Adair ER et al. 1999

Adair E R, Cobb B L, Mylacraine K S, Kelleher S A

Human exposure at two radiofrequencies (450 and 2450 MHz): similarities and differences in physiological response

In: Bioelectromagnetics, 20. Jg. (1999), S. 12.

ABSTRACT:
Thermoregulatory responses of heat production and heat loss were measured in two different groups of seven adult volunteers (males and females) during 45-min dorsal exposures of the whole body to 450 or 2450 MHz continuous-wave radio frequency (RF) fields. At each frequency, two power densities (PD) were tested at each of three ambient temperatures (T(a) = 24, 28, and 31 degrees C) plus
T(a) controls (no RF). The normalized peak surface specific absorption rate (SAR), measured at the location of the subject's center back, was the same for comparable PD at both frequencies, i.e., peak surface SAR = 6.0 and 7.7 W/kg. No change in metabolic heat production occurred under any exposure conditions at either frequency. The magnitude of increase in those skin temperatures under direct irradiation was directly related to frequency, but local sweating rates on back and chest were related more to T(a) and SAR. Both efficient sweating and increased local skin blood flow contributed to the regulation of the deep body
(esophageal) temperature to within 0.1 degrees C of the baseline level. At both frequencies, normalized peak SARs in excess of ANSI/IEEE C95.1 guidelines were easily counteracted by normal thermophysiological mechanisms. The observed frequency-related response differences agree with classical data concerning the
control of heat loss mechanisms in human beings. However, more practical dosimetry than is currently available will be necessary to evaluate realistic human exposures to RF energy in the natural environment.

SCHLAGWÖRTER:
medicine; experimentally; hf; biological effects

Adey WR 1981

Adey W R

Tissue interactions with nonionizing electromagnetic fields

In: Physiol Rev, 61. Jg. (1981), S. 435.

ABSTRACT:
No abstract available

SCHLAGWÖRTER:
bioassay; basic research; elf/hf; biological effects

Adey WR 1993

Adey W R

Biological effects of electromagnetic fields

In: J Cell Biochem, 5. Jg. (1993), S. 410.

ABSTRACT:
Life on earth has evolved in a sea of natural electromagnetic (EM) fields. Over the past century, this natural environment has sharply changed with introduction of a vast and growing spectrum of man-made EM fields. From models based on equilibrium thermodynamics and thermal effects, these fields were initially considered too weak to interact with biomolecular systems, and thus incapable of influencing physiological functions. Laboratory studies have tested a spectrum of EM fields for bioeffects at cell and molecular levels, focusing on exposures at athermal levels. A clear emergent conclusion is that many observed interactions are not based on tissue heating. Modulation of cell surface chemical events by weak EM fields indicates a major amplification of initial weak triggers associated with binding of hormones, antibodies, and neurotransmitters to their specific binding sites. Calcium ions play a key role in this amplification. These studies support new concepts of communication between cells across the barriers of cell membranes; and point with increasing certainty to an essential physical organization in living matter, at a far finer level than the structural and functional image defined in the chemistry of molecules. New collaborations between physical and biological scientists define common goals, seeking solutions to the physical nature of matter through a strong focus on biological matter. The evidence indicates mediation by highly nonlinear, nonequilibrium processes at critical steps in signal coupling across cell membranes. There is increasing evidence that these events relate to quantum states and resonant responses in biomolecular systems, and not to equilibrium thermodynamics associated with thermal energy exchanges and tissue heating.

SCHLAGWÖRTER:
bioassay; Review; elf/hf; biological effects

Adey WR et al. 1982

Adey W R, Bawin S M, Lawrence A F

Effects of weak amplitude modulated microwave fields on calcium efflux from awake cat cerebral cortex

In: Bioelectromagnetics, 3. Jg. (1982), S. 295.

ABSTRACT:
Calcium (45Ca2+) efflux was studied from preloaded cortex in cats immobilized under local anesthesia, and exposed to a 3.0-mW/cm2 450-MHz field, sinusoidally amplitude modulated at 16 Hz modulation depth 85%). Tissue dosimetry showed a field of 33 V/m in the interhemispheric fissure (rate of energy deposition 0.29 W/kg). Field exposure lasted 60 min. By comparison with controls, efflux curves from field exposed brains were disrupted by waves of increased 45Ca2+ efflux. These waves were irregular in amplitude and duration, but many exhibited periods of 20-30 min. They continued into the postexposure period. Binomial probability analysis indicates that the field-exposed efflux curves constitute a different population from controls at a confidence level of 0.96. In about 70% of cases, initiation of field exposure was followed by increased end-tidal CO2 excretion for about 5 min. However, hypercapnea induced by hypoventilation did not elicit increased 45Ca2+ efflux. Thus this increase with exposure does not appear to arise as a secondary effect of raised cerebral CO2 levels. Radioactivity measurements in cortical samples after superfusion showed 45Ca2+ penetration at about 1.7 mm/hr, consistent with diffusion of the ion in free solution.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Adey WR et al. 1999

Adey W R, Byus C V, Cain C D, Higgins R J, Jones R A, Kean C J, Kuster N, MacMurray A, Stagg R B, Zimmerman G, Phillips J L, Haggren W

Spontaneous and nitrosourea induced primary tumours in Fischer 344 rats chronically exposed to 836 MHz modulated microwaves

In: Radiat Res, 152. Jg. (1999), S. 293.

ABSTRACT:
We have tested an 836.55 MHz field with North American Digital Cellular (NADC) modulation in a 2-year animal bioassay that included fetal exposure. In offspring of pregnant Fischer 344 rats, we tested both spontaneous tumorigenicity and the incidence of induced central nervous system (CNS) tumors after a single dose of the carcinogen ethylnitrosourea (ENU) in utero, followed by intermittent digital-phone field exposure for 24 months. Far-field exposures began on gestational day 19 and continued until weaning at age 21 days. Near-field exposures began at 35 days and continued for the next 22 months, 4 consecutive days weekly, 2 h/day. SAR levels simulated localized peak brain exposures of a cell phone user. Of the 236 original rats, 182 (77%) survived to the termination of the whole experiment and were sacrificed at age 709-712 days. The 54 rats (23%) that died during the study ("preterm rats") formed a separate group for some

statistical analyses. There was no evidence of tumorigenic effects in the CNS from exposure to the TDMA field. However, some evidence of tumor-inhibiting effects of TDMA exposure was apparent. Overall, the TDMA field-exposed animals exhibited trends toward a reduced incidence of spontaneous CNS tumors (P < 0. 16, two-tailed) and ENU-induced CNS tumors (P < 0.16, two-tailed). In preterm rats, where primary neural tumors were determined to be the cause of death, fields decreased the incidence of ENU-induced tumors (P < 0.03, two-tailed). We discuss a possible approach to evaluating with greater certainty the possible inhibitory effects of TDMA-field exposure on tumorigenesis in the CNS.

SCHLAGWÖRTER:
bioassay; experimentally; hf; cancer

Ahlbom A 1988

Ahlbom A

A review of the epidemiologic literature on magnetic fields and cancer

In: Scand J Work Environ Health, 14. Jg. (1988), S. 337.

ABSTRACT:
Since 1979 several studies have been published that suggest that residential exposure to electromagnetic fields could increase the risk of childhood cancer. Such studies have also been published for adults. In addition there are several studies suggesting that people in "electrical" occupations are at an increased risk of cancer. The objective of this review was to determine whether the role of electromagnetic fields in the origin of cancer can be established from the epidemiologic literature. Several of the studies suffer from methodological or other shortcomings, but it is not clear whether these problems are likely to explain the results. No conclusion can be drawn about the role of electromagnetic fields in the origin of cancer on the basis of current data. The existing literature, however, strongly suggests that research in this area should be pursued.

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; cancer

Ahlbom A et al. 1999

Ahlbom A, Feychting M

Magnetic Field Exposure Estimates Based on Power Lines Near Homes

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 79.

ABSTRACT:
We conducted a case-control study to test the hypothesis that exposure tomagnetic fields of the type generated by high-voltage power lines increasesthe incidence of leukemia and central nervous system tumors in adults. Thestudy was based on people who, between 1960 and 1985, had lived on aproperty in Sweden located within 300 meters of 220 or 400 kilovolt powerlines. We identified a total of 325 leukemia cases and 223 cases of centralnervous system tumor. Two matched controls per case were selected atrandom. We assessed exposure by spot measurements and by calculations ofthe magnetic fields generated by the power lines. For calculated magneticfield levels of 0.2 ?T or more closest in time to diagnosis, we found anelevated relative risk (RR) for acute myeloid leukemia [RR = 1.7; 95%confidence interval (CI) = 0.8-3.5] and chronic myeloid leukemia [RR = 1.7;95% CI = 0.7-3.8]. Using cumulative exposure for the 15 years precedingdiagnosis, we found relative risk estimates for acute and chronic myeloidleukemia of 2.3 (95% CI = 1.0-4.6) and 2.1 (95% CI = 0.9-4.7),respectively, for the highest exposure category. For chronic lymphaticleukemia and for central nervous system tumors, relative risk estimateswere close to or below unity.

SCHLAGWÖRTER:
physics; ecological; elf; others

Ahlbom A et al. 1999a

Ahlbom A, Feychting M

Re: Use of cellular phones and the risk of brain tumours: a case-control study

In: Int J Oncol, 15. Jg. (1999), S. 1045.

ABSTRACT:
No abstract available

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Ahlbom A et al. 2000

Ahlbom A, Day N, Feychting M, Roman E, Skinner J, Dockerty J, Linet M, McBride M, Michaelis J, Olsen JH, Tynes T, Verkasalo PK

A pooled analysis of magnetic fields and childhood leukaemia

In: Br J Cancer, 83. Jg. (2000), S. 692.

ABSTRACT:
Previous studies have suggested an association between exposure to 50-60 Hz magnetic fields (EMF) and childhood leukaemia. We conducted a pooled analysis based on individual records from nine studies, including the most recent ones. Studies with 24/48-hour magnetic field measurements or calculated magnetic fields were included. We specified which data analyses we planned to do and how to do them before we commenced the work. The use of individual records allowed us to use the same exposure definitions, and the large numbers of subjects enabled more precise estimation of risks at high exposure levels. For the 3203 children with leukaemia and 10 338 control children with estimated residential magnetic field exposures levels < 0.4 microT, we observed risk estimates near the no effect level, while for the 44 children with leukaemia and 62 control children with estimated residential magnetic field exposures >/= 0.4 microT the estimated summary relative risk was 2.00 (1.27-3.13), P value = 0.002). Adjustment for potential confounding variables did not appreciably change the results. For North American subjects whose residences were in the highest wire code category, the estimated summary relative risk was 1.24 (0.82-1.87). Thus, we found no evidence in the combined data for the existence of the so-called wire-code paradox. In summary, the 99.2% of children residing in homes with exposure levels < 0.4 microT had estimates compatible with no increased risk, while the 0.8% of children with exposures >/= 0.4 microT had a relative risk estimate of approximately 2, which is unlikely to be due to random variability. The explanation for the elevated risk is unknown, but selection bias may have accounted for some of the increase.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Alam MT et al. 1978

Alam M T, Barthakur N, Lambert N G, Kasatiya S S

Cytological effects of microwave radiation in Chinese hamster cells in vitro

In: Can J Genet Cytol, 20. Jg. (1978), S. 23.

ABSTRACT:
Cytological effects were investigated in the Chinese hamster cell line (CHO-K1) exposed to microwave radiation of 2450 MHz frequency and incident power of 25 to 200 W for a period of 30 min. Nuclear vacuoles, pycnotic and decondensed chromosomes were observed in cells exposed to 25 W under elevated temperature conditions (uncontrolled temp). In addition a significant increase in chromosomal breakages/cell was observed. Cells exposed to relatively higher power, 75-200 W, under hypothermic conditions (29 degrees C) revealed no significant increase in either nuclear vacuoles or other chromosomal anomalies over control cells. Radiation-induced temperature elevation appears to be an essential

factor in the cytological effects of microwave.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Albert EN 1979

Albert E N
Reversibility of microwave induced blood-brain barrier permeability
In: Radio Sci, 14. Jg. (1979), S. 323.

ABSTRACT:
No abstract available

SCHLAGWÖRTER:
medicine; basic research; hf; biological effects

Albert EN et al. 1981

Albert E N, Kerns J M
Reversible microwave effects on the blood-brain barrier
In: Brain Res, 230. Jg. (1981), S. 153.

ABSTRACT:
No abstract available

SCHLAGWÖRTER:
medicine; basic research; hf; biological effects

Albert EN et al. 1987

Albert E N, Slaby F, Roche J, Loftus J
Effect of amplitude modulated 147 MHz radiofrequency radiation
on calcium ion efflux from avian brain tissue
In: Radiat Res, 109. Jg. (1987), S. 19.

ABSTRACT:
Cerebral cortex tissue slices and cerebral hemispheres prepared from Gallus domesticus chicks were exposed to 147 MHz radiofrequency radiation, amplitude modulated at 16 Hz and applied at a power density of 0.75 mW/cm2, to determine the effect of such exposure of 45Ca2+ efflux from the avian brain tissue. Statistical analysis of these data demonstrates that such exposure has no significant effect on 45Ca2+ efflux.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Aldrich TE et al. 2001

Aldrich T E, Andrews K W, Liboff A R
Brain cancer risk and electromagnetic fields (EMFs): assessing the geomagnetic component
In: Arch Environ Health, 56. Jg. (2001), S. 314.

ABSTRACT:
Cancer cluster studies in North Carolina identified several communities in which there existed an elevated risk of brain cancer. These findings prompted a series of case-control studies. The current article, which originated from the results of the 3rd of such studies, is focused on inclusion of the earth's own geomagnetic fields that interact with electromagnetic fields generated from distribution power lines. This article also contains an assessment of the contribution of confounding by residential (e.g., urban, rural) and case characteristics (e.g., age, race, gender). Newly diagnosed brain cancer cases were identified for a 4-county region of central North Carolina, which the authors chose on the basis of the results of earlier observations. A 3:1 matched series of cancer cases from the same hospitals in which the cases were diagnosed served as the comparison group. Extensive geographic information was collected and was based on an exact place of residence at the time of cancer diagnosis, thus providing several strategic geophysical elements for assessment. The model for this assessment was based on the effects of these two sources of electromagnetic fields for an ion cyclotron resonance mechanism of disease risk. The authors used logistic regression models that contained the predicted value for the parallel component of the earth's magnetic field; these models were somewhat erratic, and the elements were not merged productively into a single statistical model. Interpretation of these values was difficult; therefore, the modeled values for the model elements, at progressive distances from the nearest power-line segments, are provided. The results of this study demonstrate the merits of using large, population-based databases, as well as using rigorous Geographic Information System techniques, for the assessment of ecologic environmental risks. The results also suggest promise for exposure classification that is compatible with the theoretical biological mechanisms posited for electromagnetic fields

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Alhekail ZO 2001

Alhekail Z O
Electromagnetic radiation from microwave ovens
In: J Radiol Prot, 21. Jg. (2001), S. 251.

ABSTRACT:
Electromagnetic radiation from microwave ovens in Saudi Arabia was investigated by means of a field measurement survey. The survey was carried out for 106 ovens used in households and restaurants in Riyadh city. Ovens were between 1 month and 14 years old with operating power ranging from 0.5 to 4.4 kW. One oven was found to leak more than the 5 mW cm(-2) limit specified in the standard. Fifteen other ovens were found to leak 1 mW cm(-2) or more, with the remaining ovens leaking less than that. Based on the survey result, previous studies and the fast decay of radiated power density with distance from the oven, the conclusion was that user exposure to RF radiation from microwave ovens is much less than the general public exposure limit set by most international standards at 2450 MHz, i.e. 1 mW cm(-2), and that a detrimental effect on health is an unlikely result of exposure to radiation from microwave ovens.

SCHLAGWÖRTER:
physics; basic research; hf; others

Allis JW et al. 1987

Allis J W, Sinha-Robinson B L
Temperature-specific inhibition of human cell Na+/K+ ATPase by 2450 MHz microwave radiation
In: Bioelectromagnetics, 8. Jg. (1987), S. 203.

ABSTRACT:
The ATPase activity in human red blood cell membranes was investigated in vitro as a function of temperature and exposure to 2,450-MHz continuous wave microwave radiation to confirm and extend a report of Na+ transport inhibition under certain conditions of temperature and exposure. Assays were conducted spectrophotometrically during microwave exposure with a custom-made spectrophotometer-waveguide apparatus. Temperature profiles of total ATPase and Ca+2 ATPase (ouabain-inhibited) activity between 17 and 31 degrees C were graphed as an Arrhenius plot. Each data set was fitted to two straight lines which intersect between 23 and 24 degrees C. The difference between the total and Ca+2 ATPase activities, which represented the Na+/K+ ATPase activity, was also plotted and treated similarly to yield an intersection near 25 degrees C. Exposure of membrane suspensions to electromagnetic radiation, at a dose rate of 6 W/kg and at five temperatures between 23 and 27 degrees C, resulted in an activity change only for the Na+/K+ ATPase at 25 degrees C. The activity decreased by approximately 35% compared to sham-irradiated samples. A possible explanation for the unusual temperature/microwave interaction is proposed.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Alm H 1995

Alm H, Nilsson L

The effects of a mobile telephone task on driver behaviour in a car following situation

In: Accid Anal Prev, 27. Jg. (1995), S. 707.

ABSTRACT:
The effects of a mobile telephone task on young and elderly drivers' choice reaction time, headway, lateral position, and workload were studied when the subjects were driving in a car-following situation, in the VTI driving simulator. It was found that a mobile telephone task had a negative effect upon the drivers' choice reaction time, and that the effect was more pronounced for the elderly drivers. Furthermore, the subjects did not compensate for their increased reaction time by increasing their headway during the phone task. The subjects' mental workload, as measured by the NASA-TLX, increased as a function of the mobile telephone task. No effect on the subjects' lateral position could be detected. Taken together, these results indicate that the accident risk can increase when a driver is using the mobile telephone in a car following situation. The reasons for the increased risk, and possible ways to eliminate it, are also discussed.

SCHLAGWÖRTER:
medicine; experimentally; hf; others

Alm H et al. 1994

Alm H, Nilsson L

Changes in driver behaviour as a function of handsfree mobile phones - a simulator study

In: Accid Anal Prev, 26. Jg. (1994), S. 441.

ABSTRACT:
The effects of a mobile telephone task on drivers' reaction time, lane position, speed level, and workload were studied in two driving conditions (an easy or rather straight versus a hard or very curvy route). It was predicted that the mobile telephone task would have a negative effect on drivers' reaction time, lane position, and workload and lead to a reduction of speed. It was also predicted that the effects would be stronger for the hard driving task. The study was conducted in the VTI driving simulator. A total of 40 subjects, experienced drivers aged 23 to 61, were randomly assigned to four experimental conditions (telephone and easy or hard driving task versus control and easy or hard driving task). Contrary to the predictions, the strongest effects were found when the subjects were exposed to the easy driving task. In the condition where drivers had to perform the easy driving task, findings showed that a mobile telephone task had a negative effect on reaction time and led to a reduction of the speed level. In the condition where drivers had to perform the hard driving task, findings showed that a mobile telephone task had an effect only on the drivers' lateral position. Finally, the mobile telephone task led to an increased workload for both the easy and the hard driving task. The results are discussed in terms of which subtask, car driving or telephone task, the subjects gave the highest priority. Some implications for information systems in future cars are discussed.

SCHLAGWÖRTER:
medicine; experimentally; hf; others

Anderstam B et al. 1983

Anderstam B, Hamnerium Y, Hussain S, Ehrenberg L

Studies of possible genetic effects in bacteria of high frequency electromagnetic fields

In: Hereditas, 98. Jg. (1983), S. 11.

ABSTRACT:
Possible non-thermal mutagenic effects of high frequency electromagneticfields on Salmonella typhimurium and Escherichia coli were investigated.Bacteria were exposed to the following fields: 27.12 MHz CW electric field,27.12 MHz CW magnetic field, 2.45 GHz CW electromagnetic far field, and3.07 GHz pulsed electromagnetic far field. The temperature of the treatedsample as well as of the non-exposed control sample was kept constant at37.0°C (temperature differences between exposed and control sampleswere less than ± 0.3°C). In eleven different strains ofbacteria, forward, backmutation or prophage induction were measured.Exponentially growing bacteria in nutrient medium were exposed tomicrowaves (SAR 35-100 W/kg) and RF fields (SAR up to 4 W/kg) during 1-7hours. The cellular growth was measured for all strains. A conspicuousstimulation of growth was observed, especially under certain treatmentconditions and in certain bacterium strains. Possible temperature changesmight explain only a minor part of this effect. The relative increase inbacterium count was most marked towards the end of exponential growth.Bacteria exhibited an increased metabolic rate during exposure, illustratedby an increased rate of RNA synthesis. The pooled mutation frequency (forall exposures and strains) did not differ from that of the controls. A weakprophage-inducing capacity and a certain ability to modify the response toUV-irradiation were noted, possibly indicating a mobilization of'SOS-functions'. The upper confidence limit of the accepted hypothesis ofno mutagenic action corresponds to the response that, in the bacteriumstrains studied, is elicited by about 10 rad of ?-radiation. Applyingthe radiation-dose equivalent for risk estimation, and using a riskcoefficient of 2 x 10-4 rad-1 for cancer death, theratio of absorbed doses due to occupational exposure in Sweden (about1010J year-1) and in the present experiments (about106 J kg-1) gives an estimated cancer risk of lessthan one case annually.

SCHLAGWÖRTER:
bioassay; Review; hf; biological effects

Andrews KW et al. 1999

Andrews K W, Savitz D A

Accuracy of industry and occupation on death certificates of electric utility workers: implications for epidemiologic studies of magnetic fields and cancer

In: Bioelectromagnetics, 20. Jg. (1999), S. 512.

ABSTRACT:
A substantial epidemiologic literature has relied on occupation and industry information from death certificates to make inferences about the association of electric and magnetic field exposure with cancer, but the validity of the occupational data on death certificates is questionable. We compared occupation and industry information from death certificates to company work histories for 793 electric utility workers who died from brain cancer (n=143), leukemia (n=156), lung cancer (n=246, randomly sampled), and non-cancer causes (n=248, randomly sampled). Nearly 75% of death certificates correctly indicated utility industry employment and of those, 48% matched the longest held occupation derived from company work histories. Hence, only 36% matched on both industry and occupation. We computed odds ratios relating occupations involving magnetic field exposure to brain cancer and leukemia both for the occupation listed on the death certificate and for the longest-held occupation based on company records in order to examine the impact of exposure misclassification based on reliance on the death certificate information. For brain cancer, the odds ratio was 1.2 based on death certificates and 1.7 based on company work history, suggesting some attenuation due to misclassification. For leukemia, death certificate information yielded an odds ratio of 0.9, whereas company work histories yielded an odds ratio of 1.3. Although work histories are limited to the period of employment in a specific company, these data suggest that there is substantial misclassification in use of death certificate information on industry and occupation of utility workers, as found in other industries. The limited quality of occupation and industry information on death certificates argues against relying on such information to evaluate

modest associations with mortality.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Antonopoulos A et al. 1997

Antonopoulos A, Eisenbrandt H, Obe G

Effects of high-frequency electromagnetic fields on human lymphocytes in vitro

In: Mutat Res, 395. Jg. (1997), S. 209.

ABSTRACT:
Human peripheral lymphocytes were incubated in the presence of high-frequency electromagnetic fields of 380, 900 and 1800 MHz. The measured endpoints were cell cycle progression and the frequencies of sister-chromatid exchanges. No differences between treated and control cultures could be found.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Appleton B et al. 1972

Appleton B, McCrossan G C

Microwave lens effects in humans

In: Arch Ophthalmol, 88. Jg. (1972), S. 259.

ABSTRACT:
No abstract available

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; biological effects

Appleton B et al. 1975

Appleton B, Hirsch S, Kinion R O, Soles M, McCrossan G C, Neidlinger R M

Microwave lens effects in humans. II. Results of five-year survey

In: Arch Ophthalmol, 93. Jg. (1975), S. 257.

ABSTRACT:
Individuals selected on the basis of likelihood of occupational exposure to microwaves were subjected to a biomicroscopic examination of the lens. Control personnel were also examined along with them, the examiners having no knowledge of the exposure history of any examinee prior to or during the examination. Objective evidence of lens abnormality (opacities, vacuoles, or posterior subcapsular iridescence) was recorded and a comparison made between the two groups on the basis of that evidence. The comparison showed the two groups to be essentially the same and did not support the hypothesis that human lens damage is occurring in the military environment in this country. Instead, it tended to support the assumption that the existing safety level of 10 MW/sq cm is adequate.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; biological effects

Arber SL et al. 1984

Arber S L, Lin J C

Microwave enhancement of membrane conductance: effects of EDTA, caffeine and tetracaine

In: Physiol Chem Phys Med NMR, 16. Jg. (1984), S. 469.

ABSTRACT:
Effects of tetracaine and caffeine on snail neurons were studied. They displayed depolarization and an increase of membrane conductance. In addition, tetracaine diminished membrane time constant whereas caffeine augmented hyperpolarizing after-potential. It was also shown that tetracaine blocks the caffeine effect. Microwave irradiation of snail neurons enhanced membrane conductance. This effect was not observed in neurons treated with tetracaine or injected with EDTA. Analysis of these results points to intracellular free calcium as a possible trigger of snail neuron microwave response.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Arber SL et al. 1985

Arber S L, Lin J C

Microwave induced changes in nerve cells: effects of modulation and temperature

In: Bioelectromagnetics, 6. Jg. (1985), S. 257.

ABSTRACT:
Helix aspersa neurons were irradiated with continuous-wave (CW) and noise-amplitude-modulated microwaves (carrier frequency 2450 MHz, 20% AM, 2 Hz-20 kHz) in a specially designed waveguide exposure system. Continuous-wave microwave irradiations were conducted at 8 degrees, 21 degrees, and 28 degrees C, while noise-modulated irradiation was performed at 21 degrees C. The results showed that exposure of snail neurons to CW microwaves for 60 min at 12.9 W/kg inhibited spontaneous activity and reduced input resistance at 8 degrees and 21 degrees C but not at 28 degrees C. The relative decrease in resistance at 21 degrees C was half that at 8 degrees C. Exposure of neurons to noise-modulated microwaves at 6.8 and 14.4 W/kg predominately caused excitatory responses characterized by augmented membrane resistance and the appearance of greater activity. The effect differed qualitatively from the inhibition observed with continuous, unmodulated microwave irradiation.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Arkin H et al. 1994

Arkin H, Xu L X, Holmes K R

Recent developments in modeling heat transfer in blood perfused tissues

In: IEEE Trans Biomed Eng, 41. Jg. (1994), S. 97.

ABSTRACT:
Successful hyperthermia treatment of tumors requires understanding the attendant thermal processes in both diseased and healthy tissue. Accordingly, it is essential for developers and users of hyperthermia equipment to predict, measure and interpret correctly the tissue thermal and vascular response to heating. Modeling of heat transfer in living tissues is a means towards this end. Due to the complex morphology of living tissues, such modeling is a difficult task and some simplifying assumptions are needed. Some investigators have recently argued that Pennes' interpretation of the vascular contribution to heat transfer in perfused tissues fails to account for the actual thermal equilibration process between the flowing blood and the surrounding tissue and proposed new models, presumably based on a more realistic anatomy of the perfused tissue. The present review compares and contrasts several of the new bio-heat transfer models, emphasizing the problematics of their experimental validation, in the absence of measuring equipment capable of reliable evaluation of tissue properties and their variations that occur in the spatial scale of blood vessels with diameters less than about .2 mm. For the most part, the new models still lack sound experimental grounding, and in view of their inherent complexity, the best practical approach for modeling bio-heat transfer during hyperthermia may still be the Pennes model, providing its use is based on some insights gained from the studies described here. In such cases, these models should yield a more realistic description of tissue locations and/or thermal conditions for which the Pennes' model might not apply.

SCHLAGWÖRTER:
bioassay; Review; elf/hf; others

Armstrong B et al. 1994

Armstrong B, Theriault G, Guenel P, Deadman J, Goldberg M, Heroux P

Association between exposure to pulsed electromagnetic fields and cancer in electric utility workers in Quebec, Canada, and France

In: Am J Epidemiol, 140. Jg. (1994), S. 805.

ABSTRACT:
The authors report the association between exposure to pulsed electromagnetic fields (PEMFs) and cancer in a nested case-control study of electric utility workers in Quebec, Canada (follow-up, 1970-1988), and France (follow-up, 1978-1989), among whom 2,679 cases of cancer were identified. Exposures were assessed through a job-exposure matrix based on about 1,000 person-weeks of measurements from exposure meters worn by workers. Exposures were considerably higher in Quebec than in France. No association was found between PEMFs and cancers previously suspected of association with magnetic fields (leukemia, other hematopoietic cancers, brain cancer, or melanoma). However, there was a clear association between cumulative exposure to PEMFs and lung cancer, with odds ratios rising to 3.11 (95% confidence interval (CI) 1.60-6.04) in the highest exposure group (84 cases). This association with largely confined to Quebec, where there was a monotonic exposure-response relation with an odds ratio of 6.67 (95% CI 2.68-16.57) in the highest exposure group (32 cases). The association is substantial and was not explained by smoking or other occupational exposures. However, several factors limit the strength of the evidence for a causal relation: lack of precision in what the meters measured; little previous evidence for this association; and no elevated risk for lung cancer in the utility workers overall in comparison with the general population.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Arnetz B B et al. 1996

Arnetz B B, Berg M

Melatonin and adrenocorticotropic hormone levels in video display unit workers during work and leisure
J Occup Environ Med

In: [Titel der Zeitschrift fehlt!], 38. Jg. (1996), S. 1108.

ABSTRACT:
This study examined 47 office workers during a day of regular work in front of a video display unit (VDU) and a day of leisure in the same environment. The study investigated possible effects of VDU work on circulating melatonin and adrenocorticotropic hormone (ACTH) levels. Circulating melatonin levels decreased significantly during VDU work, whereas ACTH levels increased significantly. In contrast, melatonin and ACTh levels did not change significantly during a day of leisure. Mental strain during work was significantly and positively associated with circulating levels of ACTH but not melatonin. The results indicate that the VDU environment is associated with measurable changes in melatonin and ACTH levels. Mental strain might explain changes in ACTH levels, but specific factors that might contribute to changes in melatonin levels are unknown. These findings might be relevant to the recent debate about the possible influence that electromagnetic and VDU environments might have on electromagnetic sensitivity.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Asanami S et al. 1999

Asanami S, Shimono K

High body temperature induces micronuclei in mouse bone marrow

In: Mutat Res, 390. Jg. (1999), S. 79.

ABSTRACT:
The mouse micronucleus test was conducted to investigate the effect of highbody temperature on micronucleus induction. Groups of 10 male ddY mice wereexposed to 30°C for 1, 3 or 6 h, 37°C for 0.5, 1, 2, 3 or 4 h, and40°C for 1 or 2 h. Bone marrow cells were sampled 24 h after heatexposure. Exposure of mice to 37°C for 3 or 4 h and 40°C for 1 or 2h raised body temperature to approximately 40.5°C and producedstatistically significant increases in micronucleated polychromaticerythrocyte frequencies (8.1 ± 4.5, 6.0 ± 2.1, 5.3 ±3.3, 7.5 ± 2.9‰, respectively; control frequencies, 2.0± 1.1‰). In addition, about 25% of the induced micronucleiwere relatively large (diameter of micronucleus ? 1/4 diameter ofcytoplasm). These results suggest that body temperatures of 39.5°C orhigher for more than 30 min induce micronuclei in bone marrow cells, andone possible mechanism is disturbance of the mitotic apparatus.

SCHLAGWÖRTER:
bioassay; basic research

Auvinen A et al. 2000

Auvinen A, Linet M S, Hatch E E, Kleinerman R A, Robison L L, Kaune W T, Misakian M, Niwa S, Wacholder S, Tarone R E

Extremely low-frequency magnetic fields and childhood acute lymphoblastic leukemia: an exploratory analysis of alternative exposure metrics

In: Am J Epidemiol, 152. Jg. (2000), S. 20.

ABSTRACT:
Data collected by the National Cancer Institute-Children's Cancer Group were utilized to explore various metrics of magnetic field levels and risk of acute lymphoblastic leukemia (ALL) in children. Cases were aged 0-14 years, were diagnosed with ALL during 1989-1993, were registered with the Children's Cancer Group, and resided in one home for at least 70 percent of the 5 years immediately prior to diagnosis. Controls were identified by using random digit dialing and met the same residential requirements. With 30-second ("spot") measurements and components of the 24-hour measurement obtained in the subject's bedroom, metrics evaluated included measures of central tendency, peak exposures, threshold values, and measures of short-term temporal variability. Measures of central tendency and the threshold measures showed good-to-high correlation, but these metrics correlated less well with the others. Small increases in risk (ranging from 1.02 to 1.69 for subjects in the highest exposure category) were associated with some measures of central tendency, but peak exposures, threshold values, measures of short-term variability, and spot measurements demonstrated little association with risk of childhood ALL. In general, risk estimates were slightly higher for the nighttime (10 p.m.-6 a.m.) interval than for the corresponding 24-hour period

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Auvinen A et al. 2002

Auvinen A, Hietanen M, Luukkonen R, Koskela R S

Brain tumors and salivary gland cancers among cellular telephone users.

In: Epidemiology, 13. Jg. (2002), S. 356.

ABSTRACT:
BACKGROUND: Possible risk of cancer associated with use of cellular telephones has lately been a subject of public debate. METHODS: We conducted a register-based, case-control study on cellular phone use and cancer. The study subjects were all cases of brain tumor (N = 398) and salivary gland cancer (N = 34) diagnosed in Finland in 1996, with five controls per case. RESULTS: Cellular phone use was not associated with brain tumors or salivary gland cancers overall, but there was a weak association between gliomas and analog cellular phones

CONCLUSIONS: A register-based approach has limited value in risk assessment of cellular phone use owing to lack of information on exposure.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Averbeck D et al. 1976

Averbeck D, Dardalhon M, Berteaud A J

Microwaves action in procaryotic and eucaryotic cells and a possible interaction with x-rays

In: J Microwave Power Electromag Energy, 11. Jg. (1976), S. 143.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Balcer-Kubiczek E K et al. 1985

Balcer-Kubiczek E K, Harrison G H

Evidence for microwave carcinogenesis in vitro

In: Carcinogenesis, 6. Jg. (1985), S. 859.

ABSTRACT:
We investigated the carcinogenic activity of 2.45 GHz microwave radiation (MW) combined with benzo[a]pyrene (BP) or X-rays, using an in vitro assay for malignant transformation in C3H/10T1/2 mouse-embryo fibroblasts. Additional experiments were performed to assess the effect of a non-cytotoxic and non-transforming concentration of the tumor promoter 12-O-tetradecanoylphorbol-13-acetate (TPA) on transformation induction in cells treated with MW and X-rays. Experiments were performed at low incident power density, corresponding to an energy absorption rate of 4.4 W/kg. Cells were treated at 37.2+/-0.1 degree C. MW reduced the plating efficiency of 50%, while TPA increased it by 40%. MW had no effect on transformation induced by BP or X-rays in the absence of tumor promoter. TPA treatment of cells previously irradiated with MW and X-rays yielded a statistically significant 3.5- or 1.6-fold increase in transformation when compared with the transformation frequency of cells previously irradiated with X-rays alone at 1.5 and 4.5 Gy, respectively. Our results suggest that low-level 2.45 GHz MW radiation can induce latent transformation damage which can then be revealed by the action of tumor promoters.

SCHLAGWÖRTER:
bioassay; basic research; hf; cancer

Balcer-Kubiczek E K et al. 1989

Balcer-Kubiczek E K, Harrison G H

Induction of neoplastic transformation in C3H/10T 1/2 cells by 2.45-GHz microwaves and phorbol ester

In: Radiat Res, 117. Jg. (1989), S. 531.

ABSTRACT:
C3H/10T1/2 cells were exposed to 2.45-GHz microwaves for 24 h and/or 1.5 Gy of 238-kVp X rays at 3.75 Gy/min. Transformation frequency and cell survival were measured with or without postirradiation addition of the tumor promoter tetradecanoyl-phorbol-13-acetate (TPA) at 0.1 microgram/ml. We previously reported (Carcinogenesis 6,859-864, 1985) an enhancement of transformation frequency when 10T1/2 cells exposed to a special sequence of microwaves and X rays were subsequently cultured in TPA. The same sequence of microwaves and X rays without promotion resulted in a transformation response similar to that induced by X rays alone. We now report statistically significant (at P greater than 0.999) enhancement of transformation response by TPA in cells exposed to 2.45-GHz microwaves (SAR = 4.4 W/kg). Microwaves alone had no effect on transformation. Plating efficiency and cell survival were not affected by TPA or microwave treatments.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Balcer-Kubiczek E K et al. 1991

Balcer-Kubiczek E K

Neoplastic transformation of C3H/10T 1/2 cells following exposure to 120-Hz modulated 2.45-GHz microwaves and phorbol ester tumor promoter

In: Radiat Res, 126. Jg. (1991), S. 65.

ABSTRACT:
Some recent epidemiological studies have shown a positive association between cancer incidence and exposure to electromagnetic (EM) fields. Evidence from in vitro studies indicates that this effect could be due to synergistic interaction between EM fields and tumor promoters. However, no dose-response data related directly to carcinogenesis have been published. In this study, actively growing cultures of C3H/10T1/2 cells were exposed for 24 h to 2.45-GHz microwaves pulse-modulated at 120 Hz. Conditions of EM-field exposure were designed to simulate low-field exposures (specific absorption rate 0.1, 1, or 4.4 W/kg; the corresponding peak amplitudes were electric field 18, 56, or 120 V/m, magnetic field 0.09, 0.27, or 0.56 muT, respectively). In separate experiments, a 24-h EM-field exposure at 4.4 W/kg was preceded or followed by X irradiation at 0.5, 1, or 1.5 Gy. Cells were assayed for cell survival and neoplastic transformation with or without post-treatment administration of 0.1 micrograms/ml of 12-O-tetradecanoylphorbol-13-acetate (TPA) for the duration of the assay. The EM fields alone had no effect on cell survival or induction of neoplastic transformation. However, enhancement of transformation due to EM fields plus TPA was highly significant and ranged up to a level equivalent to that produced by 1.5 Gy of X rays. The frequency of neoplastic transformation was dependent on the level of EM exposure and was additive with doses of X rays given as a cocarcinogen.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Ballard T et al. 2000

Ballard T, Lagorio S, De Angelis G, Verdecchia A

Cancer incidence and mortality among flight personnel: a meta-analysis

In: Aviat Space Environ Med, 71. Jg. (2000), S. 216.

ABSTRACT:
BACKGROUND: Increased cancer risk among flight personnel have previously been noted, including breast cancer among flight attendants and acute myeloid leukemia among pilots. Hypothesis: Exposure to cosmic radiation and other physical or chemical agents may pose health risks for flight personnel. METHODS: We performed an exhaustive search for published and unpublished cohort studies of flight personnel from 1986-98. We combined relative risks (RR) for selected causes from four mortality and/or incidence studies of pilots and two incidence studies of flight attendants, using standard meta-analytic methods. Heterogeneity among the combined studies was explored and adjustments were made for possible confounding by socioeconomic status (SES), where indicated, using correction factors from published studies. RESULTS: SES-adjusted combined RRs were elevated (>1.2) among male pilots for mortality from melanoma 11.97 (95%, CI: 1.02-3.82)] and brain cancer [1.49 (0.89-2.20)], and for cancer incidence of the prostate [1.65 (1.19-2.29)] and the brain [1.74 (0.87-3.30)]. Among female flight attendants, increases were seen for incidence of all cancers [1.29 (0.98-1.70)], melanoma [11.54 (0.83-2.87)], and breast cancer [1.35 (1.00-1.83)]. CONCLUSIONS: Flight personnel appear to be at increased risk for several types of cancer. Both occupational exposures and well-established non-occupational risk factors may contribute to this increased

risk. To better control for confounding factors and to identify exposures potentially amenable to preventive measures, future studies should compare risks within cohorts by flight routes, work history, and exposure to cosmic and UV radiation, electromagnetic fields, and chemical substances.

SCHLAGWÖRTER:
epidemiology; other type; hf; cancer

Balode Z 1996

Balode Z

Assessment of radio-frequency electromagnetic radiation by the micronucleus test in Bovine peripheral erythrocytes

In: Sci Total Environ, 180. Jg. (1996), S. 81.

ABSTRACT:
Previous bioindicative studies in the Skrunda Radio Location Station area have focused on the somatic influence of electromagnetic radiation on plants, but it is also important to study genetic effects. We have chosen cows as test animals for cytogenetical evaluation because they live in the same general exposure area as humans, are confined to specific locations and are chronically exposed to radiation. Blood samples were obtained from female Latvian Brown cows from a farm close to and in front of the Skrunda Radar and from cows in a control area. A simplified alternative to the Schiff method of DNA staining for identification of micronuclei in peripheral erythrocytes was applied. Microscopically, micronuclei in peripheral blood erythrocytes were round in shape and exhibited a strong red colour. They are easily detectable as the only coloured bodies in the uncoloured erythrocytes. From each individual animal 2000 erythrocytes were examined at a magnification of x 1000 for the presence of micronuclei. The counting of micronuclei in peripheral erythrocytes gave low average incidences, 0.6 per 1000 in the exposed group and 0.1 per 1000 in the control, but statistically significant ($P < 0.01$) differences were found in the frequency distribution between the control and exposed groups.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Baranski S 1972

Baranski S

Histological and histochemical effects of microwave irradiation on the central nervous system of rabbits and guinea pigs

In: Am J Physiol Med, 51. Jg. (1972), S. 182.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Baris D et al. 1996

Baris D, Armstrong B G

Exposure to magnetic fields estimated from last job held in an electrical utility in Quebec, Canada: a validation study

In: Occup Environ Med, 53. Jg. (1996), S. 334.

ABSTRACT:
OBJECTIVES: To investigate how closely the variables of exposures to magnetic fields based on the last job held in an electrical utility in Quebec, Canada, compared with those based on the workers' entire employment history with the company. METHODS: In large cohort studies, the last job held is often used to assign exposure to the study subjects. Exposure was assigned in this way for a mortality study of a cohort of electrical utility workers in Quebec. For the present study, a sample of the cohort was used to compare the exposure estimates obtained from the last job with those obtained from full work histories. RESULTS: The correlations between indices based on the last job and on all jobs varied between 0.75 and 0.78. The mean was slightly lower when only the last job was used. The last job was particularly good in identifying the most highly exposed people (for the exposure cut off point of 90th percentile for the last job and for all jobs, sensitivity = 0.69, specificity = 0.97, kappa = 0.66). The results suggest that although not all workers starting in highly exposed jobs stayed in them, it seemed that the workers who ended their working life in highly exposed jobs had stayed in these jobs throughout their working life. CONCLUSION: The results indicated some (but not catastrophic) loss of information when estimates of exposure were based on the last job only.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; others

Baris D et al. 1996a

Baris D, Armstrong B G, Deadman J, Theriault G

A mortality study of electrical utility workers in Quebec

In: Occup Environ Med, 53. Jg. (1996), S. 25.

ABSTRACT:
OBJECTIVES--The objective of this study was to investigate the mortality of electrical utility workers exposed to electric and magnetic fields. METHODS--A historical cohort mortality study was carried out on 21,744 workers who were employed in an electrical company in the province of Quebec between 1970 and 1988. The last job held by each study subject was coded. A job exposure matrix (JEM) was used to estimate the exposure to 60 Hz electric and magnetic fields, and pulsed electromagnetic fields (as recorded by the PEMF (POSITRON) meter) in this job. Standardised mortality ratios (SMRs) were calculated relative to Quebec men. Because the exposure was exclusively among blue collar workers, the remainder of the analyses by exposure were restricted to them. Rate ratios (RRs) in the exposed groups relative to the background groups were estimated with Poisson regression. There were 1582 deaths by the end of follow up. RESULTS--SMRs were almost all below one and never substantially increased, although there were a few increased rate ratios (RRs). There was a significant RR of 2.00 (95% confidence interval (95% CI) 1.37-2.93) for deaths caused by accidents and violence in workers exposed to magnetic fields, RR of 1.82 (95% CI 1.25-2.65) for electric fields, and RR of 1.62 (95% CI 1.13-2.32) for pulsed electromagnetic fields. Occupational accidents related to power lines explain some of the excess of deaths from accidents and violence. Some association was found between magnetic fields and leukaemia, brain cancer, and suicide, between electric fields and brain cancer and suicide, and between pulsed electromagnetic fields and lung cancer, but these were not significant. CONCLUSION--These results are broadly reassuring that major causes of death are not strongly associated with exposure to electric and magnetic fields, but small numbers and approximate exposure assessments preclude the denial of any risk, in particular if it were to affect a rare cause of death.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; mortality

Baris D et al. 1996b

Baris D, Armstrong B G, Deadman J, Theriault G

A case cohort study of suicide in relation to exposure to electric and magnetic fields among electrical utility workers

In: Occup Environ Med, 53. Jg. (1996), S. 17.

ABSTRACT:
OBJECTIVES--This case cohort study examines whether there is an association between exposure to electric and magnetic fields and suicide in a population of 21,744 male electrical utility workers from the Canadian Province of Quebec. METHODS--49 deaths from suicide were identified between 1970 and 1988 and a subcohort was selected comprising a 1% random sample from this cohort as a basis for risk estimation. Cumulative and current

exposures to electric fields, magnetic fields, and pulsed electromagnetic fields (as recorded by the POSITRON meter) were estimated for the subcohort and cases through a job exposure matrix. Two versions of each of these six indices were calculated, one based on the arithmetic mean (AM), and one on the geometric mean (GM) of field strengths. RESULTS--For cumulative exposure, rate ratios (RR) for all three fields showed mostly small non-significant increases in the medium and high exposure groups. The most increased risk was found in the medium exposure group for the GM of the electric field (RR = 2.76, 95% CI 1.15-6.62). The results did not differ after adjustment for socioeconomic state, alcohol use, marital state, and mental disorders. There was a little evidence for an association of risk with exposure immediately before the suicide. CONCLUSION--Some evidence for an association between suicide and cumulative exposure to the GM of the electric fields was found. This specific index was not initially identified as the most relevant index, but rather emerged afterwards as showing the most positive association with suicide among the 10 indices studied. Thus the evidence from this study for a causal association between exposure to electric fields and suicide is weak. Small sample size (deaths from suicide) and inability to control for all potential confounding factors were the main limitations of this study.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; others

Baris D et al. 1999

Baris D, Linet M, Auvinen A, Kaune W T, Wacholder S, Kleinerman R, Hatch E, Robison L, Niwa S, Haines C, Taron R E

Temporal and Other Exposure Aspects of Residential Magnetic Fields Measurement in Relation to Acute Lymphoblastic Leukaemia in Children: The National Cancer Institute Children's Cancer Group Study

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 53.

ABSTRACT:
OBJECTIVES: To investigate the impact of measuring a single home then imputing information from another home among subjects who lived in two homes in a subset of the National Cancer Institute/Children's Cancer Group (NCI/CCG) investigation of residential exposure to magnetic fields and risk of childhood leukaemia. METHODS: Each subject's summary time weighted average (TWA) exposure was derived from measurements of two homes, weighted by the fraction of the reference period lived in the residence. The three cost efficient field work strategies examined were measuring: (a) the longer lived in home; (b) the currently lived in home; and (c) the former lived in home. Two different methods were used for imputing the missing values: (a) control mean imputation, (b) status specific mean imputation. The subject's summary exposure to magnetic fields estimated with each approach was compared with the subject's TWA calculated from measurements in both homes. The association between estimated exposure to magnetic fields and the risk of leukaemia under different approaches was examined with unconditional logistic regression analysis. RESULTS: The Pearson correlation coefficient between the two measurements within subjects was 0.31 ($p < 10(-4)$, indicating a lack of independence of measurements. Differences were found between mean exposures in current and former homes of cases, and between longer and shorter lived in homes of controls. All methods with measurements from one of the homes in conjunction with imputation of measurements for the second home led to marked attenuation of risk estimates at the highest exposure category, particularly when measurements from current homes were used and those from former homes were imputed. CONCLUSION: Results argue against attempting to estimate lifetime magnetic field exposure from imputed values derived from current residences to fill in gaps caused by unmeasured residences previously lived in.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; cancer

Baris D et al. 1999a

Baris D, Linet M S, Tarone R E, Kleinerman R A, Hatch E E, Kaune W T, Robison L L, Lubin J, Wacholder S

Residential exposure to magnetic fields: an empirical examination of alternative measurement strategies

In: Occup Environ Med, 56. Jg. (1999), S. 562.

ABSTRACT:
OBJECTIVES: To investigate the impact of measuring a single home then imputing information from another home among subjects who lived in two homes in a subset of the National Cancer Institute/Children's Cancer Group (NCI/CCG) investigation of residential exposure to magnetic fields and risk of childhood leukaemia. METHODS: Each subject's summary time weighted average (TWA) exposure was derived from measurements of two homes, weighted by the fraction of the reference period lived in the residence. The three cost efficient field work strategies examined were measuring: (a) the longer lived in home; (b) the currently lived in home; and (c) the former lived in home. Two different methods were used for imputing the missing values: (a) control mean imputation, (b) status specific mean imputation. The subject's summary exposure to magnetic fields estimated with each approach was compared with the subject's TWA calculated from measurements in both homes. The association between estimated exposure to magnetic fields and the risk of leukaemia under different approaches was examined with unconditional logistic regression analysis. RESULTS: The Pearson correlation coefficient between the two measurements within subjects was 0.31 ($p < 10(-4)$, indicating a lack of independence of measurements. Differences were found between mean exposures in current and former homes of cases, and between longer and shorter lived in homes of controls. All methods with measurements from one of the homes in conjunction with imputation of measurements for the second home led to marked attenuation of risk estimates at the highest exposure category, particularly when measurements from current homes were used and those from former homes were imputed. CONCLUSION: Results argue against attempting to estimate lifetime magnetic field exposure from imputed values derived from current residences to fill in gaps caused by unmeasured residences previously lived in.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; cancer

Baroncelli P et al. 1986

Baroncelli P, Battisti S, Checcucci A, Comba P, Grandolfo M, Serio A, Vecchia P

A health examination of railway high-voltage substation workers exposed to ELF electromagnetic fields

In: Am J Ind Med, 10. Jg. (1986), S. 45.

ABSTRACT:
This is a cross-sectional survey on the health conditions of railways workers active in 258 interconnection and conversion substations all over Italy. Measurements performed in both kinds of substations operating at 220 kV have shown that maximum levels of the electric field strength and of the magnetic flux density at 50 Hz are of the order of 5 kV/m and 15 microT, respectively. Three subject groups, differently exposed (1, 10, 20 h/week), and an unexposed control group, for a total number of 627 workers, constitute the population at study. All subjects underwent a general medical examination, laboratory investigations, and a series of selected examinations relative to three systems (nervous, cardiovascular, and haematopoietic) considered at higher risk. No differences have been found between the exposed and the control groups. It is concluded that workers exposed to ELF

electromagnetic fields of moderate strength do not show the presence of clear effects on their state of health.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; morbidity

Bastuji-Garin S et al. 1990

Bastuji-Garin S, Richardson S, Zittoun R

Acute leukaemia in workers exposed to electromagnetic fields

In: Eur J Cancer, 26. Jg. (1990), S. 1119.

ABSTRACT:
Results from a French case-control study of acute leukaemia and occupational exposure for the risk associated with exposure to electromagnetic fields (EMF) are reported. There were 185 cases and 513 controls. A significantly increased risk of acute leukaemia was observed for exposure to EMF other than that from arc welding (odds ratio = 4.04, 95% CI 1.26-12.88) which persisted after adjustment for possible confounding exposures. This study supports the hypothesis that workers exposed to some EMF have an increased risk of leukaemia.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Bates M N 1991

Bates M N

Extremely low frequency electromagnetic fields and cancer: the epidemiologic evidence

In: Environ Health Perspect, 95. Jg. (1991), S. 147.

ABSTRACT:
This paper reviews the epidemiologic evidence that low frequency electromagnetic fields generated by alternating current may be a cause of cancer. Studies examining residential exposures of children and adults and studies of electrical and electronics workers are reviewed. Using conventional epidemiologic criteria for inferring causal associations, including strength and consistency of the relationship, biological plausibility, and the possibility of bias as an explanation, it is concluded that the evidence is strongly suggestive that such radiation is carcinogenic. The evidence is strongest for brain and central nervous system cancers in electrical workers and children. Weaker evidence supports an association with leukemia in electrical workers. Some evidence also exists for an association with melanoma in electrical workers. Failure to find consistent evidence of a link between residential exposures and adult cancers may be attributable to exposure misclassification. Studies so far have used imperfect surrogates for any true biologically effective magnetic field exposure. The resulting exposure misclassification has produced relative risk estimates that understate any true risk.

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Baum S J et al. 1976

Baum S J, Ekstrom M E, Skidmore W D, Wyant D E, Atkinson J L

Biological measurements in rodents exposed continuously throughout their adult life to pulsed electromagnetic radiation

In: Health Phys, 30. Jg. (1976), S. 161.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; elf/hf; biological effects

Bawin S M et al. 1973

Bawin S M, Gavalas-Medici R J, Adey W R

Effects of modulated very high frequency fields on specific brain rhythms in cats

In: Brain Res, 58. Jg. (1973), S. 365.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Bawin S M et al. 1975

Bawin S M, Kaczmarek L K, Adey W R

Effects of modulated VHF fields on the central nervous system

In: Ann NY Acad Sci, 247. Jg. (1974), S. 74.

ABSTRACT:
no abstract availabe

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Beale I L et al. 2001

Beale I L, Pearce N E, Booth R J, Heriot S A

Association of health problems with 50-Hz magnetic fields in human adults living near power transmission lines

In: J Aust Coll Nutr Environ Med, 20. Jg. (2001), S. 9.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Beall C et al. 1996

Beall C, Delzell E, Cole P, Brill I

Brain tumors among electronics industry workers

In: Epidemiology, 7. Jg. (1996), S. 125.

ABSTRACT:
We evaluated the relation between work experience in the United States operations of an electronics company and brain tumor mortality, focusing on video display terminal (VDT) development jobs. Subjects were 149 brain tumor cases and 591 matched controls selected from a company registry of all employees dying between 1975 and 1989. Company databases and interviews with company personnel constituted the basis for work histories, including information on whether subjects had held VDT development jobs. Subjects who worked at plants with hardware or VDT development operations had slightly but imprecisely elevated odds ratios (OR). The study found no meaningful association between VDT development work and brain tumor mortality. Other results included an elevated OR for 10 or more years of employment in engineering/technical jobs [OR = 1.7; 95% confidence interval (CI) = 1.0-3.0] or in programming jobs (OR = 2.8; 95% CI = 1.1-7.0). The OR for glioma for all subjects who had accrued 5 years of programming work 10 years before the case's death was 3.9 (95% CI = 1.2-12.4). These associations were limited in large part to one of four division groups. Also, only male programmers experienced an elevated OR. These patterns indicate that the associations may be due to chance, although unidentified causal exposures present in a subset of engineering/technical and programming jobs cannot be ruled out.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Beechey C V et al. 1986

Beechey C V, Brooker D, Kowalczuk C I, Saunders R D, Searle A G

Cytogenetic effects of microwave irradiation on male germ cells of the mouse

In: Int J Radiat Biol, 50. Jg. (1986), S. 209.

ABSTRACT:
Hybrid male mice were exposed to 2.45 GHz microwaves for 30 min/day, 6 days a week for two consecutive weeks at power densities of 1.0, 100 or 400 W m-2, with sham-exposed controls. Rectal temperatures before and after exposure were measured on days 1, 6 and 12. Measurements made on day 1 were treated with caution because of heterogeneity in rectal temperatures taken before exposure between the groups of mice given different treatments. On days 6 and 12, rectal temperatures rose by approximately 1 degree C in mice sham exposed, or exposed to 1 W m-2 or 100 W m-2. Only in the group of mice exposed to 400 W m-2 was the mean rise in rectal temperature during exposure (about 3 degrees C) significantly increased above the sham value. In groups killed 2-3 days after treatment (mainly meiotic exposure) frequencies of chromosome aberrations in spermatocytes showed no significant heterogeneity although the highest frequency of 1.5 per cent was at the highest (400 W m-2) power density. Another group killed 30 days after 100 W m-2 exposures (spermatogonial sampling) showed no significant increase over controls in chromosome aberration frequency. There was a small but significant increase in sperm count with increasing power density in mice killed 12-13 days after exposure, but a non-significant one in those exposed as spermatogonia (killed 41 days later). Thus effects were markedly less severe than those reported previously by Manikowska-Czerska et al. (1985) with a very similar radiation regime and were probably caused by the temperature enhancement.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Belyaev I Ya

Belyaev I Ya

Some biophysical aspects of the genetic effect of low-intensity millimeter waves

In: Bioelectrochem Bioenerg, 27. Jg. (1992), S. 11.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Berg M et al. 1990

Berg M, Liden S, Axelson O

Facial skin complaints and work at visual display units. An epidemiologic study of office employees

In: J Am Acad Dermatol, 22. Jg. (1990), S. 621.

ABSTRACT:
A questionnaire about skin rashes and their symptoms was sent to 3877 randomly selected office employees with different degrees of exposure to video display units (participation rate 96.6%). From this group 809 randomly selected persons were examined and interviewed. Itching and burning sensations with few visible signs were more common among persons who were highly exposed than among those in the nonexposed category. Objective facial signs were not significantly more common among persons in the highly exposed category. No dose-response effect was observed regarding the amount of video display unit exposure and objective skin signs. Unilateral skin rashes and skin malignancies were found in the same frequency in both highly exposed and the nonexposed persons. This study does not provide support for the hypothesis that video display unit work induces any recognized type of facial skin disease.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; morbidity

Bergqvist U O et al. 1994

Bergqvist U O, Knave B G

Eye discomfort and work with visual display terminals

In: Scand J Work Environ Health, 20. Jg. (1994), S. 27.

ABSTRACT:
OBJECTIVES--The aim of this study was to investigate the relationships between eye discomfort symptoms and work with visual display terminals among routine office workers. METHODS--Three hundred and twenty-seven office workers and their work stations were investigated by means of questionnaires and worksite investigations. The data were subjected to multivariate logistic regression analyses. RESULTS--The occurrence of eye discomfort increased as the extent of VDT work increased, as did the specific symptoms of sensitivity to light and smarting, gritting feeling, or redness. The use of spectacles during visual display terminal work, age, stomach stress reaction, distances between the eye and different visual task objects, as well as the vertical position of the terminal also influenced certain symptoms. Having (i) the terminal at about eye level during prolonged terminal work, (ii) using monofocal glasses during terminal work in situations with large distance variations to visual task objects, or (iii) being elderly with prolonged terminal work and reporting stomach stress all led to increased odds ratios for certain eye discomfort symptoms. CONCLUSIONS--The use of a visual display terminal in routine office work is associated with an increased occurrence of certain eye discomfort symptoms. This association is affected also by the presence of certain other individual and ergonomic factors.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; others

Berman E et al. 1978

Berman E, Kinn J B, Carter H B

Observations of mouse fetuses after irradiation with 2.45 GHz microwaves

In: Health Phys, 35. Jg. (1978), S. 791.

ABSTRACT:
Pregnant CD-1 mice were exposed to 2.45 GHz CW radiation for 100 min daily at a range of power densities (3.4-28 mW/cm2). Near-term fetuses were examined for gross external morphologic alterations. Mean live fetal weight per litter decreased significantly with exposure to the highest power density (sham, 0.97 ± 0.15 g; irradiated, 0.89 ± 0.13 g). There was a significantly increased incidence of cranioschisis in exposed fetuses. An exposure of the dam for 100 min at these power densities did not appear to be significant thermally. Estimates of mean dose rate as determined using twin-well calorimetry ranged from 2.0 to 22.2 mW/g.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Berman E et al. 1980

Berman E, Carter H B, House D

Tests for mutagenesis and reproduction in male rats exposed to 2450 MHz (CW) microwaves

In: Bioelectromagnetics, 1. Jg. (1980), S. 65.

ABSTRACT:
Tests of mutagenesis and reproduction were conducted in male rats which were irradiated by 2,450-MHz, continuous-wave (CW) microwaves, 4 hr/day from day 6 of gestation to 90 days of age at 5 mW/cm2; or 5 hr/day for five days beginning on the 90th day of age at 10 mW/cm2; or 4 hr/day, 5 days/wk for four weeks, beginning on the 90th day of age. During selected weekly periods after treatment, the rats were bred to pairs of untreated, normal female rats that were examined in late pregnancy by means of

dominant lethal assay. The reproductive efficiency of these males, as reflected in their breeding, was also examined for changes relating to their microwave experience. No significant evidence of germ-cell mutagenesis was detected when data of microwave-exposed males were compared with those of sham-exposed males, even though there were significant increases in rectal and intra-testicular temperatures at a power density of 28 mW/cm2. Temporary sterility, as indexed by fewer pregnancies, was seen at the highest power density.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Bethwaite P et al. 2001

Bethwaite P, Cook A, Kennedy J, Pearce N

Acute leukemia in electrical workers: a New Zealand case-control study

In: Cancer Causes Control, 12. Jg. (2001), S. 683.

ABSTRACT:
OBJECTIVES: To assess the risks for adult-onset acute leukemia associated with electrical employment in New Zealand. METHODS: The occupational and environmental exposures histories of 110 incident leukemia cases and 199 general population controls were compared. The cases were recruited through referrals to treatment centers in New Zealand between 1989 and 1991. For subjects classified as having worked in one or more of the "electrical occupations," the degree of exposures to extremely low frequency electromagnetic fields (ELF-EMFs) was assessed in detail using a job-exposure matrix. RESULTS: An odds ratio of 1.9 (95% CI 1.0-3.8) was found for subjects who had ever worked in an electrical occupation. Significantly increased risks for leukemia are seen amongst welders/flame cutters (OR = 2.8 (95% CI 1.2-6.8)) and telephone line workers (OR = 5.81 (95% CI 1.2-27.8)). The excess leukemia risk appeared to be confined to acute non-lymphocytic leukemia (OR=2.31 (95% CI 1.2-4.6)), in comparison to acute lymphoblastic leukemia (OR = 0.9 (95% CI 0.3-2.9)) but for the latter category the numbers were very small. A dose-response effect was also found, with acute leukemia risk rising with increasing occupational magnetic field exposure, based on both current and historical occupational field exposure estimates. CONCLUSIONS: The findings of the current study indicate a significantly elevated risk of acute leukemia for electrical workers overall, and for the specific occupational categories of welders/flame cutters and telephone line workers. A dose-response effect was also found, indicating that acute leukemia risk was related to historical and current magnetic field exposures in an occupational context.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Bianchi N et al. 2000

Bianchi N, Crosignani P, Rovelli A, Tittarelli A, Carnelli C A, Rossitto F, Vanelli U, Porro E, Berrino F

Overhead electricity power lines and childhood leukemia: a registry-based, case-control study

In: Tumori, 86. Jg. (2000), S. 195.

ABSTRACT:
AIMS AND BACKGROUND: To evaluate the role of exposure to low-frequency electromagnetic fields generated by overhead power lines on the risk of childhood leukemia, we carried out a case-control study in the area (Varese province) covered by the Lombardy Cancer Registry. METHODS AND STUDY DESIGN: Exposure to magnetic fields was estimated using line load data and the distance between subjects' homes and the nearest power line. A total of 101 cases and 412 controls were investigated. RESULTS: Twenty subjects (9 cases and 11 controls) were considered exposed. A significant fourfold increase in risk for leukemia in exposed subjects and a dose-response relationship were found. The risk was higher than that reported by other studies. Potential biases related to the representativity of controls and validity of exposure assessment do not seem to have influenced the risk estimates. CONCLUSIONS: We suggest that measures to remedy residential exposure should be taken wherever practicable.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Bjork J et al. 2001

Bjork J, Albin M, Welinder H, Tinnerberg H, Mauritzson N, Kauppinen T, Stromberg U, Johannson B, Billstrom R, Mikoczy Z, Ahlgren T, Nilsson P G, Mitelman F, Hagmar L

Are occupational, hobby, or lifestyle exposures associated with Philadelphia chromosome positive chronic myeloid leukaemia?

In: Occup Environ Med, 58. Jg. (2001), S. 722.

ABSTRACT:
OBJECTIVES: To investigate a broad range of occupational, hobby, and lifestyle exposures, suggested as risk factors for Philadelphia chromosome positive (Ph+) chronic myeloid leukaemia (CML). METHODS: A case-control study, comprising 255 Ph+CML patients from southern Sweden and matched controls, was conducted. Individual data on work tasks, hobbies, and lifestyle exposures were obtained by telephone interviews. Occupational hygienists assessed occupational and hobby exposures for each subject individually. Also, occupational titles were obtained from national registries, and group level exposure-that is, the exposure proportion for each occupational title-was assessed with a job exposure matrix. The effects of 11 exposures using individual data and two exposures using group data (organic solvents and animal dust) were estimated. RESULTS: For the individual data on organic solvents, an effect was found for moderate or high intensity of exposure (odds ratio (OR) 3.4, 95% confidence interval (95% CI) 1.1 to 11) and for long duration (15-20 years) of exposure (OR 2.1, 95% CI 1.1 to 4.0). By contrast, the group data showed no association (OR 0.69, 95% CI 0.27 to 1.8; moderate or high intensity versus no exposure). For extremely low frequency electromagnetic fields (EMFs), only individual data were available. An association with long occupational exposure to EMFs was found (OR 2.3, 95% CI 1.2 to 4.5). However, no effect of EMF intensity was indicated. No significant effects of benzene, gasoline or diesel, or tobacco smoking were found. OR estimates below unity were suggested for personal use of hair dye and for agricultural exposures. CONCLUSIONS: Associations between exposure to organic solvents and EMFs, and Ph+CML were indicated but were not entirely consistent.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Blaasaas K G et al. 2002

Blaasaas K G, Tynes T, Irgens A, Lie R T

Risk of birth defects by parental occupational exposure to 50 Hz electromagnetic fields: a population based study

In: Occup Environ Med, 59. Jg. (2002), S. 92.

ABSTRACT:
OBJECTIVES: To study the risk of birth defects by parental occupational exposure to 50 Hz electromagnetic fields. METHODS: The Medical Birth Registry of Norway was linked with census data on parental occupation. An expert panel constructed a job exposure matrix of parental occupational exposure to 50 Hz magnetic fields. Exposure to magnetic fields was estimated by combining branch and occupation into one of three exposure levels: <4 hours, 4-24 hours, and >24 hours/week above approximately 0.1 mu T. Risks of 24 categories of birth defects were compared across exposure levels. Out of all 1.6 million births in Norway in the period 1967-95, 836,475 and 1,290,298 births had information on maternal and paternal exposure, respectively. Analyses were based on tests for

trend and were adjusted for parents' educational level, place of birth, maternal age, and year of birth. RESULTS: The total risk of birth defects was not associated with parental exposure. Maternal exposure was associated with increased risks of spina bifida (p=0.04) and clubfoot (p=0.04). A negative association was found for isolated cleft palate (p=0.01). Paternal exposure was associated with increased risks of anencephaly (p=0.01) and a category of "other defects" (p=0.02). CONCLUSION: The present study gives an indication of an association between selected disorders of the central nervous system and parental exposure to 50 Hz magnetic fields. Given the crude exposure assessment, lack of comparable studies, and the high number of outcomes considered, the results should be interpreted with caution.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Blackman C F et al. 1979

Blackman C F, Elder J A, Weil C M, Benane S G, Eichinger D C, House D E

Induction of calcium-ion efflux from brain tissue by radiofrequency radiation: effects of modulation frequency and field strength

In: Radio Sci, 14. Jg. (1979), S. 93.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Blackman C F et al. 1980

Blackman C F, Benane S G, Elder J A, House D E, Lampe J A, Faulk J M

Induction of calcium-ion efflux from brain tissue by radiofrequency radiation: effect of sample number and modulation frequency on the power-density window

In: Bioelectromagnetics, 1. Jg. (1980), S. 35.

ABSTRACT:
Changes have been found in calcium-ion binding to brain tissue exposed in vitro to a specific power density (0.83 mW/cm2) of 147-MHz radiation, amplitude modulated by a 16-Hz sine wave. This report replicates and extends this previous work. To define more precisely the range of effective power densities, two different numbers of samples were treated in a Crawford cell. In one series, four brain tissues were exposed at a time; in the other series, four brain tissues plus six dummy loads were exposed together. While the four-sample configuration produced a narrow power-density window, the ten pseudosample configuration resulted in a broader power-density window. The reason for the sample-number dependence is unresolved, but may be due to interactions between samples and field distortions caused by the close spacing. The ten pseudosample configuration was used to test for the presence and rage of a power-density window at a sinusoidal modulation frequency of 9 Hz. The response curve at 9 Hz was essentially identical to the results for 16-Hz sinewave modulation.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Blackman C F et al. 1980a

Blackman C F, Benane S G, Joines W T, Hollis M A, House D E

Calcium-ion efflux from brain tissue: power-density versus internal field-intensity dependencies at 50-MHz RF radiation.

In: Bioelectromagnetics, 1. Jg. (1980), S. 277.

ABSTRACT:
In previous experiments changes were found in calcium-ion efflux from chick-brain tissue that had been exposed in vitro to 147-MHz radiation across a specific range of power densities when the field was amplitude modulated at 16 Hz. In the present study, 50-MHz radiation, similarly modulated as a sinusoid, was found to produce changes in calcium-ion efflux from chick brains exposed in vitro in a Crawford cell. Exposure conditions were optimized to broaden any power-density window and to enhance the opportunity to detect changes in the calcium-ion efflux. The results of a power-density series demonstrated two effective ranges: One spanning a range from 1.44 to 1.67 mW/cm2, and the other including 3.64 mW/cm2, which were bracketed by no-effect results at 0.72, 2.17, and 4.32 mW/cm2. peaks of positive findings are associated with near-identical rates of energy absorption: 1.4 microW/g at 147 MHz, and 1.3 microW/g at 50 MHz, which indicates that the enhanced-efflux phenomenon is more dependent on the intensity of fields in the brain than on the power density of incident radiation. In addition, the phenomenon appears to occur at multiples of some, as yet unknown, rate of radiofrequency (RF) energy absorption. Because of the extremely small increments of temperature associated with positive findings (less than 4 X 10(-4) degrees C), and the existence of more than one productive absorption rate, a solely thermal explanation appears extremely unlikely.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Blackman C F et al. 1989

Blackman C F, Kinney L S, House D E, Joines W

Multiple power density windows and their possible origin

In: Bioelectromagnetics, 10. Jg. (1989), S. 115.

ABSTRACT:
We have previously reported that in vitro exposure of chick forebrain tissue to 50-MHz radiofrequency (RF) electromagnetic radiation, amplitude modulated (AM) at 16 Hz, would enhance the efflux of calcium ions within only two power-density ranges: one from 1.44 to 1.67 mW/cm2, and the other including 3.64 mW/cm2. No effect on efflux occurred at 0.37, 0.72, 2.17, and 4.32 mW/cm2. We confirmed and extended these results by testing at another set of power densities, which included the range of the previous study. Forebrain tissue from 1-7-day-old chickens was labeled in vitro with radioactive calcium ions (30 min, at 37 degrees C), rinsed, placed in a physiological salt solution, and then exposed for 20 min to 50-MHz radiation, AM at 16 Hz, in a transverse electric and magnetic field (TEM) cell maintained at 37 degrees C. The solution was then assayed for radioactive calcium activity. A power-density series was tested. An enhanced efflux of calcium ions was found at 1.75, 3.85, 5.57, 6.82, 7.65, 7.77, and 8.82 mW/cm2; no change was observed at 0.75, 2.30, 4.50, 5.85, 7.08, 8.19, 8.66, 10.6, and 14.7 mW/cm2. Power density is converted to specific absorption rate (SAR) by 0.36 mW/kg per mW/cm2. Even the highest SAR tested (0.005 W/kg) is much too low to result in generalized heating of the sample and thus to be the underlying cause of the enhanced response. A hypothetical mechanism is proposed involving dynamic systems that may account for the power-density dependency as well as for part of the frequency dependency observed with both modulated RF radiation and extremely-low-frequency (ELF) fields.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Blackwell R P et al. 1986

Blackwell R P, Saunders R D

The effects of low-level radiofrequency and microwave radiation on brain tissue and animal behaviour

In: Int J Radiat Biol, 50. Jg. (1986), S. 761.

ABSTRACT:
There has been much public interest and controversy about the effects of exposure to low levels of microwave and radiofrequency radiation. Of particular interest are reports of radiation-induced changes in brain tissue and

animal behaviour. This review considers the evidence supporting some of these effects. The main conclusions of the review are: The levels of tracer substances in the brain tissue of conscious or anaesthetized animals can be altered by acute exposure to microwave radiation that is sufficient to raise the brain temperature by several degrees Celsius. However, the results of such experiments are difficult to interpret, being in some cases contradictory or influenced by various confounding factors, and the data cannot be considered sufficient to recommend a threshold for human tolerance. The evidence that calcium ion exchange in living nervous tissues is affected by amplitude-modulated radiofrequency and microwave radiation is inconclusive. Exposure sufficient to cause an increase in core temperature of about 1 degree C, corresponding to specific energy absorption rates of about 2-8 W kg-1 may adversely affect animal behaviour.

SCHLAGWÖRTER:
bioassay; Review; elf/hf; others

Blevins R D et al. 1980

Blevins R D, Crenshaw R C, Houghland A E, Clark C E
The effects of microwave radiation and heat on specific mutants of Salmonella typhimurium LT2
In: Radiat Res, 82. Jg. (1980), S. 511.

ABSTRACT:
The mutagenic activity of microwave radiation at 2450 MHz and heat to levels comparable to that produced by microwave radiation treatment were investigated using histidine auxotrophs - hisTA98, hisTA100, hisTA1535, hisTA1537, and hisTA1538 - of Salmonella typhimurium LT2 developed by Dr. B.N. Ames. The conventionally used microwave oven caused a significant increase in the number of revertant colonies in all the S. typhimurium strains tested. Heat alone, though mutagenic, produced fewer revertant colonies than microwave radiation. We concluded that microwave radiation of 2450 MHz is a potent mutagen and therefore a potential carcinogenic agent for animals.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Bohr H et al. 2000

Bohr H, Bohr J
Microwave enhanced kinetics observed in ORD studies of a protein
In: Bioelectromagnetics, 21. Jg. (2000), S. 68.

ABSTRACT:
Microwaves are shown to affect the kinetics of conformational changes of the protein beta-lactoglobulin. Microwaves can accelerate conformational changes in the direction towards the equilibrium state. This applies both for the folding and the unfolding processes. Cold denaturing thermal unfolding of the proteins is accelerated by negative temperature gradients. Microwave irradiation of the protein solution heated it by about 0.3 degree, and hence the observed acceleration of denaturing is therefore non-thermal

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Boos S R et al. 1985

Boos S R, Calissendorff B M, Knave B G, Nyman K G, Voss M
Work with video display terminals among office employees. III. Ophthalmologic factors
In: Scand J Work Environ Health, 11. Jg. (1985), S. 475.

ABSTRACT:
The present ophthalmologic study is the third part of a major epidemiologic health investigation on work with a video display terminal (VDT). An initial study showed that VDT operators replying to a questionnaire reported more eye discomfort than a reference group not employed in VDT work and that women reported more eye discomfort, musculoskeletal discomfort, headache, and skin disorders than men, irrespective of whether or not they were employed in VDT work. In the present study the ophthalmologic history of eye diseases and eye discomfort yielded a much lower percentage response for symptoms and discomfort than the questionnaire, and, just as with visual acuity and refraction, there was no difference between the exposed and reference groups or between the men and women. The exposed subjects were found to be overcorrected in terms of presbyopia addition in relation to work distance. As regards ocular examination findings, low frequency rates were noted for pathological lens opacities. Opacities of this kind were slightly more frequent among the VDT operators than among the referents, but the difference was not statistically significant. There were no other differences in the ocular findings of the exposed and reference groups.

SCHLAGWÖRTER:
medicine; other type; none; others

Borbely A A et al. 1999

Borbely A A, Huber R, Graf T, Fuchs B, Gallmann E, Achermann P
Pulsed high-frequency electromagnetic field affects human sleep and sleep electroencephalogram
In: Neurosci Lett, 275. Jg. (1999), S. 207.

ABSTRACT:
To investigate whether the electromagnetic field (EMF) emitted by digital radiotelephone handsets affects the brain, healthy, young subjects were exposed during an entire night-time sleep episode to an intermittent radiation schedule (900 MHz; maximum specific absorption rate 1 W/kg) consisting of alternating 15-min on-15-min off intervals. Compared with a control night with sham exposure, the amount of waking after sleep onset was reduced from 18 to 12 min. Spectral power of the electroencephalogram in non-rapid eye movement sleep was increased. The maximum rise occurred in the 10-11 Hz and 13.5-14 Hz bands during the initial part of sleep and then subsided. The results demonstrate that pulsed high-frequency EMF in the range of radiotelephones may promote sleep and modify the sleep EEG.

SCHLAGWÖRTER:
medicine; experimentally; hf; others

Bortkiewicz A et a. 1995

Bortkiewicz A, Zmyslony M, Palczynski C, Gadzicka E, Szmigielski S
Dysregulation of autonomic control of cardiac function in workers at AM broadcasting stations (0.738 - 1.503 MHz)
In: Electro Magnetobiol, 14. Jg. (1995), S. 177.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; cvd

Bortkiewicz A et al. 1996

Bortkiewicz A, Gadzicka E, Zmyslony M
Heart rate variability in workers exposed to medium-frequency electromagnetic fields
In: J Auton Nerv Syst, 59. Jg. (1996), S. 91.

ABSTRACT:
This study was undertaken to evaluate the neurovegetative regulation of the heart in workers occupationally exposed to medium frequency (MF) electromagnetic (EM) fields. The subjects were 71 workers of MF broadcast stations, aged 20-68 (mean 47.1) with the duration of work under exposure ranging from 2-40 years and 22 workers of radio link stations, aged 21-65 (mean 46.9) who were not exposed to MF EM fields. The distribution of age and work

tenure in both groups did not differ significantly. Heart rate variability (HRV) was analysed basing on 512 normal heart evolutions registered in resting, from the body surface, using the Medea-HRV system. The analysis concerned time-domain and frequency-domain parameters of HRV using fast fourier transformation. Power spectrum in the low (0.05-0.15 Hz) and high (0.15-0.35 Hz) frequency bands (LF and HF, respectively) was determined. Statistically insignificant differences found between exposed and non-exposed groups were found either in time- or in frequency-domain parameters of HRV. No correlation between the power spectrum and the subjects age was noted. Such a relationship, however, could be observed in the control group. In the study group a statistically significant negative correlation was found between the maximum intensity of EM fields and HF power spectrum. Thus it was concluded that occupational exposure to EM fields brings about impairments in the neurovegetative regulation of the cardiovascular function.

SCHLAGWÖRTER:
epidemiology; other type; hf; cvd

Bortkiewicz A et al. 1997

Bortkiewicz A, Zmyslony M, Gadzicka E, Palczynski C, Szmigielski S

Ambulatory ECG monitoring in workers exposed to electromagnetic fields

In: J Med Eng Technol, 21. Jg. (1997), S. 41.

ABSTRACT:
The aim of this study was to evaluate the function of the circulatory system in workers occupationally exposed to medium frequency electromagnetic fields. The subjects were 71 workers at four AM broadcast stations [0.738-1.503 MHz] aged 20-68 (mean 46.9 +/- 13.1) years and 22 workers at radio link stations aged 23-67 (mean 48.2 +/- 17.4) years. Workers at AM broadcast stations experienced 2-40 (mean 18.6 +/- 12.1) years' exposure to electromagnetic fields (average daily exposure dose about 115 Vh m-1, maximum exposure levels during shift about 165 V m-1), workers at radio link stations had no history of regular exposure to electromagnetic fields. In all the subjects a general medical examination, resting ECG and 24 h Holter monitoring were performed. The work organization, work period structure, age, lifestyle, nutritional habits and health status in both groups remained fairly similar. The electrocardiographic abnormalities detected in the resting and/ or 24 h ECG were significantly more frequent ($p = 0.006$) in workers exposed to electromagnetic fields than in non-exposed subjects (75% versus 25%). A clear tendency for a higher number of rhythm disturbances (mostly ExV) was observed in AM broadcast station workers.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf/hf; cvd

Bowman J D et al. 1995

Bowman J D, Thomas D C, London S J, Peters J M
Bowman J D, Thomas D C, London S J, Peters J M

Hypothesis: the risk of childhood leukemia is related to combinations of power-frequency and static magnetic fields

In: Bioelectromagnetics, 16. Jg. (1995), S. 48.

ABSTRACT:
We present a hypothesis that the risk of childhood leukemia is related to exposure to specific combinations of static and extremely-low-frequency (ELF) magnetic fields. Laboratory data from calcium efflux and diatom mobility experiments were used with the gyromagnetic equation to predict combinations of 60 Hz and static magnetic fields hypothesized to enhance leukemia risk. The laboratory data predicted 19 bands of the static field magnitude with a bandwidth of 9.1 microT that, together with 60 Hz magnetic fields, are expected to have biological activity. We then assessed the association between this exposure metric and childhood leukemia using data from a case-control study in Los Angeles County. ELF and static magnetic fields were measured in the bedrooms of 124 cases determined from a tumor registry and 99 controls drawn from friends and random digit dialing. Among these subjects, 26 cases and 20 controls were exposed to static magnetic fields lying in the predicted bands of biological activity centered at 38.0 microT and 50.6 microT. Although no association was found for childhood leukemia in relation to measured ELF or static magnetic fields alone, an increasing trend of leukemia risk with measured ELF fields was found for subjects within these static field bands (P for trend = 0.041). The odds ratio (OR) was 3.3 [95% confidence interval (CI) = 0.4-30.5] for subjects exposed to static fields within the derived bands and to ELF magnetic field above 0.30 microT (compared to subjects exposed to static fields outside the bands and ELF magnetic fields below 0.07 microT). When the 60 Hz magnetic fields were assessed according to the Wertheimer-Leeper code for wiring configurations, leukemia risks were again greater with the hypothesized exposure conditions (OR = 9.2 for very high current configurations within the static field bands; 95% CI = 1.3-64.6). Although the risk estimates are based on limited magnetic field measurements for a small number of subjects, these findings suggest that the risk of childhood leukemia may be related to the combined effects of the static and ELF magnetic fields. Further tests of the hypothesis are proposed.

SCHLAGWÖRTER:
medicine; experimentally; elf; biological effects

Bracken M B et al. 1995

Bracken M B, Belanger K, Hellenbrand K, Dlugosz L, Holford T R, McSharry J E, Addesso K, Leaderer B

Exposure to electromagnetic fields during pregnancy with emphasis on electrically heated beds: association with birthweight and intrauterine growth retardation

In: Epidemiology, 6. Jg. (1995), S. 263.

ABSTRACT:
Several animal and human studies indicate that fetal growth may be retarded following exposure to electromagnetic fields (EMF). We conducted a prospective study (N = 2,967) to evaluate the relation of birthweight and fetal growth retardation with use of electrically heated beds (electric blankets and heated water beds) during pregnancy. A "nested" study design allowed monitoring of exposure at different stages of pregnancy using both direct and indirect methods. We assessed EMF exposure using personal monitors, home measurement, video display terminal use, and wire code. Exposure to EMF during pregnancy, either at conception, at < or = 16 weeks, or in the third trimester, showed no important relation to risk of low birth-weight or fetal growth retardation. This result was the same whether we used subjective measures of exposure or direct measurement. Use of video display terminals at home or work, exposure to > or = 2.0-milligauss fields as measured by home or personal monitors, and home wire code were unrelated to the reproductive outcomes studied. A time-weighted analysis of electric bed use, which accounted for strength of EMF exposure and hours of use, also showed evidence of no meaningful increase in risk. None of the exposure measures showed a dose response relation to risk. We conclude that risk of low birth-weight and intrauterine growth retardation is not increased after electrically heated bed use during pregnancy.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Bracken M B et al. 1998

Bracken M B, Belanger K, Hellenbrand K, Addesso K, Patel S, Triche E, Leaderer B P

Correlates of residential wiring code used in studies of health effects of residential electromagnetic fields

In: Am J Epidemiol, 148. Jg. (1998), S. 467.

ABSTRACT:
The home wiring code is the most widely used metric for studies of residential electromagnetic field (EMF) exposure and health effects. Despite the fact that wiring code often shows stronger correlations with disease outcome than more direct EMF home assessments, little is known about potential confounders of the wiring code association. In a study carried out in southern Connecticut in 1988-1991, the authors used strict and widely used criteria to assess the wiring codes of 3,259 homes in which respondents lived. They also collected other home characteristics from the tax assessor's office, estimated traffic density around the home from state data, and interviewed each subject (2,967 mothers of reproductive age) for personal characteristics. Women who lived in very high current configuration wiring coded homes were more likely to be in manual jobs and their homes were older (built before 1949, odds ratio (OR) = 73.24, 95% confidence interval (CI) 29.53-181.65) and had lower assessed value and higher traffic densities (highest density quartile, OR = 3.99, 95% CI 1.17-13.62). Because some of these variables have themselves been associated with health outcomes, the possibility of confounding of the wiring code associations must be rigorously evaluated in future EMF research.

SCHLAGWÖRTER:
epidemiology; other type; elf; morbidity

Braune S et al. 1998

Braune S, Wrocklage C Raczek J, Gailus T, Lucking C H

Resting blood pressure increase during exposure to a radiofrequency electromagnetic field

In: Lancet, 351. Jg. (1998), S. 1857.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; cvd

Braune S et al. 1998a

Braune S, Wrocklage C Raczek J, Gailus T, Lucking C H

Radiofrequency electromagnetic field from mobile phones

In: Lancet, 352. Jg. (1998), S. 576.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
physics; other type; hf; others

Breysse P N et al. 1994

Breysse P N, Matanoski G M, Elliott E A, Francis M, Kaune W T, Thomas K

60 Hertz magnetic field exposure assessment for an investigation of leukemia in telephone lineworkers

In: Am J Ind Med, 26. Jg. (1994), S. 681.

ABSTRACT:
The purpose of this paper is to present the assessment of magnetic field exposure conducted as a part of a nested case-control investigation of leukemia mortality in telephone lineworkers. For the purposes of exposure classification, telephone company jobs were initially divided into two classes: those with potential for working in an electric environment, referred to as linework jobs, and those not working in an electric environment, referred to as nonlinework jobs. Linework jobs were further divided into the following four categories: outside plant technicians (OPT), installation/maintenance/repair (IMR) technicians, central office technicians (COT), and cable splicing technicians (CST). These job groupings were based on similarity of work tasks and exposure environments. Emdex data-logging dosimeters were used to measure personal exposures to ELF magnetic fields for 204 telephone company workers. Three general classes of exposure indices were calculated for each exposure record: measures of central tendency, measures of peak or maximum exposure, and measures of exposure variability. CSTs had the highest full-shift mean and median exposure, 4.3 and 3.2 mG, respectively. CSTs also ranked the highest, with average peak, average 95th percentile, and average time above background equal to 99.2 mG, 11.1 mG, and 156 min, respectively. In addition, the results suggest the OPT and IMR technicians have exposures similar to nonlineworkers. Exposure classifications, therefore, which misclassify all lineworkers into one "telephone lineworker" job grouping are not appropriate and future studies should concentrate on cable splicing technicians.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Broadbent D E et al. 1985

Broadbent D E, Broadbent M H, Male J C, Jones M R

Health of workers exposed to electric fields

In: Br J Ind Med, 42. Jg. (1985), S. 75.

ABSTRACT:
The results of health questionnaire interviews with 390 electrical power transmission and distribution workers, together with long term estimates of their exposure to 50 Hz electric fields, and short term measurements of the actual exposure for 287 of them are reported. Twenty eight workers received measurable exposures, averaging about 30 kVm-1h over the two week measurement period. Estimated exposure rates were considerably greater, but showed fair correlation with the measurements. Although the general level of health was higher than we have found in manual workers in other industries, there were significant differences in the health measures between different categories of job, different parts of the country, and in association with factors such as overtime, working alone, or frequently changing shift. After allowing for the effects of job and location, however, we found no significant correlations of health with either measured or estimated exposure to electric fields.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; morbidity

Brookhuis K A et al. 1991

Brookhuis K A, De Vries G, de Waard D

The effects of mobile telephoning on driving performance

In: Accid Anal Prev, 23. Jg. (1991), S. 309.

ABSTRACT:
The effects of telephoning while driving were studied in three different traffic conditions, i.e. in light traffic on a quiet motorway, in heavy traffic on a four-lane ring-road, and in city traffic. Twelve subjects, unfamiliar with mobile telephones, drove an instrumented vehicle for one hour each day during three weeks and while in each of the three traffic conditions, had to operate the mobile telephone for a short while. To ensure a fixed "heavy traffic load" in the second condition, the subjects were instructed to follow another instrumented vehicle (at a safe distance). The results showed a significant effect of telephoning while driving as opposed to normal driving (i.e., not involving telephone conversation), on the effort subjectively measured by an effort scale and objectively measured by heartrate indices and on some of the measured parameters of driving performance. One half of the subjects had to operate the telephone manually, the other half performed the telephone task with a handsfree mobile telephone set. The subjects who operated the handsfree telephone showed better control over the test vehicle than the subjects who operated the handheld telephone, as

measured by the steering wheel movements. Also, a clear improvement over time in the course of the 15 test days was found for some of the measurements. As a consequence of the results, some advice concerning mobile telephoning can be given to authorities, manufacturers, and users.

SCHLAGWÖRTER:
epidemiology; experimentally; hf; others

Brown D et al. 1969

Brown D, Tickner A H, Simmonds D C V
Interference between concurrent tasks of driving and telephoning
In: J Appl Psychol, 53. Jg. (1969), S. 419.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Brusick D et al. 1998

Brusick D, Albertini R, McRee D, Peterson D, Williams G, Hanawalt P, Preston J
Genotoxicity of radiofrequency radiations
In: Environ Mol Mutagen, 32. Jg. (1998), S. 1.

ABSTRACT:
During the past several years, concerns have been raised regarding the potential adverse effects of exposures to nonionizing radiation, particularly in the extremely low frequency (ELF) range (50 to 60 MHz) and radiofrequency radiation (RFR) with frequencies ranging from 30 KHz to 30,000 MHz. One focus of concern has been potential DNA interactions. Publications reviewing the genotoxicity of ELF radiation [McCann et al. (1993): Mutat Res 297(1):61-95; Murphy et al. (1993): Mutat Res 296:221-240; NAS (1997)], have been uniform in concluding that the weight of evidence does not indicate any genotoxic risk from exposure to this type of radiation. Concern that RFR may be associated with adverse biological effects [WHO, 1993], including recent allegations that they may be involved in the production of brain tumors in humans [Elmer-Dewit (1993): Time, February 8:42], has resulted in the production of a large number of publications describing the effects of RFR on the integrity of nucleic acids. Data from studies conducted in a frequency range from 800 to 3,000 MHz were reviewed and subjected to a weight-of-evidence evaluation. The evaluation focused on direct toxicological effects of RFR as well as on studies addressing basic biological responses to RFR at the cellular and molecular level. The data from over 100 studies suggest that RFR is not directly mutagenic and that adverse effects from exposure of organisms to high frequencies and high power intensities of RFR are predominantly the result of hyperthermia; however, there may be some subtle indirect effects on the replication and/or transcription of genes under relatively restricted exposure conditions.

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; biological effects

Bryant H E et al. 1989

Bryant H E, Love E J
Video display terminal use and spontaneous abortion risk
In: Int J Epidemiol, 18. Jg. (1989), S. 132.

ABSTRACT:
A matched case-control study investigated the potential effects of video display terminal (VDT) use on risk of spontaneous abortion in pregnancy. Structured interviews were administered to 334 cases immediately following a miscarriage. For each case, two age and parity-matched controls were enrolled, the first being a woman still pregnant (less than 25 weeks' gestation), and the second a woman in the postpartum ward of the same participating hospital. Separate analyses were carried out for each comparison group due to potential and observed differences in recall loss and selection bias. The overall exposure to VDT's during the period of interest (three months preceding the last menstrual period [LMP] to four months post-LMP) did not indicate an increased risk for either control group comparison (OR = 1.14, p = 0.47 with postnatal controls; OR = 0.80, p = 0.20 with prenatal controls). Furthermore, when exposure data were re-classified to remove women with distant or single exposures, no significant odds ratios were found. While several socioeconomic and obstetric variables were significantly associated with VDT use, multivariate analysis did not alter the lack of association of VDT use with case-control status. Finally, evidence for recall bias in postnatal control reporting, evidenced by underreporting of trivial exposures in this group, is examined.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Bunin G R et al. 1990

Bunin G R, Ward E, Kramer S, Rhee C A, Meadows A T
Neuroblastoma and parental occupation
In: Am J Epidemiol, 131. Jg. (1990), S. 776.

ABSTRACT:
A matched case-control study of neuroblastoma investigated parental occupational risk factors. Cases diagnosed in 1970-1979 were identified through tumor registries in the Greater Philadelphia area. Controls were selected by random digit dialing and were matched to cases on race, birth date, and telephone exchange. Parents of 104 matched pairs were interviewed by telephone. In contrast to results of a previous study, no significant associations were noted for paternal employment in a job cluster of occupations in electricity, electronics, insulation, utility, and printing; in jobs with electromagnetic field exposure; or in jobs as workers in electronics. Six cases and one control, however, had a father or mother who worked in electrical or electronic products assembly.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Burr R G et al. 1988

Burr R G, Hoiberg A
Health profile of U.S. Navy pilots of electronically modified aircraft
In: J Occup Environ Med, 37. Jg. (1988), S. 336.

ABSTRACT:
This study compared hospitalization rates of pilots who primarily flew electronically modified aircraft (n = 1,063) with an age-matched group of pilots who flew other types of aircraft (n = 2,126). Of the two groups, control pilots at ages 21-26 had a significantly higher mortality rate for aviation-related injuries and a higher hospitalization rate for the diagnostic category of accidents, poisonings, and violence. Their hospitalization rates also were significantly higher than pilots of electronically modified aircraft for mental disorders at ages 27-32 and supplementary classifications at ages 39-44. Significant age-specific increases in rates were observed for cardiovascular disease and alcoholism in the control group whereas no significant increases were noted for pilots of electronic models. Pilots in the latter group had low rates for conditions postulated as related to radiation exposure. Such results indicated that pilots of electronically modified aircraft were not at increased risk for illness or injury because of the aircraft models they primarily flew.

SCHLAGWÖRTER:
epidemiology; case-control; hf; mortality

Byus C V et al. 1988

Byus C V, Kartun K, Pieper S, Adey W R

Increased ornithine decarboxylase activity in cultured cells exposed to low energy modulated microwave fields and phorbol ester tumor promoters

In: Cancer Res, 48. Jg. (1988), S. 4222.

ABSTRACT:
Ornithine decarboxylase (ODC) is present in all nucleated cells and is the rate-limiting enzyme for synthesis of polyamines. In turn, the polyamines are required for DNA synthesis and cell growth. In Reuber H35 hepatoma cells, we show that ODC activity is increased by about 50% during exposure to a 1-h "athermal" (less than 0.1 degree C temperature rise) (450 MHz, 1.0 mW/cm2 peak-envelope-power) microwave field sinusoidally amplitude-modulated at 16 Hz. The increased activity of ODC persisted for several hours following the 1-h exposure to the field. A similar field amplitude-modulated at 60 and 100 Hz did not alter the hepatoma cell ODC activity. The stimulated ODC activity in the cultured cells that followed treatment with a phorbol ester tumor promoter (12-O-tetradecanoylphorbol-13-acetate) was further potentiated by prior exposure to the same low energy electromagnetic field. This field did not alter either basal or 12-O-tetradecanoylphorbol-13-acetate-stimulated DNA synthesis. We observed a similar increase in the basal ODC activity of cultures of two additional cell lines (Chinese hamster ovary; and 294T melanoma) exposed for 1 h to the amplitude-modulated field. Chinese hamster ovary cells exposed to the radio frequency field for 1 h also responded to subsequent treatment with 12-O-tetradecanoylphorbol-13-acetate by exhibiting a further increase in ODC activity. We have observed previously that the activity of this enzyme is increased in cultured cells following a transient exposure to a 60-Hz electric field. Altered ODC activity may serve as a sensitive and specific molecular marker of the transductive coupling of weak pericellular electromagnetic fields to biological systems.

SCHLAGWÖRTER:
medicine; basic research; hf; others

Cain C D et al. 1997

Cain C D, Thomas D L, Adey W R

Focus formation of C3H/10T 1/2 cells and exposure to a 836.55 MHz modulated radiofrequency field

In: Bioelectromagnetics, 18. Jg. (1997), S. 237.

ABSTRACT:
Disruption of communication between transformed cells and normal cells is involved in tumor promotion. We have tested the hypothesis that exposures to radiofrequency (RF) fields using a form of digital modulation (TDMA) and a chemical tumor promoter, 12-O-tetradecanoylphorbol-13-acetate (TPA), are copromoters that enhance focus formation of transformed cells in coculture with parental C3H/10T1/2 murine fibroblasts. RF field exposures did not influence TPA's dose-dependent promotion of focus formation in coculture. Cell cultures were exposed to an 836.55 MHz TDMA-modulated field in TEM transmission line chambers, with incident energies that simulated field intensities at a user's head. Specific absorption rates (SARs) of 0.15, 1.5, and 15 muW/g were used during each digital packet, and the packet frequency was 50/s. The TEM chambers were placed in a commercial incubator at 37 degrees C and 95% humidity/5% CO2. The RF field exposures were in a repeating cycle, 20 min on, 20 min off, 24 h/day for 28 days. At 1.5 muW/g, TPA-induced focus formation (at 10, 30, and 50 ng/ml) was not significantly different in RF-exposed cultures compared to parallel sham-exposed cultures in ten independent experiments in terms of the number, density, and area of foci. Similarly, at 0.15 and 15.0 muW/g, in two and four experiments, respectively, RF exposure did not alter TPA-induced focus formation. The findings support a conclusion that repeated exposures to this RF field do not influence tumor promotion in vitro, based on the RF field's inability to enhance TPA-induced focus formation.

SCHLAGWÖRTER:
medicine; experimentally; hf; biological effects

Cantor K P et al. 1995

Cantor K P, Dosemeci M, Brinton L A, Stewart P A

Re: Breast cancer mortality among female electrical workers in the United States

In: J Natl Cancer Inst, 87. Jg. (1995), S. 227.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Cantor K P et al. 1995a

Cantor K P, Stewart P A, Brinton L A, Dosemeci M

Occupational exposures and female breast cancer mortality in the United States

In: J Occup Environ Med, 37. Jg. (1995), S. 336.

ABSTRACT:
Mortality records from 24 states, gathered from 1984 to 1989 and coded for occupation and industry, were used to develop leads to workplace exposures as possible breast cancer risk factors. A case-control approach was used, with separate analyses for blacks and whites. After excluding homemakers, 33,509 cases and 117,794 controls remained. A job exposure matrix was used to estimate the probability and level of 31 workplace exposures. After adjusting for socioeconomic status, suggestive associations for probability and level of exposure were found for styrene, several organic solvents (methylene chloride, carbon tetrachloride, formaldehyde), and several metals/metal oxides and acid mists. Because of the methodologic limitations of this study, its primary value is in suggesting hypotheses for further evaluation. The findings for styrene, selected solvents, and metals and metal-related exposures deserve additional study.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Carpenter R L 1979

Carpenter R L

Ocular effects of microwave radiation

In: Bull NY Acad Sci, 55. Jg. (1979), S. 1048.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
medicine; other type; hf; others

Chagnaud J-L et al. 1999

Chagnaud J-L, Moreau J-M, Veyret B

No effect of short-term exposure to GSM-modulated low-power microwaves on benzopyrene-induced tumours in rat

In: Int J Radiat Biol, 75. Jg. (1999), S. 1251.

ABSTRACT:
PURPOSE: In view of current interest in the biological effects of amplitude-modulated microwaves arising from the rapid development of mobile communications, the effects of low-level microwaves on cancer development were investigated using a rat sarcoma model. MATERIALS AND METHODS: Two-month-old female Sprague-Dawley rats were treated by injection of benzo(a)pyrene and irradiated with GSM (Global System for Mobile)-modulated 900-MHz microwaves in an anechoic chamber at 55 or 200 microW cm(-2) (75 and 270 mW kg(-1) average whole-body SAR, 2h daily for 2 weeks). Rats were exposed from day 20, 40 or 75 after carcinogen injection. Additional groups of rats were sham-

exposed in a second anechoic chamber. Anti-phosphatidylinositol autoantibody levels were evaluated in sera to monitor malignant transformation. RESULTS: Microwave exposure had no effect on the development of tumours. No acceleration or delays in tumour onset were observed. Animal survival was not modified and serum autoantibody levels were similar in exposed and sham-exposed groups. CONCLUSION: Low-level GSM microwave exposure of rat bearing benzo(a)pyrene-induced tumours had no effect on auto-antibody levels, tumour appearance and survival. The low exposure levels used here correspond to exposure limits for whole-body exposure of humans.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Chapman S et al. 1998

Chapman S, Schofield W N
Emergency use of cellular (mobile) telephones
In: Lancet, 351. Jg. (1998), S. 650.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
other field; other type; hf; others

Chapman S et al. 1998a

Chapman S, Schofield W N
Lifesavers and Samaritans: emergency use of cellular (mobile) phones in Australia
In: Accid Anal Prev, 30. Jg. (1998), S. 815.

ABSTRACT:
BACKGROUND: There has been highly publicised concern about possible radiation health effects from mobile phones and towers, but scant attention has been paid to the use of mobile phones in reducing notification times in emergencies. METHOD: National random telephone survey of Australian mobile phone users (n = 720) and extrapolation to national user population (n = 5.1 million). FINDINGS: Using a cellular phone, 1 in 8 users have reported a traffic accident; 1 in 4 a dangerous situation; 1 in 16 a non-road medical emergency; 1 in 20 a crime; and 1 in 45 being lost in the bush or being in difficulty at sea. INTERPRETATION: Any debate about the net health impact of mobile phone proliferation must balance possible negative effects (cancer, driving incidents) with the benefits from what appears to be their widespread use in rapidly reporting emergencies and in numerous acts of often health-relevant 'cellular Samaritanism'.

SCHLAGWÖRTER:
other field; other type; hf; others

Chen K M et al. 1974

Chen K M, Samuel A, Hoopingarner R
Chromosomal aberration of living cells induced by microwave radiation
In: Environ Lett, 6. Jg. (1974), S. 37.

ABSTRACT:
An experimental study was conducted on chromosomal aberrations in animal and human cells induced by microwave radiation. Chinese hamster cells and human amnion cells were exposed to a microwave of 2.45 GHz at various intensities over various periods of time. Chromosomal aberrations induced in these two types of cells were observed and they appeared to be non thermal in nature.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Chernovetz M E et al. 1977

Chernovetz M E, Justesen D R, Oke A F
A teratological study of the rat: microwave and infrared radiations compared
In: Radio Sci, 12. Jg. (1977), S. 191.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Chizhenkova R A et al 1996

Chizhenkova R A, Safroshkina A A
Electrical reactions of brain to microwave irradiation
In: Electro-Magnetobiology, 15. Jg. (1996), S. 253.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Chou C-K et al. 1978

Chou C-K, Guy A W
Effects of electromagnetic fields on isolated nerve and muscle preparation
In: IEEE Trans Microwave Theory Tech, 26. Jg. (1978), S. 141.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Chou C-K et al. 1979

Chou C-K, Guy A W
Microwave-induced auditory responses in guinea pigs: relationship of threshold and microwave-pulse duration
In: Radio Sci, 14. Jg. (1979), S. 193.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Chou C-K et al. 1983

Chou C-K, Guy A W, Borneman L E, Kunz L L, Kramar
Chronic exposure of rabbits to 0.5 and 5 mW/cm 2 2450-MHz CW microwave radiation
In: Bioelectromagnetics, 4. Jg. (1983), S. 63.

ABSTRACT:
Two groups of 16 male New Zealand rabbits were exposed to 2450-MHz continuous wave microwave fields in two experiments of 90 days each. The incident power densities of the first and second experiment were 0.5 and 5 mW/cm2, respectively. During each study, 16 animals were adapted to a miniature anechoic chamber exposure system for at least 2 weeks, then 8 of them were exposed for 7 h daily, 5 days a week for 13 weeks, and the other 8 animals were sham exposed. The rabbits were placed in acrylic cages, and each was exposed from the top in an individual miniature anechoic chamber. Thermography showed a maximum specific absorption rate of 5.5 W/kg in the head and 7 W/kg in the back at 5-mW/cm2 incident power density. After each 7-h exposure session, the animals were returned to their home cages. Food consumption in the exposure chamber and body mass were measured daily. Blood samples were taken before exposure and monthly thereafter for hematological, morphological, chemical, protein electrophoresis, and lymphocyte blast transformation studies. Eyes were examined for cataract formation. Finally, pathological examinations of 28 specimens of organs and tissues of each rabbit were performed. Statistically, there was a

significant (P less than .01) decrease only of food consumption during the 5-mW/cm2 exposure; other variables were not significantly different between exposed and control groups.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Chou C-K et al. 1985

Chou C-K, Yee K C, Guy A W

Auditory response in rats exposed to 2,450 MHz electromagnetic fields in a circularly polarized waveguide

In: Bioelectromagnetics, 6. Jg. (1985), S. 323.

ABSTRACT:
Rats were exposed to 2,450-MHz pulsed microwave fields in a circularly polarized waveguide. The threshold incident energy density per pulse was about 1.5 to 3 microJ/cm2 over the range 1-10 microseconds. The corresponding whole-body averaged specific absorption of energy was 0.9 to 1.8 mJ/kg per pulse. The same response was evoked when the incident energy density or absorbed energy density per pulse was the same, regardless of the pulse widths.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Chou C-K et al. 1992

Chou C-K, Guy A W, Kunz L L, Johnson R B, Crowley J J, Krupp J H

Long-term, low-level microwave irradiation of rats

In: Bioelectromagnetics, 13. Jg. (1992), S. 469.

ABSTRACT:
Our goal was to investigate effects of long-term exposure to pulsed microwave radiation. The major emphasis was to expose a large sample of experimental animals throughout their lifetimes and to monitor them for effects on general health and longevity. An exposure facility was developed that enabled 200 rats to be maintained under specific-pathogen-free (SPF) conditions while housed individually in circularly-polarized waveguides. The exposure facility consisted of two rooms, each containing 50 active waveguides and 50 waveguides for sham (control) exposures. The experimental rats were exposed to 2,450-MHz pulsed microwaves at 800 pps with a 10-microseconds pulse width. The pulsed microwaves were square-wave modulated at 8-Hz. Whole body calorimetry, thermographic analysis, and power-meter analysis indicated that microwaves delivered at 0.144 W to each exposure waveguide resulted in an average specific absorption rate (SAR) that ranged from 0.4 W/kg for a 200-g rat to 0.15 W/kg for an 800-g rat. Two hundred male, Sprague-Dawley rats were assigned in equal numbers to radiation-exposure and sham-exposure conditions. Exposure began at 8 weeks of age and continued daily, 21.5 h/day, for 25 months. Animals were bled at regular intervals and blood samples were analyzed for serum chemistries, hematological values, protein electrophoretic patterns, thyroxine, and plasma corticosterone levels. In addition to daily measures of body mass, food and water consumption by all animals, O2 consumption and CO2 production were periodically measured in a sub-sample (N = 18) of each group. Activity was assessed in an open-field apparatus at regular intervals throughout the study. After 13 months, 10 rats from each group were euthanized to test for immunological competence and to permit whole-body analysis, as well as gross and histopathological examinations. At the end of 25 months, the survivors (11 sham-exposed and 12 radiation-exposed rats) were euthanized for similar analyses. The other 157 animals were examined histopathologically when they died spontaneously or were terminated in extremis.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Ciaravino V et al. 1987

Ciaravino V, Meltz M L, Erwin D N

Effects of radiofrequency radiation and simultaneous exposure with mitomycin C on the frequency of sister chromatid exchanges in Chinese hamster ovary cells

In: Environ Mutagen, 9. Jg. (1987), S. 393.

ABSTRACT:
Chinese hamster ovary (CHO) cells were exposed for 2 hr with and without mitomycin C (MMC) (1 X 10(-8)M) to pulsed wave radiofrequency radiation (RFR) at 2450 MHz. The repetition rate of 25,000 pulses per sec (pps), pulse width of 10 microseconds, and exposure geometry used, resulted in a specific absorption rate (SAR) of 33.8 W/kg. The following exposure regimens were used: a 37 degrees C water bath control; a water bath temperature control (TC) in which the continuously monitored medium temperature closely followed the temperature rise in the RFR-exposed flasks; and the RFR-exposed cells in a water bath set at 37 degrees C prior to exposure. RFR exposure resulted in a maximum cell culture medium temperature of 39.2 degrees C. In the absence of MMC, there was no significant increase in sister chromatid exchange (SCE) in the RFR-exposed or TC groups over that of the 37 degrees C control. When a simultaneous treatment of RFR and MMC occurred there was no statistical difference in SCE frequency from that caused by chemical treatment alone.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Ciaravino V et al. 1991

Ciaravino V, Meltz M L, Erwin D N

Absence of a synergistic effect between moderate-power radio-frequency electromagnetic radiation and adriamycin on cell-cycle progression and sister-chromatid exchange

In: Bioelectromagnetics, 12. Jg. (1991), S. 289.

ABSTRACT:
In our laboratories we are conducting investigations of potential interactions between radio-frequency electromagnetic radiation (RFR) and chemicals that are toxic by different mechanisms to mammalian cells. The RFR is being tested at frequencies in the microwave range and at different power levels. We report here on the 1) ability of simultaneous RFR exposures to alter the distribution of cells in first and second mitoses from that after treatment by adriamycin alone, and 2) on the ability of simultaneous RFR exposure to alter the extent of sister chromatid exchanges (SCEs) induced by adriamycin alone. This chemical was selected because of its reported mechanism of action and because it is of interest in the treatment of cancer. In our studies, Chinese hamster ovary (CHO) cells were exposed for 2 h simultaneously to adriamycin and pulsed RFR at a frequency of 2,450 MHz and a specific absorption rate of 33.8 W/Kg. The maximal temperature (in the tissue-culture medium) was 39.7 +/- 0.2 degrees C. The experiments were controlled for chemical and RFR exposures, as well as for temperature. Verified statistically, the data indicate that the RFR did not affect changes in cell progression caused by adriamycin, and the RFR did not change the number of SCEs that were induced by the adriamycin, which adriamycin is known to affect cells by damaging their membranes and DNA.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Ciccone G et al. 1993

Ciccone G, Mirabelli D, Levis A, Gavarotti P, Rege-Cambrin G, Davico L, Vineis P

Myeloid leukemias and myelodysplastic syndromes: chemical exposure, histologic subtype and cytogenetics in a case-control study

In: Cancer Genet Cytogenet, 68. Jg. (1993), S. 135.

ABSTRACT:
We conducted a case control study of 50 acute myeloid leukemias (AML), 17 chronic myeloid leukemias (CML), 19 myelodysplastic syndromes (MDS), and 246 controls. The cases were classified according to the French-American-British (FAB) classification, and chromosome aberrations were recorded according to the International System for Human Cytogenetic Nomenclature. Exposure to suspected leukemogenic agents was assessed blindly by an industrial hygienist. Increased risks were noted for mechanics, welders, electricians, and drivers among men and among farmers and textile workers among women. Increased SMRs for leukemias in a census-based cohort study conducted in the same area (Torino) were previously reported for electricians and drivers among men and for textile workers among women. We detected nonstatistically significant increased relative risks for exposure to benzene (odds ratio, OR = 1.7), petrol refining products (1.9), polycyclic aromatic hydrocarbons (1.7), and electromagnetic fields (1.6) in men; in women, a statistically significant association with exposure to pesticides was detected [OR = 4.4; 95% confidence interval (CI) 1.7-11.5]. Although exposure to pesticides was confined to AML, MDS cases included a high proportion of subjects exposed to benzene and electromagnetic fields. No particular histologic subtype of AML was associated with chemical exposures except for that of pesticides with the M4 category. Chromosome aberrations were not associated with chemical exposures (OR = 1.0), but a nonstatistically significant excess was noted in association with electromagnetic fields (OR = 2.1).

SCHLAGWÖRTER:
epidemiology; case-control; cancer

Cleary S F et al. 1965

Cleary S F, Pasternack B S, Beebe G W

Cataract incidence in radar workers

In: Arch Environ Health, 11. Jg. (1965), S. 179.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Cleary S F et al. 1990

Cleary S F, Liu L-M, Merchant R E

Glioma proliferation modulated in vitro by isothermal radiofrequency radiation exposure

In: Radiat Res, 121. Jg. (1990), S. 38.

ABSTRACT:
Isothermal (37 +/- 0.2 degrees C) exposure of glioma cells (LN71) for 2 h to 27 or 2450 MHz continuous-wave radiofrequency (RF) radiation in vitro modulated the rates of DNA and RNA synthesis 1, 3, and 5 days after exposure. The alterations indicate effects on cell proliferation and were not caused by RF-induced cell heating. The dose response for either frequency of the radiation was biphasic. Exposure to specific absorption rates (SARs) of 50 W/kg or less stimulated incorporation rates of tritiated thymidine (3H-TdR) and tritiated uridine (3H-UdR), whereas higher SARs suppressed DNA and RNA synthesis. Statistically significant time-dependent alterations were detected for up to 5 days postexposure, suggesting a kinetic cellular response to RF radiation and the possibility of cumulative effects on cell proliferation. General mechanisms of effects are discussed.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Cleary S F et al. 1990a

Cleary S F, Liu L-M, Merchant R E

In vitro lymphocyte proliferation induced by radiofrequency electromagnetic radiation under isothermal conditions

In: Bioelectromagnetics, 11. Jg. (1990), S. 47.

ABSTRACT:
Whole human blood was exposed or sham-exposed in vitro for 2 h to 27 or 2,450 MHz radio-frequency electromagnetic (RF) radiation under isothermal conditions (i.e., 37 +/- 0.2 degrees C). Immediately after exposure, mononuclear cells were separated from blood by Ficoll density-gradient centrifugation and cultured for 3 days at 37 degrees C with or without mitogenic stimulation by phytohemagglutinin (PHA). Lymphocyte proliferation was assayed at the end of the culture period by 6 h of pulse labeling with 3H-thymidine (3H-TdR). Exposure to radiation at either frequency at specific absorption rates (SARs) below 50 W/kg resulted in a dose-dependent, statistically significant increase of 3H-TdR uptake in PHA-activated or unstimulated lymphocytes. Exposure at 50 W/kg or higher suppressed 3H-TdR uptake relative to that of sham-exposed cells. There were no detectable effects of RF radiation on lymphocyte morphology or viability. Notwithstanding the characteristic temperature dependence of lymphocyte activation in vitro, the isothermal exposure conditions of this study warrant the conclusion that the biphasic, dose-dependent effects of the radiation on lymphocyte proliferation were not dependent on heating.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Cleary S F et al. 1996

Cleary S F, Cao G, Liu L M

Effects of isothermal 2450 MHz microwave radiation on the mammalian cell cycle: comparison with effects of isothermal 27 MHz radiofrequency radiation exposure

In: Bioelectrochem Bioenerget, 39. Jg. (1996), S. 167.

ABSTRACT:
Synchronized Chinese hamster ovary (CHO) cells were exposed to continuouswave (CW) 2.45 GHz microwave radiation (MWR) or CW 27 MHz radiofrequencyradiation (RFR) under isothermal conditions (37 ± 0.2°) to testthe following hypotheses: (1) high frequency electromagnetic radiationexposure directly affects the mammalian cell cycle in the absence ofradiation-induced heating; and (2) the magnitude of the cell cyclealteration is frequency dependent. CHO cells in eitherG0/G1-, S-, or G2/M-phase of the cellcycle were simultaneously exposed to CW 27 MHz RFR or CW 2.45 GHz MWR atspecific absorption rates (SARs) of 5 or 25 W kg-1,or sham exposed, at 37 ± 0.2°C. Cell cycle alterations weredetermined by flow cytofluorometry over a 4 d period after exposure. TheDNA distributions of RFR, MWR, and sham exposed cells were compared todetect qualitative effects on the cell cycle. Quantitative measures of theeffects of isothermal radiation exposure were determined from differencesin the number of exposed and sham exposed cells in various cell cyclephases as well as comparison of the mean DNA content of exposed and sbamexposed cell samples. Flow cytofluorometric assay precision and accuracywere determined by comparison of DNA distributions of replicate CHO controlcell samples and by the use of internal DNA standards. Exposure to 27 MHzRFR or 2.45 GHz MWR altered the CHO cell cycle for periods of up to 4 dfollowing exposure at SARs of 5 or 25 W kg-1. Therewere significant differences in temporal responses, cell cycle phasesensitivity, and overall degree of cell cycle alteration for 27 MHzcompared with 2.45 GHz radiation exposure. In contrast to the effect of 27MHz RFR, which

did not affect G2/M-phase CHO cells, 2.45 GHz MWRaltered all cell cycle phases to varying degrees. Exposure to 2.45 GHz MWRat 5 or 25 W kg-1 was twice as effective as 27 MHzRFR in inducing cell cycle alterations as determined by differences in thenumber of exposed versus sham-exposed cells in various cell cycle phases.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Cocco P et al. 1998

Cocco P, Dosemeci M, Heineman E F

Occupational risk factors for cancer of the central nervous system: a case-control study on death certificates from 24 U.S. states

In: Am J Ind Med, 33. Jg. (1998), S. 247.

ABSTRACT:
We evaluated the risk of gastric cardia cancer by occupation and industry in a case-control study using information from death certificates for 24 US states in 1984-1992. One thousand fifty-six cases of gastric cardia cancer were identified among men aged 20 years or more, including 1,023 whites and 33 blacks. Controls were 5,280 subjects who died of nonmalignant diseases, 5:1 matched to cases by geographic region, race, gender, and 5-year age group. Among white men, occupations with elevated risk included financial managers (odds ratio [OR] = 6.1; 95% confidence interval [CI], 1.3-28.8), janitors and cleaners (OR = 1.7; 95% CI, 1.0-2.9), production inspectors (OR = 3.2; 95% CI, 1.5-6.9), and truck drivers (OR = 1.5; 95% CI, 1.0-2.2). Industries with elevated risk included pulp and paper mills (OR = 2.0; 95% CI, 1.0-37), newspaper publishing and printing (OR = 2.6; 95% CI, 1.0-6.3), industrial and miscellaneous chemicals (OR = 2.0; 95% CI, 1.0-3.9), water supply and irrigation (OR = 5.6; 95% CI, 1.6-19.9). Among black men, risks were nonsignificantly increased for subjects employed in railroads (3 cases, 2 controls) and for carpenters (3 cases, 0 controls). We created job-exposure matrices for asbestos, inorganic dust, metal dust, lead, polycyclic aromatic hydrocarbons, nitrogen oxides, nitrosamines, sulfuric acid, fertilizers, herbicides, other pesticides, and wood dust. Among white men, a consistent pattern of risk increase by level and probability of exposure was observed only for sulfuric acid mists, with a twofold excess (95% CI, 0.6-7.3) associated with high probability of high intensity exposure. A significant 30% increase in risk was observed for those subjects with a high probability of exposure (all levels combined) to lead, and a 60% increase was observed for subjects with high-level exposure to lead (all probabilities combined). However, crosstabulation of gastric cardia cancer risk by probability and level of exposure to lead did not show consistent trends. Asbestos exposure also showed an overall 50% increase but no consistent trends among white men. None of the 12 occupational hazards showed an association with risk for black men.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Cocco P et al. 1998a

Cocco P, Figgs L, Dosemeci M, Hayes R, Linet M S, Hsing A W

Case-control study of occupational exposures and male breast cancer

In: Occup Environ Med, 55. Jg. (1998), S. 599.

ABSTRACT:
OBJECTIVE: To investigate whether risk of male breast cancer is associated with workplace exposures. METHODS: A case-control study of 178 cases of male breast cancer and 1041 controls was carried out with data from the United States national mortality follow-back survey, which collected questionnaire information from proxy respondents of a 1% sample of all 1986 United States deaths among subjects aged 25-74 years. Occupational exposure to electromagnetic fields, high temperatures, polycyclic aromatic hydrocarbons (PAHs), herbicides, other pesticides, and organic solvents was assessed by applying job-exposure matrices, based on the 1980 United States census occupation and industry codes, to the longest job held by study subjects as reported by the informants. A socioeconomic status index was created by combining information on annual family income, education, assets, and occupation to assess the association of socioeconomic status with male breast cancer. Relative risks were derived from logistic regression modelling, which included age, socioeconomic status, marital status, and body mass index, as well as occupational exposures. RESULTS: Risk for male breast cancer increased significantly with increasing socioeconomic status index (test for trend: $p < 0.01$), but the risks associated with individual socioeconomic status variables were smaller and the trends were not significant. A significant increase in risk of male breast cancer was associated with employment in blast furnaces, steel works, and rolling mills (odds ratio (OR) 3.4; 95% confidence interval (95% CI) 1.1 to 10.1, based on six cases), and motor vehicle manufacturing (OR 3.1; 95% CI 1.2 to 8.2, based on seven cases). However, exposures to electromagnetic fields, high temperature, PAHs, herbicides, other pesticides, and organic solvents were not associated with risk of male breast cancer. CONCLUSIONS: The role of workplace exposures in increasing risk of breast cancer among men employed in motor vehicle manufacturing and in blast furnaces, steel works, and rolling mills deserves further investigation. The finding on socioeconomic status suggests that, as well as reproductive factors, other lifestyle factors such as diet that may be related to high socioeconomic status in men should be investigated further.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Cocco P et al. 1999

Cocco P, Heineman E F, Dosemeci M

Occupational risk factors for cancer of the central nervous system (CNS) among US women

In: Am J Ind Med, 36. Jg. (1999), S. 70.

ABSTRACT:
BACKGROUND: In a recent report, we found an elevated risk of cancer of the central nervous system (CNS) in several occupations and industries, and a modest association with exposure to solvents and to contact with the public. METHODS: To further explore the occupational risk of CNS cancer among women, we extended the analysis of the previous death certificate-based case-control study, including 12,980 female cases (ICD-9 codes 191 and 192) in 24 US states in 1984-1992 and 51,920 female controls who died from diseases other than malignancies and neurological disorders. We applied newly designed job-exposure matrices for 11 occupational hazards, previously reported as brain cancer risk factors, to the occupation and industry codes in the death certificates. We also conducted a separate analysis of 161 meningioma cases (ICD-9 codes 192.1 and 192.3), a tumor more frequent among women, particularly in the postmenopausal age group. RESULTS: Overall, CNS cancer risk showed a 20-30% increase among women exposed to electromagnetic fields (EMF), methylene chloride, insecticides and fungicides, and contact with the public. Risk for meningioma was elevated among women exposed to lead (OR = 1.9; 95% CI 1.0, 3.9). CNS cancer did not show a clear pattern of risk increase by probability and intensity of exposure to any of the explored risk factors. Cross-classification by probability and intensity of exposure did not reveal any significant trend. Cases were too few to explore trends of meningioma by probability and intensity of exposure to lead. CONCLUSIONS: We did not find evidence of a strong contribution of 11 occupational

hazards to the etiology of CNS cancer. However, limitations of the occupational information might have reduced our ability to detect clear patterns of risk.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Coghill R W et al. 1996

Coghill R W, Steward J, Philips A

Extra low frequency electric and magnetic fields in the bedplace of children diagnosed with leukaemia: a case-control study

In: Eur J Cancer Prev, 5. Jg. (1996), S. 153.

ABSTRACT:
This retrospective case-control study of 56 cases and 56 controls measured extra low frequency (ELF) electric and magnetic fields between 2000 h and 0800 h in the bedplaces of children with leukaemia. Mean ELF electric field (E-field) levels found in case homes of 13.9 Vm-1 (SD: 13.6) were significantly higher (P < 0.01) compared with only 7.3 Vm-1 (SD: 12.9) in controls matched for age and sex. Moreover, applying conditional logistic regression, a dose-response relationship emerged between E-field exposure and incidence: above 20 Vm-1 the relative risk was 4.69 (95% CI: 1.17-27.78; P = 0.025), whereas at levels of 10-19 Vm-1 it was 2.40 (95% CI: 0.79-8.09) and at levels of 5-9 Vm-1 it was only 1.46 (95% CI: 0.47-5.10). By contrast, similar readings of the rms ELF magnetic field found no significant case-control differences: mean levels in cases' homes of 0.070 microT (SD: 0.070) compared with 0.057 microT (SD: 0.038) in controls. Although there were imperfections in the study design, it is concluded that the importance of the E-field may have been overlooked in epidemiological studies to date.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Coleman M P et al. 1989

Coleman M P, Bell C M, Taylor H L, Primic-Zakelj M

Leukaemia and residence near electricity transmission equipment: a case-control study

In: Br J Cancer, 60. Jg. (1989), S. 793.

ABSTRACT:
A population-based case-control study of leukaemia and residential proximity to electricity supply equipment has been carried out in south-east England. A total of 771 leukaemias was studied, matched for age, sex, year of diagnosis and district of residence to 1,432 controls registered with a solid tumour excluding lymphoma; 231 general population controls aged 18 and over from one part of the study area were also used. The potential for residential exposure to power frequency magnetic fields from power-lines and transformer substations was assessed indirectly from the distance, type and loading of the equipment near each subject's residence. Only 0.6% of subjects lived within 100 m of an overhead power-line, and the risk of leukaemia relative to cancer controls for residence within 100 m was 1.45 (95% confidence interval (CI) 0.54-3.88); within 50 m the relative risk was 2.0 but with a wider confidence interval (95% CI 0.4-9.0). Over 40% of subjects lived within 100 m of a substation, for which the relative risk of leukaemia was 0.99. Residence within 25 m carried a risk of 1.3 (95% CI 0.8-2.0). Weighted exposure indices incorporating measures of the current load carried by the substations did not materially alter these risks estimates. For persons aged less than 18 the relative risk of leukaemia from residence within 50 m of a substation was higher than in adults (PR = 1.5, 95% CI 0.7-3.4).

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Coogan P F et al. 1996

Coogan P F, Clapp R W, Newcomb P A, Wenzl T B, Bogdan G, Mittendorf R, Baron J A, Longnecker M P

Occupational exposure to 60-hertz magnetic fields and risk of breast cancer in women

In: Epidemiology, 7. Jg. (1996), S. 459.

ABSTRACT:
We used data from a large population-based case-control study to test the hypothesis that women whose "usual occupation" entailed exposure to higher than background 60-Hz magnetic fields had a higher risk of breast cancer than women without such exposure. Breast cancer cases were identified from four statewide tumor registries, and controls were randomly selected from lists of licensed drivers and Medicare beneficiaries. Information on usual occupation and breast cancer risk factors was obtained by telephone interview. We calculated adjusted odds ratios from logistic regression models for women holding occupations with potential for low, medium, or high magnetic field exposure, compared with background exposure. There was a modest increase in risk for women with potential for high exposure [odds ratio (OR) = 1.43; 95% confidence interval (CI) = 0.99-2.09], and no increase for women with potential for medium (OR = 1.09; 95% CI = 0.83-1.42) or low (OR = 1.02; 95% CI = 0.91-1.15) exposure The risk among premenopausal women in the highest-exposure category was higher (OR = 1.98; 95% CI = 1.04-3.78) than for postmenopausal women (OR = 1.33; 95% CI = 0.82-2.17).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Coogan P F et al. 1998

Coogan P F, Aschengrau A

Exposure to power frequency magnetic fields and risk of breast cancer in the Upper Cape Cod Cancer Incidence Study

In: Arch Environ Health, 53. Jg. (1998), S. 359.

ABSTRACT:
Investigators used a population-based case-control study to evaluate the relationship between breast cancer risk and exposure to 60-Hz magnetic fields from various sources. There was no increase in breast cancer risk associated with (a) holding a job with high (odds ratio [OR] = 1.2; 95% confidence interval [CI] = 0.4, 3.4) or medium (OR = 0.9; 95% CI = 0.5, 1.7) exposure to magnetic fields; (b) living in a home heated electrically (OR = 1.0; 95% CI = 0.7, 1.4); or (c) sleeping with an electric blanket (OR = 1.0; 95% CI = 0.7, 1.4). There was a nonsignificant 50% increase in risk for subjects who lived within 152 m (500 ft) of an electricity transmission line or substation (OR = 1.5; 95% CI = 0.6, 3.3). Although limited by small numbers and exposure misclassification, the data in this study did not support the hypothesis that exposure to 60-Hz magnetic fields increases the risk of breast cancer in women.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

D'Andrea J A 1991

D'Andrea J A

Microwave radiation absorption: behavioural effects

In: Health Phys, 61. Jg. (1991), S. 29.

ABSTRACT:
The literature contains much evidence that absorption of microwave energy will lead to behavioral changes in man and laboratory animals. The changes include simple perturbations or outright stoppage of ongoing behavior. On one extreme, intense microwave absorption can result in seizures followed by death. On the other extreme, man and animals can hear microwave pulses at very low rates of absorption. Under certain conditions of exposure, animals will avoid microwaves, while under other conditions, they

will actively work to obtain warmth produced by microwaves. Some research has shown behavioral effects during chronic exposure to low-level microwaves. The specific absorption rates that produce behavioral effects seem to depend on microwave frequency, but controversy exists over thresholds and mechanism of action. In all cases, however, the behavioral disruptions cease when chronic microwave exposure is terminated. Thermal changes in man and animals during microwave exposure appear to account for all reported behavioral effects.

SCHLAGWÖRTER:
epidemiology; Review; hf; others

D'Andrea J A 1999

D'Andrea J A

Behavioral evaluation of microwave irradiation

In: Bioelectromagnetics, 20. Jg. (1999), S. 64.

ABSTRACT:
Establishing safe exposure levels for microwave irradiation is important since new, more powerful emitters are developed and the potential for accidental exposure is increasing. Analysis of the behavior of exposed laboratory animals has proven to be an accurate and repeatable metric for assessing the effects of microwave irradiation. Determining the specific absorption rate (SAR) at which an animal will cease an ongoing behavior has proven useful in the development of safe exposure levels for humans. Behaviors that have been used are simple tasks, and the point at which behavior changes significantly or ceases has often been referred to as "work stoppage." The tasks have been used to evaluate the overwhelming effects of heating produced by microwave irradiation. Both whole-body exposures and partial-body exposures with hotspots have been evaluated. Recent studies have suggested that microwave effects on specific cognitive aspects of behavior such as attention, learning, memory, discrimination, and time perception may occur at SAR levels far below the SARs needed to cause work stoppage. New research studies are underway to evaluate microwave-induced cognitive effects.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

D'Andrea J A et al. 1977

D'Andrea J A, Gandhi O P, Lords J L

Behavioral and thermal effects of microwave radiation at resonant and non-resonant wavelengths

In: Radio Sci, 12. Jg. (1977), S. 251.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
other field; other type; hf; others

D'Andrea J A et al. 1979

D'Andrea J A, Gandhi O P, Lords J L, Durney C H, Johnson C C, Astle L

Physiological and behavioral effects of chronic exposure to 2450 MHz microwaves

In: J Microw Power, 14. Jg. (1979), S. 351.

ABSTRACT:
Long-Evans male adult rats were exposed for sixteen weeks to 2450-MHz CW microwaves at an average power density of mW/cm2. The resulting dose rate was 1.23 (+/- 0.25SEM) mW/g. The animals were exposed eight hours a day, five days a week, for a total of 640 h in a monopole-above-ground radiation chamber while housed in Plexiglas holding cages. Daily measures of body mass and of food and water intakes indicated no statistically significant effects of microwave irradiation. Biweekly stabilimetric tests immediately after exposure revealed a significant depression of behavioral activity by 15 microwave-exposed rats as compared with 15 sham-exposed animals. Measures of locomotor activity based on revolutions of a running wheel, which were obtained during 12-h periods between each 8-h exposure, showed no significant effect of irradiation. Blood sampled after 2, 6, 10, and 14 weeks of exposure indicated slight alterations of sulfhydryl groups, and of red and white blood-cell counts. Measures of levels of 17-ketosteroids in urine at weeks 1, 5, 9, and 12 of exposure, and mass of adrenals, heart, and liver at the end of the sixteen-week period of exposure, revealed no indications of stress.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

D'Andrea J A et al. 1980

D'Andrea J A, Gandhi O P, Lords J L, Durney C H, Astle L, Stensaas S, Schoenberg A A

Physiological and behavioral effects of prolonged exposure to 915 MHz microwaves

In: J Microw Power, 15. Jg. (1980), S. 123.

ABSTRACT:
Long-Evans male adult rats were exposed for 16 weeks to 915-MHz CW microwaves at an average power density of 5 mW/cm2. The resulting dose rate was 2.46 (+/- 0.29 SEM) mW/g. The animals were exposed eight hours a day, five days a week, for a total of 640 h in a monopole-above ground radiation chamber while housed in Plexiglas cages. Daily measures of body mass and of food and water intake indicated no statistically significant effects of microwave irradiation. Measures by activity wheels and stabilimetric platforms of spontaneous locomotion indicate than mean activity levels increased about 25% after microwave exposure, but the findings are doubtful statistical significance (Ps < .10 but > .05). Studies of blood sampled after 2, 6, 10, and 14 weeks of exposure revealed alterations of free sulfhydryls. Measures of levels of urinary 17-ketosteroids at weeks 1, 5, 9, and 12 of exposure, and measures of brain hypothalamic tissue, and of mass of adrenals, heart, and liver at the end of the 16-week period, revealed no significant differences between irradiated and control animals. Cortical EEGs sampled after conclusion of microwave exposures also revealed no significant differences.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

D'Andrea J A et al. 1986

D'Andrea J A, Dewitt J R, Gandhi O P, Stensaas S, Lords J L, Neilson H C

Behavioral and physiological effects of chronic 2450 MHz microwave irradiation of the rat at 0.5 mW/cm2

In: Bioelectromagnetics, 7. Jg. (1986), S. 45.

ABSTRACT:
Adult male Long-Evans rats were intermittently exposed to 2450 MHz CW microwaves at an average power density of 0.5 mW/cm2 for 90 days. The resulting SAR was 0.14 W/kg (range 0.11 to 0.18 W/kg). The animals were exposed 7 h/day, 7 days/wk, for a total of 630 h in a monopole-above-ground radiation chamber while housed in Plexiglas holding cages. Daily measures of body mass and food and water intake indicated no statistically significant effects of microwave exposure. Monthly assessment of reactivity to electric footshock, levels of cholinesterase and sulfhydryl groups in blood, and 17-ketosteroids in urine revealed no reliable differences between 14 sham-exposed and 14 microwave-exposed rats. After the 90 days of exposure, seven rats, randomly chosen from each group, were assessed for open-field behavior, shuttlebox performance, and schedule-controlled (IRT schedule) lever pressing for food pellets. Statistically significant differences between microwave-exposed and sham-exposed rats were observed in shuttlebox performances and lever pressing. Post mortem measures of mass of several organs and microscopic examination of adrenal tissue revealed no differences between the two

groups of animals.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

D'Andrea J A et al. 1986a

D'Andrea J A, Dewitt J R, Emmerson R Y, Bailey C, Stensaas S, Gandhi O P

Intermittent exposure of rats to 2450 MHz microwaves at 2.5 mW/cm 2 . Behavioural and physiological effects

In: Bioelectromagnetics, 7. Jg. (1986), S. 315.

ABSTRACT:
Long-Evans male adult rats were intermittently exposed for 14 weeks to continuous wave (CW) 2450-MHz microwaves at an average power density of 2.5 mW/cm2. The mean specific absorption rate was 0.70 W/kg (+/- 0.02 SEM). The rats were exposed 7 h/day, 7 days/week in a radiation chamber with a monopole above ground, while housed in Plexiglas cages. Weekly measures of body mass and food intake did not indicate statistically significant effects of microwave irradiation. Assessments of threshold for electric-footshock detection revealed a significant difference between microwave and sham-exposed animals. Assessments of cholinesterase and sulfhydryl groups in blood and 17-ketosteroids in urine did not distinguish the two groups of rats. Behavioral measures made at the end of the 14-week exposure included an open-field test, shuttlebox avoidance performance, and schedule-controlled lever-pressing for food pellets. Statistically significant differences between microwave- and sham-exposed rats were observed for these measures. Examination of adrenal tissue, plasma electrolytes, and organ masses after 14 weeks of exposure revealed no difference between the two groups of rats.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

D'Inzeo G et al. 1988

D'Inzeo G, Bernardi P, Eusebi F, Grassi F, Tamburello C, Zani B M

Microwave effects on acetylcholine-induced channels in cultured chick myotubes

In: Bioelectromagnetics, 9. Jg. (1988), S. 363.

ABSTRACT:
The behavior of cultured myotubes from chick embryos exposed to microwaves has been experimentally analyzed. Recordings of acetylcholine-induced currents have been obtained via patch-clamp techniques using both cell-attached (single-channel current recording) and whole-cell (total current recording) configurations. During the exposure to low-power microwaves the frequency of the ACh-activated single channel openings decreased, while the ACh-induced total current showed a faster falling phase. Channel open time and conductance were not affected by microwave irradiation. It is concluded that the exposure to microwaves increases the rate of desensitization and decreases the channel opening probability. The nonthermal origin and the molecular interaction mechanisms governing these electromagnetic-induced effects are discussed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Daniells C et al. 1998

Daniells C, Duce I, Thomas D, Sewell P, Tattersall J, de Pomerai D

Transgenic nematodes as biomonitors of microwave-induced stress

In: Mutat Res [Angaben zu Jahrgang oder Jahr der Zeitschrift fehlen!], S. 55.

ABSTRACT:
Transgenic nematodes (Caenorhabditis elegans strain PC72), carrying a stress-inducible reporter gene (Escherichia coli beta-galactosidase) under the control of a C. elegans hsp16 heat-shock promoter, have been used to monitor toxicant responses both in water and soil. Because these transgenic nematodes respond both to heat and toxic chemicals by synthesising an easily detectable reporter product, they afford a useful preliminary screen for stress responses (whether thermal or non-thermal) induced by microwave radiation or other electromagnetic fields. We have used a transverse electromagnetic (TEM) cell fed from one end by a source and terminated at the other end by a matched load. Most studies were conducted using a frequency of 750 MHz, at a nominal power setting of 27 dBm. The TEM cell was held in an incubator at 25 degrees C inside a shielded room; corresponding controls were shielded and placed in the same 25 degrees C incubator; additional baseline controls were held at 15 degrees C (worm growth temperature). Stress responses were measured in terms of beta-galactosidase (reporter) induction above control levels. The time-course of response to continuous microwave radiation showed significant differences from 25 degrees C controls both at 2 and 16 h, but not at 4 or 8 h. Using a 5 x 5 multiwell plate array exposed for 2 h, the 25 microwaved samples showed highly significant responses compared with a similar control array. The wells most strongly affected were those in the rows closest to the source, whereas the most distant row did not rise above control levels, suggesting a shadow effect. These differential responses are difficult to reconcile with general heating effects, although localised power absorption affords a possible explanation. Experiments in which the frequency and/or power settings were varied suggested a greater response at 21 than at 27 dBm, both at 750 and 300 MHz, although extremely variable responses were observed at 24 dBm and 750 MHz. Thus, lower power levels tended, if anything, to induce larger responses (with the above-mentioned exception), which is opposite to the trend anticipated for any simple heating effect. These results are reproducible and data acquisition is both rapid and simple. The evidence accrued to date suggests that microwave radiation causes measurable stress to transgenic nematodes, presumably reflecting increased levels of protein damage within cells (the common signal thought to trigger hsp gene induction). The response levels observed are comparable to those observed with moderate concentrations (ppm) of metal ions such as Zn2+ and Cu2+. We conclude that this approach deserves further and more detailed investigation, but that it has already demonstrated clear biological effects of microwave radiation in terms of the activation of cellular stress responses (hsp gene induction).

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Dardalhon M et al. 1981

Dardalhon M, Averbeck D, Berteaud A J

Studies on possible genetic effects of microwaves in procaryotic and eucaryotic cells

In: Radiat Environ Biophys, 20. Jg. (1981), S. 37.

ABSTRACT:
The biological effects of microwaves in the hyperfrequency range, 9,4 GHz, and 70-75 GHz were investigated in bacteria and yeast. At power densities below 60 mW/cm2 and SAR values not exceeding 28 mW/g no significant effects on survival of repair competent an deficient strains were observed in Escherichia coli and Saccharomyces cerevisiae. In addition, microwaves of 17 GHz did not induce mutations in E. coli B/r WP2 trp- uvr- above the spontaneous level, and the induction of nuclear reversions, cytoplasmic "petite" mutations and mitotic recombination as well as the efficiency of sporulation was not affected in yeast.

SCHLAGWÖRTER:
bioassay; basic research; hf; others

Darmon P et al. 1998

Darmon P, Guillaume V, Wiart J, Dutour A, Oliver C
Do mobile cellular phones interfere with portable insulin pumps?
In: Diabetes Care, 21. Jg. (1998), S. 1775.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Davanipour Z et al. 1997

Davanipour Z, Sobel E, Bowman J D, Qian Z, Will A D
Amyotrophic lateral sclerosis and occupational exposure to electromagnetic fields
In: Bioelectromagnetics, 18. Jg. (1997), S. 231.

ABSTRACT:
In an hypothesis-generating case-control study of amyotrophic lateral sclerosis, lifetime occupational histories were obtained. The patients (n = 28) were clinic based. The occupational exposure of interest in this report is electromagnetic fields (EMFs). This is the first and so far the only exposure analyzed in this study. Occupational exposure up to 2 years prior to estimated disease symptom onset was used for construction of exposure indices for cases. Controls (n = 32) were blood and nonblood relatives of cases. Occupational exposure for controls was through the same age as exposure for the corresponding cases. Twenty (71%) cases and 28 (88%) controls had at least 20 years of work experience covering the exposure period. The occupational history and task data were used to classify blindly each occupation for each subject as having high, medium/high, medium, medium/low, or low EMF exposure, based primarily on data from an earlier and unrelated study designed to obtain occupational EMF exposure information on workers in "electrical" and "nonelectrical" jobs. By using the length of time each subject spent in each occupation through the exposure period, two indices of exposure were constructed: total occupational exposure (E1) and average occupational exposure (E2). For cases and controls with at least 20 years of work experience, the odds ratio (OR) for exposure at the 75th percentile of the E1 case exposure data relative to minimum exposure was 7.5 (P < 0.02; 95% CI, 1.4-38.1) and the corresponding OR for E2 was 5.5 (P < 0.02; 95% CI, 1.3-22.5). For all cases and controls, the ORs were 2.5 (P < 0.1; 95% CI, 0.9-8.1) for E1 and 2.3 (P = 0.12; 95% CI, 0.8-6.6) for E2. This study should be considered an hypothesis-generating study. Larger studies, using incident cases and improved exposure assessment, should be undertaken.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Davis R L et al. 1993

Davis R L, Mostofi F K
Cluster of testicular cancer in police officers exposed to hand-held radar
In: Am J Ind Med, 24. Jg. (1993), S. 231.

ABSTRACT:
Within a cohort of 340 police officers, six incident cases of testicular cancer occurred between 1979 and 1991 (O/E 6.9; p < 0.001, Poisson distribution). Occupational use of hand-held radar was the only shared risk factor among all six officers, and all routinely held the radar gun directly in close proximity to their testicles. Health effects of occupational radar use have not been widely studied, and further research into a possible association with testicular cancer is warranted.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Davis S et al. 2001

Davis S, Kaune W T, Mirick D K, Chen C, Stevens R G
Residential magnetic fields, light-at-night, and nocturnal urinary 6-sulfatoxymelatonin concentration in women
In: Am J Epidemiol, 154. Jg. (2001), S. 591.

ABSTRACT:
Exposure to 60-Hz magnetic fields may increase breast cancer risk by suppressing the normal nocturnal rise in melatonin. This 1994-1996 Washington State study investigated whether such exposure was associated with lower nocturnal urinary concentration of 6-sulfatoxymelatonin in 203 women aged 20-74 years with no history of breast cancer. Each woman was interviewed and provided data on the following for a 72-hour period at two different seasons of the year: 1) magnetic field and ambient light measured every 30 seconds in her bedroom, 2) personal magnetic field measured at 30-second intervals, and 3) complete nighttime urine samples on three consecutive nights. Lower nocturnal urinary 6-sulfatoxymelatonin level was associated with more hours of daylight, older age, higher body mass index, current alcohol consumption, and current use of medications classified as beta blockers, calcium channel blockers, or psychotropics. After adjustment for these factors, higher bedroom magnetic field level was associated with significantly lower urinary concentration of 6-sulfatoxymelatonin during the same night, primarily in women who used these medications and during times of the year with the fewest hours of darkness. These results suggest that exposure to nighttime residential 60-Hz magnetic fields can depress the normal nocturnal rise in melatonin.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Davis S et al. 2002

Davis S, Mirick D K, Stevens R
Residential magnetic fields and the risk of breast cancer
In: Am J Epidemiol, 155. Jg. (2002), S. 446.

ABSTRACT:
Chronic exposure to 60-Hz magnetic fields may increase the risk of breast cancer by suppressing the normal nocturnal production of melatonin. This population-based case-control study investigated whether such exposure is associated with an increased risk of breast cancer in women aged 20-74 years from the greater Seattle, Washington, area. Cases were diagnosed between November 1992 and March 1995 (n = 813); controls were identified by random digit dialing and were frequency matched by 5-year age groups (n = 793). Exposure was estimated using magnetic field measurements in the home at diagnosis, wiring configuration of all homes occupied in the 10 years prior to diagnosis, and self-reported measures of at-home electric appliance use. Odds ratios and 95% confidence intervals were estimated using conditional logistic regression with adjustment for other potential risk factors. Risk did not increase with measured nighttime bedroom magnetic field level, wiring configuration of the home at diagnosis, weighted summary wire codes of all homes occupied 5 and 10 years prior to diagnosis, or reported use of common household appliances, including bed-warming devices. These data do not support the hypothesis that exposure to residential magnetic fields is associated with an increased risk of developing breast cancer.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

De Guire L et al. 1988

De Guire L, Theriault G, Iturra H, Provencher S, Cyr D, Case BW

Increased incidence of malignant melanoma of the skin in workers in a telecommunications industry

In: Br J Ind Med, 45. Jg. (1988), S. 824.

ABSTRACT:
In 1982 physicians at a hospital melanoma clinic in Montreal noticed that among their patients there had been seven men working in a single telecommunications company. This raised suspicions that working in that industry might be associated with development of malignant melanoma of the skin (MMS). A preliminary gross comparison with general population rates indicated that there was an increased risk in this working group. To estimate the risk of MMS more accurately, a standardised incidence ratio (SIR) was calculated based on the rates of MMS in the local population of the Greater Metropolitan Montreal Area for the years 1976-83. During that period, among workers in all plants for the company, 10 male cases of MMS were observed for an expected number of 3.7 (SIR = 2.7; 95% CI = 1.31-5.02). No cases were observed among female workers (expected = 1.3). The excess was significant among cases with a short latency (less than 20 years since beginning of employment). There was no apparent pattern of exposure based on job titles or departments.

SCHLAGWÖRTER:
epidemiology; other type; none; cancer

De Lorge J O 1984

De Lorge J O

Operant behavior and colonic temperature of Macaca mulatta exposed to radio frequency fields at and above resonant frequencies

In: Bioelectromagnetics, 1. Jg. (1984), S. 183.

ABSTRACT:
Five food-deprived rhesus monkeys were exposed to 225-MHz continuous-wave, and 1.3-GHz, and 5.8-GHz pulsed radiation to determine the minimal power densities affecting performance. The monkeys were trained to press a lever (observing-response) thereby producing signals that indicated availability of food. In the presence of the aperiodically appearing food signals, a detection response on a different lever was reinforced by a food pellet. Continuous, stable responding during 60-min sessions developed and was followed by repeated exposures to radiofrequency radiation. The subjects, restrained in a Styrofoam chair, were exposed to free-field radiation while performing the task. Colonic temperature was simultaneously obtained. Observing-response performance was impaired at increasingly higher power densities as frequency increased from the near-resonance 225 MHz to the above-resonance 5.8 GHz. The threshold power density of disrupted response rate at 225 MHz was 8.1 mW/cm2; at 1.3 GHz it was 57 mW/cm2, and at 5.8 GHz it was 140 mW/cm2. These power densities were associated with reliable increases in colonic temperatures above sham-exposure levels. The mean increase was typically in the range of 1 degree C, and response-rate changes were not observed in the absence of concomitant temperature increases. In these experiments increase of colonic temperature was a much better predictor of behavioral disruption than was either the power density of the incident field or estimates of whole-body-averaged rates of energy absorption.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

De Lorge J O et al. 1980

De Lorge J O, Ezell C S

Observing responses of rats exposed to 1.28- and 5.62-GHz microwaves

In: Bioelectromagnetics, 1. Jg. (1980), S. 183.

ABSTRACT:
The effects of microwave irradiation at two different frequencies (1.28 and 5.62 GHz) on observing-behavior of rodents were investigated. During daily irradiation, eight male hooded rats performed on a two-lever task; depression of one lever produced one of two different tones and the other lever produced food when depressed in the presence of the appropriate tone. At 5.62 GHz, the observing-response rate was not consistently affected until the power density approximated 26 mW/cm2 at 1.28 GHz, the observing-response rate of all rats was consistently affected at a power density of 15 mW/cm2. The respective whole-body specific absorption rates (SARs) were 4.94 and 3.75 W/kg. Measurements of localized SAR in a rat-shaped model of simulated muscle tissue revealed marked differences in the absorption pattern between the two frequencies. The localized SAR in the model's head at 1.28 GHz was higher on the side distal to the source of radiation. At 5.62 GHz the localized SAR in the head was higher on the proximal side. It is concluded that the rat's observing behavior is disrupted at a lower power density at 1.28 than at 5.62 GHz because of deeper penetration of energy at the lower frequency, and because of frequency-dependent differences in anatomic distribution of the absorbed microwave energy.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

De Roos A J et al. 2001

De Roos A J, Teschke K, Savitz D A, Poole C, Grufferman S, Pollock B H, Olshan A F

Parental occupational exposures to electromagnetic fields and radiation and the incidence of neuroblastoma in offspring

In: Epidemiology, 12. Jg. (2001), S. 508.

ABSTRACT:
We examined parental occupational exposures to electromagnetic fields and radiation and the incidence of neuroblastoma in offspring. Cases were 538 children diagnosed with neuroblastoma between 1992 and 1994 in the United States or Canada. Age-matched controls were selected by random-digit dialing. Occupational exposures to electrical equipment and radiation sources were classified by an industrial hygienist, and average exposures to extremely low frequency magnetic fields were estimated using a job exposure matrix. Maternal exposure to a broad grouping of sources that produce radiofrequency radiation was associated with an increased incidence of neuroblastoma (odds ratio = 2.8; 95% confidence interval = 0.9-8.7). Paternal exposure to battery-powered forklifts was positively associated with neuroblastoma (odds ratio = 1.6; 95% confidence interval = 0.8-3.2), as were some types of equipment that emit radiofrequency radiation (odds ratios congruent with 2.0); however, the broad groupings of sources that produce ELF fields, radiofrequency radiation, or ionizing radiation were not associated with neuroblastoma. Paternal average extremely low frequency magnetic field exposure >0.4 microTesla was weakly associated with neuroblastoma (odds ratio = 1.6; 95% confidence interval = 0.9-2.8), whereas maternal exposure was not. Overall, there was scant supportive evidence of strong associations between parental exposures in electromagnetic spectrum and neuroblastoma in offspring.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Delpizzo V 1992

Delpizzo V

An apparently incongruous exposure-response relationship resulting from the use of job description to assess magnetic field exposure

In: Scand J Work Environ Health, 18. Jg. (1992), S. 242.

ABSTRACT:
Empirical data are presented to support the observation that nondifferential misclassification of subjects classified according to an ordinal scale can result in an artifactual nonmonotonic exposure-response curve. This phenomenon can be interpreted erroneously as an indication that an observed relationship is not causal. The occupational exposure of 40 subjects to extremely low-frequency magnetic fields was estimated on the basis of their job description while their "true" exposure was determined by direct dosimetry. A "true" risk was assumed to exist, and estimates of risk that could be obtained through hypothetical case-referent or cohort studies were calculated.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Delpizzo V 1994

Delpizzo V

Epidemiological studies of work with video display terminals and adverse pregnancy outcomes (1984-1992)

In: Am J Ind Med, 26. Jg. (1994), S. 465.

ABSTRACT:
Many epidemiological studies have investigated the claim that work with video display terminals (VDT) is a risk factor during pregnancy. Results have been inconsistent, although in the majority of cases the hypothesis was not supported. Exposure assessment has been very poor and the statistical power of the studies generally low. Overall, the studies indicate that VDT operators are not at greater risk than the general population, because very low frequency (VLF) magnetic fields do not appear to be a risk factor and extremely low frequency (ELF) magnetic field exposure is not significantly greater than that experienced in other occupational and residential environments. However, since some studies lend support to the hypothesis that ELF magnetic fields may be a risk factor for pregnancy outcome, studies of subjects exposed to higher than average ELF fields are justified.

SCHLAGWÖRTER:
epidemiology; Review; elf; others

Delpizzo V 1995

Delpizzo V

Imprecise exposure assessment and the sample size requirements of case-control studies of residential magnetic field exposure and cancer in adults

In: Bioelectromagnetics, 16. Jg. (1995), S. 132.

ABSTRACT:
A computer program simulating case-control studies is described. It is used to estimate the minimum sample size required and to assess how this is affected by imprecise exposure assessment. In particular, the consequences of neglecting measurements of nonresidential exposure in case-control studies of residentially exposed adults are investigated. According to this model, while the consequent loss of power is not as large as was predicted by algebraic methods, it would be unwise to neglect it when planning a study.

SCHLAGWÖRTER:
epidemiology; experimentally; elf/hf; others

Delpizzo V et al. 1991

Delpizzo V, Salzberg M R, Farish S J

The use of 'spot' measurements in epidemiological studies of the health effects of magnetic field exposure

In: Int J Epidemiol, 20. Jg. (1991), S. 448.

ABSTRACT:
In several countries, epidemiological studies are being planned, or are in progress, to test the hypothesis that a causal relation exists between exposure to extremely low frequency magnetic fields and cancer incidence. One of the major difficulties in these studies is the development of valid and efficient protocols to assess magnetic field exposure. In studies focusing on residential magnetic fields, many researchers are turning to recently developed stationary automated magnetic field monitors to characterize exposure. We argue that a relatively small number of manually collected 'spot' measurements may be an adequate alternative which has several advantages. We compared a dichotomous exposure classification based on continuous magnetic field monitoring of 40 houses with that obtained through 'spot' measurements randomly sampled from the continuous records. We found that a single spot measurement had at least an 80% chance of classifying houses correctly and that this probability did not increase significantly as the number of readings was increased. We also calculated the sensitivity and specificity of various simulated measurement protocols and, from these, the effect of misclassification on estimates of relative risk. Since relatively large spatial variations in background magnetic field exist in many homes, we suggest that a small number of readings collected manually at several points within a residence may characterize the magnetic field better than continuous monitoring at one fixed location.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Demers P A et al. 1991

Demers P A, Thomas D B, Rosenblatt K A, Jimenez L M, McTiernan A, Stalsberg H, Stemhagen A, Thompson W D, Curnen M G, Satariano W, Austin D F

Occupational exposure to electromagnetic fields and breast cancer in men

In: Am J Epidemiol, 134. Jg. (1991), S. 340.

ABSTRACT:
Data from a population-based case-control study of breast cancer in men were used to examine the hypothesis that occupational exposure to electromagnetic fields increases the risk of breast cancer. Incident cases (n = 227) diagnosed between 1983 and 1987 were obtained from 10 population-based cancer registries of the Surveillance, Epidemiology, and End Results program of the National Cancer Institute. Controls (n = 300) were selected by random digit dialing and from Medicare eligibility lists. Exposure status, defined as ever having been employed in a job which has been classified as involving potential exposure to electromagnetic fields, was assigned without knowledge of case/control status. An elevated risk was found for any job with exposure (odds ratio (OR) = 1.8, 95 percent confidence interval (CI) 1.0-3.7), and risk was highest among electricians, telephone linemen, and electric power workers (OR = 6.0, 95 percent CI 1.7-21) and radio and communications workers (OR = 2.9, 95 percent CI 0.8-10). Risk did not vary with duration of exposed employment. The risk was highest among subjects who were first employed in jobs with exposure before the age of 30 years and who were initially exposed at least 30 years prior to diagnosis. These results lend support to the theory that electromagnetic fields may be related to breast cancer in men. The hypothesis warrants evaluation in women.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Dimbylow P J et al. 1994

Dimbylow P J, Mann S M

SAR calculations in an anatomically realistic model of the head for mobile communication transceivers at 900 MHz and 1.8 GHz

In: Phys Med Biol, 39. Jg. (1994), S. 1537.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Djordjevic Z et al. 1979

Djordjevic Z, Kolak A, Stojkovic M, Rankovic N, Ristic P

A study of the health status of radar workers

In: Aviat Space Environ Med, 50. Jg. (1979), S. 396.

ABSTRACT:
The health status was examined of 322 radar workers with a history of occupational exposure in a microwave field from 5-10 years. The clinical findings were compared with a control group of 220 persons. There were no statistically significant differences in clinical and laboratory findings between exposed and control group. Only some subjective complaints were found more frequently in the exposed group than in the control. The authors' feeling is that subjective complaints in radar workers could not be ascribed only to the influence of microwaves because they could be due to other nonspecific harmful occupational factors. On the basis of the results of this work, the authors concluded that it is unlikely to expect marked harmful effects from microwaves in radar workers in normal working conditions.

SCHLAGWÖRTER:
epidemiology; case-control; hf; subjective complaints

Djordjevic Z et al. 1988

Djordjevic Z, Kolak A, Djokovic V, Ristic P, Kelecevic Z

Results of our 15-year study into the biological effects of microwave exposure

In: Aviat Space Environ Med, 54. Jg. (1988), S. 539.

ABSTRACT:
The results obtained during 15 years of clinical and experimental examinations of biological microwave exposure effects are briefly surveyed. Some important results are reported. Based on their experience, the authors present their attitudes concerning harmful microwave effects on living matter. They consider that microwave effects, either direct or indirect, are the results of hyperthermia. Exposure of the living body to irradiation intensities not causing thermal effects do not induce important pathological alterations in the irradiated organisms. Also, it has been pointed out that the term "injury" is more suitable than the term "microwave sickness" when harmful effects of microwaves to the living organism are concerned. According to the authors, the term "microwave sickness" is not acceptable as a synonym for professional diseases of persons working with sources of microwave energy, since it refers to the complex of insufficiently defined symptoms of uncertain etiology.

SCHLAGWÖRTER:
bioassay; other type; hf; biological effects

Dlugosz L et al. 1992

Dlugosz L, Vena J, Byers T, Sever L, Bracken M, Marshall E

Congenital defects and electric bed heating in New York State: a register-based case-control study

In: Am J Epidemiol, 135. Jg. (1992), S. 1000.

ABSTRACT:
Exposure to 60-cycle electromagnetic fields has been hypothesized to be a cause of childhood cancer and congenital defects. Because electric bed heaters are a major source of variation in electromagnetic field exposure in the population, the authors conducted a case-control study in 1988-1989 to examine the relations between congenital defects and the use of electric blankets and heated waterbeds. Cases were identified by the New York State Congenital Malformations Registry as babies with cleft palate (n = 121), cleft lip with or without cleft palate (n = 197), born in 1983-1984, and anencephalus and spina bifida (n = 224), born in 1983-1986, all to upstate New York residents. Controls were selected at random from birth registrations individually matched to cases by maternal race, age, home county, month of last menses, and child's sex. Information on periconceptional electric blanket and heated waterbed use as well as known and suspected risk factors for defects was obtained from questionnaires mailed to the mothers. Matched odds ratio estimates and 95% confidence intervals (CIs) for electric blanket use relative to nonuse were 0.8 (95% CI 0.3-2.1) for cleft palate, 0.7 (95% CI 0.3-1.3) for cleft lip, and 0.9 (95% CI 0.5-1.6) for neural tube defects. The respective odds ratios for heated waterbed use were nearly identical to these. Adjustment for potential confounding factors (maternal education, vitamin use, smoking) and stratification by season of conception and bed heat control setting had no meaningful effect on odds ratios. These results suggest that 60-cycle fields do not cause neural tube and oral cleft defects.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Dockerty J D et al. 1998

Dockerty J D, Elwood J M, Skegg D C, Herbison G P

Electromagnetic field exposures and childhood cancers in New Zealand

In: Cancer Causes Control, 9. Jg. (1998), S. 299.

ABSTRACT:
OBJECTIVES: To assess childhood cancer risks for electromagnetic field (EMF) exposures. METHODS: A case-control study was conducted in New Zealand. Cases (aged from zero to 14 years) were ascertained from national databases including the New Zealand Cancer Registry; 303 took part (participation rate, 88 percent). The 303 age- and gender-matched controls were selected randomly from birth records (participation, 69 percent). Mothers were interviewed about appliance exposures (all cases and controls), and 24-hour residential measurements of EMFs were made (leukemia cases and matched controls). RESULTS: For the various appliance exposures, there were some odds ratios (OR) above 1.0 and others below 1.0. For electric blanket use by the child before diagnosis, the adjusted ORs were: leukemia, 2.2 (95 percent confidence interval [CI] = 0.7-6.4); central nervous system cancers, ORs = 1.6 (CI = 0.4-7.1); and other solid cancers, OR = 2.4 (CI = 1.0-6.1). Leukemia risk was increased for the highest category of the mean measured bedroom magnetic field (> or = 0.2microT cf < 0.1 microT), with an adjusted OR of 15.5 (CI = 1.1-224). A gradient in OR with exposure was not shown (middle category: OR 1.4, CI = 0.3-7.6), and there was no association with exposure categorized into thirds based on controls' exposure. The adjusted OR for leukemia in relation to the measured daytime room magnetic field (> or = 0.2 microT cf < 0.1 microT) was 5.2 (CI = 0.9-30.8). CONCLUSIONS: This was a small study and multiple comparisons were made. The positive findings thus should be interpreted cautiously.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Dolk H et al. 1997

Dolk H, Elliott P, Shaddick G, Walls P, Thakrar B
Cancer incidence near radio and television transmitters in Great Britain. II. All high power transmitters
In: Am J Epidemiol, 145. Jg. (1997), S. 10.

ABSTRACT:
A small area study of cancer incidence, 1974-1986, near 20 high power television (TV) and frequency modulation (FM) radio transmitters in Great Britain was carried out to place in context the findings of an earlier study around the Sutton Coldfield transmitter. The national database of postcoded cancer registrations was used with population and socioeconomic data from the 1981 census. Cancers examined were adult leukemias, skin melanoma, and bladder cancer, following the findings in the earlier study of significant declines in risk of these cancers with distance from the Sutton Coldfield transmitter. Childhood leukemia and brain cancer were also examined. Statistical analysis was performed for all transmitters combined, four overlapping groups of transmitters defined by their transmission characteristics, and for all transmitters separately. There were 3,305 adult leukemia cases from 0-10 km (observed/expected (O/E) ratio = 1.03, 95% confidence interval (CI) 1.00-1.07). A decline in risk of adult leukemia was found for all transmitters combined (p = 0.05), two of the transmitter groups, and three of the single transmitters; for all transmitters combined, observed excess risk was no more than 15% at any distance up to 10 km, and there was no observed excess within 2 km of transmitters (O/E ratio = 0.97, 95% CI 0.78-1.21). For childhood leukemia and brain cancer, and adult skin melanoma and bladder cancer, results were not indicative of a decline in risk with distance from transmitters. The magnitude and pattern of risk found in the Sutton Coldfield study did not appear to be replicated. The authors conclude that the results at most give no more than very weak support to the Sutton Coldfield findings.

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

Dolk H et al. 1997a

Dolk H, Shaddick G, Walls P, Grundy C, Thakrar B, Kleinschmidt L, Elliott P
Cancer incidence near radio and television transmitters in Great Britain. 1: Sutton Coldfield transmitter
In: Am J Epidemiol, 145. Jg. (1997), S. 1.

ABSTRACT:
A small area study of cancer incidence in 1974-1986 was carried out to investigate an unconfirmed report of a "cluster" of leukemias and lymphomas near the Sutton Coldfield television (TV) and frequency modulation (FM) radio transmitter in the West Midlands, England. The study used a national database of postcoded cancer registrations, and population and socioeconomic data from the 1981 census. Selected cancers were hematopoietic and lymphatic, brain, skin, eye, male breast, female breast, lung, colorectal, stomach, prostate, and bladder. Expected numbers of cancers in small areas were calculated by indirect standardization, with stratification for a small area socioeconomic index. The study area was defined as a 10 km radius circle around the transmitter, within which 10 bands of increasing distance from the transmitter were defined as a basis for testing for a decline in risk with distance, and an inner area was arbitrarily defined for descriptive purposes as a 2 km radius circle. The risk of adult leukemia within 2 km was 1.83 (95% confidence interval 1.22-2.74), and there was a significant decline in risk with distance from the transmitter (p = 0.001). These findings appeared to be consistent over the periods 1974-1980, 1981-1986, and were probably largely independent of the initially reported cluster, which appeared to concern mainly a later period. In the context of variability of leukemia risk across census wards in the West Midlands as a whole, the Sutton Coldfield findings were unusual. A significant decline in risk with distance was also found for skin cancer, possibly related to residual socioeconomic confounding, and for bladder cancer. Study of other radio and TV transmitters in Great Britain is required to put the present results in wider context. No causal implications can be made from a single cluster investigation of this kind.

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

Doody M M et al. 1995

Doody MM, Mandel JS, Boice JD Jr
Employment practices and breast cancer among radiologic technologists
In: J Occup Environ Med, 37. Jg. (1995), S. 321.

ABSTRACT:
A case-control study of breast cancer and employment practices among female radiologic technologists was conducted. The cohort from which cases and controls were derived included over 105,000 female medical radiation workers certified by the American Registry of Radiologic Technologists during 1926-1980. Breast cancer cases (n = 528) were individually matched to an average of five control subjects (n = 2628) based on year of birth, year of certification, and length of follow-up. Procedures most commonly performed by controls included fluoroscopy (93%), portable radiographs (92%), routine radiographs (92%), multifilm procedures (87%), dental x-rays (46%), radium therapy (31%), orthovoltage (23%), and cobalt-60 (21%). Breast cancer was not significantly increased with occupational experience with any of these procedures. Furthermore, risk was not related to number of years worked with a particular procedure. This study is reassuring in indicating that medical radiation workers are not at substantial risk for developing radiation-induced breast cancer. However, because only surrogate measures of radiation exposure were available, possibility of a small risk cannot be discounted. Ongoing follow-up of this cohort for incident cancers will incorporate detailed exposure assessment schemes, providing additional information on effects of long-term low-dose radiation through occupation.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Dosemeci M et al. 1994

Dosemeci M, Blair A
Occupational cancer mortality among women employed in the telephone industry
In: J Occup Med, 36. Jg. (19894), S. 1204.

ABSTRACT:
We conducted a mortality odds ratio (MOR) analysis among women employed in the telephone industry, using death certificates from 24 reporting states for 1984 through 1989. Usual occupation and industry from the death certificates were coded using the 1980 Bureau of the Census occupational and industrial classification system. There were 2444 cancer deaths among women in the telephone industry (code 441). Among younger (age < 49) white women, significant excess risks were observed from cancers of the rectum (MOR = 3.3; 95% confidence interval [CI] = 1.2 to 8.7), connective tissue (MOR = 4.4; 95% CI = 2.2 to 8.8), breast (MOR = 1.6; 95% CI = 1.3 to 2.1), corpus uteri (MOR = 3.3; 95% CI = 1.5 to 7.5), ovary (MOR = 2.1; 95% CI = 1.3 to 3.5), and brain (MOR = 2.1; 95% CI = 1.2 to 3.7). Cancer of the connective tissue showed an almost sixfold risk (MOR = 5.5; 95% CI = 2.0 to 14.8) for the age group of 30 to 39 years. Excess risks of cancer of the connective tissue were observed among engineers and technicians, office workers, telephone operators, and mechanics and repairers (MOR = 8.5, 4.9, 1.7, and 4.4, respectively), suggesting a possible relationship with modern technological exposures in the telephone industry. Risks for cancers of the breast, corpus uteri, ovary, and brain were also elevated among these

jobs. We did not have information on other risk factors for these cancer sites; therefore, socioeconomic status or lifestyle may explain these observed associations, particularly for the cancers of the reproductive system.(ABSTRACT TRUNCATED AT 250 WORDS)

SCHLAGWÖRTER:
epidemiology; cross-sectional; none; cancer

Dowson D I et al. 1988

Dowson D I, Lewith G T, Campbell M, Mullee M A, Brewster L A

Overhead high-voltage cables and recurrent headache and depressions

In: Practitioner, 232. Jg. (1988), S. 435.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf; subjective complaints

Dreyer N A et al. 1999

Dreyer N A, Loughlin J E, Rothman K J

Cause-specific mortality in cellular telephone users

In: JAMA, 282. Jg. (1999), S. 1814.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; mortality

Dreyer N A et al. 1999a

Dreyer N A, Loughlin J E, Rothman K J

Epidemiological Safety Surveillance of Cellular Telephones in the US

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 159.

ABSTRACT:
In 1994 a surveillance programme was initiated to monitor the effects ofexposure to the human head from radiofrequency waves, such as those emittedfrom handheld cellular telephones. Cellular carriers contributedinformation about 1.5 million telephone account holders, their phones andtwo months of data on minutes used and number of calls. Cellular telephonemanufacturers provided data that allowed classification of phones asanalogue or digital and as handheld or mobile (car or bag) for 67% of thephones. Thus far 1,021,767 individuals have been identified who had atleast one active cellular telephone account in 1994 and/or 1995 and whoused either a handheld (41%) or a mobile (59%) phone during the studyperiod, but not both. Seventy-four per cent of the cohort had used theircellular phone for ? 2 years, and 30% for ? 3 years.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Dutta S K et al. 1979

Dutta S K, Nelson W H, Blackman C F, Brusick D J

Lack of microbial genetic response to 2.45-GHz CW and 8.5- to 9.6-GHz pulsed microwaves

In: J Microwave Power Electromag Energy, 14. Jg. (1979), S. 275.

ABSTRACT:
Strain D4 of the yeast Saccharomyces cerevisiae, and strains TA-1535, TA-100 and TA-98 of the bacterium Salmonella typhimurium, were exposed to 2.45-GHz continuous wave or 8.5- to 9.6-GHz pulsed electromagnetic radiation (EMR) at various power densities from 1 to 45 mW/cm2. The temperature during radiation was maintained at 30 degrees C for yeast cultures and at 37 degrees C for bacterial cultures. The studies revealed no increase in mutations or of mitotic gene conversions when cells were radiated for two hours or less. Decreased viability of cells was noted in all cultures tested after radiation at power densities of 30 mW/cm2 or more; however, no reliable changes in genetic events occurred.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Dutta S K et al. 1984

Dutta S K, Subramoniam A, Ghosh B, Parshad R

Microwave radiation induced calcium ion efflux from human neuroblastoma cells in culture

In: Bioelectromagnetics, 5. Jg. (1984), S. 71.

ABSTRACT:
Monolayer cultures of human neuroblastoma cells were exposed to 915-MHz radiation, with or without sinusoidal amplitude modulation (80%) at 16 Hz, at specific absorption rates (SAR) for the culture medium and cells of 0.00, 0.01, 0.05, 0.075, 0.1, 0.5, 0.75, 1.0, 1.5, 2, or 5 mW/g. A significant increase in the efflux of calcium ions (45Ca2+) as compared to unexposed control cultures occurred at two SAR values: 0.05 and 1 mW/g. Increased efflux at 0.05 mW/g was dependent on the presence of amplitude modulation at 16 Hz but at the higher value it was not. These results indicate that human neuroblastoma cells are sensitive to extremely low levels of microwave radiation at certain narrow ranges of SAR.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Dutta S K et al. 1989

Dutta S K, Ghosh B, Blackman C FDutta S K, Ghosh B, Blackman C FDutta S K, Ghosh B, Blackman C F

Radiofrequency radiation-induced calcium ion efflux enhancement from human and other neuroblastoma cells in culture

In: Bioelectromagnetics, 10. Jg. (1989), S. 197.

ABSTRACT:
To test the generality of radiofrequency radiation-induced changes in 45Ca2+ efflux from avian and feline brain tissues, human neuroblastoma cells were exposed to electromagnetic radiation at 147 MHz, amplitude-modulated (AM) at 16 Hz, at specific absorption rates (SAR) of 0.1, 0.05, 0.01, 0.005, 0.001, and 0.0005 W/kg. Significant 45Ca2+ efflux was obtained at SAR values of 0.05 and 0.005 W/kg. Enhanced efflux at 0.05 W/kg peaked at the 13-16 Hz and at the 57.5-60 Hz modulation ranges. A Chinese hamster-mouse hybrid neuroblastoma was also shown to exhibit enhanced radiation-induced 45Ca2+ efflux at an SAR of 0.05 W/kg, using 147 MHz, AM at 16 Hz. These results confirm that amplitude-modulated radiofrequency radiation can induce responses in cells of nervous tissue origin from widely different animal species, including humans. The results are also consistent with the reports of similar findings in avian and feline brain tissues and indicate the general nature of the phenomenon.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Dutta S K et al. 1992

Dutta S K, Das K, Ghosh B, Blackman C F

Dose dependence of acetylcholinesterase activity in neuroblastoma cells expopsed to modulated radio-frequency electromagnetic radiation

In: Bioelectromagnetics, 13. Jg. (1992), S. 317.

ABSTRACT:
Radio-frequency electromagnetic radiation (RFR) at 915 and 147 MHz, when sinusoidally amplitude modulated (AM) at 16 Hz, has been shown to enhance release of calcium ions from neuroblastoma cells in culture. The dose-response relation is unusual, consisting of two power-density "windows" in which enhanced efflux occurs,

separated by power-density regions in which no effect is observed. To explore the physiological importance of these findings, we have examined the impact of RFR exposure on a membrane-bound enzyme, acetylcholinesterase (AChE), which is intimately involved with the acetylcholine (ACh) neurotransmitter system. Neuroblastoma cells (NG108), exposed for 30 min to 147-MHz radiation, AM at 16 Hz, demonstrated enhanced AChE activity, as assayed by a procedure using 14C-labeled ACh. Enhanced activity was observed within a time window between 7.0 and 7.5 h after the cells were plated and only when the exposure occurred at power densities identified in a previous report as being effective for altering the release of calcium ions. Thus RFR affects both calcium-ion release and AChE activity in nervous system-derived cells in culture in a common dose-dependent manner.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Ebi K L 1999

Ebi K L

Developments in the Generation and Interpretation of Wire Codes

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 71.

ABSTRACT:
Three new developments in the generation and interpretation of wire codesare discussed. First, a method was developed to computer generate wirecodes using data gathered from a utility database of the local distributionsystem and from tax assessor records. This method was used to wire codemore than 250,000 residences in the greater Denver metropolitan area. Therewas an approximate 75% agreement with field wire coding. Other research inDenver suggests that wire codes predict some characteristics of a residenceand its neighbourhood, including age, assessed value, street layout andtraffic density. A third new development is the case-specular method tostudy the association between wire codes and childhood cancers. Recentresults from applying the method to the Savitz et al and London et alstudies suggest that the associations between childhood cancer and VHCCresidences were strongest for residences with a backyard rather than streetservice drop, and for VHCC residences with LCC speculars.

SCHLAGWÖRTER:
physics; other type; elf; others

Ebi K L et al. 1999

Ebi K L, Zaffanella L E, Greenland S

Application of the case-specular method to two studies of wire codes and childhood cancers

In: Epidemiology, 10. Jg. (1999), S. 398.

ABSTRACT:
This paper presents the results of applying the case-specular method to two earlier studies of wire codes and childhood cancers (DA Savitz et al, Am J Epidemiol 1988;128:21-38, and SJ London et al, Am J Epidemiol 1991;9:923-937). The method compares the wire codes of case residences with the wire codes of specular residences constructed by switching the location of the case residence across the center of the street. The method was designed to discriminate between the magnetic field hypothesis, which postulates that childhood cancer is affected by magnetic fields and that wire codes are a proxy for magnetic fields, and the neighborhood hypothesis, which postulates that childhood cancer is affected by some characteristics of the neighborhood other than magnetic fields and that wire codes are a proxy for those characteristics. Although the results from the two applications of the method have limited precision, they support the results originally reported (odds ratios of around 2 for very high current configuration residences and childhood cancers) and do not support suggestions that the associations are due to confounding by socio-economic and neighborhood factors. The results leave open the question of whether or not control selection bias could have influenced the original associations, because there was no convincing evidence that the control-specular matrices were symmetric.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Edwards G S et al. 1984

Edwards G S, Davis C C, Saffer J D, Swicord, M L

Resonant microwave absorption of selected DNA molecules

In: Phys Rev Lett, 53. Jg. (1984), S. 1284.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Elwood J M 1999

Elwood J M

A critical review of epidemiologic studies of radiofrequency exposure and human cancers

In: Environ Health Perspect, 107. Jg. (1999), S. 155.

ABSTRACT:
This paper reviews studies that have assessed associations between likely exposure to radiofrequency (RF) transmissions and various types of human cancer. These studies include three cluster investigations and five studies relating to general populations; all of these studies consider place of residence at the time of cancer diagnosis in regard to proximity to radio or television transmitters. There are also five relevant occupational cohort studies and several case-control studies of particular types of cancer. These studies assessed a large number of possible associations. Several positive associations suggesting an increased risk of some types of cancer in those who may have had greater exposure to RF emissions have been reported. However, the results are inconsistent: there is no type of cancer that has been consistently associated with RF exposures. The epidemiologic evidence falls short of the strength and consistency of evidence that is required to come to a reasonable conclusion that RF emissions are a likely cause of one or more types of human cancer. The evidence is weak in regard to its inconsistency, the design of the studies, the lack of detail on actual exposures, and the limitations of the studies in their ability to deal with other likely relevant factors. In some studies there may be biases in the data used

SCHLAGWÖRTER:
epidemiology; Review; hf; cancer

Ericson A et al. 1986

Ericson A, Kallen B

An epidemiological study of work with video screens and pregnancy outcome: I. A registry study

In: Am J Ind Med, 9. Jg. (1986), S. 447.

ABSTRACT:
Three cohorts of women were identified with the aid of occupational codes in the census, linked to the Medical Birth Registry and an Inpatient Registry, containing information on women hospitalized for spontaneous abortion. The three cohorts were selected from the same socioeconomic stratum but had different probabilities to be exposed for video screen work: high, medium, and low. The total pregnancy outcome of the three groups of women did not differ significantly, but there was a weak trend for more spontaneous abortions and perhaps also for congenital malformations in the group with the highest video screen work exposure; however, the differences could be random. Comparisons of delivery outcomes for these cohorts in 1976-77 with those in 1980-81 did not

show any consistent pattern in spite of the heavy computerization of these workplaces which occurred between the two time periods. The second part of this report studies the material in further detail.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Ericson A et al. 1986a

Ericson A, Kallen B
An epidemiological study of work with video screens and pregnancy outcome: II. A case-control study
In: Am J Ind Med, 9. Jg. (1986), S. 459.

ABSTRACT:
A case-control study on work with video screen equipment during pregnancy has been made for three cohorts of women, identified with the aid of occupational codes in the census, linked to the Medical Birth Registry and a registry containing information on women hospitalized for spontaneous abortion. Five hundred and twenty-two cases were selected (women with spontaneous abortions or women who had infants that died, had severe malformations, or had a birth-weight below 1,500 g) and 1,032 controls (women who had infants without any of these characteristics) taken from the same age stratum as the cases. All pregnancies had occurred in 1980-81. Questionnaires were mailed to the women asking for information on their work situation, including questions about work with video screen equipment. Fifty-eight women were excluded for various reasons. Response rate was 93%--lower (89%) among women with spontaneous abortions than among women who gave birth (95%). As stress and smoking were associated with video screen work, the effect of video screen work was analyzed after stratification for stress and smoking--no statistically significant effect of video screen work was seen but odds ratios were above 1. Crude odds ratios for video screen work were significantly elevated and showed a dose-dependent effect. This finding is discussed from the point of view of biases in the study: selective non-responding, recall bias, geographical variability, and lack of information on women who had induced abortions. Using questionnaire data for exposure rates in the populations studied, an estimate of the effect greater than or equal to 10 hr weekly work with video screens on spontaneous abortion rate was made. The point estimate was 1.04 with a 95% confidence interval of 0.9-1.2. Analysis of 44 infants with birth defects whose mothers had worked more than 10 hr/week with video screen equipment compared to 30 infants with birth defects whose mothers had not used such equipment in early pregnancy showed no signs of specificity in the type of birth defect.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Eulitz C et al. 1998

Eulitz C, Ullsperger P, Freude G, Elbert T
Mobile phones modulate response patterns of human brain activity
In: NeuroReport, 9. Jg. (1998), S. 3229.

ABSTRACT:
Mobile phones emit a pulsed high-frequency electromagnetic field (PEMF) which may penetrate the scalp and the skull. Increasingly, there is an interest in the interaction of this pulsed microwave radiation with the human brain. Our investigations show that these electromagnetic fields alter distinct aspects of the brain's electrical response to acoustic stimuli. More precisely, our results demonstrate that aspects of the induced but not the evoked brain activity during PEMF exposure can be different from those not influenced by PEMF radiation. This effect appears in higher frequency bands when subjects process task-relevant target stimuli but was not present for irrelevant standard stimuli. As the induced brain activity in higher frequency bands has been proposed to be a correlate of coherent high-frequency neuronal activity, PEMF exposure may provide means to systematically alter the pattern fluctuations in neural mass activity.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Evans J A et al. 1993

Evans J A, Savitz D A, Kanal E, Gillen J
Infertility and pregnancy outcome among magnetic resonance imaging workers
In: J Occup Med, 35. Jg. (1993), S. 1191.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Fear N T et al. 1996

Fear N T, Roman E, Carpenter L M, Newton R, Bull D
Cancer in electrical workers: an analysis of cancer registrations in England, 1981-87.
In: Br J Cancer, 73. Jg. (1996), S. 935.

ABSTRACT:
Associations between work in the electrical and electronic industry and cancer incidence were assessed using data for 371 890 cancers registered in England between 1981 and 1987, of which 7981 were in electrical workers. Proportional registration ratios (PRRs) were calculated, both with and without the commonest cancers, with adjustment for age, social class, cancer registry of origin and sex. Of four cancers previously linked with work in the electrical and electronic industry (leukaemia, brain, breast and melanoma), only two were significantly raised: leukaemia (PRR=124, 95% CI=109-142, based on 217 cases) and malignant brain cancer (PRR=118, 95% CI=103-136, based on 204 cases). A significantly increased risk was also observed for pleural cancer (PRR=201, 95% CI=167-241, based on 115 cases). The histology of almost 90% of pleural cancers was coded as mesothelioma, confirming the previously observed association between pleural cancer and exposure to asbestos in electrical workers. The extent to which workplace exposures to extremely low frequency electromagnetic fields explains the excesses seen here for leukaemia and brain cancer requires further study.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf/hf; cancer

Fesenko E E et al. 1999

Fesenko E E, Makar V R, Novoselova E G, Sadovnikov V B
Microwaves and cellular immunity. I. Effect of whole body microwave irradiation on tumour necrosis factor production in mouse cells
In: Bioelectrochem Bioenerg, 49. Jg. (1999), S. 29.

ABSTRACT:
Whole body microwave sinusoidal irradiation of male NMRI mice with 8.15-18 GHz (1 Hz within) at a power density of 1 microW/cm2 caused a significant enhancement of TNF production in peritoneal macrophages and splenic T lymphocytes. Microwave radiation affected T cells, facilitating their capacity to proliferate in response to mitogenic stimulation. The exposure duration necessary for the stimulation of cellular immunity ranged from 5 h to 3 days. Chronic irradiation of mice for 7 days produced the decreasing of TNF production in peritoneal macrophages. The exposure of mice for 24 h increased the TNF production and immune proliferative response, and these stimulatory effects persisted over 3 days after the termination of exposure. Microwave treatment increased the endogenously produced TNF more effectively than did lipopolysaccharide, one of the most potential stimuli of

synthesis of this cytokine. The role of microwaves as a factor interfering with the process of cell immunity is discussed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Feychting M et al. 1993

Feychting M, Ahlbom A

Magnetic fields and cancer in children residing near Swedish high-voltage power lines

In: Am J Epidemiol, 138. Jg. (1993), S. 467.

ABSTRACT:
A case-control study was conducted to test the hypothesis that exposure to magnetic fields of the type generated by high-voltage power lines increases cancer incidence in children. The study base consisted of everyone under age 16 years who had lived on a property located within 300 meters of any of the 220 and 400 kV power lines in Sweden during the period 1960-1985. Subjects were followed from their entry into the study base through 1985. A total of 142 cancer cases were identified through a record linkage to the Swedish Cancer Registry. There were 39 leukemia and 33 central nervous system tumor cases. A total of 558 controls were selected at random from the study base. Exposure was assessed by spot measurements and by calculations of the magnetic fields generated by the power lines, taking distance, line configuration, and load into account. Information about historical loads on the power lines was used to calculate the magnetic fields for the year closest in time to diagnosis. When historical calculations were used as exposure assessment for childhood leukemia with cutoff points at 0.1 and 0.2 microtesla (microT), the estimated relative risk increased over the two exposure levels and was estimated at 2.7 (95% confidence interval (CI) 1.0-6.3) for 0.2 microT and over; p for trend = 0.02. When the upper cutoff point was shifted to 0.3 microT, the relative risk was 3.8 (95% CI 1.4-9.3); p for trend = 0.005. These results persisted when adjustment for potential confounding factors was made. For central nervous system tumor, lymphoma, and all childhood cancers combined, there was no support for an association.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Feychting M et al. 1994

Feychting M, Ahlbom AFeychting M, Ahlbom AFeychting M, Ahlbom AFeychting M, Ahlbom A

Magnetic fields, leukemia, and central nervous system tumors in Swedish adults residing near high-voltage power lines

In: Epidemiology, 5. Jg. (1994), S. 501.

ABSTRACT:
We conducted a case-control study to test the hypothesis that exposure to magnetic fields of the type generated by high-voltage power lines increases the incidence of leukemia and central nervous system tumors in adults. The study was based on people who, between 1960 and 1985, had lived on a property in Sweden located within 300 meters of 220 or 400 kilovolt power lines. We identified a total of 325 leukemia cases and 223 cases of central nervous system tumor. Two matched controls per case were selected at random. We assessed exposure by spot measurements and by calculations of the magnetic fields generated by the power lines. For calculated magnetic field levels of 0.2 microT or more closest in time to diagnosis, we found an elevated relative risk (RR) for acute myeloid leukemia [RR = 1.7; 95% confidence interval (CI) = 0.8-3.5] and chronic myeloid leukemia [RR = 1.7; 95% CI = 0.7-3.8]. Using cumulative exposure for the 15 years preceding diagnosis, we found relative risk estimates for acute and chronic myeloid leukemia of 2.3 (95% CI = 1.0-4.6) and 2.1 (95% CI = 0.9-4.7), respectively, for the highest exposure category. For chronic lymphatic leukemia and for central nervous system tumors, relative risk estimates were close to or below unity.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Feychting M et al. 1995

Feychting M, Schulgen G, Olsen J H, Ahlbom A

Magnetic fields and childhood cancer - a pooled analysis of two Scandinavian studies

In: Eur J Cancer, 31. Jg. (1995), S. 2035.

ABSTRACT:
To test the hypothesis that exposure to magnetic fields, of the type generated by high voltage installations, increases cancer incidence in children, the original data from two case-control studies were pooled. The Swedish study was based on children living within 300 m from transmission lines, and the Danish study on the total population of Denmark. In both these studies, national cancer registries were used to identify cases of leukaemia, lymphoma or central nervous system tumour. Controls were selected randomly from the study populations. Magnetic field exposure was assessed through theoretical calculations of the magnetic fields before the time of diagnosis. An elevated relative risk of childhood leukaemia was found for calculated magnetic field levels of > or = 0.2 microT, estimated at 2.0 (95% CI 1.0-4.1), and for magnetic field levels of > or = 0.5 microT, estimated at 5.1 (95% CI 2.1-12.6). The results support the hypothesis of an association between magnetic fields and childhood leukaemia.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Feychting M et al. 1996

Feychting M, Kaune W T, Savitz D A, Ahlbom A

Estimating exposure in studies of residential magnetic fields and cancer: importance of short-term variability, time interval between diagnosis and measurement, and distance to power line

In: Epidemiology, 7. Jg. (1996), S. 220.

ABSTRACT:
Validity of exposure assessment methods has been a major concern in epidemiologic studies of magnetic field exposure and cancer. We conducted a study to evaluate the relative importance of distance to power lines and calculated historical magnetic fields when estimating past magnetic field exposure. Another goal was to compare results based on various estimates of magnetic field exposure, to assess the importance of short-term variability in magnetic fields, time between diagnosis and measurement, and sources of magnetic field exposure. We used data from a Swedish case-control study of residential exposure to magnetic fields and cancer. Childhood leukemia risk was associated with calculated historical annual average magnetic fields regardless of distance, and the association with distance disappeared when both variables were entered into the same logistic regression model. Relative risks for measurements at the time of the study (contemporary annual average fields, spot calculations, and spot measurements) were all close to or below unity. The results support the hypothesis that the difference between results using historical calculations and spot measurements is explained by the time interval between diagnosis and contemporary magnetic field estimates.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Feychting M et al. 1997

Feychting M, Forssen U, Floderus B

Occupational and residential magnetic field exposure and leukemia and central nervous system tumors

In: Epidemiology, 8. Jg. (1997), S. 384.

ABSTRACT:
Studies of magnetic field exposure and cancer have focused on either residential or occupational exposure. We conducted a case-control study taking into account both exposure sources. We identified leukemia and central nervous system tumor cases and controls from a population living within 300 m of transmission lines in Sweden. We have previously reported results considering residential exposure alone. Here, we evaluate the effect of occupational exposure and of the combined exposures. We estimated residential exposure through calculations of the magnetic fields generated by power lines. We obtained information about occupation from censuses and linked the occupations to a job-exposure matrix based on magnetic field measurements. For occupational exposure of > or = 0.2 microT, we estimated the relative risk for leukemia to be 1.7 [95% confidence interval (CI) = 1.1-2.7]. The increased risk was confined to acute myeloid and chronic lymphocytic leukemia. For residential exposure of > or = 0.2 microT, the relative risk for leukemia was estimated at 1.3 (95% CI = 0.8-2.2), with higher risk estimates for acute and chronic myeloid leukemia. We estimated the relative risk for leukemia among subjects highly exposed both at home and at work to be 3.7 (95% CI = 1.5-9.4). These results provide support for an association between magnetic field exposure and leukemia. Relative risks for nervous system tumors were close to unity.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Feychting M et al. 1998

Feychting M, Forssen U, Rutqvist L E, Ahlbom A
Magnetic fields and breast cancer in Swedish adults residing near high-voltage power lines
In: Epidemiology, 9. Jg. (1998), S. 392.

ABSTRACT:
We conducted a case-control study to test the hypothesis that residential magnetic field exposures increase the incidence of breast cancer. The study was based on people who had lived within 300 m of 220- or 400-kV power lines in Sweden at any time between 1960 and 1985. We identified 699 cases of breast cancer in women and 9 cases in men. One matched control per female case and eight per male case were selected at random. Estrogen receptor information was available for a subset of female cases. We assessed magnetic field exposure through calculations of the magnetic fields generated by the power lines before diagnosis. For calculated magnetic field levels > or = 0.2 microtesla (microT) closest in times before diagnosis, we estimated the relative risk to be 1.0 [95% confidence interval (CI) = 0.7-1.5] for women and 2.1 (95% CI = 0.3-14.1) for men. Women younger than 50 years of age at diagnosis had a relative risk of 1.8 (95% CI = 0.7-4.3). For women with estrogen receptor-positive breast cancer, the relative risk was estimated at 1.6 (95% CI = 0.6-4.1), using the exposure cutoff point > or = 0.1 microT. Among estrogen receptor-positive women younger than 50 years at diagnosis, the relative risk increased to 7.4 (95% CI = 1.0-178.1).

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Feychting M et al. 1998a

Feychting M, Pedersen N L, Svedberg P, Floderus B, Gatz M
Dementia and occupational exposure to magnetic fields
In: Scand J Work Environ Health, 24. Jg. (1998), S. 46.

ABSTRACT:
OBJECTIVES: The purpose of the present report was to assess whether occupational magnetic field exposure is a risk factor for dementia, in particular for Alzheimer's disease. METHODS: Case-control analyses were applied to 77 dementia cases, 55 of whom had Alzheimer's disease, ascertained from the population-based Swedish twin register. Two reference groups were derived, with 228 and 238 persons, respectively. Occupations were linked to a job-exposure matrix based on magnetic field measurements. Primary occupation, last occupation before reference date, and the occupation with the highest magnetic field exposure during the subject's lifetime were evaluated. RESULTS: For primary occupation, all relative risk estimates were close to unity. For last occupation, at the exposure level > or = 0.2 microT, a relative risk was found for dementia estimated at 3.3 [95% confidence interval (95% CI) 1.3-8.6] and 3.8 (95% CI 1.4-10.2) for reference groups 1 and 2, respectively. The relative risk for Alzheimer's disease was estimated at 2.4 (95% CI 0.8-6.9) and 2.7 (95% CI 0.9-7.8), respectively. For the occupation with the highest magnetic field exposure, the relative risk estimates were close to unity for reference group 1 and slightly elevated for reference group 2. The relative risk estimates were greater for the subjects who were younger at onset (< or =75 years). CONCLUSIONS: These results only partially support previous findings, but they indicate that occupational magnetic field exposure may possibly influence the development of dementia.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Feychting M et al. 2000

Feychting M, Floderus B, Ahlbom A
Parental occupational exposure to magnetic fields and childhood cancer (Sweden)
In: Cancer Causes Control, 11. Jg. (2000), S. 151.

ABSTRACT:
OBJECTIVES: To test the hypothesis that parental occupational exposure to magnetic fields before conception and during pregnancy increases the risk of cancer in the offspring. METHODS: The study is designed as a cohort study based on a population of 235,635 children born shortly after two different censuses in Sweden. The children were followed from birth to 14 years and cases of cancer were identified in the Swedish cancer registry. The parents' occupational titles in the censuses were linked to a job-exposure matrix with information about magnetic field levels in different occupations. The cancer incidence among the exposed was compared to that among the unexposed using Cox proportional hazards modeling. RESULTS: There was no association between childhood cancer and maternal occupational magnetic field exposure. Paternal exposure was associated with an increased risk of childhood leukemia, with a relative risk of 2.0 (95% CI 1.1-3.5) for exposures > or = 0.30 microT. A decreased risk was found for brain tumors (RR = 0.5; 95% CI 0.3-1.0). CONCLUSIONS: The results do not support previous findings of an increased risk of childhood brain tumors associated with paternal occupational exposure to magnetic fields. The finding for childhood leukemia has to be interpreted with caution.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Fincham S M et al. 2000

Fincham S M, Ugnat A M, Hill G B, Kreiger N, Mao Y
Is occupation a risk factor for thyroid cancer? Canadian Cancer Registries Epidemiology Research Group
In: J Occup Environ Med, 42. Jg. (2000), S. 318.

ABSTRACT:
A Canadian case-control study explored the etiology of thyroid cancer, including occupational exposure. Analysis of job history from 1272 thyroid cancer patients and 2666 controls revealed statistically significant risks among the following occupations: Wood Processing, Pulp and Papermaking (odds ratio [OR] = 2.54, 95% confidence interval [CI] = 1.11-5.83); Sales and Service (OR = 1.26, 95% CI = 1.05-1.52); and Clerical (OR = 0.81, 95% CI = 0.67-0.97). ORs were adjusted for age, sex, province,

cigarette smoking, education, self-reported exposure to radiation at work, and duration of employment. Exposure to ionizing radiation or electromagnetic fields at work (inferred from job histories) did not affect risk, nor did socioeconomic status, measured by education, income, or occupational prestige. Possible explanations for the results and further investigations are discussed.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Finkelstein M M 1998

Finkelstein M M

Cancer incidence among Ontario police officers

In: Am J Ind Med, 34. Jg. (1998), S. 157.

ABSTRACT:
The National Institute for Occupational Safety and Health (NIOSH) published a report in 1995 suggesting the possibility of increased incidence of testicular cancer, leukemia, and cancers of the brain, eye, and skin among police officers working with traffic radar. NIOSH recommended epidemiologic study of the issue. This report presents the results of a retrospective cohort cancer incidence study among 22,197 officers employed by 83 Ontario police departments. The standardized incidence ration (SIR) for all tumors sites was 0.9% (95% confidence interval [CI] = 0.83-0.98). There was an increased incidence of testicular cancer (SIR = 1.3, 90% CI = 0.9-1.8) and melanoma skin cancer (SIR = 1.45, 90% CI = 1.1-1.9). These anatomical sites might absorb energy from radar units, but at this time the author has no information about individual exposures to radar emissions, and it is not possible to draw etiologic conclusions. Nested case-control studies are planned to assess individual radar exposures.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Floderus B et al. 1993

Floderus B, Persson T, Stenlund C, Wennberg A, Ost A, Knave B

Occupational exposure to electromagnetic fields in relation to leukemia and brain tumors: a case-control study in Sweden

In: Cancer Causes Control, 4. Jg. (1993), S. 465.

ABSTRACT:
Occupational exposure to low-frequency electromagnetic fields (EMF) was studied in 250 leukemia patients and 261 brain-tumor cases, diagnosed in 1983-87 and compared with a control group of 1,121 randomly selected men, from the mid-region of Sweden, 1983-87. We based the exposure assessment on measurements from 1,015 different workplaces. On the basis of the job held longest during the 10-year period before diagnosis, we found an association between the average, daily, mean level of EMF and chronic lymphocytic leukemia (CLL). The risk increased with increasing level of exposure. The odds ratios (OR) and the 95 percent confidence interval (CI) for three consecutive levels of exposure were: 1.1 (CI = 0.5-2.3); 2.2 (CI = 1.1-4.3); 3.0 (CI = 1.6-5.8), respectively. No association was observed for acute myeloid leukemia (OR = 1.0, CI = 0.5-1.8; OR = 0.8, CI = 0.4-1.6; OR = 1.0, CI = 0.6-1.9). For brain tumors, the corresponding risk estimates were 1.0 (CI = 0.7-1.6); 1.5 (CI = 1.0-2.2); 1.4 (CI = 0.9-2.1). Different EMF indices were tested. Tasks with frequent or large variations between high and low field-densities (high standard deviation) were more common among CLL subjects. For brain tumors, a prolonged high level (high median values) showed the strongest association. Confounding by place of residence, smoking, benzene, ionizing radiation, pesticides, and solvents was evaluated, and these factors did not seem to have a decisive influence on the associations. We also analyzed other potential sources of bias. For CLL, there were indications of an excess number of low-exposure subjects among non-responders, which, to some extent, may have enhanced but not caused the risk estimates obtained. Our conclusion is that the study supports the hypothesis that occupational EMF exposure is a hazard in the development of certain cancers.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Floderus B et al. 1994

Floderus B, Tornqvist S, Stenlund

Incidence of selected cancers in Swedish railway workers, 1961-79

In: Cancer Causes Control, 5. Jg. (1994), S. 189.

ABSTRACT:
Among all Swedish men, 20 to 64 years of age and employed in 1960, railway workers were selected and compared with the population at large, concerning the incidence of leukemia, lymphoma, tumors of the brain, breast, and the pituitary gland. The study was a re-analysis of the 1961-79 incidence data previously showing no increase in risk for leukemia and brain tumors for railway workers. In the present study, follow-up was divided into two 10-year periods, and elevated relative risks (RR) were found for the first decade. For the first decade, engine drivers and conductors combined had an RR of chronic lymphocytic leukemia, acute myeloid leukemia, and lymphoma of 1.9 (95 percent confidence interval [CI] = 0.9-4.0), 1.4 (CI = 0.4-4.3), and 1.0 (CI = 0.5-1.9), respectively. For all brain tumors, the RR was 1.2 (CI = 0.8-1.9), with a higher risk estimate for those below age 30 (RR = 12.2, CI = 2.8-52.5). Three cases of breast cancer and nine cases of tumors of the pituitary gland occurred among engine drivers and conductors, corresponding to RRs of 4.9 (CI = 1.6-11.8) and 3.2 (CI = 1.6-6.2), respectively. Work on trains entails extremely high exposure to low frequency magnetic fields (EMF). The results give some support to the hypothesis of an association between EMF and certain types of cancers. The outcome for the pituitary gland, being a focal point of hormonal regulation, suggests a hormonal link.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; cancer

Floderus B et al. 1999

Floderus B, Stenlund C, Persson T

Occupational magnetic field exposure and site-specific cancer incidence: a Swedish cohort study

In: Cancer Causes Control, 10. Jg. (1999), S. 323.

ABSTRACT:
OBJECTIVE: Based on 1,596,959 men and 806,278 women, site-specific cancer incidence during 1971 through 1984 was analyzed in relation to occupational magnetic field exposure. The objective was to explore potential associations for cancer diseases beyond those extensively studied before (leukemia and brain tumors). METHODS: Exposure was assessed from Census information on occupations that were linked to a job exposure matrix based on measurements. In a basic analysis, three levels of exposure were used. In addition, subjects with a more definite low exposure were compared with an aggregate of occupations with more definite exposures. RESULTS: Observed associations were weak and there were no evident exposure-response relationships. For all cancer, an approximate 10% increase in risk was seen in the medium and high exposure groups. Several types of cancer were associated with exposure among men, including cancer of the colon, biliary passages and liver, larynx and lung, testis, kidney, urinary organs, malignant melanoma, non-melanoma skin cancer, astrocytoma III-IV. For women, associations were seen for cancer of the lung, breast, corpus uteri, malignant melanoma and chronic lymphocytic leukemia. CONCLUSIONS: In the analysis of occupations with a more definite exposure, the most notable finding for men

was an increased risk of testicular cancer in young workers, and for women a clear association emerged for cancer of the corpus uteri. The outcome suggests an interaction with the endocrine/immune system.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Foliart D E et al. 2001

Foliart D E, Iriye R N, Tarr K J, Silva J M, Kavet R, Ebi K L
Alternative magnetic field exposure metrics: relationship to TWA, appliance use, and demographic characteristics of children in a leukemia survival study
In: Bioelectromagnetics, 22. Jg. (2001), S. 574.

ABSTRACT:
The ongoing Childhood Leukemia Survival Study is examining the possible association between magnetic field exposure and survival of children with newly diagnosed acute lymphocytic leukemia (ALL). We report the results of the first year 24 h personal magnetic field monitoring for 356 US and Canadian children by time weighted average TWA and alternative exposure metrics. The mean TWA of 0.12 microT was similar to earlier personal exposure studies involving children. A high correlation was found between 24 h TWA and alternative metrics: 12 h day TWA, 12 night TWA, geometric mean, 95th percentile value, percentage time over 0.2 and 0.3 microT, and an estimate of field stability (Constant Field Metric). Two measures of field intermittency, rate of change metric (RCM) and standardized rate of change metric (RCMS), were not highly correlated with TWA. The strongest predictor of TWA was location of residence, with highest TWAs associated with urban areas. Residence in an apartment, lower paternal educational level, and residential mobility were also associated with higher TWAs. There were no significant differences in the appliance use patterns of children with higher TWA values. Children with the highest field intermittency (high RCM) were more likely to sit within 3 feet of a video game attached to the TV. Our results suggest that 24 h TWA is a representative metric for certain patterns of exposure, but is not highly correlated with two metrics that estimate field intermittency.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Forssen U M et al. 2000

Forssen U M, Feychting M, Rutqvist L E, Floderus B, Ahlbom A
Occupational and residential magnetic field exposure and breast cancer in females
In: Epidemiology, 11. Jg. (2000), S. 24.

ABSTRACT:
The purpose of this study was to evaluate the effect of occupational magnetic field exposure on breast cancer in females and to combine residential and occupational magnetic field exposure to reduce misclassification. The study was conducted as a case-control study within a population living within 300 meters of transmission lines in Sweden. We identified cases of breast cancer in females from the national cancer registry, and we selected one matched control per case at random. Residential exposure was estimated through calculations of the magnetic fields generated by power lines. We obtained information about occupation from censuses, and the occupations were linked to a job-exposure matrix that was based on magnetic field measurements. For occupational exposure to magnetic fields over 0.25 microT closest in time before diagnosis, the estimated relative risk was 1.0 [96% confidence interval (CI) = 0.6-1.7]. Women below age 50 years at diagnosis had a relative risk of 1.5 (95% CI = 0.6-3.5). For women below 50 years of age who had estrogen receptor-positive breast cancer, there was a relative risk of 3.2 (95% CI = 0.5-18.9). The results for residential and occupational exposures combined showed similar results.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Forssen U M et al. 2002

Forssen U M, Ahlbom A, Feychting M
Relative contribution of residential and occupational magnetic field exposure over twenty-four hours among people living close to and far from a power line
In: Bioelectromagnetics, 23. Jg. (2002), S. 239.

ABSTRACT:
This study sought to estimate the relative contribution of exposure to 50 Hz magnetic fields experienced at home, at work/school, or elsewhere to the total exposure over 24 hr. Personal exposure meters were carried by 97 adults and children in the Stockholm area. About half of the subjects lived close (<50 m) to a transmission line and half far (>100 m) away. Spot measurements and calculations for the residential exposure were also made. For subjects living<50 m from the line, the exposure at home contributed about 80% of the total magnetic field exposure, measured in mT-hours. Adults living far away experienced only 38% of the total exposure at home, but children still received 55%. Subjects with low time-weighted average (TWA) exposure both at home and at work spent 84% of their time in fields <0.1 microT, and those with high TWA at both locations spent 69% of their time in fields > or = 0.2 microT. This contrast was diluted if only exposure at one location was considered. For spot measurements and calculations of the residential exposure, both sensitivity and specificity was good. However, the intermediate field exposure category (0.1-0.19 microT) showed poor correlation to the 24 hr personal measurements.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Foster K R et al. 1987

Foster K R, Epstein B R, Gealt M A
Resonances in the dielectric absorption of DNA?
In: Biophy J, 52. Jg. (1987), S. 421.

ABSTRACT:
An attempt was made to confirm previous reports of resonant-like dielectric absorption of plasmid DNA in aqueous solutions at 1-10 GHz. The dielectric properties of the sample were measured using an automatic network analyzer with two different techniques. One technique used an open-ended coaxial probe immersed in the sample; the other employed a coaxial transmission line. No resonances were observed that could be attributed to the sample; however, resonance-type artifacts were prominent in the probe measurements. The coaxial line technique appears to be less susceptible to such artifacts. We note two important sources of error in the calibration of the automatic network analyzer using the probe technique.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Frei M R et al. 1998

Frei M R, Berger R E, Dusch S J, Guel V, Jauchem J R, Merritt J H, Stedham M A
Chronic exposure of cancer-prone mice to low-level 2450 MHz radiofrequency radiation
In: Bioelectromagnetics, 19. Jg. (1998), S. 20.

ABSTRACT:
The purpose of this study was to determine whether chronic, low-level exposure of mammary-tumor-prone mice to 2450 MHz radiofrequency radiation (RFR) promotes an earlier onset (decreased latency), a greater total incidence, or a faster growth rate of mammary tumors. One hundred C3H/ HeJ mice were exposed in circularly polarized waveguides (CWG) for 18 months (20 h/day, 7 days/wk) to continuous-wave, 2450 MHz RFR at a whole body average specific absorption rate (SAR) of 0.3 W/kg; 100 mice were sham exposed. Before exposure, SARs were determined

calorimetrically; during experimentation, SARs were monitored by differential power measurement. All animals were visually inspected twice daily and were removed from the CWG cages for a weekly inspection, palpation, and weighing. From the time of detection, tumor size was measured weekly. Animals that died spontaneously, became moribund, or were killed after 18 months of exposure were completely necropsied; tissues were fixed and subjected to histopathological evaluations. Results showed no significant difference in weight profiles between sham-irradiated and irradiated mice. Concerning mammary carcinomas, there was no significant difference between groups with respect to palpated tumor incidence (sham = 52%; irradiated = 44%), latency to tumor onset (sham = 62.3 +/- 1.2 wk; irradiated = 64.0 +/- 1.6 wk), and rate of tumor growth. In general, histopathological examination revealed no significant differences in numbers of malignant, metastatic, or benign neoplasms between the two groups; a significantly greater incidence of alveolar-bronchiolar adenoma in the sham-irradiated mice was the only exception. In addition, survival analysis showed no significant difference in cumulative percent survival between sham and irradiated animals. Thus, results indicate that under the conditions of this study, long-term, low-level exposure of mammary-tumor-prone mice to 2450 MHz RFR did not affect mammary tumor incidence, latency to tumor onset, tumor growth rate, or animal longevity when compared with sham-irradiated controls.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Frei M R et al. 1998a

Frei M R, Jauchem J R, Dusch S J, Merritt J H, Berger R E, Stedham M A

Chronic, low-level (1.0 W/kg) exposure of mice prone to mammary cancer to 2450 MHz microwaves

In: Radiat Res, 150. Jg. (1998), S. 568.

ABSTRACT:
In a previous study (Frei et al., Bioelectromagnetics 19, 20-31, 1998), we showed that low-level (0.3 W/kg), long-term exposure of mice prone to mammary tumors to 2450 MHz radiofrequency (RF) radiation did not affect the incidence of mammary tumors, latency to tumor onset, tumor growth rate or animal survival when compared to sham-irradiated animals. In the current study, the specific absorption rate (SAR) was increased from 0.3 W/kg to 1.0 W/kg. The same biological end points were used. One hundred C3H/HeJ mice were exposed in circularly polarized waveguides for 78 weeks (20 h/day, 7 days/week) to continuous-wave, 2450 MHz RF radiation; 100 mice were sham-exposed. There was no significant difference between exposed and sham-exposed groups with respect to the incidence of palpated mammary tumors (sham-exposed = 30%; irradiated = 38%), latency to tumor onset (sham-exposed = 62.0 +/- 2.3 weeks; irradiated = 62.5 +/- 2.2 weeks) and rate of tumor growth. Histopathological evaluations revealed no significant difference in numbers of malignant, metastatic or benign neoplasms between the two groups. Thus long-term exposures of mice prone to mammary tumors to 2450 MHz RF radiation at SARs of 0.3 and 1.0 W/kg had no significant effects when compared to sham-irradiated animals.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Freude G et al. 1998

Freude G, Ullsperger P, Eggert S, Ruppe I

Effects of microwaves emitted by cellular phones on human slow brain potentials

In: Bioelectromagnetics, 19. Jg. (1998), S. 384.

ABSTRACT:
The influence of electromagnetic fields (EMF) emitted by cellular phones on preparatory slow brain potentials (SP) was studied in two different experimental tasks: In the first, healthy male human subjects had to perform simple self-paced finger movements to elicit a Bereitschaftspotential; in the second, they performed a complex and cognitive demanding visual monitoring task (VMT). Both tasks were performed with and without EMF exposure in counterbalanced order. Whereas subjects' performance did not differ between the EMF exposure conditions, SP parameters were influenced by EMF in the VMT: EMF exposure effected a significant decrease of SPs at central and temporo-parieto-occipital brain regions, but not at the frontal one. In the simple finger movement task, EMF did not affect the Bereitschaftspotential.

SCHLAGWÖRTER:
medicine; experimentally; hf; biological effects

Frey A H 1985

Frey A H

Data analysis reveals significant microwave-induced eye damage in humans

In: J Microwave Power Electromag Energy, 20. Jg. (1985), S. 53.

ABSTRACT:
Appleton and McCrossan undertook a study for the U.S. Army at Ft. Monmouth to determine if microwave exposure would cause cataracts. They concluded: "The comparison showed the groups (microwave exposed vs. not exposed) to be essentially the same and did not support the hypothesis that human cataracts are being caused by chronic exposure to microwaves in the military environment in this country." There are three major flaws in Appleton and McCrossan's work. First, the exposed group likely included people with little or no exposure. This would tend to minimize the possibility of finding microwave effects. Secondly, their control group consisted of people working with equipment known to cause eye damage. This also would tend to minimize the possibility of finding microwave effects. Thirdly, and most important, they did not do a statistical analysis on their data. When the writer did one, it was found that Appleton and McCrossan have a statistically significant difference between groups, with the microwave exposed showing more lens opacities than would be expected by chance. Thus, their conclusion should have been the opposite of what they stated. It is the uncritical acceptance of negative biological studies of non-ionizing radiation, such as this, that has contributed to the distortion of science in this area of research and has stimulated public opposition to the installation of such energy sources.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Frick U et al. 2002

Frick U, Rehm J, Eichhammer P

Risk perception, somatization, and self report of complaints related to electromagnetic fields - a randomized survey study

In: Int J Hyg Environ Health, 205. Jg. (2002), S. 353.

ABSTRACT:
Exposure to electromagnetic fields (EMF) as well as EMF-related complaints has increased over the past decades. However, it is unclear whether these complaints are related to the electromagnetic or other physical properties of these fields per se, to salience of EMF in media, or to both. What is the prevalence of EMF-related complaints in the general population? What are the influencing factors on this prevalence? Does reporting of EMF-related symptoms depend on cognitive factors? To answer these questions, a survey with random variation of three cognitive factors was performed. As expected, EMF-related complaints were reported more by females and people with higher somatization tendency. Age had no significant linear effect on EMF-related complaints. The cognitive condition of threat produced a significant contrast effect among people with high somatization tendency on EMF-related

complaints. Cognition can influence reporting of EMF-related effects. Thus, in future research of such effects, psychologically influencing factors should be included. Also risk communication should incorporate knowledge about social cognition.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; subjective complaints

Friedman D R et al. 1996

Friedman D R, Hatch E E, Tarone R, Kaune W T, Kleinerman R A, Wacholder S, Boice jr. J D, Linet M S

Childhood exposure to magnetic fields: residential area measurements compared to personal dosimetry

In: Epidemiology, 7. Jg. (1996), S. 151.

ABSTRACT:
We examined the relation between area measurements of residential magnetic fields and personal dosimetry measurements among 64 control children age 2-14 years from the National Cancer Institute-Children's Cancer Group's nine-state case-control study of childhood leukemia. During a typical weekday, an activity diary was completed, and a 24-hour measurement was obtained in each child's bedroom. According to the activity diaries, children spent more than 40% of the 24 hours in their bedrooms, and 68% of their time at home. We found that at-home personal dosimetry levels were highly correlated with total personal dosimetry levels in children under 9 years (Spearman correlation coefficient, R = 0.94), whereas the correlation was lower in older children (R = 0.59). For all children combined, bedroom 24-hour measurements correlated well with at-home personal dosimetry levels (R = 0.76). The 24-hour bedroom measurement was a useful predictor of both at-home and total personal dosimetry measurements. Particularly for younger children, our data suggest that in-home area measurements predict both current residential and current total magnetic field exposures. This information will be valuable for assessing the validity of exposure assessment in previous and ongoing studies and for developing measurement protocols for future studies.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf/hf; others

Fritze K et al. 1997

Fritze K, Sommer C, Schmitz B, Mies G, Hossman K-A, Kiessling M, Wiessner C

Effect of global system for mobile communication (GSM) microwave exposure on blood-brain permeability in rat

In: Acta Neuropathol, 94. Jg. (1997), S. 465.

ABSTRACT:
We investigated the effects of global system for mobile communication (GSM) microwave exposure on the permeability of the blood-brain barrier using a calibrated microwave exposure system in the 900 MHz band. Rats were restrained in a carousel of circularly arranged plastic tubes and sham-exposed or microwave irradiated for a duration of 4 h at specific brain absorption rates (SAR) ranging from 0.3 to 7.5 W/kg. The extravasation of proteins was assessed either at the end of exposure or 7 days later in three to five coronal brain slices by immunohistochemical staining of serum albumin. As a positive control two rats were subjected to cold injury. In the brains of freely moving control rats (n = 20) only one spot of extravasated serum albumin could be detected in one animal. In the sham-exposed control group (n = 20) three animals exhibited a total of 4 extravasations. In animals irradiated for 4 h at SAR of 0.3, 1.5 and 7.5 W/kg (n = 20 in each group) five out of the ten animals of each group killed at the end of the exposure showed 7, 6 and 14 extravasations, respectively. In the ten animals of each group killed 7 days after exposure, the total number of extravasations was 2, 0 and 1, respectively. The increase in serum albumin extravasations after microwave exposure reached significance only in the group exposed to the highest SAR of 7.5 W/kg but not at the lower intensities. Histological injury was not observed in any of the examined brains. Compared to other pathological conditions with increased blood-brain barrier permeability such as cold injury, the here observed serum albumin extravasations are very modest and, moreover, reversible. Microwave exposure in the frequency and intensity range of mobile telephony is unlikely to produce pathologically significant changes of the blood-brain barrier permeability.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Fritze K et al. 1997a

Fritze K, Wiessner C, Kuster N, Sommer C, Gass P, Hermann D M, Kiessling M, Hossmann K-A

Effect of Global system for mobile communication microwave exposure on the genomic response of the rat brain

In: Neuroscience, 81. Jg. (1997), S. 627.

ABSTRACT:
The acute effect of global system for mobile communication (GSM) microwave exposure on the genomic response of the central nervous system was studied in rats by measuring changes in the messenger RNAs of hsp70, the transcription factor genes c-fos and c-jun and the glial structural gene GFAP using in situ hybridization histochemistry. Protein products of transcription factors, stress proteins and marker proteins of astroglial and microglial activation were assessed by immunocytochemistry. Cell proliferation was evaluated by bromodeoxyuridine incorporation. A special GSM radiofrequency test set, connected to a commercial cellular phone operating in the discontinuous transmission mode, was used to simulate GSM exposure. The study was conducted at time averaged and brain averaged specific absorption rates of 0.3 W/kg (GSM exposure), 1.5 W/kg (GSM exposure) and 7.5 W/kg (continuous wave exposure), respectively. Immediately after exposure, in situ hybridization revealed slight induction of hsp70 messenger RNA in the cerebellum and hippocampus after 7.5 W/kg exposure, but not at lower intensities. A slightly increased expression of c-fos messenger RNA was observed in the cerebellum, neocortex and piriform cortex of all groups subjected to immobilization, but no differences were found amongst different exposure conditions. C-jun and GFAP messenger RNAs did not increase in any of the experimental groups. 24 h after exposure, immunocytochemical analysis of FOS and JUN proteins (c-FOS, FOS B, c-JUN JUN B, JUN D), of HSP70 or of KROX-20 and -24 did not reveal any alterations. Seven days after exposure, neither increased cell proliferation nor altered expression of astroglial and microglial marker proteins were observed. In conclusion, acute high intensity microwave exposure of immobilized rats may induce some minor stress response but does not result in lasting adaptive or reactive changes of the brain.

SCHLAGWÖRTER:
bioassay; basic research; hf; biological effects

Fröhlich H 1968

Fröhlich H

Long-range coherence and energy storage in biological systems

In: Int J Quantum Chem, II. Jg. (1968), S. 641.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; elf/hf; biological effects

Fröhlich H 1980

Fröhlich H
The biological effects of microwaves and related questions
In: Adv Electronics Electron Phys, 53. Jg. (1980), S. 85.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Fulton J et al. 1980

Fulton J P, Cobb S, Preble L, Leone L, Forman E
Electrical wiring configurations and childhood leukemia in Rhode Island
In: Am J Epidemiol, 111. Jg. (1980), S. 292.

ABSTRACT:
The study of the relationship between childhood leukemia and electric power line configurations in the greater Denver, Colorado, area by Wertheimer and Leeper (Am J Epidemiol 109:273-284, 1979) was repeated in Rhode Island, focusing on leukemia (age at onset, 0-20 years; year of onset, 1964-1978). The addresses of 119 leukemia patients and 240 controls were studied by mapping power lines within 50 yards (45.72 m) of each residence. The shortest distance between each power line and the point of the residence closest to it was found; the number and types of wires in each power line were noted. Exposure weights were assigned each type of wire using Wertheimer and Leeper's median field strength reading for each. Assuming that the strength of the field decreases with the square of the distance from its source, and that fields generated by different wires grouped in the same power line are simply additive, a summary value of relative exposure was calculated for each address. Quartile exposure values for controls were used to group patient exposures. Contrary to Wertheimer and Leeper's results, no relationship was found between leukemia and electric power line configurations.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Funch D et al. 1996

Funch D P, Rothman K J, Loughlin J E, Dreyer N A
Utility of telephone company records for epidemiologic studies of cellular telephones
In: Epidemiology, 7. Jg. (1996), S. 299.

ABSTRACT:
We conducted a survey of over 5,000 telephone users who were customers of one large cellular telephone company covering four major geographical areas. Our primary goal was to assess the utility of ascertaining information on telephone use and type from telephone company records. We compared information from 3,949 respondents with corresponding data from company billing records. We found that 48% of the account holders were sole users, and 69% were the primary user, meaning that they accounted for at least 75% of the use. Respondent reports of amount of telephone use were highly correlated with data on the billing record (r = 0.74). Respondent reports of telephone type were similarly correlated with data from the manufacturer (r = 0.92). We also inquired about telephone holding patterns, since these have implications for exposure. Most users reported favoring one side of the head when using the telephone, but the side of the head used was not strongly associated with handedness.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; others

Furia L et al. 1986

Furia L, Hill D W, Gandhi O P
Effect of millimeter-wave irradiation on growth of Saccharomyces cerevisiae
In: IEEE Trans Biomed Eng, 33. Jg. (1986), S. 993.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Gabriel C et al. 1987

Gabriel C, Grant E H, Tata R, Brown P R, Gestblom B, Noreland E
Microwave absorption in aqueous solutions of DNA
In: Nature, 328. Jg. (1987), S. 145.

ABSTRACT:
In a recent Nature leading article the possibility of the occurrence of resonance absorption at microwave frequencies in DNA was discussed in terms of the latest available theoretical and experimental evidence, and its implications were assessed. Because of the far-reaching nature of these implications it is important that the existence or otherwise of such absorption be firmly established. Here we report on a concerted effort in two independent laboratories which has involved the measurement of the dielectric properties of aqueous solutions of circular DNA molecules in the frequency range 1-10 GHz. No resonance absorption or any form of enhanced absorption was demonstrated.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Galvin M J et al. 1981

Galvin M J, Parks D L, McRee D L
Influence of 2.45 GHz microwave radiation on enzyme activity
In: Radiat Environ Biophys, 19. Jg. (1981), S. 149.

ABSTRACT:
The in vitro activity of acetylcholinesterase and creatine phosphokinase was determined during in vitro exposure to 2.45 GHz microwave radiation. The enzyme activities were examined during exposure to microwave radiation at specific absorption rates (SAR) of 1, 10, 50, and 100 mW/g. These specific absorption rates had no effect on the activity of either enzyme when the temperature of the control and exposed samples were similar. These data demonstrate that the activity of these two enzymes is not affected by microwave radiation at the SARs and frequency employed in this study.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Gamberale F et al. 1989

Gamberale F, Olson B A, Eneroth P, Lindh T, Wennberg A
Acute effects of ELF electromagnetic fields: a field study of linesmen working with 400 kV power lines
In: Br J Ind Med, 46. Jg. (1989), S. 729.

ABSTRACT:
The aim of the study was to investigate the possible acute effects of exposure to electric and magnetic fields. Twenty six experienced linesmen, aged 25 to 52, were studied during two working days while performing a simulated routine inspection of insulators on steel poles of a 400 kV power line. During one of the working days the inspection was performed on a power line in operation and on the other day the same procedure was performed on an identical power line, which was not in operation. The two days were found to be comparable with regard to the physical workload which, on the basis of heart rate measurements, was estimated to be high. Exposure to the electric and magnetic fields was measured using a device

designed for on-worker sampling on each linesman. The mean exposure for the working day was estimated to be 2.8 kV/m (SD = 0.35) and 23.3 microT (SD = 4.2). The possible effects of exposure were studied using a battery of four automated performance tests, EEG, a mood scale, and a questionnaire to assess subjective symptoms. All workers were examined immediately before and after each workday. Furthermore, blood samples were collected for each subject on three different occasions during each workday. The battery of behavioural tests comprised a test of simple reaction time, a vigilance test, a test of short term memory (digit span), and a perceptual test (symbol digit). The four EEG recordings for each worker were judged blindly and sorted with regard to amount and stability of alpha activity.(ABSTRACT TRUNCATED AT 250 WORDS)

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Gammon M D et al. 1998

Gammon M D, Schoenberg J B, Britton J A, Kelsey J L, Stanford J L, Malone K E, Coates R J, Brogan D J, Potischman N, Swanson C A, Brinton L A

Electric blanket use and breast cancer risk among younger women

In: Am J Epidemiol, 148. Jg. (1998), S. 556.

ABSTRACT:
To investigate whether use of electric blankets, one of the largest sources of electromagnetic field exposure in the home, is associated with the risk of female breast cancer, the authors analyzed data from a population-based US case-control study. The 2,199 case patients were under age 55 years and had been newly diagnosed with breast cancer between 1990 and 1992. The 2,009 controls were frequency-matched to cases by 5-year age group and geographic area. There was little or no risk associated with ever having used electric blankets, mattress pads, or heated water beds among women under age 45 years (adjusted odds ratio = 1.01, 95% confidence interval 0.86-1.18) or among women aged > or =45 years (adjusted odds ratio = 1.12, 95% confidence interval 0.87-1.43). There was no substantial variation in risk with duration of use; with whether the appliance was used only to warm the bed or used throughout the night; with menopausal status; or with the cases' hormone receptor status or stage of disease. Potential breast cancer risk factors that were associated with electric blanket use did not substantially confound the associations under investigation. These data do not support the hypothesis that electric blanket use increases breast cancer risk among women under age 55 years.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Gandhi C R et al. 1989

Gandhi C R, Ross D H

Microwave induced stimulation of 32 P incorporation into phosphoinositides of rat brain synaptosomes

In: Radiat Environ Biophys, 28. Jg. (1989), S. 223.

ABSTRACT:
Exposure of synaptosomes to microwave radiation at a power density of 10 mW/sq cm or more produced stimulation of the 32Pi-incorporation into phosphoinositides. The extent of 32Pi incorporation was found to be much more pronounced in phosphatidylinositol-4-phosphate (PIP), and phosphatidylinositol-4,5-bisphosphate (PIP2) as compared to phosphatidylinositol (PI) and phosphatidic acid (PA). Other lipids were also found to incorporate 32Pi but no significant changes in their labeling were seen after exposure to microwave radiation. Inclusion of 10 mM lithium in the medium reduced the basal labeling of PIP2, PIP and PI and increased PA labeling. Li+ also inhibited the microwave stimulated PIP2, PIP and PI labeling but had no effect on PA labeling. Calcium ionophore, A23187, inhibited the basal and microwave stimulated 32Pi labeling of PIP and PIP2, stimulated basal labeling of PA and PI and had no effect on microwave stimulated PA and PI labeling. Calcium chelator, EGTA, on the other hand, had no effect on basal labeling of PA and PI, stimulated basal PIP and PIP2 labeling but did not alter microwave stimulated labeling of these lipids. Exposure of synaptosomes to microwave radiation did not alter the chemical concentration of phosphoinositides indicating that the turnover of these lipids was altered. These results suggest that low frequency microwave radiation alter the metabolism of inositol phospholipids by enhancing their turnover and thus may affect the transmembrane signalling in the nerve endings.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Garaj-Vrhovac V 1999

Garaj-Vrhovac V

Micronucleus assay and lymphocyte mititic activity in risk assessment of occupational exposure to microwave radiation

In: Chemosphere, 39. Jg. (1999), S. 2301.

ABSTRACT:
The effects of radiofrequency electromagnetic radiation (RFR) on the cell kinetics and genome damages in peripheral blood lymphocytes were determined in lymphocytes of 12 subjects occupationally exposed to microwave radiation. Results showed an increase in frequency of micronuclei (MN) as well as disturbances in the distribution of cells over the first, second and third mitotic division in exposed subjects compared to controls. According to previous reports micronucleus assay can serve as a suitable indicator for the assessment of exposure to genotoxic agents (such as RFR) and the analysis of mitotic activity as an additional parameter for the efficient biomonitoring.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Garaj-Vrhovac V et al. 1990

Garaj-Vrhovac V, Horvat D, Koren Z

The effect of microwave radiation on the cell genome

In: Mutat Res, 243. Jg. (1990), S. 8.

ABSTRACT:
Cultured V79 Chinese hamster cells were exposed to continuous radiation, frequency 7.7 GHz, power density 30 mW/cm2 for 15, 30, and 60 min. The parameters investigated were the incorporation of [3H]thymidine and the frequency of chromosome aberrations. Data obtained by 2 methods (the incorporation of [3H]thymidine into DNA and autoradiography) showed that the inhibition of [3H]thymidine incorporation took place by complete prevention of DNA from entering into the S phase. The normal rate of incorporation of [3H]thymidine was recovered within 1 generation cycle of V79 cells. Mutagenic tests performed concurrently showed that even DNA macromolecules were involved in the process. In comparison with the control samples there was a higher frequency of specific chromosome lesions in cells that had been irradiated. Results discussed in this study suggest that microwave radiation causes changes in the synthesis as well as in the structure of DNA molecules.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Garaj-Vrhovac V et al. 1990a

Garaj-Vrhovac V, Horvat D, Koren Z

Comparison of chromosome aberration and micronucleus induction in human lymphocytes after occupational exposure to vinyl chloride monomer and microwave radiation

In: Periodicum Biologorium, 92. Jg. (1990), S. 411.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Garaj-Vrhovac V et al. 1991

Garaj-Vrhovac V, Horvat D, Koren Z

The relationship between colony forming ability, chromosome aberrations and incidence of micronuclei in V79 Chinese hamster cells exposed to microwave radiation

In: Mutat Res, 263. Jg. (1991), S. 143.

ABSTRACT:
Cultured V79 Chinese hamster fibroblast cells were exposed to continuous radiation, frequency 7.7 GHz, power density 0.5 mW/cm2 for 15, 30 and 60 min. The effect of microwave radiation on cell survival and on the incidence and frequency of micronuclei and structural chromosome aberrations was investigated. The decrease in the number of irradiated V79 cell colonies was related to the power density applied and to the time of exposure. In comparison with the control samples there was a significantly higher frequency of specific chromosome aberrations such as dicentric and ring chromosomes in irradiated cells. The presence of micronuclei in irradiated cells confirmed the changes that had occurred in chromosome structure. These results suggest that microwave radiation can induce damage in the structure of chromosomal DNA.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Garaj-Vrhovac V et al. 1992

Garaj-Vrhovac V, Fucic A, Horvat D

The correlation between the frequency of micronuclei and specific chromosome aberrations in human lymphocytes exposed to microwave radiation in vitro

In: Mutat Res, 281. Jg. (1992), S. 181.

ABSTRACT:
Human whole-blood samples were exposed to continuous microwave radiation, frequency 7.7 GHz, power density 0.5, 10 and 30 mW/cm2 for 10, 30 and 60 min. A correlation between specific chromosomal aberrations and the incidence of micronuclei after in vitro exposure was observed. In all experimental conditions, the frequency of all types of chromosomal aberrations was significantly higher than in the control samples. In the irradiated samples the presence of dicentric and ring chromosomes was established. The incidence of micronuclei was also higher in the exposed samples. The results of the structural chromosome aberration test and of the micronucleus test were comparatively analyzed. The values obtained showed a positive correlation between micronuclei and specific chromosomal aberrations (acentric fragments and dicentric chromosomes). The results of the study indicate that microwave radiation causes changes in the genome of somatic human cells and that the applied tests are equally sensitive for the detection of the genotoxicity of microwaves.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Garland F C et al. 1987

Garland F C, Gorham E D, Garland C F

Hodgkin's disease in the US Navy

In: Int J Epidemiol, 16. Jg. (1987), S. 367.

ABSTRACT:
Hodgkin's disease incidence has an early peak in young adulthood. The US Navy maintains computerized career history and hospitalization information for one of the largest defined populations of young adults available for prospective studies. There were approximately 2.3 million person-years at risk in white male enlisted personnel involved in more than 80 occupations in the Navy from 1974-79. During this period 88 incident cases were identified. Navy age-adjusted incidence rates of Hodgkin's disease did not differ significantly from US population rates. There was a slight, but not significant, increased incidence with increasing length of Navy service. One occupation, machinists' mate, had about double the risk of Hodgkin's disease as the entire Navy (SIR = 2.3, p = 0.004) and the US population (SIR = 1.8, ns). Probable exposures of machinists' mates include: volatile solvents, metal dusts and, possibly, ionizing radiation. Further studies are needed, however, to clarify this association.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Garland F C et al. 1988

Garland F C, Gorham E, Garland C, Ferns J A

Non-Hodgkin's lymphomas in US Navy personnel

In: Arch Environ Health, 43. Jg. (1988), S. 425.

ABSTRACT:
Non-Hodgkin's lymphomas are one of the most commonly occurring cancers in the age groups heavily represented in the U.S. Navy. The Navy has a wide range of potential occupational exposures. This study was initiated to identify any occupational associations of non-Hodgkin's lymphomas that may adversely affect naval readiness. The objective of this study was to compare the incidence of non-Hodgkin's lymphomas in U.S. Navy active duty enlisted personnel during the period 1974-1983 with the general U.S. population, and to assess if risk varied by naval occupation or length of service. The Naval Health Research Center's computer-based disease registry was used to conduct a prospective study of all white U.S. Navy enlisted men during 1974-1983 to test for the existence of any short-term risk possibly due to occupation. Men in 80 occupations, ranging from clerk to journalist to machinist and boiler operator were observed for 3,704,864 person-years; mean length of service was 5.1 yr, but 19% of person-years were contributed by men who had served at least 11 yr. Incident cases of non-Hodgkin's lymphomas were identified and verified using Medical Board findings or review of original medical records. Average annual age-specific and age-adjusted incidence rates were calculated. Examination of pathology records and medical review boards confirmed 68 cases of non-Hodgkin's lymphomas. The annual age-adjusted incidence rate per 100,000 person-years in Navy men was significantly lower than in the U.S. Surveillance, Epidemiology, and End Results (SEER) population, probably due to screening and other selection factors associated with Navy service that result in a healthy worker effect.(ABSTRACT TRUNCATED AT 250 WORDS)

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Garland F C et al. 1990

Garland F C, Shaw E, Gorham E D, Garland C F, White M R, Sinsheimer P J

Incidence of leukaemia in occupations with potential electromagnetic field exposure in United States Navy personnel

In: Am J Epidemiol, 132. Jg. (1990), S. 293.

ABSTRACT:
Leukemia is the fourth most commonly occurring cancer in the United States population between the ages of 17 and 34 years, an age group heavily represented in the US Navy. Historical computerized military career records maintained at the Naval Health Research Center, San Diego, California, were used to determine person-years at risk (total, 4,072,502 person-years) by demographic characteristics and occupation for active-duty naval personnel during 1974-1984. Computerized inpatient medical records were searched for first hospitalizations for leukemia. Cases of leukemia (n = 102) were verified by using pathology reports or Navy Medical Board or Physical Evaluation Board findings. For comparisons, age-adjusted incidence rates and standardized incidence ratios were calculated by using rates for the US population provided by the Surveillance, Epidemiology, and End Results program of the National Cancer Institute. The overall age-adjusted incidence rate of leukemia in active-duty naval personnel was found to be very close to that of the Surveillance, Epidemiology, and End Results program population (6.0 vs. 6.5 per 100,000 person-years). Only one occupation, electrician's mate, emerged with a borderline statistically significant excess risk of leukemia (standardized incidence ratio compared with the Surveillance, Epidemiology, and End Results program population = 2.4, 95% confidence interval 1.0-5.0). This finding is intriguing in the light of several studies showing an excess risk of leukemia associated with exposure to electromagnetic fields.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Garson O M et al. 1991

Garson O M, McRobert T L, Campbell L J, Hocking B A, Gordon I

A chromosomal study of workers with long-term exposure to radiofrequency radiation

In: Med J Aust, 155. Jg. (1991), S. 289.

ABSTRACT:
OBJECTIVE: To examine whether an increased level of chromosome damage occurs in the stimulated lymphocytes of radio-linemen after long-term but intermittent exposure to radio-frequency radiation (RFR) during the course of their work. DESIGN AND PARTICIPANTS: Chromosome studies were performed on blood samples from 38 radio-linemen matched by age with 38 controls, all of whom were employed by Telecom Australia. The radio-linemen had all worked with RFR in the range 400 kHz-20 GHz with exposures at or below the Australian occupational limits, and the controls were members of the clerical staff who had no exposure to RFR. Two hundred metaphases from each subject were studied and chromosome damage was scored by an observer who was blind to the status of the subjects. RESULTS: The ratio of the rate of aberrant cells in the radio-linemen group to that in the control group was 1.0 (95% confidence interval, 0.8-1.3). There were no statistically significant differences in the types of aberrations that were scored. CONCLUSION: Exposure to RFR at or below the described limits did not appear to cause any increase in chromosomal damage in circulating lymphocytes.

SCHLAGWÖRTER:
medicine; case-control; hf; biological effects

Goldhaber M K et al. 1988

Goldhaber MK, Polen MR, Hiatt RA
Goldhaber MK, Polen MR, Hiatt RA

The risk of miscarriage and birth defects among women who use visual display terminals during pregnancy

In: Am J Ind Med, 13. Jg. (1988), S. 695.

ABSTRACT:
Use of visual display terminals (VDTs) was examined in a case-control study of pregnancy outcome among 1,583 pregnant women who attended three Kaiser Permanente obstetrics and gynecology clinics in Northern California, 1981-1982. We found a significantly elevated risk of miscarriage for working women who reported using VDTs for more than 20 hr per week during the first trimester of pregnancy compared to other working women who reported not using VDTs (odds ratio 1.8, 95% CI: 1.2-2.8). This risk could not be explained by age, education, occupation, smoking, alcohol consumption, or other maternal characteristics. No significantly elevated risk for birth defects was found among working women although odds ratios were 1.4 for both moderate and high VDT exposure, compared with no exposure (95% CI: 0.7-2.7 and 0.7-2.9, respectively). One possible explanation for these findings is that women who had adverse pregnancy outcomes may have overreported their exposures to VDTs and/or women with normal births may have underreported theirs. The findings may also be due to unmeasured factors confounded with high VDT use such as poor ergonomic conditions or job-related stress. That VDTs themselves are hazardous to the pregnant operator remains a possibility. Our results underscore the need for large cohort studies of working women that will provide objective measures of VDT exposures, ergonomic factors, and stress.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Goldoni J 1990

Goldoni J

Hematological changes in peripheral blood of workers occupationally exposed to microwave radiation

In: Health Phys, 58. Jg. (1990), S. 205.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
medicine; other type; hf; others

Goldoni J et al. 1992

Goldoni J, Bobic J, Saric M

Psychological and ergonomic aspects of work with video display terminals

In: Arh Hig Rada Toksikol, 43. Jg. (1992), S. 219.

ABSTRACT:
Forty-nine operators of video display terminals were administered a questionnaire on subjective complaints in connection with work conditions. Measurements of non-ionizing and ionizing radiation emissions during normal operation of video display terminals showed them to be within permissible levels. A detailed ergonomic analysis of equipment and workstations was also performed. Results showed a high occurrence of subjective complaints, significant differences between age subgroups in a few variables, and significant correlation between sets of variables of some perceived ergonomic features and subjective complaints.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; subjective complaints

Goldoni J et al. 1993

Goldoni J, Durek M, Koren Z

Health status of personnel occupationally exposed to radiowaves

In: Arh Hig Rada Toksikol, 44. Jg. (1993), S. 223.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; morbidity

Goldsmith J R 1995

Goldsmith J R

Epidemiological evidence of radiofrequency radiation (microwave) effects on health in military, broadcasting and occupational studies

In: Int J Occup Environ Health, 1. Jg. (1995), S. 47.

ABSTRACT:
In this opinion piece, the author brings together and discusses the collective relevance of possible health effects of microwave or radar exposure in military, broadcasting, and occupational circumstances, with a view to assuring optimal protective practices. Sources of the information presented include 1) historical data, 2) experiences of Polish soldiers, 3) a study of U.S. naval personnel using radar in the Korean War, 4) preliminary findings of exposures to the Skrunda, Latvia, transmitter, 5) data obtained near Hawaiian broadcasting facilities, 6) occupational studies of electronic and electrical workers, including ham radio operators, 7) reproductive outcomes among physiotherapists using short-wave and microwave diathermy, and 8) U.S. foreign service personnel exposed at Embassies in Eastern Europe. Some of the data are available in the peer-reviewed literature, others in abstracts, reports, or other non-peer-reviewed forms. Some were obtained under Freedom of Information statutes and are incomplete. For some of these, there is reason to believe that further evidence desired by the investigator was not obtained. Some are case-referent studies, but most are not. Some are ecological, and all are retrospective. Few have reliable dose estimations, and none has accurate dosage information on each subject. None includes evidence of tissue heating or any short-term effect. Possible outcomes considered included 1) blood count changes, 2) evidence of somatic mutation, 3) impairment of reproductive outcomes, especially increased spontaneous abortion, and 4) increase in cancer incidence and mortality, especially of the hematopoietic system, brain, and breast. The author presents evidence that sufficient microwave exposures are associated with all four of these outcomes, concluding that the possible effects and their timings with respect to exposure are qualitatively similar to those on ionizing radiation. A prudent course of action would be to provide more protection for those exposed than required by present regulations. No systematic effort to include negative studies is made; thus this review has a positive reporting bias.

SCHLAGWÖRTER:
epidemiology; Review; hf; cancer

Goldsmith J R 1996

Goldsmith J R

Epidemiological studies of radio-frequency radiation: current status and areas of concern

In: Sci Total Environ, 180. Jg. (1996), S. 3.

ABSTRACT:
These comments deal with the possible impact on human populations of intense sources of radio-frequency radiation, and not the much lower level of the usual sources of such radiation associated, for example with household appliances. These intense sources were developed and extensively used first in World War II (1940-45). Much of the health evaluation has been done by, and for, military organizations. There are important differences in the energy generated by low frequency (ELF) and radar; it then follows that there may be differences in their effects on human populations. Problems common to both types are: (1) the uncertainty as to biological mechanisms; (2) weak experimental evidence of effect; (3) epidemiological preoccupation with carcinogenesis, with its latency and low incidence. For both types there is the presumption of greater occupational than community risk, the latter often not well studied, and problems as to exposure quantification and specificity. To these one must add (4) the inherently epidemiological problems of a study at a given source of adequate sample size, case-findings, exposure estimation, confounders, and residential and job instability. Despite these problems, there are findings from sets of studies which suggest four possible health effects from radar (radio-frequency radiation) exposure: (A) disturbances in blood counts, not necessarily of clinical severity; (B) changes in chromosomes of white blood cells; (C) increases in frequency of unfavorable reproductive outcomes, especially spontaneous abortion, and (D) increases in cancers of certain sites. A review article on this topic was published (although after the Skrunda meeting) [6] providing evidence from various exposures on such possible effects. A brief critique is provided of evidence on these four possible effects, identifying some areas of uncertainty for which studies at sites like Skrunda could provide useful information.

SCHLAGWÖRTER:
epidemiology; Review; hf; others

Goodman M et al. 2002

Goodman M, Kelsh M, Ebi K, Iannuzzi J, Langholz B

Evaluation of potential confounders in planning a study of occupational magnetic field exposure and female breast cancer

In: Epidemiology, 13. Jg. (2002), S. 50.

ABSTRACT:
We examined potential confounding factors that, if unaccounted for, could possibly produce a spurious association in a study of breast cancer among women occupationally exposed to magnetic fields. For each risk factor, we estimated strength of association, prevalence in the general population, and prevalence of the risk factor in the exposed group required to explain completely hypothetical odds ratios between occupational exposure to magnetic fields and breast cancer. We performed similar analyses for two, three, four, and five confounding factors acting simultaneously. Factors numerically capable of substantial confounding included obesity, continent of birth, family history of breast cancer in a first-degree relative, densities on the mammogram, benign proliferative breast disease, history of cancer in one breast, and consumption of at least two alcoholic drinks per day. Nevertheless, only continent of birth, history of cancer, obesity, and consumption of alcohol could potentially be related to occupation. Uncontrolled confounders, either alone or in combination, could possibly account for odds ratios in the 1.2-1.3 range but were very unlikely to produce an odds ratio of more than 1.5. A spurious negative association between magnetic fields and breast cancer could occur if the exposed group included a large number of immigrants from Asia and Africa.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Gos P et al. 1997

Gos P, Eicher B, Kohli J, Heyer W-D

Extremely high frequency electromagnetic fields at low power density do not affect the division of exponential phase Saccharomyces cerevisiae cells

In: Bioelectromagnetics, 18. Jg. (1997), S. 142.

ABSTRACT:
Exponentially growing cells of the yeast Saccharomyces

cerevisiae were exposed to electromagnetic fields in the frequency range from 41.682 GHz to 41.710 GHz in 2 MHz increments at low power densities (0.5 microW/cm2 and 50 microW/cm2) to observe possible nonthermal effects on the division of this microorganism. The electronic setup was carefully designed and tested to allow precise determination and stability of the electromagnetic field parameters as well as to minimize possible effects of external sources. Two identical test chambers were constructed in one exposure system to perform concurrent control and test experiments at every frequency step under well-controlled exposure conditions. Division of cells was assessed via time-lapse photography. Control experiments showed that the cells were dividing at submaximal rates, ensuring the possibility of observing either an increase or a decrease of the division rate. The data from several independent series of exposure experiments and from control experiments show no consistently significant differences exposed and unexposed cells. This is in contrast to previous studies claiming nonthermal effects of electromagnetic fields in this frequency range on the division of S. cerevisiae cells. Possible reasons for this difference are discussed

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Goswami P C et al. 1999

Goswami P C, Albee L D, Parsian A J, Baty J D, Moros E G, Pickard W F, Roti Roti J L, Hunt C R

Proto-oncogene mRNA levels and activities of multiple transcription factors in C3H10T¢ murine embryonic fibroblasts exposed to 835.62 and 847.74 MHz cellular phone communication frequency radiation.

In: Radiat Res, 151. Jg. (1999), S. 300.

ABSTRACT:
This study was designed to determine whether two differently modulated radiofrequencies of the type generally used in cellular phone communications could elicit a general stress response in a biological system. The two modulations and frequencies studied were a frequency-modulated continuous wave (FMCW) with a carrier frequency of 835.62 MHz and a code division multiple-access (CDMA) modulation centered on 847.74 MHz. Changes in proto-oncogene expression, determined by measuring Fos, Jun, and Myc mRNA levels as well as by the DNA-binding activity of the AP1, AP2 and NF-kappaB transcription factors, were used as indicators of a general stress response. The effect of radiofrequency exposure on proto-oncogene expression was assessed (1) in exponentially growing C3H 10T 1/2 mouse embryo fibroblasts during their transition to plateau phase and (2) during transition of serum-deprived cells to the proliferation cycle after serum stimulation. Exposure of serum-deprived cells to 835.62 MHz FMCW or 847.74 MHz CDMA microwaves (at an average specific absorption rate, SAR, of 0.6 W/kg) did not significantly change the kinetics of proto-oncogene expression after serum stimulation. Similarly, these exposures did not affect either the Jun and Myc mRNA levels or the DNA-binding activity of AP1, AP2 and NF-kappaB in exponential cells during transit to plateau-phase growth. Therefore, these results suggest that the radiofrequency exposure is unlikely to elicit a general stress response in cells of this cell line under these conditions. However, statistically significant increases (approximately 2-fold, P = 0.001) in Fos mRNA levels were detected in exponential cells in transit to the plateau phase and in plateau-phase cells exposed to 835.62 MHz FMCW microwaves. For 847.74 MHz CDMA exposure, the increase was 1.4-fold (P = 0.04). This increase in Fos expression suggests that expression of specific genes could be affected by radiofrequency exposure.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Goud G N et al. 1982

Goud G N, Usha Rani M U, Reddy P P, Reddi O S, Rao M S, Saxena V K

Genetic effects of microwave radiation in mice

In: Mutat Res, 103. Jg. (1982), S. 39.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Grajewski B et al. 1997

Grajewski B, Schnorr T M, Reefhuis J, Roeleveld N, Salvan A, Mueller C A, Conover D L, Murray W E

Work with video display terminals and the risk of reduced birthweight and preterm birth

In: Am J Ind Med, 32. Jg. (1997), S. 681.

ABSTRACT:
To determine whether the use of video display terminals (VDTs) is associated with an increased risk of reduced birthweight (RBW) and preterm birth, a cohort of telephone operators who used VDTs at work was compared to a cohort of non-VDT-users. Among 2,430 women interviewed, 713 eligible singleton live births were reported. Exposure was estimated from company records and a representative sample of electromagnetic fields was measured at the VDT workstations. For RBW (< or = 2,800 g), we found no excess risk associated with any VDT use during pregnancy (odds ratio [OR] = 0.9; 95% confidence interval [CI] = 0.5-1.7). For preterm birth (< or = 37 weeks), we similarly found no excess risk (OR = 0.7; 95% CI = 0.4-1.1). The risks estimated did not change substantially when hours working with VDTs were used as exposure variables. By contrast, increased risks were found for several known risk factors for LBW and preterm birth. We conclude that occupational VDT use does not increase the risk of RBW and preterm birth.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Grajewski B et al. 2000

Grajewski B, Cox C, Schrader S M, Murray W E, Edwards R M, Turner T W, Smith J M, Shekar S S, Evenson D P, Simon S D, Conover D L

Semen quality and hormone levels among radiofrequency heater operators

In: J Occup Environ Med, 42. Jg. (2000), S. 993.

ABSTRACT:
Approximately 9,000,000 US workers are occupationally exposed to radiofrequency (RF) radiation; over 250,000 operate RF dielectric heaters. Our purpose was to determine whether male RF heater operators experience increased adverse reproductive effects reflected in reduced semen quality or altered hormone levels. We measured incident RF heater radiation exposures and RF-induced foot currents at four companies. For 12 male heater operators and a comparison group of 34 RF-unexposed men, we measured 33 parameters of semen quality and four serum hormones. Despite wide variation in individual exposure levels, near field strengths and induced foot currents did not exceed current standard levels and guidelines. We observed minor semen quality and hormonal differences between the groups, including a slightly higher mean follicle-stimulating hormone level for exposed operators (7.6 vs 5.8 mIU/mL). Further occupational studies of RF-exposed men may be warranted.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Grasso P et al. 1997

Grasso P, Parazzini F, Chatenoud L, Di Cintio E, Benzi G
Exposure to video display terminals and risk of spontaneous abortion
In: Am J Ind Med, 32. Jg. (1997), S. 403.

ABSTRACT:
Clusters of spontaneous abortion among video display terminal (VDT) users in North America and Canada in the late 1970s aroused suspicion about the potential risk of an association between VDT. exposure and pregnancy outcome. This case-control study considered the association between VDT use and the risk of miscarriage. Cases were 508 women admitted for spontaneous abortion to the Clinica Luigi Mangiagalli and a network of obstetric departments in the Milan area. Controls were 1,148 women who gave birth at term to healthy infants on randomly selected days at the same hospitals where cases were identified. No association emerged between VDT exposure and spontaneous abortion, the estimated odds ratio being 1.0 (95% CI: 0.8-1.2). This evidence agrees with studies conducted in different countries by various authors.

SCHLAGWÖRTER:
epidemiology; case-control; hf; others

Graves A B et al. 1999

Graves A B, Rosner D, Echeverria D, Yost M, Larson E B
Occupational exposure to electromagnetic fields and Alzheimer disease
In: Alzheimer Dis Assoc Disord, 13. Jg. (1999), S. 165.

ABSTRACT:
The association between occupational exposure to electromagnetic fields (EMF) and Alzheimer disease (AD) was examined. Subjects were identified from a large health maintenance organization in Seattle, Washington, and matched by age, sex, and proxy type. A complete occupational history was obtained from proxies and controls. Following the interview, two industrial hygienists (IHs) rated exposures to EMF for each job blinded to case-control status. Exposures to EMF were rated as probable intermittent exposure or probable exposure for extended periods to levels above threshold. Conditional logistic regression was used to calculate the risk of AD given EMF exposure stratified by IH. The odds ratios for ever having been exposed to EMF were 0.74 [95% confidence interval (CI) 0.29-1.92] and 0.95 (95% CI 0.27-2.43) for each IH, adjusting for age and education. No dose-response effect was noted. Agreement between the two IHs for ever having been exposed to EMF was good (kappa = 0.57, p < 0.0001). This study was unable to support an association between EMF and AD.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Grayson J K 1996

Grayson J K
Radiation exposure, socioeconomic status and brain tumor risk in US Air Force: a nested case- control study
In: Am J Epidemiol, 143. Jg. (1996), S. 480.

ABSTRACT:
A nested case-control study was used to investigate the relation between a range of electromagnetic field exposures and brain tumor risk in the US Air Force. Cumulative extremely low frequency and radiofrequency/microwave electromagnetic field potential exposures were estimated from a job-exposure matrix developed for this study. Ionizing radiation exposures were obtained from personal dosimetry records. Men who were exposed to nonionizing electromagnetic fields had a small excess risk for developing brain tumors, with the extremely low frequency and radiofrequency/microwave age-race-senior military rank-adjusted odds ratios being 1.28 (95% confidence interval (Cl) 0.95-1.74) and 1.39 (95% Cl 1.01-1.90), respectively. By contrast, men who were exposed to ionizing radiation had an age-race-senior military rank-adjusted odds ratio of 0.58 (95% Cl 0.22-1.52). These results support a small association between extremely low frequency and radiofrequency/microwave electromagnetic field exposure and no association between ionizing radiation exposure and brain tumors in the US Air Force population. Military rank was consistently associated with brain tumor risk. Officers were more likely than enlisted men to develop brain tumors (age-race-adjusted odds ratio (OR) = 2.11, 95% Cl 1.48-3.01), and senior officers were at increased risk compared with all other US Air Force members (age-race-adjusted OR = 3.30, 95% Cl 1.99-5.45)

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Green L M et al. 1999

Green L M, Miller A B, Agnew D A, Greenberg M L, Li J, Villeneuve P J, Tibshirani R
Childhood leukemia and personal monitoring of residential exposures to electric and magnetic fields in Ontario, Canada
In: Cancer Causes Control, 10. Jg. (1999), S. 233.

ABSTRACT:
OBJECTIVES: To evaluate the risk of childhood leukemia in relation to residential electric and magnetic field (EMF) exposures. METHODS: A case control study based on 88 cases and 133 controls used different assessment methods to determine EMF exposure in the child's current residence. Cases comprised incident leukemias diagnosed at 0-14 years of age between 1985-1993 from a larger study in southern Ontario; population controls were individually matched to the cases by age and sex. Exposure was measured by a personal monitoring device worn by the child during usual activities at home, by point-in-time measurements in three rooms and according to wire code assigned to the child's residence. RESULTS: An association between magnetic field exposures as measured with the personal monitor and increased risk of leukemia was observed. The risk was more pronounced for those children diagnosed at less than 6 years of age and those with acute lymphoblastic leukemia. Risk estimates associated with magnetic fields tended to increase after adjusting for power consumption and potential confounders with significant odds ratios (OR) (OR: 4.5, 95% confidence interval (CI): 1.3-15.9) observed for exposures > or = 0.14 microTesla (microT). For the most part point-in-time measurements of magnetic fields were associated with non-significant elevations in risk which were generally compatible with previous research. Residential proximity to power lines having a high current configuration was not associated with increased risk of leukemia. Exposures to electric fields as measured by personal monitoring were associated with a decreased leukemia risk. CONCLUSIONS: The findings relating to magnetic field exposures directly measured by personal monitoring support an association with the risk of childhood leukemia. As exposure assessment is refined, the possible role of magnetic fields in the etiology of childhood leukemia becomes more evident.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Green L M et al. 1999a

Green L M, Miller A B, Villeneuve P J, Agnew D A, Greenberg M L, Li J, Donnelly K E
A case-control study of childhood leukemia in southern Ontario, Canada, and exposure to magnetic fields in residences
In: Int J Cancer, 82. Jg. (1999), S. 161.

ABSTRACT:
A population-based case-control study was conducted in

Ontario, Canada, to assess the relation between the risk of childhood leukemia and residential exposure to magnetic fields. Participating subjects consisted of 201 cases, diagnosed at 0 to 14 years of age during 1985-1993, ascertained from the records at the Hospital for Sick Children (Toronto), and 406 individually matched controls. Where possible, point-in-time measurements of magnetic fields were made in all residences occupied by subjects during the period of inquiry in the defined catchment area. Three different classification schemes of wire code were assigned to each residence. Detailed information was collected by interviewer-administered questionnaires, which enabled risk estimates to be adjusted for socio-economic characteristics, medical history of parent(s) and child and environmental exposures. Inconsistent elevations in risk were associated with time-weighted averages of magnetic fields both inside and outside the home for subjects having residential point-in-time measurements that represented at least 70% of their etiological period. These risks increased in magnitude when analysis was restricted to children under 6 years of age at diagnosis or to those with acute lymphoblastic leukemia. For children younger than 6 years at diagnosis, outside perimeter measurements of the residence, > or = 0.15 microT, were associated with increased leukemia risk (OR = 3.45, 95% CI = 1.14-10.45). Evaluation of different exposure times for point-in-time magnetic field measurements and wire configuration suggested that exposures earliest in the etiological period were associated with greater risks for children diagnosed at a younger age (OR = 2.50, 95% CI = 1.14-5.49). Our findings did not support an association between leukemia and proximity to power lines with high current configuration.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Greenland S et al. 2000

Greenland S, Sheppard A R, Kaune W T, Poole C, Kelsh M A

A pooled analysis of magnetic fields, wire codes, and childhood leukemia. Childhood Leukemia-EMF Study Group

In: Epidemiology, 11. Jg. (2000), S. 624.

ABSTRACT:
We obtained original individual data from 15 studies of magnetic fields or wire codes and childhood leukemia, and we estimated magnetic field exposure for subjects with sufficient data to do so. Summary estimates from 12 studies that supplied magnetic field measures exhibited little or no association of magnetic fields with leukemia when comparing 0.1-0.2 and 0.2-0.3 microtesla (microT) categories with the 0-0.1 microT category, but the Mantel-Haenszel summary odds ratio comparing >0.3 microT to 0-0.1 microT was 1.7 (95% confidence limits = 1.2, 2.3). Similar results were obtained using covariate adjustment and spline regression. The study-specific relations appeared consistent despite the numerous methodologic differences among the studies. The association of wire codes with leukemia varied considerably across studies, with odds ratio estimates for very high current vs low current configurations ranging from 0.7 to 3.0 (homogeneity P = 0.005). Based on a survey of household magnetic fields, an estimate of the U.S. population attributable fraction of childhood leukemia associated with residential exposure is 3% (95% confidence limits = -2%, 8%). Our results contradict the idea that the magnetic field association with leukemia is less consistent than the wire code association with leukemia, although analysis of the four studies with both measures indicates that the wire code association is not explained by measured fields. The results also suggest that appreciable magnetic field effects, if any, may be concentrated among relatively high and uncommon exposures, and that studies of highly exposed populations would be needed to clarify the relation of magnetic fields to childhood leukemia.

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Groves FD 2002

Groves FD, Page WF, Gridley G, Lisimaque L, Stewart PA, Tarone RE, Gail MH,
Boice JD Jr, Beebe GW

Cancer in Korean war navy technicians: mortality survey after 40 years

In: Am J Epidemiol, 155. Jg. (2002), H. 9, S. 810-8.

ABSTRACT:
This study reports on over 40 years of mortality follow-up of 40,581 Navy veterans of the Korean War with potential exposure to high-intensity radar. The cohort death rates were compared with mortality rates for White US men using standardized mortality ratios, and the death rates for men in occupations considered a priori to have high radar exposure were compared with the rates for men in low-exposure occupations using Poisson regression. Deaths from all
diseases and all cancers were significantly below expectation overall and for the 20,021 sailors with high radar exposure potential. There was no evidence of increased brain cancer in the entire cohort (standardized mortality ratio (SMR) = 0.9, 95% confidence interval (CI): 0.7, 1.1) or in high-exposure occupations
(SMR = 0.7, 95% CI: 0.5, 1.0). Testicular cancer deaths also occurred less frequently than expected in the entire cohort and high-exposure occupations.
Death rates for several smoking-related diseases were significantly lower in the high-exposure occupations. Nonlymphocytic leukemia was significantly elevated among men in high-exposure occupations but in only one of the three high-exposure occupations, namely, electronics technicians in aviation squadrons (SMR = 2.2, 95% CI: 1.3, 3.7). Radar exposure had little effect on mortality in this cohort of US Navy veterans.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Grundler W et al. 1992

Grundler W, Kaiser F, Keilmann F, Walleczek J

Mechanisms of electromagnetic interaction with cellular systems

In: Naturwissenschaften, 79. Jg. (1992), S. 551.

ABSTRACT:
The question of how electromagnetic fields--static or low to high frequency--interact with biological systems is of great interest. The current discussion among biologists, chemists, and physicists emphasizes aspects of experimental verification and of defining microscopic and macroscopic mechanisms. Both aspects are reviewed here. We emphasize that in certain situations nonthermal interactions of electromagnetic fields occur with cellular systems.

SCHLAGWÖRTER:
bioassay; Review; elf/hf; biological effects

Guberan E et al. 1994

Guberan E, Campana A, Faval P, Guberan M, Sweetnam P M, Tuyn J W, Usel M

Gender ratio of offspring and exposure to shortwave radiation among female physiotherapists

In: Scand J Work Environ Health, 20. Jg. (1994), S. 345.

ABSTRACT:
OBJECTIVES--The goal of this study was to investigate whether the deficit of male births found among the offspring of Danish physiotherapists exposed to shortwave radiation during the first month of their pregnancy could be confirmed among the offspring of physiotherapists from Switzerland. METHODS--A self-administrated questionnaire was mailed (two mailings) to all of the 2846

female members of the Swiss Federation of Physiotherapists. It included questions on the gender and birth-weight of all children of the physiotherapists, as well as on the use of shortwave or microwave equipment during the first month of each pregnancy. The response rate was 79.5%, and the analysis was based on 1781 pregnancies. RESULTS--The gender ratio (the number of males per number of females x 100) was 107 with a 95% confidence interval (95% CI) of 89-127 for the 508 pregnancies exposed to shortwave radiation and 101 (95% CI 90-113) for the 1273 unexposed pregnancies. There was no trend in the gender ratio with increasing intensity or duration of exposure. The prevalence of low birthweight (< or = 2500 g) was not related to exposure to shortwave radiation for either the boys or the girls. CONCLUSIONS--No atypical gender ratio was found for the children of female physiotherapists from Switzerland who had been exposed to shortwave radiation at the beginning of pregnancy. The findings of the Danish study could not be confirmed.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; others

Guenel P et al. 1993

Guenel P, Raskmark P, Andersen J B, Lynge E
Incidence of cancer in persons with occupational exposure to electromagnetic fields in Denmark
In: Br J Ind Med, 50. Jg. (1993), S. 758.

ABSTRACT:
Several studies suggest that work in electrical occupations is associated with an increased risk of cancer, mainly leukaemia and brain tumours. These studies may, however, not be representative if there is a publication bias where mainly positive results are reported. To study an unselected population the incidence of cancer was followed up over a 17 year period (1970-87) in a cohort of 2.8 million Danes aged 20-64 years in 1970. Each person was classified by his or her industry and occupation in 1970. Before tabulation of the data on incidence of cancer, each industry-occupation group was coded for potential exposure to magnetic fields above the threshold 0.3 microT. Some 154,000 men were considered intermittently exposed and 18,000 continuously exposed. The numbers for women were 79,000 and 4000 respectively. Intermittent exposure was not associated with an increased risk of leukaemia, brain tumours, or melanoma. Men with continuous exposure, however, had an excess risk of leukaemia (observed (obs) 39, expected (exp) 23.80, obs/exp 1.64, 95% CI 1.20-2.24) with equal contributions from acute and other leukaemias. These men had no excess risk of brain tumours or melanoma. A risk for breast cancer was suggested in exposed men but not in women. The risk for leukaemia in continuously exposed men was mainly in electricians in installation works and iron foundry workers. Besides electromagnetic fields other exposures should be considered as possible aetiological agents.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Guenel P et al. 1996

Guenel P, Nicolau J, Imbernon E, Chevalier A, Goldberg M
Exposure to 50-Hz electric field and incidence of leukemia, brain tumors, and other cancers among French electric utility workers
In: Am J Epidemiol, 144. Jg. (1996), S. 1107.

ABSTRACT:
Recent studies on the association between exposure to 50- to 60-Hz fields and cancer carried out among electric utility workers have focused mainly on the magnetic field component of exposure. The authors have investigated tumor risks specifically associated with electric fields, as this exposure is distinct from magnetic fields. The study design is a case-control study nested within a cohort of 170,000 workers employed at Electricite de France-Gaz de France (EDF) between 1978 and 1989. All incident cases of cancer and benign tumor of the brain diagnosed in 1978-1989 among workers before the age of retirement were included. Four randomly selected controls were individually matched to each case by year of birth. The exposure to electric fields was assessed from measurements collected in 850 EDF workers for a full work week. Arithmetic and geometric mean exposures were included in a job-exposure matrix to determine the cumulative exposure of the cases and the controls. Exposures to potentially carcinogenic chemicals found at the workplace were also evaluated through expert judgment. The analysis by site of tumor did not show any increased risk for leukemia (72 cases). An odds ratio of 3.08 (95% confidence interval 1.08-8.74) was observed for all brain tumors (69 cases) for exposure above the 90th percentile (> or = 387 V/m-year), and there was some indication of a dose-response relation, although the risk did not increase monotonically with exposure. No confounding from magnetic fields or from other potentially carcinogenic hazards was apparent. The observed association was somewhat stronger after allowing a 5-year latency period before diagnosis (odds ratio = 3.69, 95% confidence interval 1.10-12.43) for exposure above the 90th percentile. However, the risk of brain tumor could not be linked to a specific type of tumor. An unexpected association was also observed for colon cancer, using geometric indexes of exposure, but no other association was seen for any other type of cancer. Our study indicates that electric fields may have a specific effect on the risk of brain tumor, and that this should be taken into account in future analyses on the carcinogenic effects of 50- to 60-Hz fields.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Guenel P et al. 2002

Guenel P, Imbernon E, Chevalier A, Crinquand-Calastreng A, Goldberg M
Leukemia in relation to occupational exposures to benzene and other agents: A case-control study nested in a cohort of gas and electric utility workers
In: Am J Ind Med, 42. Jg. (2002), S. 87.

ABSTRACT:
BACKGROUND: Many occupational and environmental exposures have been implicated in the etiology of leukemia, but only a few, such as benzene, are well-established leukemogens. The risk of leukemia in a large cohort of gas and electricity utility workers with exposures to several suspected or confirmed carcinogens was investigated. METHODS: A case-control study nested within the cohort was conducted, with 72 leukemia cases identified among male workers, and 285 controls matched to the cases by year of birth. Only cases, and their matched controls, active in the company at the date of diagnosis were included. Exposure assessment was based on a job-exposure matrix (JEM) developed from expert judgment using a standardized procedure. RESULTS: The risk of leukemia was increased in workers with an estimated cumulative exposure to benzene > or = 16.8 ppm-years (OR = 3.6; 95% CI 1.1-11.7), and there was an indication of a dose-response relation (OR = 1.2; 95% CI 1.0-1.5 per 10 ppm-years increase in exposure). The link with benzene was more pronounced for acute leukemia than for chronic leukemia, but no association with a particular leukemia cell type was apparent. The risk of leukemia remained elevated for latency periods of 2, 5, or 10 years. CONCLUSIONS: From our evaluation, it could be estimated that the median TWA exposure to benzene among exposed workers was 0.16 ppm, i.e., within concentration ranges where an increased leukemia risk was usually not apparent in previous epidemiological studies. Although an increased leukemia risk may be real, it may also be related to other occupational factors not totally controlled for in the analysis, or to benzene exposures actually higher than expected.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Gurney J G et al. 1995

Gurney J G, Davis S, Schwartz S M, Mueller B A, Kaune W T, Stevens R G

Childhood cancer occurrence in relation to power line configurations: a study of potential selection bias in case-control studies

In: Epidemiology, 6. Jg. (1995), S. 31.

ABSTRACT:
Several case-control studies have reported positive associations between childhood cancer and proximity to high-current residential power lines as defined by the Wertheimer-Leeper code. We conducted a study to evaluate whether or not differential nonparticipation of controls as a function of socioeconomic status is likely to account for the observed associations. We assessed the relation of annual family income to the Wertheimer-Leeper code in a sample of 392 households in western Washington state, and we evaluated the magnitude of bias that could occur from differential participation of low- and high-income eligible controls. Very-high-current configurations were most frequently located among households with self-reported family income of less than +15,000 per year, and very-low-current configurations were most frequently located among those with self-reported family income of more than +45,000 per year. In a hypothetical case-control study in which: (1) it was assumed that there is no true etiologic relation between power line configurations and cancer occurrence, and (2) controls with very low income were less likely to participate than others, observed (biased) odds ratios ranged from 1.03 to 1.24. If these results are applicable to other areas where case-control studies of cancer in relation to power lines have been conducted, they suggest that relatively lower participation among exposed controls (as a function of very low income) is not likely to account for the elevated risks of 1.5- to 3-fold that have been observed in these previous studies.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Gurney J G et al. 1996

Gurney J G, Mueller B A, Davis S, Schwartz S M, Stevens R G, Kopecky K J

Childhood brain tumor occurrence in relation to residential power line configurations, electric heating sources, and electric appliance use

In: Am J Epidemiol, 143. Jg. (1996), S. 120.

ABSTRACT:
To assess the relation between childhood brain tumor occurrence and exposure to potential sources of residential magnetic fields, a population-based case-control study of incident brain tumors was conducted in the Seattle, Washington, area at the Fred Hutchinson Cancer Research Center from 1989 to 1994 among children younger than age 20 years who were diagnosed from 1984 to 1990. The specific aims were to evaluate whether proximity to high-current residential power lines, as defined by the Wertheimer-Leeper code, or use of electric appliances or electric heating sources by the mother while pregnant or by the child before diagnosis were associated with increased risks of brain tumor occurrence. The mothers of 133 cases and 270 controls (recruited by random digit dialing) participated. Risk of brain tumor occurrence did not increase with increasing exposure, as indicated by the five-level Wertheimer-Leeper code. When exposure was dichotomized as high versus low, the odds ratio was 0.9 (95% confidence interval 0.5-1.5) and did not vary significantly by sex, age, or histology. No elevations in risk were found for ever versus never use of electric blankets, water beds, or electric heating sources. Odds ratios were slightly elevated for pipe appliances and were at or below 1.0 for eight others. These data do not support the hypothesis that exposure to magnetic fields from high-current power lines, electric heating sources, or electric appliances is associated with the subsequent occurrence of brain tumors in children.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Guy A W et al 1980

Guy A W, Kramar P O, Harris C A, Chou C K

Long-term 2450-MHz CW microwave irradiation of rabbits: methodology and evaluation of ocular and physiologic effects

In: J Microwave Power, 15. Jg. (1980), S. 37.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Haidler T et al. 1994

Haidler T, Knasmueller S, Kundi M, Haidler M

Clastogenic effects of radiofrequency radiations on chromosomes of Tradescantia

In: Mutat Res, 324. Jg. (1994), S. 65.

ABSTRACT:
The clastogenicity of electromagnetic fields (EMF) has so far been studiedonly under laboratory conditions. We used the Tradescantia-micronucleus(Trad-MCN) bioassay in an in situ experiment to find out whether short-waveelectromagnetic fields used for broadcasting (10-21 MHz) may show genotoxiceffects. Plant cuttings bearing young flower buds were exposed (30 h) onboth sides of a slewable curtain antenna (300/500 kW, 40-170 V/m) and IS m(90 V/m) and 30 m (70 V/m) distant from a vertical cage antenna (100 kW) aswell as at the neighbors living near the broadcasting station (200 m, 1-3V/m). The exposure at both sides of the slewable curtain antenna wasperformed simultaneously within cages, one of the Faraday type shieldingthe field and one non-shielding mesh cage. Laboratory controls weremaintained for comparison. Higher MCN frequencies than in laboratorycontrols were found for all exposure sites in the immediate vicinity of theantennae, where the exposure standards of the electric field strength ofthe International Radiation Protection Association (IRPA) were exceeded.The results at all exposure sites except one were statisticallysignificant. Since the parallel exposure in a non-shielding and a shieldingcage also revealed significant differences in MCN frequencies (the lattershowing no significant differences from laboratory controls), theclastogenic effects are clearly attributable to the short-wave radiationfrom the antennae.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Haldorsen T et al. 2000

Haldorsen T, Reitan J B, Tveten U

Cancer incidence among Norwegian airline pilots

In: Scand J Work Environ Health, 26. Jg. (2000), S. 106.

ABSTRACT:
OBJECTIVES: In this retrospective cohort study, the cancer incidence of commercial pilots was studied to determine whether exposure at work has any influence on the incidence of cancer. METHODS: The cohort was established from the files of the Civil Aviation Administration and included people who had valid licenses as commercial pilots between 1946 and 1994. Basic data about their flight careers were recorded, and exposure to cosmic radiation was estimated. The cohort was linked to the Cancer Register of Norway. The observed number of cases was compared with that expected based on national rates. RESULTS: A group of 3701 male pilots was

followed over 70 560 person-years. There were 200 cases of cancer versus 188.8 expected, with a standardized incidence ratio (SIR) of 1.06 and a 95% confidence interval (95% CI) of 0.92-1.22. No significant decreased risk was found for any cancer site. Excess risks were found for malignant melanoma (22 cases SIR 1.8, 95% CI 1.1-2.7) and nonmelanoma skin cancer (14 cases, SIR 2.4, 95% CI 1.3-4.0). For malignant melanoma, there was a significant trend for the SIR by cumulative dose. CONCLUSIONS: For most cancer sites, the incidence among pilots did not deviate from that of the general population and could not be related to block hours of flight time or dose. It seems more likely that the excess risks of malignant melanoma and skin cancer are explained by factors related to life-style rather than by conditions at work.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Hallberg O et al. 2002

Hallberg O, Johansson O
Melanoma incidence and frequency modulation (FM) broadcasting
In: Arch Environ Health, 57. Jg. (2002), S. 106.

ABSTRACT:
The incidence of melanoma has been increasing steadily in many countries since 1960, but the underlying mechanism causing this increase remains elusive. The incidence of melanoma has been linked to the distance to frequency modulation (FM) broadcasting towers. In the current study, the authors sought to determine if there was also a related link on a larger scale for entire countries. Exposure-time-specific incidence was extracted from exposure and incidence data from 4 different countries, and this was compared with reported age-specific incidence of melanoma. Geographic differences in melanoma incidence were compared with the magnitude of this environmental stress. The exposure-time-specific incidence from all 4 countries became almost identical, and they were approximately equal to the reported age-specific incidence of melanoma. A correlation between melanoma incidence and the number of locally receivable FM transmitters was found. The authors concluded that melanoma is associated with exposure to FM broadcasting.

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

Hamburger S et al. 1983

Hamburger S, Logue J N, Silverman P M
Occupational exposure to non-ionizing radiation and an association with heart disease: an exploratory study
In: J Chronic Dis, 36. Jg. (1983), S. 791.

ABSTRACT:
Exploratory analyses for dose-related exposure to non-ionizing radiation and adverse health effects among male physical therapists were done from a mail questionnaire survey. The cohort consisted of 3004 respondents who were stratified into subgroups according to exposure across and within the various types of non-ionizing radiation energy emitted from diathermy equipment. The radiation modalities considered were ultrasound, microwave, shortwave, and infrared. An association between heart disease and exposure to shortwave radiation was the only consistently significant finding when high and low exposure groups were compared.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; cvd

Hamnerius Y et al. 1985

Hamnerius Y, Rasmuson A, Rasmuson B
Biological effects of high-frequency electromagnetic fields on Salmonella typhimurium and Drosophila melanogaster
In: Bioelectromagnetics, 6. Jg. (1985), S. 405.

ABSTRACT:
Salmonella typhimurium and Drosophila melanogaster were exposed to continuous wave (CW) 2.45-GHz electromagnetic radiation, pulsed 3.10-GHz electromagnetic radiation, CW 27.12-MHz magnetic fields, or CW 27.12-MHz electric fields (only Drosophila). The temperatures of the treated sample and the nonexposed control sample were kept constant. The temperature difference between exposed and control samples was less than +/- 0.3 degrees C. Ames' assays were made on bacteria that had been exposed to microwaves (SAR 60-130 W/kg) or RF fields (SAR up to 20 W/kg) when growing exponentially in nutrient broth. Survival and number of induced revertants to histidine prototrophy were determined by common plating techniques on rich and minimal agar plates. The Drosophila test consisted of a sensitive somatic system where the mutagenicity was measured by means of mutations in a gene-controlling eye pigmentation. In none of these test systems did microwave or radiofrequency fields induce an elevated mutation frequency. However, a significantly higher concentration of cells was found in the bacterial cultures exposed to the 27-MHz magnetic field or 2.45-GHz CW and 3.10-GHz pulsed microwave radiation.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Hansen N H et al. 2000

Hansen N H, Sobel E, Davanipour Z, Gillette L M, Niiranen J, Wilson B W
EMF exposure assessment in the finnish garment industry: evaluation of proposed EMF exposure metrics
In: Bioelectromagnetics, 21. Jg. (2000), S. 57.

ABSTRACT:
Recently published studies indicate that having worked in occupations that involve moderate to high electromagnetic field (EMF) exposure is a risk factor for neurodegenerative diseases, including Alzheimer's disease. In these studies, the occupational groups most over-represented for EMF exposure comprised seamstresses, dressmakers, and tailors. Future epidemiologic studies designed to evaluate the possibility of a causal relationship between exposure to EMF and a neuro degenerative disease endpoint such as incidence of Alzheimer's disease, will benefit from the measurement of electromagnetic field metrics with potential biological relevance. Data collection methodology in such studies would be highly dependent upon how the metrics are defined. In this research the authors developed and demonstrated (1) protocols for collecting EMF exposure data suitable for estimating a variety of exposure metrics that may have biological relevance, and (2) analytical methods for calculation of these metrics. The authors show how exposure might be estimated under each of the three prominent EMF health-effects mechanism theories and evaluate the assertion that relative exposure ranking is dependent on which mechanism is assumed. The authors also performed AC RMS magnetic flux density measurements, confirming previously reported findings. The results indicate that seamstresses, as an occupational group, should be considered for study of the possible health effects of long-term EMF exposure.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Hardell L et al. 1998

Hardell L, Nasman A, Ohlson C G, Fredrikson M
Case-control study on risk factors for testicular cancer
In: Int J Oncol, 13. Jg. (1998), S. 1299.

ABSTRACT:
Occupational exposures were assessed in a case-control study on testicular cancer using self administered questionnaires. Answers were obtained for 148 (91%) cases and 314 (87%) controls. Of the cases 101 had

seminoma and 47 had embryonal testicular cancer. Occupational plastics work yielded odds ratio (OR) 2.9 with 95% confidence interval (CI) 1.3-6.5. Increased risk was found for embryonal cancer regarding farming (OR 3.1; CI 1.03-9.1) and contact with farm animals (OR 3.3; CI 1.00-10.9), but not for seminoma. For all testicular cancer exposure to insects repellents, mostly containing N,N-diethyl-m-toluamide (DEET) gave OR 1.7; CI 1.03-2.8, with a dose-response effect. Somewhat increased risks were found for amateur radio operators (OR 2.2; CI 0.7-6.6), work with radar equipment (OR 2.0; CI 0.3-14.2) and engineers in electronics and telecommunication industry (OR 2.3; CI 0.8-6.7) based on few exposed subjects, however. Video display unit work gave OR 1.5; CI 0.98-2.3 and for exposure 480 working days (median number) the risk increased further to OR 1.8; CI 1.1-3.2. Because of low numbers of exposed subjects in some calculations some of these results might be spurious and need to be further studied

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Hardell L et al. 1999

Hardell L, Nasman A, Pahlson A, Hallquist A, Hansson Mild KHardell L, Nasman A, Pahlson A, Hallquist A, Hansson Mild KHardell L, Nasman A, Pahlson A, Hallquist A, Hansson Mild KHardell L, Nasman A, Pahlson A, Hallquist A, Hansson Mild K

Use of cellular telephones and the risk for brain tumours: a case-control study

In: Int J Oncol, 15. Jg. (1999), S. 113.

ABSTRACT:
The use of cellular telephones has increased dramatically during the 1990's in the world. In the 1980's the analogue NMT system was used whereas the digital GSM system was introduced in early 1990's and is now the preferred system. Case reports of brain tumours in users initiated this case-control study on brain tumours and use of cellular telephones. Also other exposures were assessed. All cases, both males and females, with histopathologically verified brain tumour living in Uppsala-Orebro region (1994-96) and Stockholm region (1995-96) aged 20-80 at the time of diagnosis and alive at start of the study were included, 233 in total. Two controls to each case were selected from the Swedish Population Register matched for sex, age and study region. Exposure was assessed by questionnaires supplemented over the phone. The analyses were based on answers from 209 (90%) cases and 425 (91%) controls. Use of cellular telephone gave odds ratio (OR) = 0.98 with 95% confidence interval (CI) = 0. 69-1.41. For the digital GSM system OR = 0.97, CI = 0.61-1.56 and for the analogue NMT system OR = 0.94, CI = 0.62-1.44 were calculated. Dose-response analysis and using different tumour induction periods gave similar results. Non-significantly increased risk was found for tumour in the temporal or occipital lobe on the same side as a cellular phone had been used, right side OR = 2.45, CI = 0.78-7.76, left side OR = 2.40, CI = 0.52-10.9 Increased risk was found only for use of the NMT system. For GSM use the observation time is still too short for definite conclusions. An increased risk for brain tumour in the anatomical area close to the use of a cellular telephone should be especially studied in the future.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Hardell L et al. 2000

Hardell L, Nasman A, Pahlson A, Hallquist

Case-control study on radiology work, medical x-ray investigations, and use of cellular telephones as risk factors for brain tumors

In: MedGenMed [Angaben zu Jahrgang oder Jahr der Zeitschrift fehlen!], [Seitenangaben fehlen!]

ABSTRACT:
CONTEXT: Ionizing radiation is a well established risk factor for brain tumors. During recent years, microwave exposure from the use of cellular telephones has been discussed as a potential risk factor. OBJECTIVE: To determine risk factors for brain tumors. DESIGN: A case control study, with exposure assessed by questionnaires. PARTICIPANTS: A total of 233 currently living men and women, aged 20 to 80 years, were included. The case patients had histopathologically verified brain tumors and lived in the Uppsala Orebro region (1994 1996) or the Stockholm region (1995 1996). Two matched controls to each case were selected from the Swedish Population Register.
MAIN OUTCOME MEASURES: Ionizing radiation and use of cellular telephones as risk factors for brain tumors.
RESULTS: A total of 209 cases (90%) and 425 controls (91%) answered the questionnaire. Work as a physician yielded an odds ratio (OR) of 6.00, with a 95% confidence interval (CI) of 0.62 to 57.7. All three case patients had worked with fluoroscopy. Radiotherapy of the head and neck region yielded an OR of 3.61 (95% CI, 0.65 19.9). Medical diagnostic x ray examination of the same area yielded an OR of 2.10 (95% CI, 1.25 3.53), with a tumor induction period of 5 years or more. Chemical industry work yielded an OR of 4.10 (95% CI, 1.25 13.4), and laboratory work yielded an OR of 3.21 (95% CI, 1.16 8.85). Ipsilateral use of cellular telephones increased the risk for tumors in the temporal, temporoparietal, and occipital lobes (OR, 2.42; 95% CI, 0.97 6.05), ie, the anatomic areas with highest exposure to microwaves from a mobile telephone. The result was further strengthened (OR, 2.62; 95% CI, 1.02 6.71) in a multivariate analysis that included laboratory work and medical diagnostic x ray investigations of the head and neck.
CONCLUSION: Exposure to ionizing radiation, work in laboratories, and work in the chemical industry increased the risk of brain tumors. Use of a cellular telephone was associated with an increased risk in the anatomic area with highest exposure.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Hardell L et al. 2001

Hardell L, Mild K H, Pahlson A, Hallquist A

Ionizing radiation, cellular telephones and the risk for brain tumours

In: Eur J Cancer Prev, 10. Jg. (2001), S. 523.

ABSTRACT:
A case-control study on brain tumours included 233 patients aged 20-80 years and alive at the study time. They had histopathologically verified brain tumour and lived in the Uppsala-Orebro region (1994-1996) or the Stockholm region (1995-1996). Two matched controls to each case were selected from the Swedish Population Register. Two hundred and nine cases (90%) and 425 controls (91%) answered the questionnaire. Results are presented for the whole study group, as given here, and for malignant and benign tumours separately. For workers in the chemical industry the odds ratio (OR) was 4.10, 95% confidence interval (95% CI) 1.25-13.4 and laboratory workers OR 3.21, 95% CI 1.16-8.85. Radiotherapy of the head and neck region gave OR 3.61, 95% CI 0.65-19.9. Medical diagnostic X-ray of the same area yielded OR 1.64, 95% CI 1.04-2.58. Work as a physician gave OR 6.00, 95% CI 0.62-57.7. All three cases had worked with fluoroscopy. Ipsilateral (same side) use of a cellular telephone increased the risk of tumours in the temporal, temporoparietal and occipital areas, with OR 2.42, 95% CI 0.97-6.05 (i.e. the anatomical areas with highest exposure to microwaves from a mobile phone).

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Hardell L et al. 2002

Hardell L, Hallquist A, Mild K H, Carlberg M, Pahlson A, Lilja A

Cellular and cordless telephones and the risk for brain tumours

In: Eur J Cancer Prev, 11. Jg. (2002), S. 377.

ABSTRACT:
Microwave exposure from the use of cellular telephones has been discussed in recent years as a potential risk factor for brain tumours. We included in a case-control study 1617 patients aged 20-80 years of both sexes with brain tumour diagnosed between 1 January 1997 and 30 June 2000. They were alive at the study time and had histopathologically verified brain tumour. One matched control to each case was selected from the Swedish Population Register. The study area was the Uppsala-Orebro, Stockholm, Linkoping and Goteborg medical regions of Sweden. Exposure was assessed by a questionnaire that was answered by 1429 (88%) cases and 1470 (91%) controls. In total, use of analogue cellular telephones gave an increased risk with an odds ratio (OR) of 1.3 (95% confidence interval (CI) 1.02-1.6). With a tumour induction period of >10 years the risk increased further: OR 1.8 (95% CI 1.1-2.9). No clear association was found for digital or cordless telephones. With regard to the anatomical area of the tumour and exposure to microwaves, the risk was increased for tumours located in the temporal area on the same side of the brain that was used during phone calls; for analogue cellular telephones the OR was 2.5 (95% CI 1.3-4.9). Use of a telephone on the opposite side of the brain was not associated with an increased risk for brain tumours. With regard to different tumour types, the highest risk was for acoustic neurinoma (OR 3.5, 95% CI 1.8-6.8) among analogue cellular telephone users.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Harrington J M et al. 1997

Harrington J M, McBride D I, Sorahan T, Paddle G M, van Tongeren M

Occupational exposure to magnetic fields in relation to mortality from brain cancer among electricity generation and transmission workers

In: Occup Environ Med, 54. Jg. (1997), S. 7.

ABSTRACT:
OBJECTIVE: To investigate whether the risks of mortality from brain cancer are related to occupational exposure to magnetic fields. METHODS: A total of 112 cases of primary brain cancer (1972-91) were identified from a cohort of 84,018 male and female employees of the (then) Central Electricity Generating Board and its privatised successor companies. Individual cumulative occupational exposures to magnetic fields were estimated by linking available computerised job history data with magnetic field measurements collected over 675 person-workshifts. Estimated exposure histories of the case workers were compared with those of 654 control workers drawn from the cohort (nested case-control study), by means of conditional logistic regression. RESULTS: For exposure assessments based on arithmetic means, the risk of mortality from brain cancer for subjects with an estimated cumulative exposure to magnetic fields of 5.4-13.4 microT.y v subjects with lower exposures (0.0-5.3 microT.y) was 1.04 (95% confidence interval (95% CI) 0.60 to 1.80). The corresponding relative risk in subjects with higher exposures (> or = 13.5 microT.y) was 0.95 (95% CI 0.54 to 1.69). There was no indication of a positive trend for cumulative exposure and risk of mortality from brain cancer either when the analysis used exposure assessments based on geometric means or when the analysis was restricted to exposures received within five years of the case diagnosis (or corresponding period for controls). CONCLUSIONS: Although the exposure categorisation was based solely on recent observations, the study findings do not support the hypothesis that the risk of brain cancer is associated with occupational exposure to magnetic fields.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Harrington J M et al. 2001

Harrington J M, Nichols L, Sorahan T, van Tongeren M

Leukaemia mortality in relation to magnetic field exposure: findings from a study of United Kingdom electricity generation and transmission workers, 1993-97

In: Occup Environ Med, 58. Jg. (2001), S. 507.

ABSTRACT:
OBJECTIVE: To investigate whether risks of leukaemia are related to occupational exposure to magnetic fields. METHODS: The mortality experienced by a cohort of 83 997 employees of the former Central Electricity Generating Board of England and Wales was investigated for the period 1973-97. All employees were employed for at least 6 months with some employment in the period 1973-82. Computerised work histories were available for 79 972 study subjects for the period 1971-93. Detailed calculations were performed by others to enable a novel assessment to be made of exposures to magnetic fields. Two analytical approaches were used, indirect standardisation (n=83 997) and Poisson regression (n=79 972). RESULTS: Based on serial mortalities for England and Wales, the standardised mortality ratio of 84 for all leukaemias (observed 111, expected 132.3) was similar to that of 83 for all causes (observed 14 845, expected 17 918). No significant positive trends were found for the risks of various types of leukaemia (chronic lymphatic leukaemia, acute myeloid leukaemia, chronic myeloid leukaemia, all leukaemia) either with lifetime cumulative exposure to magnetic fields or with such exposures received in the most recent 5 years. CONCLUSIONS: There are no discernible excess risks of leukaemia as a consequence of occupational exposure to magnetic fields in United Kingdom electricity generation and transmission workers.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Hatch E E et al. 1998

Hatch E E, Linet M S, Kleinerman R A, Tarone R E, Severson R K, Hartsock C T, Haines C, Kaune W T, Friedman D, Robison L L, Wacholder S

Association between childhood acute lymphoblastic leukemia and use of electrical appliances during pregnancy and childhood

In: Epidemiology, 9. Jg. (1998), S. 234.

ABSTRACT:
As part of a comprehensive study of residential magnetic field exposure in nine midwestern and mid-Atlantic states, we evaluated the use of appliances by 640 patients with acute lymphoblastic leukemia, 0-14 years of age, diagnosed between 1989 and 1993, and 640 matched control children. Mothers were interviewed regarding use of electrical appliances during their pregnancy with the subject and the child's postnatal use. The risk of acute lymphoblastic leukemia was elevated in children whose mothers reported use of an electric blanket or mattress pad during pregnancy [odds ratio (OR) = 1.59; 95% confidence interval (CI) = 1.11-2.29] but was reduced for use of sewing machines during pregnancy (OR = 0.76; 95% CI = 0.59-0.98). The risk of acute lymphoblastic leukemia was increased with children's use of electric blankets or mattress pads (OR = 2.75; 95% CI = 1.52-4.98) and three other electrical appliances (hair dryers, video machines in arcades, and video games connected to a television), but the patterns of risk for duration in years of use and frequency of use were inconsistent for most appliances used by children. Risks rose with increasing

number of hours per day children spent watching television, but risks were similar regardless of the usual distance from the television. The inconsistency in the dose-response patterns for many appliances, reporting and selection bias, and the lack of an effect for measured 60 Hertz magnetic fields or wire codes in our companion study must be considered before ascribing these associations to exposures from magnetic fields.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Hatch E E et al. 2000

Hatch E E, Kleinerman R A, Linet M S, Tarone R E, Kaune W T, Auvinen A, Baris D, Robison L L, Wacholder S

Do confounding or selection factors of residential wiring codes and magnetic fields distort findings of electromagnetic fields studies?

In: Epidemiology, 11. Jg. (2000), S. 189.

ABSTRACT:
In contrast with several previous studies, our recent large case-control study found little association between childhood acute lymphoblastic leukemia (ALL) and electric-power-line wire codes. Here we examine internal evidence from our study to assess the possibility that selection bias and/or confounding may have affected the findings. We compared the relation between childhood ALL and wire codes and direct measurements of magnetic fields in subjects who participated in all phases of the study with the relation in all subjects, including those who declined to allow access inside the home. We found that the odds ratio for ALL among those living in homes with very high current configurations increased by 23% when 107 "partial participants" were excluded. We found similar, but slightly smaller, increases in the odds ratios when we performed the same comparisons using direct measurements of magnetic fields, excluding subjects who allowed only a measurement outside the front door. "Partial participants" tended to be characterized by lower socioeconomic status than subjects who participated fully, suggesting possible selection bias. We also examined the relation between a large number of potential confounding variables and both proxy and direct measurements of magnetic fields. Univariate adjustment for individual variables changed the odds ratio for ALL by less than 8%, while simultaneous adjustment for several factors reduced the estimate by a maximum of 15%. We conclude that while confounding alone is unlikely to be an important source of bias in our own and previous studies of magnetic fields, selection bias may be more of a concern, particularly in light of the generally low response rates among controls in case-control studies.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Hayes R B et al. 1990

Hayes R B, Brown L M, Pottern L M, Gomez M, Kardaun J W, Hoover R N, O'Connell K J, Sutzman R E and Javadpour N

Occupation and risk for testicular cancer: a case-control study

In: Int J Epidemiol, 19. Jg. (1990), S. 825.

ABSTRACT:
A case-control study of 271 testicular cancer cases aged 18-42, including 60 seminomas and 206 other germinal cell tumours, and 259 controls was carried out to study the association between occupation and testicular cancer risk. Study subjects were identified at three medical centres, two of which treat military personnel. Controls were men diagnosed with a cancer other than of the genital tract. Associations were identified between professional employment (administrators, teachers and other professionals) and risk for testicular seminoma, OR = 2.8 (95% CI: 1.4-5.4) and between employment in production work and risk for other germinal cell tumours, OR = 1.8 (95% CI: 1.1-2.7). No specific occupations within these broad groups were responsible for observed increases. Self-reported exposure to microwave and other radio waves was associated with an excess risk for both seminomas and other germinal cell tumours. However, an assessment of radio wave exposure based on job title did not support this finding. Although testicular cancer has been increasing in recent decades among young males, occupational factors did not appear to account for a substantial proportion of testicular cancer occurrence in the population studied.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Heineman E F et al. 1995

Heineman EF, Gao YT, Dosemeci M, McLaughlin JK

Occupational risk factors for brain tumors among women in Shanghai, China

In: J Occup Environ Med, 37. Jg. (1995), S. 288.

ABSTRACT:
The etiology of brain cancer is not well understood and few studies have evaluated occupational risk factors among women. We evaluated occupation and industry at time of diagnosis for 276 incident primary brain tumor cases among women in Shanghai, China, for the period 1980-1984, identified through the Shanghai Cancer Registry. Standardized incidence ratios (SIRs) and their 95% confidence intervals (CIs) were calculated for all occupations and industries with at least three female cases. SIRs compared observed to expected numbers of cases, based on incidence rates for Shanghai and the number of women in each occupation and industry according to the 1982 census. Statistically significant excesses of brain tumors were seen among grain farmers (SIR = 6.5, 95% CI = 1.3-19.1), rubber workers (SIR = 5.0, 95% CI = 1.6-11.6), and workers in transportation equipment manufacture and repair (SIR = 2.3, 95% CI = 1.1-4.3). Risks among textile spinners and winders were of borderline significance (SIR = 1.7, 95% CI = 1.0-2.8). Elevated but nonsignificant risks of 2.0 or greater were seen among nurses, plastic products workers, sanitation workers, painters, and workers in manufacture of equipment for electrical generation, transmission, and distribution. Results for farmers, rubber workers, and painters are consistent with previously reported excesses among these occupations in men. The increase among nurses is a new finding, although elevated risks have been observed among male medical professionals. Risks were elevated with likely exposure to pesticides, particularly among those thought to have a high probability and a high level of exposure (SIR = 3.6, 95% CI = 1.2-8.5).

SCHLAGWÖRTER:
epidemiology; other type; none; cancer

Hermann D et al. 1997

Hermann D M, Hossman K-A

Neurologic effects of microwave exposure related to mobile communication

In: J Neurol Sci, 152. Jg. (1997), S. 1.

ABSTRACT:
Due to the wide and growing use of mobile communication, there is increasing concern about the interactions of electromagnetic radiation with the human organism, and, in particular, with the brain. In the present report, experimental studies on putative electrophysiological, biochemical and morphological effects of continuous or pulsed microwave radiation are briefly reviewed. Such effects have been described in vitro and in vivo using animals and humans. Particularly, effects on neuronal electrical activity, cellular calcium homeostasis, energy metabolism, genomic responses, neurotransmitter balance and blood-brain barrier permeability have been reported. However, some results

have either been disputed, since experimental replication led to contradictory findings, or been related to procedural side effects. Since neurological disturbances induced by mobile telephone devices would be of considerable interest for public health, the authors recognize that further experimental studies, involving strict positive and negative control conditions, will be required in the future. At the present state of knowledge there is no positive evidence that pulsed or continuous microwave exposure in the non-thermal range confers elevated risk to the health of the brain.

SCHLAGWÖRTER:
epidemiology; Review; hf; biological effects

Higashikubo R et al. 1999

Higashikubo R, Culbreath V O, Spitz D R, LaRegina M C, Pickard W F, Straube W L, Moros E G, Roti Roti J L
Radiofrequency electromagnetic fields have no effect on the in vivo proliferation of the 9L brain tumour
In: Radiat Res, 152. Jg. (1999), S. 665.

ABSTRACT:
The intracranial 9L tumor model was used to determine if exposure to a radiofrequency (RF) electromagnetic field similar to those used in cellular telephone has any effects on the growth of a central nervous system tumor. Fischer 344 rats implanted with different numbers of 9L gliosarcoma cells were exposed to 835.62 MHz frequency-modulated continuous wave (FMCW) or 847.74 MHz code division multiple access (CDMA) RF field with nominal slot-average specific absorption rates in the brain of 0.75 +/- 0.25 W/kg. The animals were exposed to the RF field for 4 h a day, 5 days a week starting 4 weeks prior to and up to 150 days after the implantation of tumor cells. Among sham-exposed animals injected with 2 to 10 viable cells (group 1), the median survival was 70 days, with 27% of the animals surviving at 150 days. The median survival length and final survival fraction for animals injected with 11 to 36 viable cells (group 2) were 52 days and 14%, respectively, while the values for those injected with 37 to 100 cells (group 3) were 45 days and 0%. The animals exposed to CDMA or FMCW had similar survival parameters, and the statistical comparison of the survival curves for each of the groups 1, 2 and 3 showed no significant differences compared to sham-exposed controls.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Hillert L et al. 2002

Hillert L, Berglind N, Arnetz B B, Bellander T
Prevalence of self-reported hypersensitivity to electric or magnetic fields in a population-based questionnaire survey
In: Scand J Work Environ Health, 28. Jg. (2002), S. 33.

ABSTRACT:
OBJECTIVES: The prevalence of medically unexplained symptoms attributed to exposure to electromagnetic fields is still largely unknown. Previous studies have investigated reported hypersensitivity to electricity in selected groups recruited from workplaces or outpatient clinics. The aim of this study was to estimate the prevalence of self-reported hypersensitivity to electric or magnetic fields in the general population and to describe characteristics of the group reporting such hypersensitivity with regard to demographics, other complaints, hypersensitivities, and traditional allergies. METHODS: A cross-sectional questionnaire survey was conducted in 1997 among 15,000 men and women between 19 and 80 years of age in Stockholm County. The response rate was 73%. RESULTS: One and a half percent of the respondents reported hypersensitivity to electric or magnetic fields. Prevalence was highest among women and in the 60- to 69-year age group. The hypersensitive group reported all symptoms, allergies, and other types of hypersensitivities included in the survey (as well as being disturbed by various factors in the home) to a significantly greater extent than the rest of the respondents. No specific symptom profile set off the hypersensitive group from the rest of the respondents. CONCLUSIONS: The results should be interpreted with caution. But they suggest that there is widespread concern among the general population about risks to health posed by electric and magnetic fields. More research is warranted to explore ill health among people reporting hypersensitivity to electric or magnetic fields.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; subjective complaints

Hocking B 1998

Hocking B
Preliminary report: symptoms associated with mobile phone use
In: Occup Med, 48. Jg. (1998), S. 357.

ABSTRACT:
Mobile phone use is ubiquitous, although the alleged health effects of low level radio-frequency radiation (RFR) used in transmission are contentious. Following isolated reports of headache-like symptoms arising in some users, a survey has been conducted to characterize the symptoms sometimes associated with mobile phone usage. A notice of interest in cases was placed in a major medical journal and this was publicized by the media. Respondents were interviewed by telephone using a structured questionnaire. Forty respondents from diverse occupations described unpleasant sensations such as a burning feeling or a dull ache mainly occurring in the temporal, occipital or auricular areas. The symptoms often began minutes after beginning a call, but could come on later during the day. The symptoms usually ceased within an hour after the call, but could last until evening. Symptoms did not occur when using an ordinary handset, and were different from ordinary headaches. There were several reports suggestive of intra-cranial effects. Three respondents reported local symptoms associated with wearing their mobile phone on their belts. There was one cluster of cases in a workplace. Seventy-five per cent of cases were associated with digital mobile phones. Most of the respondents obtained relief by altering their patterns of telephone usage or type of phone. Cranial and other diverse symptoms may arise associated with mobile phone usage. Physicians and users alike should be alert to this. Further work is needed to determine the range of effects, their mechanism and the possible implications for safety limits of RFR.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; subjective complaints

Hocking B et al. 1996

Hocking B, Gordon I R, Grain H L, Hatfield G E
Cancer incidence and mortality and proximity to TV towers
In: Med J Aust, 165. Jg. (1996), S. 601.

ABSTRACT:
OBJECTIVE: To determine whether there is an increased cancer incidence and mortality in populations exposed to radiofrequency radiations from TV towers. DESIGN: An ecological study comparing cancer incidence and mortality, 1972-1990, in nine municipalities, three of which surround the TV towers and six of which are further away from the towers. (TV radiofrequency radiation decreases with the square of the distance from the source.) Cancer incidence and mortality data were obtained from the then Commonwealth Department of Human Services and Health. Data on frequency, power, and period of broadcasting for the three TV towers were obtained from the Commonwealth Department of Communications and the Arts. The calculated power density of the radiofrequency radiation in the exposed area ranged from 8.0 microW/cm2 near the towers to 0.2 microW/cm2 at a radius of 4km and 0.02 microW/cm2 at 12 km. SETTING: Northern Sydney, where three TV towers have been

broadcasting since 1956. OUTCOME MEASURES: Rate ratios for leukaemia and brain tumour incidence and mortality, comparing the inner with the outer areas. RESULTS: For all ages, the rate ratio for total leukaemia incidence was 1.24 (95% confidence interval [CI], 1.09-1.40). Among children, the rate ratio for leukaemia incidence was 1.58 (95% CI, 1.07-2.34) and for mortality it was 2.32 (95% CI, 1.35-4.01). The rate ratio for childhood lymphatic leukaemia (the most common type) was 1.55 (95% CI, 1.00-2.41) for incidence and 2.74 (95% CI, 1.42-5.27) for mortality. Brain cancer incidence and mortality were not increased. CONCLUSION: We found an association between increased childhood leukaemia incidence and mortality and proximity to TV towers

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

Holly E A et al. 1996

Holly E A, Aston D A, Ahn D K, Smith A H

Intraocular melanoma linked to occupations and chemical exposures

In: Epidemiology, 7. Jg. (1996), S. 55.

ABSTRACT:
We conducted a case-control study in the western United States to determine the relation between occupations or chemical exposures and increased risk of uveal melanoma. Among men (221 patients, 447 controls), we found increased risks for occupational groups who had intense exposure to ultraviolet light [odds ratio (OR) = 3.0; 95% confidence interval (CI) = 1.2-7.8], welding exposure (OR = 2.2; 95% CI = 1.3-3.5), and asbestos exposure (OR = 2.4; 95% CI = 1.5-3.9 for most likely exposed). The highest odds ratio was for the small number of men (nine cases, three controls) who were chemists, chemical engineers, and chemical technicians (OR = 5.9; 95% CI = 1.6-22.7). Odds ratios also were elevated for exposures to antifreeze, formaldehyde, pesticides, and carbon tetrachloride, but these findings, based on recall of specific chemical exposures, are more subject to recall bias than the findings based on occupational groups.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Huang A T et al. 1977

Huang A T, Engle M E, Elder J A, Kinn J B, Ward T R

The effect of microwave radiation (2450 MHz) on the morphology and chromosomes of lymphocytes

In: Radio Sci, 12. Jg. (1977), S. 173.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Hunt E L et al. 1975

Hunt E L, King N W, Phillips R D

Behavioral effects of pulsed microwave radiation

In: Ann NY Acad Sci, 247. Jg. (1975), S. 440.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
other field; other type; hf; others

Hyland G J 1998

Hyland, G J

Non-thermal bioeffects induced by low-intensity microwave irradiation of living systems

In: Engineer Sci Educ J, 7. Jg. (1998), S. 261.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Imaida K et al. 1998

Imaida K, Taki M, Yamaguchi T, Ito T, Watanabe S, Wake K, Aimoto A, Kamimura Y, Ito N, Shirai T

Lack of promoting effects of the electromagnetic near-field used for cellular phones (929.2 MHz) on rat liver carcinogenesis in a medium-term liver bioassay

In: Carcinogenesis, 19. Jg. (1998), S. 311.

ABSTRACT:
The possible cancer promotion potential of local exposure to a pulse modulated 929.2 MHz electromagnetic near-field on chemically-initiated rat liver carcinogenesis was investigated employing a medium-term bioassay. A 929.2-MHz electromagnetic near-field of time division multiple access (TDMA) signal for PDC (Personal Digital Cellular, Japanese cellular telephone standard) system was directed to rats through a quarter-wavelength monopole antenna. Maximum local specific absorption rates (SARs) on temporal average were 7.2-6.6 W/kg within the whole body and 2.0-1.7 W/kg within the liver, which was the target organ. The whole-body average SARs on temporal average were 0.80-0.58 W/kg. Temporal peak SARs had three times these values due to the duty ratio of the PDC signal. Exposure was for 90 min a day, 5 days a week, over 6 weeks. The exposure apparatus was specially designed for this experiment, to allow exposure of the lateral mid-section of the rat body to the electromagnetic near-field. Male F344 rats, 6 week-old, were initially (at week 0) given a single dose of diethylnitrosamine (DEN, 200 mg/kg body wt, i.p.). At 2 weeks later, exposure (48 rats) or sham-exposure (48 rats) was started. The exposure of electromagnetic near-fields was performed using the exposure apparatus mentioned above. At week 3, all rats were subjected to a 2/3 partial hepatectomy. At week 8 (i.e. after 6 weeks exposure or sham-exposure), the experiment was terminated and all rats were killed. Carcinogenic potential was scored by comparing the numbers and areas of the induced glutathione S-transferase placental form (GST-P) positive foci in the livers of the exposed and sham-exposed rats. A further group of 24 animals, given only DEN and partial hepatectomy, served as the controls. The numbers (no./cm2) of GST-P positive foci were 4.61 +/- 1.77, 5.21 +/- 1.92 ($P < 0.05$, versus control) and 4.09 +/- 1.47 and the areas (mm2/cm2) were 0.30 +/- 0.16, 0.36 +/- 0.21 and 0.28 +/- 0.15, for the exposed, sham-exposed and control groups, respectively. There were no significant differences between the exposed and sham-exposed groups. These findings clearly indicated that local body exposure to a 929.2-MHz field, modulated in a PDC waveform, has no significant effect on rat liver carcinogenesis under the experimental conditions employed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Imaida K et al. 1998a

Imaida K, Taki M, Watanabe S-I, Kamimura Y, Ito T, Yamaguchi T, Ito N, Shirai T

The 1.5 GHz electromagnetic near-field used for cellular phones does not promote rat liver carcinogenesis in a medium-term liver bioassay

In: Jpn J Cancer Res, 89. Jg. (1998), S. 995.

ABSTRACT:
We have recently established that local exposure to a 929.2 MHz electromagnetic near-field, used for cellular phones, does not promote rat liver carcinogenesis in a medium-term bioassay system. In the present study, a 1.439 GHz electromagnetic near-field (EMF), another microwave band employed for cellular phones in Japan, was similarly investigated. Time division multiple access (TDMA) signals for the Personal Digital Cellular (PDC) Japanese cellular telephone standard system were directed to rats through a quarter-wavelength monopole

antenna. Numerical dosimetry showed that the peak SARs within the liver were 1.91-0.937 W/kg, while the whole-body average specific absorption rates (SARs) were 0.680-0.453 W/kg, when the time-averaged antenna radiation power was 0.33 W. Exposure was for 90 min a day, 5 days a week, over 6 weeks, to male F344 rats given a single dose of diethylnitrosamine (200 mg/kg, i.p.) 2 weeks previously. At week 3, all rats were subjected to a two-thirds partial hepatectomy. At week 8, the experiment was terminated and the animals were killed. Carcinogenic potential was scored by comparing the numbers and areas of the induced glutathione S-transferase placental form (GST-P)-positive foci in the livers of exposed (48) and sham-exposed rats (48). Despite increased serum levels of corticosterone, adrenocorticotropic hormone (ACTH) and melatonin, the numbers and the areas of GST-P-positive foci were not significantly altered by the exposure. These findings clearly indicated that local body exposure to a 1.439 GHz EMF, as in the case of a 929.2 MHz field, has no promoting effect on rat liver carcinogenesis in the present model.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Inskip P D et al. 1999

Inskip P D, Hatch E E, Stewart P A, Heineman E F, Ziegler R G, Dosemeci M, Parry D, Rothman N, Boice J D Jr, Wilcosky T C, Watson D J, Shapiro W R, Selker R G, Fine H A, Black P McL, Loeffler J S, Linet M S

Study design for a case-control investigation of cellular telephones and other risk factors for brain tumours in adults

In: Radiat Prot Dosimetry, 86. Jg. (1999), S. 45.

ABSTRACT:
The aetiology of brain tumours is poorly understood. Due, in part, topublic concern about a postulated relationship between the use of cellulartelephones or other increasingly prevalent environmental exposures and theincidence of brain cancer in adults, the National Cancer Institute iscollaborating with three US hospitals in a comprehensive case-control studyof malignant and benign brain tumours. Factors under consideration includeuse of cellular phones and other wireless communication devices, workplaceexposures to chemical agents and electromagnetic fields, dietary factors,family history of tumours, genetic determinants of susceptibility, homeappliance use, reproductive history and hormonal exposures, viruses,medical and dental exposure to ionising radiation, and other aspects ofmedical history. Approximately 800 newly diagnosed brain tumour cases and800 controls were enrolled at hospitals in Boston, Phoenix and Pittsburghfrom 1994 to 1998. Cases include all adults (age ? 18 y) newly diagnosedwith a histologically confirmed intracranial glioma, histologicallyconfirmed intracranial meningioma or acoustic neuroma. Controls arepatients admitted to the same hospitals as the cases, and treated for anyof a variety of non-malignant conditions. Key features of the study includeits large size, the emphasis on rapid ascertainment of incident cases andinterview of study subjects rather than surrogate respondents, the use ofdetailed, job-specific questions developed by industrial hygienists toascertain occupational exposures, and the storage of blood samples forfuture evaluation of inherited susceptibility, biomarkers of exposure andgene-environment interactions.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Inskip P D et al. 2001

Inskip P D, Tarone R E, Hatch E E, Wilcosky T C, Shapiro W R, Selker R G, Fine H A, Black P M, Loeffler J S, Linet M S

Cellular-telephone use and brain tumors

In: N Engl J Med, 344. Jg. (2001), S. 79.

ABSTRACT:
BACKGROUND: Concern has arisen that the use of hand-held cellular telephones might cause brain tumors. If such a risk does exist, the matter would be of considerable public health importance, given the rapid increase worldwide in the use of these devices. METHODS: We examined the use of cellular telephones in a case-control study of intracranial tumors of the nervous system conducted between 1994 and 1998. We enrolled 782 patients through hospitals in Phoenix, Arizona; Boston; and Pittsburgh; 489 had histologically confirmed glioma, 197 had meningioma, and 96 had acoustic neuroma. The 799 controls were patients admitted to the same hospitals as the patients with brain tumors for a variety of nonmalignant conditions. RESULTS: As compared with never, or very rarely, having used a cellular telephone, the relative risks associated with a cumulative use of a cellular telephone for more than 100 hours were 0.9 for glioma (95 percent confidence interval, 0.5 to 1.6), 0.7 for meningioma (95 percent confidence interval, 0.3 to 1.7), 1.4 for acoustic neuroma (95 percent confidence interval, 0.6 to 3.5), and 1.0 for all types of tumors combined (95 percent confidence interval, 0.6 to 1.5). There was no evidence that the risks were higher among persons who used cellular telephones for 60 or more minutes per day or regularly for five or more years. Tumors did not occur disproportionately often on the side of head on which the telephone was typically used. CONCLUSIONS: These data do not support the hypothesis that the recent use of hand-held cellular telephones causes brain tumors, but they are not sufficient to evaluate the risks among long-term, heavy users and for potentially long induction periods.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Int. Commission on Non-Ionizing Radiat. Protection 1996

International Commission on Non-Ionizing Radiation Protection

Health issues related to the use of hand-held radiotelephones and base transmitters

In: Health Phys, 70. Jg. (1996), S. 587.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
physics; other type; hf; others

Int. Commission on Non-Ionizing Radiat. Protection 1998

International Commission on Non-Ionizing Radiation Protection

Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)

In: Health Phys, 74. Jg. (1998), S. 494.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
physics; other type; hf; others

Int. Commission on Non-Ionizing Radiat. Protection 1998a

International Commission on Non-Ionizing Radiation Protection

Response to questions and comments on ICNIRP guidelines

In: Health Phys, 75. Jg. (1998), S. 438.

ABSTRACT:
no abstract available
text written by Matthes R

SCHLAGWÖRTER:
physics; other type; hf; others

International Non-Ionizing Radiation Committee 1988

International Non-Ionizing Radiation Committee of the International Radiation Protection Association
Guidelines on limits of exposure to radiofrequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz
In: Health Phys, 54. Jg. (1988), S. 115.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
physics; other type; hf; others

International Non-ionizing Radiation Committee 1990

International Non-ionizing Radiation Committee of the International Radiation Protection Association
Interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields
In: Health Phys, 58. Jg. (1990), S. 113.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
physics; other type; elf; others

Irgens A et al. 1997

Irgens A, Kruger K, Skorve A H, Irgens L M
Male proportion in offspring of parents exposed to strong static and extremely low-frequency electromagnetic fields in Norway
In: Am J Ind Med, 32. Jg. (1997), S. 557.

ABSTRACT:
Reduced male proportion in offspring of male carbon setters prompted a study into whether offspring of workers exposed to strong static and extremely low-frequency electromagnetic fields (ELF) had a deviant sex ratio. The study was based on all births in Norway 1970-1993. The reference population was offspring of parents not exposed to ELF. The male proportion in offspring of men in aluminum works was 50.38%, RR 0.98 (0.94-1.03), in manganese works 47.32%, RR 0.92 (0.83-1.02), in factories producing iron 50.03%, RR 0.97 (0.93-1.02), in nickel works 48.27%, RR 0.94 (0.84-1.05), and in electric wire production 47.20%, RR 0.92 (0.80-1.05). In the offspring of women in aluminum works, the male proportion was 37.04%, RR 0.72 (0.59-0.90), in all smelter works grouped together, 45.13%, RR 0.88 (0.79-0.99). The male proportion in the reference population was 51.42%. The male proportion in offspring of men in industries with ELF, was slightly reduced, while offspring of women was significantly reduced.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Ivaschuk O I et al. 1997

Ivaschuk O I, Jones R A, Ishida-Jones T, Haggren W, Adey W R, Phillips J I
Exposure of nerve growth factor-treated PC-12 rat pheochromocytoma cells to a modulated radiofrequency field at 836.55 MHz: effects on c-jun and c-fos expression
In: Bioelectromagnetics, 18. Jg. (1997), S. 223.

ABSTRACT:
Rat PC12 pheochromocytoma cells have been treated with nerve growth factor and then exposed to athermal levels of a packet-modulated radiofrequency field at 836.55 MHz. This signal was produced by a prototype time-domain multiple-access (TDMA) transmitter that conforms to the North American digital cellular telephone standard. Three slot average power densities were used: 0.09, 0.9, and 9 mW/cm2. Exposures were for 20, 40, and 60 min and included an intermittent exposure regimen (20 min on/20 min off), resulting in total incubation times of 20, 60, and 100 min, respectively. Concurrent controls were sham exposed. After extracting total cellular RNA, Northern blot analysis was used to assess the expression of the immediate early genes, c-fos and c-jun, in all cell populations. No change in c-fos transcript levels were detected after 20 min exposure at each field intensity (20 min was the only time period at which c-fos message could be detected consistently). Transcript levels for c-jun were altered only after 20 min exposure to 9 mW/cm2 (average 38% decrease).

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Jackson J D 1992

Jackson J D
Are the stray 60-Hz electromagnetic fields associated with the distribution and use of electric power a significant cause of cancer?
In: Proc Natl Acad Sci U S A, 89. Jg. (1992), S. 3508.

ABSTRACT:
The putative causal relation between ambient low-frequency (50 or 60 Hz) electromagnetic fields (necessarily present in living and working environments because of our ever increasing use of electrical devices) and cancer, especially leukemia, can be tested on the large scale by examining historical data on the growth of the generation and consumption of electric power since 1900 and corresponding data on cancer death and incidence rates. The United States per capita generation and residential consumption of electric power have grown roughly exponentially since 1900; total per capita generation has increased by a factor of 10 since 1940, and per capita residential consumption has increased by a factor of 20 in the same period. The ubiquitous stray fields from power distribution lines and internal and external wiring in buildings have grown in the same proportions. In contrast to the explosive increase in the generation and use of electricity, the age-adjusted cancer death rate for the population as a whole shows only a slight rise since 1900. When respiratory cancers (largely caused by tobacco use) are subtracted, the remaining death rate has actually fallen since 1940. That the death rate may have fallen because of better diagnosis and treatment, despite a rising incidence rate, is not substantiated, especially for leukemia, including childhood leukemia, where the incidence rate has been constant or declining slightly for the past 25 yr. The absence of any appreciable change in the national cancer incidence rates during a period in which residential use of electric power has increased dramatically shows that the associated stray 50- or 60-Hz electromagnetic fields pose no significant hazard to the average individual.

SCHLAGWÖRTER:
epidemiology; ecological; elf; cancer

Jaffa K C et al. 2000

Jaffa K C, Kim H, Aldrich T E
The relative merits of contemporary measurements and historical calculated fields in the Swedish childhood cancer study
In: Epidemiology, 11. Jg. (2000), S. 353.

ABSTRACT:
We present arguments that suggest that historical average calculated fields, which are widely used to estimate biologically relevant exposure to electromagnetic fields, may be less accurate than contemporary spot measurements, which are made at a time following the biologically relevant period of exposure. We use data from the seminal Feychting and Ahlbom study of the health effects of electromagnetic field exposure in a Swedish population to illustrate our argument. We also show how the two types of measurements can produce divergent estimates of risk, and show how in the Feychting and Ahlbom study, the less accurate measurement, the historical average calculated fields, may have resulted in a

spurious increase in the estimates of risk. Finally, we consider the implications of our arguments for other studies that rely on wire codes and historical calculations of personal exposure.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Jarvholm B et al. 2001

Jarvholm B, Stenberg A

Suicide mortality among electricians in the Swedish construction industry

In: Occup Environ Med, 59. Jg. (2001), S. 199.

ABSTRACT:
OBJECTIVES: To investigate the risk of suicide in Swedish electricians employed in the construction industry. A few studies have indicated an increased risk of suicide for electricians in the construction industry and electricians exposed to electromagnetic fields. METHODS: This is a cohort study. Electricians were identified through a computerised register of construction workers who had participated in health examinations in 1971-92. In this register, 33,719 male electricians were identified together with a reference group consisting of 72,653 male glass or woodworkers. Through a linkage with the Swedish Death Register, the cause of death was identified to the end of 1997. Mortality as a result of suicide was also compared with the general population with adjustments for sex, age, and period. RESULTS: The risk of mortality from suicide was decreased for electricians (standardised mortality ratio (SMR) 0.58, 95% confidence interval (95% CI) 0.47 to 0.71) and for the reference group of construction workers (SMR 0.81, 95% CI 0.72 to 0.91) compared with the general population. CONCLUSION: Contrary to some other studies, risk of suicide was not increased among electricians in the construction industry.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; others

Jauchem J R 1997

Jauchem J R

Exposure to extremely-low-frequency electromagnetic fields and radiofrequency radiation: cardiovascular effects on humans

In: Int Arch Occup Environ Health, 70. Jg. (1997), S. 9.

ABSTRACT:
Cardiovascular changes in humans exposed to nonionizing radiation [including extremely-low-frequency electromagnetic fields (ELF EMFs) and radiofrequency radiation (RFR)] are reviewed. Both acute and long-term effects have been investigated. In general, if heating does not occur during exposure, current flow appears to be necessary for major cardiovascular effects to ensue, such as those due to electric shock. Whereas most studies have revealed no acute effect of static or time-varying ELF EMFs on the blood pressure, heart rate, or electrocardiogram waveform, others have reported subtle effects on the heart rate. The possible health consequences of these results are unknown. Regarding long-term effects of ELF EMFs, reports from the former Soviet Union in the early 1960s indicated arrhythmias and tachycardia in high-voltage-switchyard workers. Subsequent studies in Western countries, however, did not confirm these findings. These studies are limited by uncertainties regarding exposure durations and appropriate control groups. Investigations of acute cardiovascular changes in humans purposely exposed to RFR have been limited to studies of magnetic resonance imaging (which, in addition to RFR, involves static and time-varying magnetic fields). It has been concluded that such exposures, as presently performed, are not likely to cause adverse cardiovascular effects. Reports of hypertension in workers potentially exposed to high levels of RFR during accidents are considered to be incidental (due to anxiety and posttraumatic stress). Soviet investigators have also indicated that long-term RFR exposure may result in hypotension and bradycardia or tachycardia. Other researchers, however, have been incapable of replicating these results, and some scientists have attributed the effects to chance variations and mishandling of data. In summary, studies have not yielded any obvious cardiovascular-related hazards of acute or long-term exposures to ELF EMFs or RFR at levels below current exposure standards

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; cvd

Jauchem J R 1998

Jauchem J R

Health effects of microwave exposures: a review of the recent (1995-1998) literature

In: J Microwave Power Electromag Energy, 33. Jg. (1998), S. 263.

ABSTRACT:
Occupational or residential exposures to radio frequency radiation, including microwaves, have been alleged to result in health problems, including leukemia, other cancers, and reproductive mishaps. This review covers the recent literature (from 1995 to 1998) dealing with possible health effects, including original studies, reviews, commentaries, and editorials. A number of these articles have presented misconceptions, errors in citation, and inaccuracies regarding the alleged effects. Epidemiological reviews and studies dealing with exposures to radio frequency radiation from television transmitters, cellular telephones and towers, magnetic resonance imaging, phased array radar systems, and other occupational exposures are analyzed. On the basis of studies reported in the past several years, one can conclude that the evidence for any proven health effects of low-level microwave exposure is minimal to non-existent.

SCHLAGWÖRTER:
epidemiology; Review; hf; morbidity

Jauchem J R et al. 1992

Jauchem J R, Frei M R

Heart rate and blood pressure changes during radiofrequency irradiation and environmental heating

In: Comp Biochem Physiol A, 101. Jg. (1992), S. 1.

ABSTRACT:
1. Whole-body exposure of animals to radiofrequency radiation (RFR) can cause an increase in body temperature. 2. Responses to heating, whether due to RFR or to more conventional means, include changes in heart rate and blood pressure. 3. Although cardiovascular responses to various types of heating are similar, differences in the magnitude of changes may result from different thermal gradients within the body. 4. This review compares the effects of RFR and conventional environmental heating on heart rate and blood pressure.

SCHLAGWÖRTER:
epidemiology; Review; hf; cvd

Jauchem J R et al. 1995

Jauchem J R, Frei M R

High-peak-power microwave pulses: effects on heart rate and blood pressure in unanaesthetised rats

In: Aviat Space Environ Med, 66. Jg. (1995), S. 992.

ABSTRACT:
INTRODUCTION: Exposure sources capable of generating high-peak-power microwave pulses, with relatively short pulse widths, have recently been developed. Studies of the effect of these sources on the cardiovascular systems of animals have not been reported previously. METHODS: We exposed 14 unanesthetized male Sprague-Dawley rats to 10 high-peak-power microwave pulses generated by a transformer-energized

megawatt pulsed output (TEMPO) microwave source, at frequencies ranging from 1.2-1.8 GHz. Peak power densities were as high as 51.6 kW/cm2. At 14 d prior to irradiation, the animals were implanted with chronic aortic cannulae. With appropriate shielding of the transducer, blood pressure recordings were obtained during microwave pulsing. RESULTS: In a preliminary series of exposures at 1.7-1.8 GHz (peak power density 3.3-6.5 kW/cm2), an immediate but transient increase in mean arterial blood pressure (significant) and decrease in heart rate (non-significant) were observed. A loud noise was associated with each pulse produced by the TEMPO; this factor was subsequently attenuated. In a second series of exposures at 1.2-1.4 GHz (peak power density 14.6-51.6 kW/cm2), there were no significant changes in mean arterial blood pressure or heart rate during microwave exposure. CONCLUSIONS: The earlier significant increase in blood pressure that occurred during microwave exposure appeared to be related to the sharp noise produced by the TEMPO source. After appropriate sound attenuation, there were no significant effects of exposure to the microwave pulses.

SCHLAGWÖRTER:
bioassay; experimentally; hf; cvd

Jensen J K et al. 1994

Jensen J K, Olsen J H, Folkersen E

Assessment of exposure to EMF in a Danish case-control study of childhood cancer

In: Rev Environ Health, 10. Jg. (1994), S. 187.

ABSTRACT:
In Denmark it is permitted to draw overhead lines across residential areas. In connection with a Danish case-control study we developed a method for estimating the historical values of magnetic fields at residences. The study included 1,707 cases with childhood cancer and 4,788 matched population controls. A total of 16,082 different addresses had been occupied by the families from the time of conception until the date of diagnosis. The values of the extreme, maximum, middle and minimum 50 Hz magnetic field strengths originating from a 50-400 kV high-voltage installation were estimated for each of the dwellings included in a potential exposure area. 30 children were exposed to an average level of magnetic fields of 0.1 microT or more. The evaluated Danish method of exposure assessment was compared with the method for residential wiring codes developed by Wertheimer and Leeper /1/. We concluded that the US wiring codes are inappropriate for use in connection with the Danish electricity transmission system.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Jensh R P 1984

Jensh R P

Studies of the teratogenic potential of exposure of rats to 6000-MHz microwave radiation. I. Morphologic analysis at term

In: Radiat Res, 97. Jg. (1984), S. 272.

ABSTRACT:
Thirty-six pregnant Wistar strain albino rats were exposed throughout pregnancy to 6000-MHz microwave radiation at a power density level of 35 mW/cm2 or were used as controls. The irradiation did not cause a significant increase in maternal body temperature as measured by a rectal thermocouple. The rats were randomly assigned to one of four groups: home cage control (5), anechoic chamber control (10), sham-irradiated concurrent control (10), and irradiated (11). All animals were killed on the 22nd day of gestation, and maternal tissues were removed and weighed and maternal blood samples were taken. The 384 resultant fetuses and their placentas were individually weighed, fixed, and dissected to determine normality. Teratologic evaluation included the following parameters: maternal weight and weight gain; mean litter size; maternal organ weight and organ weight/body weight ratios; body weight ratios of brain, liver, kidneys, and ovaries; maternal peripheral blood parameters including hematocrit, hemoglobin, and white cell counts; number of resorptions and resorption rate; number of abnormalities and abnormality rate; mean term fetal weight. The irradiated fetuses exhibited slight but statistically significant growth retardation at term. Term maternal monocyte count was also significantly depressed. No other parameters differed between the control groups and the irradiated group.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Jensh R P 1984a

Jensh R P

Studies of the teratogenic potential of exposure of rats to 6000-MHz microwave radiation. II. Postnatal psychophysiologic evaluations

In: Radiat Res, 97. Jg. (1984), S. 282.

ABSTRACT:
Wistar rats (36) were exposed daily throughout pregnancy to a power density level of 35 mW/cm2 of 6000-MHz microwave radiation (11), sham irradiated (10), or used as control animals (15). Litters were culled to a maximum of eight F1a offspring/litter (total = 124) on Postnatal Day 1 and subjected to a series of reflex tests beginning Day 3. Mothers were rebred 10 days after weaning. Teratologic evaluations were completed on 263 F1b offspring. Weekly weights were recorded for 298 F1a offspring. At 60 days, behavioral testing was initiated on 121 offspring. At 90 days, offspring were bred within/across groups. Teratologic evaluations were completed on 659 F2 term fetuses. Organ weight analyses were completed on 17 mothers and 181 F1a adult offspring, and blood analyses on 21 mothers and 131 offspring. Sex differences within groups were observed in four behavioral tests and in blood data. Significant differences between groups were observed for: F1b term fetal weight; F1a eye opening, postnatal growth to the fifth week, water T-maze and open field test results; and several organ/body weight ratios. These results indicate that exposure to 6000-MHz radiation at this power density level may result in subtle long-term neurophysiologic alterations not detectable at term using conventional morphologic teratologic procedures.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Jensh R P 1997

Jensh R P

Behavioural teratologic studies using microwave radiation: is there an increased risk from exposure to cellular phones and microwave ovens?

In: Reproduct Toxicol, 11. Jg. (1997), S. 601.

ABSTRACT:
The objective of the investigations presented in this review was to determine if there are adverse effects due to chronic prenatal microwave exposure in rats at term and/or alterations in neonatal and adult offspring psychophysiologic development and growth. Following the establishment of a nonhyperthermal power density level of microwave radiation, pregnant rats were exposed throughout pregnancy to continuous wave 915 MHz, 2450 MHz, or 6000 MHz radiation at power density levels of 10, 20, or 35 mW/cm2, respectively. Teratologic evaluation included the following parameters: maternal weight and weight gain; mean litter size; maternal organ weight and organ weight/body weight ratios; body weight ratios of brain, liver, kidneys, and ovaries; maternal peripheral blood parameters including hematocrit, hemoglobin, and white cell counts; number of resorptions and resorption rate; number of abnormalities and abnormality rate; mean term fetal weight. Mothers were rebred, and the second

nonexposed litters were evaluated for teratogenic effects. Exposed offspring were evaluated using the following perinatal and adult tests: eye opening, surface righting, negative geotaxis, auditory startle, air righting, open field, activity wheel, swimming, and forelimb hanging. Offspring were also monitored for weekly weight and weight gain. Animals exposed to 915 MHz did not exhibit any consistent significant alterations in any of the above parameters. Exposure to 2450 MHz resulted only in a significantly increased adult offspring activity level compared to nonexposed offspring. Offspring exposed to 6000 MHz radiation exhibited an initial slight, but significant, retardation in term weight, while mothers had a significantly reduced monocyte count. No changes in any of the other term parameters were observed. A few postnatal parameters were affected in offspring exposed to 6000 MHz. Weekly weights were lower in the exposed offspring, but they recovered by the fifth week. Eye opening was delayed, and there were changes in the water T-maze and open field performance levels. Several organ/body weight ratios differed from those of the control offspring. These results indicate that exposure to 6000 MHz radiation at this power density level may result in subtle long-term neurophysiologic alterations. However, in the absence of a hyperthermic state, the microwave frequencies tested, which included frequencies used in cellular phones and microwave ovens, do not induce a consistent, significant increase in reproductive risk as assessed by classical morphologic and postnatal psychophysiologic parameters.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Jensh R P et al. 1983

Jensh R P, Vogel W H, Brent R L

An evaluation of the teratogenic potential of protracted exposure of pregnant rats to 2450-MHz microwave radiation. I. Morphologic analysis at term

In: J Toxicol Environ Health, 11. Jg. (1983), S. 23.

ABSTRACT:
The present investigation was designed to study the effects of protracted prenatal exposure of rats to a 20-mW/cm2 power density level of microwave radiation at a frequency of 2450 MHz. Preliminary studies using 24 rats indicated that this power density level did not cause a significant increase in maternal body temperature as measured by a rectal thermocouple. Of 75 pregnant rats, 12 were exposed to microwave radiation, 4 sham-irradiated, and 59 used as environmental control animals. Rats were exposed throughout pregnancy for a total exposure time of approximately 270 h. Daily maternal weights were recorded before irradiation. At term animals were killed, selected maternal tissues were removed, and fetal and placental positions and weights were recorded. After fixation for at least 3 wk, 462 term fetuses were dissected and examined for abnormalities. No significant alterations were observed for the following parameters: maternal weight gain during pregnancy, term maternal organ weights (brain, liver, kidneys, ovaries), term fetal weight, resorption rate, or abnormality rate. These results indicate that the protracted exposure of pregnant rats to 2450-MHz microwave radiation at a power density level of 20 mW/cm2 is not embryopathic.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Jensh R P et al. 1983a

Jensh R P, Vogel W H, Brent R L

An evaluation of the teratogenic potential of protracted exposure of pregnant rats to 2450-MHz microwave radiation. II. Postnatal physiologic analysis

In: J Toxicol Environ Health, 11. Jg. (1983), S. 23.

ABSTRACT:
The objective of this study was to determine whether protracted prenatal exposure of rats to 2450-MHz microwave radiation at a power density level of 20 mW/cm2 would significantly alter postnatal growth and psychophysiologic development. Of 75 pregnant rats, 12 were exposed to microwave radiation, 4 sham-irradiated, and 59 served as environmental control animals. Forty-five females were allowed to deliver their offspring. The neonates were examined and weighed on d 3 and weekly thereafter until 87 d of age. Neonatal reflex tests were initiated as early as d 3 (surface righting, air righting, auditory startle, visual placing). One physiologic parameter, eye opening, was also observed. Mothers were rebred 10 d after weaning and a morphologic evaluation was completed on the second litter. Behavioral tests were begun at 60 d of age and included water T-maze, conditioned avoidance response, open field, activity wheel, forelimb hanging, and swimming. At 90 d of age offspring were bred within and across groups, and a morphologic teratologic analyses was completed on the offspring. Representative tissue samples were collected and organ weights recorded for the brain, liver, kidneys, and gonads of all animals. Analyses of the data indicated that there were no significant malformations or significant alterations in the neonatal physiologic or reflex test results, body/organ weight ratios, or breeding results in the adult offspring. There were no significant alterations in five of the six adult behavioral tests. There were significant differences in activity among the irradiated and control offspring between the sexes, the irradiated offspring being more active. These results are indicative of possible radiation-induced behavioral alterations. Further studies are needed to explore the possibility of microwave radiation-related alterations in animal behavior.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Ji B T et al. 1999

Ji B T, Silverman D T, Dosemeci M, Dai Q, Gao Y T, Blair A

Occupation and pancreatic cancer risk in Shanghai, China

In: Am J Ind Med, 35. Jg. (1999), S. 76.

ABSTRACT:
BACKGROUND: Any association between occupation and pancreatic cancer risk has not been conclusively demonstrated. A population-based case-control study was conducted to examine occupational risks of pancreatic cancer in Shanghai, China. METHODS: The study included 451 pancreatic cancer patients newly diagnosed in 1990-1993 and 1,552 controls randomly selected from Shanghai residents. Information on a lifetime job history and other factors was obtained in a face-to-face interview. RESULTS: Among men, an increased risk of pancreatic cancer was associated with employment as an electrician (OR = 7.5, CI = 2.6-21.8), and a positive trend in risk with increasing duration of employment was apparent (P for trend = 0.0003). Exposure to electric magnetic fields (EMF) as measured by a job exposure matrix also was associated with an increased risk among electricians. Threefold risks were observed for men with the highest level of intensity and for those with the highest probability of EMF exposure, although women with heavy EMF exposure did not experience increased risk. Among men, elevated risks also were found for metal workers (OR = 2.1, CI = 1.0-4.8); toolmakers (OR = 3.4, CI = 14-7.1); plumbers and welders (OR = 3.0, CI = 1.2-7.5); and glass manufacturers, potters, painters, and construction workers (OR = 2.6, CI = 1.1-6.3). Among women, textile workers experienced an increased risk (OR = 1.4, CI = 0.8-2.6). CONCLUSIONS: Our results suggest that occupations associated with exposures to metal and textile dusts or certain chemicals may increase the risk of pancreatic cancer. The elevated risk among electricians may warrant further study to evaluate the possible role of EMF or other exposures.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Johansen C 2000

Johansen C

Exposure to electromagnetic fields and risk of central nervous system disease in utility workers

In: Epidemiology, 11. Jg. (2000), S. 539.

ABSTRACT:
Occupational exposure to electromagnetic fields has been associated with neurological diseases such as amyotrophic lateral sclerosis, senile dementia, Parkinson disease, and Alzheimer disease. I studied the incidence of central nervous system diseases in 30,631 persons employed in Danish utility companies between 1900 and 1993. I linked the cohort to the nationwide, population-based Danish National Register of Patients and compared the numbers of cases of these diseases observed between 1978 and 1993 with the corresponding rates in the general population. In addition I fit to the data on utility workers a multiplicative Poisson regression model in relation to estimated levels of exposure to 50-Hz electromagnetic fields. Overall, there was an increase in risk for senile dementia and motor neuron diseases combined. The incidences of Parkinson disease, Alzheimer disease, and other diseases of the central nervous system were essentially unrelated to exposure to electromagnetic fields. A decreased risk of epilepsy compared with the general population probably reflects a healthy worker effect; I observed an increased risk of epilepsy based on internal comparisons. The increased risk for senile dementia and motorneuron diseases may be associated with above-average levels of exposure to electromagnetic fields.

SCHLAGWÖRTER:
epidemiology; cohort; elf; morbidity

Johansen C et al. 1998

Johansen C, Olsen J H

Mortality from amyotrophic lateral sclerosis, other chronic disorders, and electric shocks among utility workers

In: Am J Epidemiol, 148. Jg. (1998), S. 362.

ABSTRACT:
Above-average exposure to electromagnetic fields has been associated with certain nonmalignant medical conditions such as amyotrophic lateral sclerosis, other neurologic diseases, depressive symptoms, and suicide. The authors conducted a nationwide mortality study in Denmark of 21,236 men employed in utility companies between 1900 and 1993. The causes of death were ascertained for January 1, 1974, through December 31, 1993, and cause-specific mortality was analyzed by latency and estimated levels of exposure to 50-Hz electromagnetic fields. Overall, 3,540 deaths were observed as compared with 3,709 expected from national mortality rates, yielding a standardized mortality ratio of 0.96 (95% confidence interval 0.93-0.99). A slight excess in mortality from cancer was due to deaths from cancers of the lung and pleural cavity, probably because of exposure to asbestos. A twofold increase in mortality from amyotrophic lateral sclerosis and a tenfold increase in mortality from electrical accidents were seen on the basis of 14 and 10 deaths, respectively, the former increasing with time since first employment in a utility company. The excess mortality from amyotrophic lateral sclerosis seems to be associated with above-average levels of exposure to electromagnetic fields and may be due to repeated episodes with electric shocks.

SCHLAGWÖRTER:
epidemiology; cohort; elf; mortality

Johansen C et al. 1998a

Johansen C, Olsen J H

Risk of cancer among Danish utility workers - a nationwide cohort study

In: Am J Epidemiol, 147. Jg. (1998), S. 548.

ABSTRACT:
The authors report the incidence of cancer in a large cohort of employees identified from all 99 Danish utility companies. Personal data and information on employment and exposure to magnetic fields and asbestos were obtained from manual files at the companies, the Danish Supplementary Pension Fund, and the public payroll administration. A total of 32,006 individuals with more than 3 months of employment were linked with the files of the Danish Cancer Registry. The period of follow-up for cancer occurrence among the employees was from April 1968 through December 1993 in the study conducted from 1994 to 1997. Overall, 3,008 cancers were observed, with 2,825 expected, yielding a small but significantly increased risk of 1.06 (95% confidence interval 1.03-1.10) among the utility workers in comparison with the general population. No excess was observed for all leukemias or for cancers of the brain or breast among men or women. There was no association of electromagnetic field exposure with risk of these cancers, even when the level and length of exposure to magnetic fields were taken into account. Increased risks for cancers of the lung and pleural cavity were seen mainly for workers whose jobs involved exposure to asbestos. The results from this study do not support the hypothesis of an association between occupational exposures to magnetic fields in the electric utility industry and the risk for cancer.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Johansen C et al. 1999

Johansen C, Koch-Henriksen N, Rasmussen S, Olsen J H

Multiple sclerosis among utility workers

In: Neurology, 52. Jg. (1999), S. 1279.

ABSTRACT:
The incidence of MS was assessed in a nationwide cohort study of 31,990 employees of Danish utility companies between 1900 and 1993. Overall, 32 cases of MS were diagnosed, as compared with 23.7 expected from national incidence rates, to yield a standardized incidence ratio of 1.35 (95% confidence interval, 0.92 to 1.91). We found no support for the hypothesis of an association between occupational exposure to electromagnetic fields and the risk of MS.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; morbidity

Johansen C et al. 1999a

Johansen C, Olsen J H

Cellular Telephones, Magnetic Field Exposure, Risk of Brain Tumours and Cancer at Other Sites: A Cohort Study

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 155.

ABSTRACT:
The purpose of the study is to investigate whether exposure toelectromagnetic fields from cellular telephones is associated with braintumours and cancer at other sites. Key information has been obtained on allcellular telephone subscribers in Denmark from 1 January 1982 to 31December 1995. The overall subscriber cohort will include approximately500,000 individuals. Collected information includes name of subscriber,address, telephone number, system used (analogue or digital), and annualuse of the telephone. The name and address of the subscribers will belinked to the Central Population Register, and the personal identificationnumber will be supplied in addition to information on vital status andmigration. Finally, all members of the cohort will be

linked to the DanishCancer Registry, and the observed number of tumours will be compared withthose expected on the basis of national cancer incidence rates stratifiedby sex, age, and calendar time.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Johansen C et al. 2001

Johansen C, Boice Jr J D, McLaughlin J K, Olsen J H

Cellular telephones and cancer - a nationwide cohort study in Denmark

In: J Natl Cancer Inst, 93. Jg. (2001), S. 203.

ABSTRACT:
BACKGROUND: Use of cellular telephones is increasing exponentially and has become part of everyday life. Concerns about possible carcinogenic effects of radiofrequency signals have been raised, although they are based on limited scientific evidence. METHODS: A retrospective cohort study of cancer incidence was conducted in Denmark of all users of cellular telephones during the period from 1982 through 1995. Subscriber lists from the two Danish operating companies identified 420 095 cellular telephone users. Cancer incidence was determined by linkage with the Danish Cancer Registry. All statistical tests are two-sided. RESULTS: Overall, 3391 cancers were observed with 3825 expected, yielding a significantly decreased standardized incidence ratio (SIR) of 0.89 (95% confidence interval [CI] = 0.86 to 0.92). A substantial proportion of this decreased risk was attributed to deficits of lung cancer and other smoking-related cancers. No excesses were observed for cancers of the brain or nervous system (SIR = 0.95; 95% CI = 0.81 to 1.12) or of the salivary gland (SIR = 0.72; 95% CI = 0.29 to 1.49) or for leukemia (SIR = 0.97; 95% CI = 0.78-1.21), cancers of a priori interest. Risk for these cancers also did not vary by duration of cellular telephone use, time since first subscription, age at first subscription, or type of cellular telephone (analogue or digital). Analysis of brain and nervous system tumors showed no statistically significant SIRs for any subtype or anatomic location. CONCLUSIONS: The results of this investigation, the first nationwide cancer incidence study of cellular phone users, do not support the hypothesis of an association between use of these telephones and tumors of the brain or salivary gland, leukemia, or other cancers.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Johansen C et al. 2002

Johansen C, Boice Jr J D, McLaughlin J K, Christensen H C, Olsen J H

Mobile phones and malignant melanoma of the eye

In: Br J Cancer, 86. Jg. (2002), S. 348.

ABSTRACT:
Recently a four-fold increase in the risk of malignant melanoma of the eye was associated with the use of radiofrequency transmitting devices, including mobile phones in Germany. We contrasted the incidence rates of this rare cancer with the number of mobile phone subscribers in Denmark. We observed no increasing trend in the incidence rate of melanoma, which was in sharp contrast to the exponentially increasing number of mobile phone subscribers starting in the early 1980s. Our study provides no support for an association between mobile phones and ocular melanoma

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; cancer

Johansen C et al. 2002a

Johansen C, Raaschou-Nielsen O, Skotte J, Thomsen B L, Olsen J H

Validation of a job-exposure matrix for assessment of utility worker exposure to magnetic fields

In: Appl Occup Environ Hyg, 17. Jg. (2002), S. 304.

ABSTRACT:
The aim of this study was to evaluate a 50-Hz electromagnetic field job-exposure matrix used in epidemiological studies of a nationwide cohort of utility workers in Denmark. We compared a job-exposure matrix that distinguished four categories of exposure to 50-Hz time-weighted average (TWA) magnetic fields: low (< 0.1 microT), medium (0.1-0.29 microT), high (0.3-0.99 microT) and very high (> 1.0 microT) of utility company employees with 196 measurements of 8-h exposure for 129 workers in this industry. The 129 workers were selected from the following five main work environments: generation facilities, transmission lines, distribution lines, substations, and other electrically and non-electrically relates jobs. This study shows that the job-exposure matrix can be expected to introduce misclassification mainly between adjacent categories of exposure. Thus, the distribution of measurements of exposure to 50-Hz magnetic fields was similar for workers in the medium and the high exposure matrix categories. But the two extreme categories satisfactorily separate low and very highly exposed workers. The study shows that epidemiological use of this job-exposure matrix might combine the two intermediate categories of exposure. If the sample size in extreme categories provides enough power, a study in which this job-exposure matrix is used should allow detection of a true association between exposure to 50-Hz magnetic field and disease.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Johnson C C et al. 1989

Johnson C C, Spitz M R

Childhood nervous system tumours: an assessment of risk associated with paternal occupations involving use, repair or manufacture of electrical and electronic equipment

In: Int J Epidemiol, 18. Jg. (1989), S. 756.

ABSTRACT:
Parental occupational exposures to chemical carcinogens have been associated with malignancies in offspring. Recent studies have raised the issue that electromagnetic fields may play a role in carcinogenesis. We conducted a population-based case-control study testing for an association between the occurrence of a nervous system tumour in a child and paternal employment at the time of the child's birth in occupations involving potential exposure to low frequency electromagnetic fields, primarily in the electrical and electronics industries. Birth certificate data, including parental occupation information, of 499 children who died in Texas from intracranial and spinal cord tumours were compared with 998 controls randomly selected from Texas livebirths. The odds ratio for paternal employment in industries involving potential electromagnetic field exposure was 1.6 (p less than 0.07). A risk of 3.5 (p less than 0.05) was detected for fathers who were electricians. The additional presence of chemical exposures in these diverse occupations and industries must also be considered.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Johnson Liakouris A G 1998

Johnson Liakouris A G

Radiofrequency (RF) sickness in the Lilienfeld Study: an effect of modulated microwaves?

In: Arch Environ Health, 53. Jg. (1998), S. 236.

ABSTRACT:
There is a controversy among professionals regarding whether radiofrequency radiation sickness syndrome is a medical entity. In this study, this controversy was evaluated with a methodology adapted from case studies. The author reviewed U.S. literature, which revealed that research results are sufficiently consistent to warrant further inquiry. A review of statistically significant health effects noted in the Lilienfeld Study provided evidence that the disregarded health conditions match the cluster attributed to the radiofrequency sickness syndrome, thus establishing a possible correlation between health effects and chronic exposure to low-intensity, modulated microwave radiation. The author discusses these health effects relative to (a) exposure parameters recorded at the U.S. Embassy in Moscow and (b) the Soviet 10-microwatt safety standard for the public. Given the evidence, new research-with current knowledge and technology-is proposed.

SCHLAGWÖRTER:
epidemiology; Review; hf; others

Jones T L et al. 1993

Jones T L, Shih C H, Thurston D H, Ware B J, Cole P

Selection bias from differential residential mobility as an explanation for associations of wire codes with childhood cancer

In: J Clin Epidemiol, 46. Jg. (1993), S. 545.

ABSTRACT:
Several studies of childhood cancer, especially leukemia, in residential areas have reported an association with wire configuration codes. These codes were suggested to be surrogates of electromagnetic field exposure. However, the selection criteria used in several of the studies caused the case and control populations to be non-comparable, especially with respect to residential mobility. Specifically, controls were required to be residentially stable but cases were not. Thus, an artificial association between residential mobility and cancer was created by the subject selection procedure. The present study of 5721 residences in Columbus, Ohio was conducted to learn if bias due to differences in residential mobility, rather than electromagnetic fields, could explain the reported association between wire configuration codes and childhood cancer. It was found that the proportion of homes classified as "high" wire code in the non-stable population was 31% greater than the corresponding proportion in the stable population. This finding shows that high wire codes are associated with homes in which the residents are mobile and low wire codes are associated with homes occupied by stable residents. Thus, as a consequence of this association between residential mobility and high wire codes, studies that created an artificial association between residential mobility and childhood cancer will also produce a false association between high wire codes and cancer.

SCHLAGWÖRTER:
physics; other type; elf; others

Jorritsma J B et al. 1984

Jorritsma J B, Konings A W

The occurrence of DNA strand breaks after hyperthermic treatments of mammalian cells with and without radiation

In: Radiat Res, 98. Jg. (1984), S. 198.

ABSTRACT:
Strand breaks were detected in the DNA of Ehrlich ascites cells as well as in HeLa S3 cells directly after 1-5 hr at 43-45 degrees C by the use of the unwinding in high salt/hydroxylapatite method. The strand breaks found could not be attributed to the decay of incorporated tritiated thymidine. When the cells were incubated at 37 degrees C after the hyperthermic treatments, the amount of strand breaks formed remained at a constant level. Hyperthermia inhibited the repair of "radiation-induced" strand breaks. The repair curves obtained this way show a heat-dose-dependent decrease of the relative weight of the fast component of repair. Similar repair curves of "radiation-induced" strand breaks could be obtained by mixing heat inactivated and vital control cells prior to irradiation. In the latter case, however, the DNA repair was inhibited to a greater extent for identical levels of cell survival. The possible underlying molecular mechanisms are discussed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Juutilainen J et al. 1990

Juutilainen J, Laara E, Pukkala E

Incidence of leukaemia and brain tumours in Finnish workers exposed to ELF magnetic fields

In: Int Arch Occup Environ Health, 62. Jg. (1990), S. 289.

ABSTRACT:
The relative incidence of leukaemia, acute myeloid leukaemia (AML) and central nervous system (CNS) tumours among workers presumably exposed to extremely low frequency (ELF) magnetic fields (MFs) was studied. The study population consisted of all male industrial workers in Finland aged 25 to 64 years during 1971-1980 according to the Population Census in 1970. The occupations were grouped into three exposure categories according to the probability of exposure. The category of "probable" exposure included electrical occupations and the category of "possible" exposure included occupations where electric motors or welding are common. All other occupations were included to the category of "no exposure". Cancer incidence rates in different occupational groups during 1971-1980 were obtained after linking the census records with the national death certificates and the files of the Finnish Cancer Registry. The adjusted relative risks (with 95% confidence limits) in the categories of "probable" and "possible" exposure were for all leukaemia 1.9 (1.0-3.5) and 1.4 (1.1-1.8), for AML 1.5 (0.5-4.7) and 1.4 (0.9-2.1), and for CNS tumours 1.3 (0.7-2.3) and 1.3 (1.0-1.6), respectively. The results are concordant with earlier studies suggesting elevated risk among workers exposed to ELF magnetic fields

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Juutilainen J et al. 1993

Juutilainen J, Matilainen P, Saarikoski S, Laara E, Suonio S

Early pregnancy loss and exposure to 50-Hz magnetic fields

In: Bioelectromagnetics, 14. Jg. (1993), S. 229.

ABSTRACT:
The possibility of an association of early pregnancy loss (EPL) with residential exposure to ELF magnetic fields was investigated in a case-control study. Eighty-nine cases and 102 controls were obtained from the data of an earlier study aimed at investigating the occurrence of EPL in a group of women attempting to get pregnant. Magnetic-field exposure was characterized by measurements in residences. Strong magnetic fields were measured more often in case than in control residences. In an analysis based on fields measured at the front door, a cutoff score of 0.5 A/m (0.63 microT) resulted in an odds ratio of 5.1 (95% confidence interval 1.0-25). The results should be interpreted cautiously due to the small number of highly exposed subjects and other limitations of the data.

SCHLAGWÖRTER:

epidemiology; case-control; elf; others

Kallen B et al. 1982

Kallen B, Malmquist G, Moritz U

Delivery outcome among physiotherapists in Sweden: is non-ionizing radiation a fetal hazard?

In: Arch Environ Health, 37. Jg. (1982), S. 81.

ABSTRACT:
A cohort study was made on 2,043 infants born to 2,018 females registered as physiotherapists at the time of pregnancy during 1973 to 1978. The incidence of perinatal death, serious malformation, short gestational duration, and low birth weight was slightly below the expected with consideration given to maternal age and parity distribution. Information on occupational exposure (use of shortwave, microwave, and ultrasonic equipment, X-ray exposure, use of electrostimulator or hexachlorophene-containing soaps) was obtained in a case-control study within the cohort from mail questionnaires with a 93% response rate. The only positive finding was a higher incidence of shortwave equipment use among the females with a dead or malformed infant than among controls. Various explanations for this finding are discussed.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Kanal E et al. 1993

Kanal E, Gillen J, Evans JA, Savitz DA, Shellock FG

Survey of reproductive health among female MR workers

In: Radiology, 187. Jg. (1993), S. 395.

ABSTRACT:
Epidemiologic data were obtained to evaluate potential risks from exposure to the static and time-varying magnetic fields used in magnetic resonance (MR) imaging. A questionnaire sent to women workers in more than 90% of clinical MR facilities in the United States addressed menstrual-reproductive experiences, work activities, and potential confounders (eg, age, smoking, alcohol use). In 1,915 completed questionnaires, 1,421 pregnancies were reported: 280 occurred in an MR worker (technologist or nurse), 894 in an employee in another job, 54 in a student, and 193 in homemakers. Comparing MR-worker pregnancies with those occurring in employees at other jobs, a relative risk ratio of 1.27 (95% confidence interval [CI], 0.92-1.77) was found for spontaneous abortions; for conception taking more than 12 months, 0.90 (CI, 0.54-1.51); for delivery before 39 weeks, 1.19 (CI, 0.76-1.88); for birth weight below 5.5 lb (2.5 kg), 1.01 (CI, 0.50-2.04); and for male gender of the offspring, 0.99 (CI, 0.80-1.22). Adjustment for maternal age, smoking, and alcohol use also failed to markedly change any of the associations. These results suggest that there is not a substantial increase in these common adverse reproductive outcomes.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Kaplan I T et al. 1971

Kaplan I T, Metlay M, Zaret MM, Birenbaum

Absence of heart rate effects in rabbits during low-level microwave irradiation

In: IEEE Trans Microwave Theory Tech, 19. Jg. (1971), S. 168.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; cvd

Kaplan S et al. 1997

Kaplan S, Etlin S, Novikov I, Modan B

Occupational risks for the development of brain tumors

In: Am J Ind Med, 31. Jg. (1997), S. 15.

ABSTRACT:
Occupationally related risk factors were assessed in a population-based, case-control study of 139 patients with primary brain tumors (BT), carried out in central Israel between 1987-1991. For each case, two control groups were matched by age (+/-5 years), sex, and ethnic origin. The interview schedule included questions about lifelong occupational history before diagnosis. Odds ratios (OR) for BT, according to industrial categories, showed a significantly increased risk among blue-collar workers, especially among those employed in the textile industry, and among drivers and motor vehicle operators. When histologic tumor types were assessed separately, a significantly increased risk for malignant BT was found among drivers and motor vehicle operator occupations, while for meningiomas, an increased risk was found among weavers and tailors. Our results may provide clues for etiology and prevention measures.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Kaune W T et al. 1994

Kaune W T, Zaffanella L E

Assessing historical exposures of children to power-frequency magnetic fields

In: J Expo Anal Environ Epidemiol, 4. Jg. (1994), S. 149.

ABSTRACT:
One risk factor for human cancer currently being studied is residential exposure to power-frequency magnetic fields. A key problem in such research is how best to use contemporaneous measurements to assess past magnetic-field exposures. The main goal of the research presented in this paper was to examine the effectiveness of various surrogate measures in predicting historical exposures and to determine if residential power consumptions and the loads served by neighborhood electric networks could be used to improve the accuracy of such predictions. Residential magnetic-field data were collected during 24-h periods in the spring of 1990 and, again, in the winter of 1990-1991 for 35 children living in Western Massachusetts and Northern California. Measurements included spot magnetic fields in rooms occupied by subjects for an average of one or more hours per day, 24-h recordings at locations selected to emphasize ground-current and power-line fields, personal exposures, wire codes, residential power consumptions, and loads served by neighborhood electric networks. The geometric means of time-weighted-averaged (TWA) room spot magnetic fields measured during earlier and later visits to each home were 0.052 microT and 0.060 microT, respectively. Geometric-mean personal exposures for these visits were 0.084 microT and 0.111 microT and were significantly larger. Wertheimer-Leeper wire codes were associated with exposure. These codes, TWA spot fields, and the 24-h averages of the magnetic-field recordings taken to emphasize power-line contributions were about equally effective in explaining between-home variability in personal exposures measured eight months in the past or future. In contrast, personal exposure measurements were ineffective surrogates for past or future exposure. The study yielded little evidence suggesting that residential power consumption or neighborhood electric power flow are helpful in explaining temporal changes in personal exposure.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Kaune W T et al. 1998

Kaune W T, Feychting M, Ahlbom A, Ulrich R M, Savitz D A

Temporal characteristics of transmission-line loadings in the Swedish childhood cancer study

In: Bioelectromagnetics, 19. Jg. (1998), S. 354.

ABSTRACT:
A recent study conducted in Sweden reported that 1) leukemia risk in children who lived near 220 or 400 kV electric-power transmission lines was associated with calculated historical magnetic field levels; 2) children living within a distance of 50 m of transmission lines had an elevated risk of leukemia; and 3) there was no association between leukemia and residential magnetic fields measured many years after diagnosis. Subsequently, these investigators found through logistic regression analysis that disease was more strongly associated with calculated historical fields than with distance. Since the calculated historical fields in that study depended predominantly on distance and transmission-line load current, the logistic regression results suggest that historical load current plays an important role in the epidemiological results. Thus, we studied hourly 1974 load-current data for six transmission lines, and we examined 1958-1985 annual load-current data for 112 transmission lines. Most lines exhibited marked diurnal load-current rhythms during 1974, and all six showed systematic weekday-weekend differences. During 1958-1985, average loadings of Swedish 220 and 400 kV lines increased by about 1.3% year. Predictive-value and kappa-statistic analyses indicated that Swedish transmission-line load currents were not stable over long periods, so that contemporaneous load current (or a contemporary magnetic field measurement) was not a good surrogate for historical load current (or historical magnetic fields). The results provide a potential explanation of the failure of the Swedish Study to find an association between leukemia and contemporaneous magnetic field levels measured many years after the etiologic period, and suggest that the inclusion of load-current data could significantly improve the quality of historical field calculations.

SCHLAGWÖRTER:
physics; other type; elf; others

Kaune W T et al. 2000

Kaune W T, Bracken T D, Senior R S, Rankin R F, Niple J C, Kavet R

Rate of occurrence of transient magnetic field events in U.S. residences

In: Bioelectromagnetics, 21. Jg. (2000), S. 197.

ABSTRACT:
Recent interest in the transient magnetic field events produced by electrical switching events in residential and occupational environments has been kindled by the possibility that these fields may explain observed associations between childhood cancer and wire codes. This paper reports the results of a study in which the rate of occurrence of magnetic field events with 2-200 kHz frequency content were measured over 24 h or longer periods in 156 U.S. residences. A dual-channel meter was developed for the study that, during 20 s contiguous intervals of time, counted the number of events with peak 2-200 kHz magnetic fields exceeding thresholds of 3. 3 nT and 33 nT. Transient activity exhibited a distinct diurnal rhythm similar to that followed by power frequency magnetic fields in residences. Homes that were electrically grounded to a conductive water system that extended into the street and beyond, had higher levels of 33 nT channel transient activity. Homes located in rural surroundings had less 33 nT transient activity than homes in suburban/urban areas. Finally, while transient activity was perhaps somewhat elevated in homes with OLCC, OHCC, and VHCC wire codes relative to homes with underground (UG) and VLCC codes, the elevation was the smallest in VHCC and the largest in OLCC homes. This result does not provide much support for the hypothesis that transient magnetic fields are the underlying exposure that explains the associations, observed in several epidemiologic studies, between childhood cancer and residence in homes with VHCC, but not OLCC and OHCC, wire codes.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Kaune W T et al. 2000a

Kaune W T, Miller M C, Linet M S, Hatch E E, Kleinerman R A, Wacholder S, Mohr A H, Tarone R E, Haines

Children's exposure to magnetic fields produced by U.S. television sets used for viewing programs and playing video games

In: Bioelectromagnetics, 21. Jg. (2000), S. 214.

ABSTRACT:
Two epidemiologic studies have reported increased risk of childhood leukemia associated with the length of time children watched television (TV) programs or played video games connected to TV sets. To evaluate magnetic field exposures resulting from these activities, the static, ELF, and VLF magnetic fields produced by 72 TV sets used by children to watch TV programs and 34 TV sets used to play video games were characterized in a field study conducted in Washington DC and its Maryland suburbs. The resulting TV-specific magnetic field data were combined with information collected through questionnaires to estimate the magnetic field exposure levels associated with TV watching and video game playing. The geometric means of the ELF and VLF exposure levels so calculated were 0.0091 and 0.0016 microT, respectively, for children watching TV programs and 0.023 and 0.0038 microT, respectively, for children playing video games. Geometric means of ambient ELF and VLF levels with TV sets turned off were 0.10 and 0.0027 microT, respectively. Summed over the ELF frequency range (6-3066 Hz), the exposure levels were small compared to ambient levels. However, in restricted ELF frequency ranges (120 Hz and 606-3066 Hz) and in the VLF band, TV exposure levels were comparable to or larger than normal ambient levels. Even so, the strengths of the 120 Hz or 606-3066 Hz components of TV fields were small relative to the overall ambient levels. Consequently, our results provide little support for a linkage between childhood leukemia and exposure to the ELF magnetic fields produced by TV sets. Our results do suggest that any future research on possible health effects of magnetic fields from television sets might focus on the VLF electric and magnetic fields produced by TV sets because of their enhanced ability relative to ELF fields to induce electric currents.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Kaune W T et al. 2002

Kaune W T, Dovan T, Kavet R I, Savitz D A, Neutra R R

Study of high- and low-current-configuration homes from the 1988 Denver childhood cancer study

In: Bioelectromagnetics, 23. Jg. (2002), S. 177.

ABSTRACT:
An epidemiological study conducted by Savitz et al. reported that residential wire codes were more strongly associated with childhood cancer than were measured magnetic fields, a peculiar result because wire codes were originally developed to be a surrogate for residential magnetic fields. The primary purpose of the study reported here, known as the Back to Denver (BTD) study, was to obtain data to help in the interpretation of the original results of Savitz et al. The BTD study included 81 homes that had been occupied by case and control subjects of Savitz et al., stratified by wire code as follows: 18 high current configuration (HCC) case homes; 20 HCC control homes; 20 low current configuration (LCC) case homes;

and 23 LCC control homes. Analysis of new data acquired in these homes led to the following previously unpublished conclusions. The home-averaged (i.e., mean of fields measured in subjects' bedrooms, family/living rooms, and rooms where meals normally eaten) spot 60 Hz, 180 Hz, and harmonic (i.e., 60-420 Hz) magnetic fields were associated with wire codes. The 180 Hz and harmonic components, but not the 60 Hz component, were associated with case/control status. Measured static magnetic fields were only weakly correlated (rapproximately 0.2) between rooms in homes. The BTD data provide little support for, but are too sparse to definitively test, the 1995 resonance hypothesis proposed by Bowman et al. Case and control homes had similar concentrations of copper in their tap water. Copper concentration was not associated with wire codes nor with the level of electric current carried by a home's water pipe. These results of the BTD study suggest that future case/control studies investigating power frequency magnetic fields might wish to include measurements of 180 Hz or harmonic magnetic fields in order to examine their associations (if any) with disease status.

SCHLAGWÖRTER:
physics; other type; elf; others

Kelsh M A et al. 2000

Kelsh M A, Kheifets L, Smith R

The impact of work environment, utility, and sampling design on occupational magnetic field exposure summaries

In: Am Ind Hyg Assoc J, 61. Jg. (2000), S. 174.

ABSTRACT:
Most recent epidemiologic studies investigating the potential health effects of occupational magnetic field (MF) exposure have relied on MF measurement data linked to job titles. These measurements are summarized by occupational categories, which represent similar groups of job titles. However, job titles alone explain only a small proportion of exposure variability. A comprehensive MF occupational exposure database was used to (1) develop summary job-specific estimates of magnetic field exposure, (2) evaluate the impact of incorporating work environment data to improve electric and magnetic field exposure assessment, and (3) evaluate the use of random versus nonrandom sampling when estimating mean MF exposure levels by occupational categories. Uniform classification systems were developed for occupational and work environment data. A factorial design was used to summarize and calculate arithmetic means and 95% confidence intervals for occupational MF data, assuming that the total variation in MF exposure resulted from variation in occupation, work environment, utility, worker, and day. Occupation-specific means varied across different work environments, particularly for craft workers. Although within-worker and between-worker variability account for a large proportion (over 50%) of exposure variation, work environment (24%) accounted for more exposure variability than occupation (4.9%) or utility (15%). Some differences were observed when results were compared from surveys that used random and nonrandom sampling; however, these differences were not consistent or systematic. It was concluded that MF exposure assessment should consider work environment in addition to job title to reduce exposure misclassification.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Kerbacher J J et al. 1990

Kerbacher J J, Meltz M L, Erwin D N

Influence of radiofrequency radiation on chromosome aberrations in CHO cells and its interaction with DNA-damaging agents

In: Radiat Res, 123. Jg. (1990), S. 311.

ABSTRACT:
A limited number of contradictory reports have appeared in the literature about the ability of radiofrequency (rf) radiation to induce chromosome aberrations in different biological systems. The technical documentation associated with such reports is often absent or deficient. In addition, no information is available as to whether any additional genotoxic hazard would result from a simultaneous exposure of mammalian cells to rf radiation and a chemical which (by itself) induces chromosome aberrations. In the work described, we have therefore tested two hypotheses. The first is that rf radiation by itself, at power densities and exposure conditions which are higher than is consistent with accepted safety guidelines, can induce chromosome aberrations in mammalian cells. The second is that, during a simultaneous exposure to a chemical known to be genotoxic, rf radiation can affect molecules, biochemical processes, or cellular organelles, and thus result in an increase or decrease in chromosome aberrations. Mitomycin C (MMC) and Adriamycin (ADR) were selected because they act by different mechanisms, and because they might put normal cells at risk during combined-modality rf radiation (hyperthermia)-chemotherapy treatment of cancer. The studies were performed with suitable 37 degrees C and equivalent convection heating-temperature controls in a manner designed to discriminate between any thermal and possible nonthermal action. Radiofrequency exposures were conducted for 2 h under conditions resulting in measurable heating (a maximum increase of 3.2 degrees C), with pulsed-wave rf radiation at a frequency of 2450 MHz and an average net forward power of 600 W, resulting in an SAR of 33.8 W/kg. Treatments with MMC or ADR were for a total of 2.5 h and encompassed the 2-h rf radiation exposure period. The CHO cells from each of the conditions were subsequently analyzed for chromosome aberrations. In cells exposed to rf radiation alone, and where a maximum temperature of approximately 40 degrees C was achieved in the tissue culture medium, no alteration in the frequency from 37 degrees C control levels was observed. Relative to the chemical treatment with MMC alone at 37 degrees C, for two different concentrations, no alteration was observed in the extent of chromosome aberrations induced by either simultaneous rf radiation exposure or convection heating to equivalent temperatures. At the ADR concentration that was used, most of the indices of chromosome aberrations which were scored indicated a similar result.(ABSTRACT TRUNCATED AT 400 WORDS)

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Khalil A M et al. 1993

Khalil A M, Qassem W F, Suleiman M M

A preliminary study on the radiofrequency field-induced cytogenetic effects in cultured human lymphocytes

In: Dirasat, 20. Jg. (1993), S. 121.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Kheifets L I 1999

Kheifets L I

Occupational Exposure Assessment in Epidemiological Studies of EMF

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 61.

ABSTRACT:
Numerous epidemiological studies have examined associations betweenoccupational exposures to electric and magnetic fields (EMF) and adultcancers, with a particular focus on leukaemia and brain cancer.Meta-analyses that explored the patterns of these results with a particularemphasis on the qualitative aspects of exposure

assessment are reviewed.Comparative analysis of the studies of electric utility employees arepresented, along with an assessment of whether methodological differencesamong the studies might explain reported inconsistencies. Exposureassessment remains a foremost challenge in EMF studies. Mostepidemiological studies have relied on magnetic field measurements linkedto job titles. However, job titles alone explain only a small amount ofvariability in exposure. Recent results indicate that magnetic fieldexposure assessment should consider work environment in addition to jobtitle to reduce exposure misclassification. The paper concludes with adiscussion of numerous difficulties in occupational exposure assessment andoffers suggestions for research.

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; others

Kheifets L I et al. 1995

Kheifets L I, Afifi A A, Buffler P A, Zhang Z W

Occupational electric and magnetic field exposure and brain cancer: a meta-analysis

In: J Occup Environ Med, 37. Jg. (1995), S. 1327.

ABSTRACT:
We conducted a meta-analysis to acquire an understanding of the association between central nervous system cancer and occupational exposure to electric and magnetic fields. To explore sources of heterogeneity, study characteristics were scored and examined using regression analysis. An inverse-variance weighted pooling leads to a small overall increase in relative risk (10 to 20%) for the broad group of electrical occupations. One of the largest differences was lower relative risk for Scandinavian studies. Lower relative risks were also reported in cohort- and incidence-based studies. Findings were not sensitive to assumptions, including unpublished data, influence of individual studies, weighting schemes, and modeling. Whereas most studies present a small elevation in risk, there is considerable heterogeneity among the results.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Kheifets L I et al. 1997

Kheifets L I, London S J, Peters J M

Leukemia risk and occupational electric field exposure in Los Angeles County, California

In: Am J Epidemiol, 146. Jg. (1997), S. 87.

ABSTRACT:
The authors analyzed data on electric fields from a prior study of occupational magnetic field exposure and leukemia risk conducted in Los Angeles County, California, in 1972-1990. Ranking of exposure differed somewhat for magnetic and electric fields. The odds ratios were 1.22 (95% confidence interval (CI) 0.80-1.86) and 1.15 (95% confidence interval 0.78-1.72) for medium and high exposure categories, respectively, and there was no clear evidence of an exposure-response relation (odds ratio for 10 V/m increase = 1.05, 95% CI 0.95-1.16). Although not conclusive, our analyses provide little support for an association between occupational electric field exposure and leukemia.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Kheifets L I et al. 1999

Kheifets L I, Gilbert E S, Sussman S S, Guenel P, Sahl J D, Savitz D A, Theriault G

Comparative analyses of the studies of magnetic fields and cancer in electric utility workers: studies from France, Canada, and the United States

In: Occup Environ Med, 56. Jg. (1999), S. 567.

ABSTRACT:
OBJECTIVES: To summarise and to facilitate comparison of three major studies of electric utility workers that examined the relation between quantitative measurements of occupational exposure to magnetic fields and risk of brain cancer and leukaemia. These studies have been interpreted as providing conflicting evidence. METHODS: A common analytical approach was applied to data from the five cohorts included in the three studies based on original data from four of the cohorts, and published data from one additional cohort. A nested case-control design with conditional logistic regression was used to estimate the relative risk/10 microtesla-years (microT-years) for each of the contributing cohorts and for the combined data. The homogeneity of these estimates among the studies was also evaluated. RESULTS: Apparent inconsistencies in the findings of these studies can be explained by statistical variation. Overall, the studies suggest a small increase in risk of both brain cancer and leukaemia. Different methodological choices had little impact on the results. Based on a combined analysis of data from all five studies, the relative risk/10 microT-years was 1.12 (95% confidence interval (95% CI) 0.98 to 1.28) for brain cancer, and 1.09 (95% CI 0.98 to 1.21) for leukaemia. CONCLUSIONS: The combined estimates seem to provide the best summary measures of the data from all studies. However, fluctuations in risks among studies may reflect real differences, and the exposure measurements in different studies may not be entirely comparable.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Kheifets L I et al. 1999a

Kheifets L I, Matkin C

Industrialization, electromagnetic fields, and breast cancer risk

In: Environ Health Perspect, 107. Jg. (1999), S. 145.

ABSTRACT:
The disparity between the rates of breast cancer in industrialized and less-industrialized regions has led to many hypotheses, including the theory that exposure to light-at-night and/or electromagnetic fields (EMF) may suppress melatonin and that reduced melatonin may increase the risk of breast cancer. In this comprehensive review we consider strengths and weaknesses of more than 35 residential and occupational epidemiologic studies that investigated the association between EMF and breast cancer. Although most of the epidemiologic data do not provide strong support for an association between EMF and breast cancer, because of the limited statistical power as well as the possibility of misclassification and bias present in much of the existing data, it is not possible to rule out a relationship between EMF and breast cancer. We make several specific recommendations for future studies carefully designed to test the melatonin-breast cancer and EMF-breast cancer hypotheses. Future study designs should have sufficient statistical power to detect small to moderate associations; include comprehensive exposure assessments that estimate residential and occupational exposures, including shift work; focus on a relevant time period; control for known breast cancer risks; and pay careful attention to menopausal and estrogen receptor status.

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; cancer

Kheifets L I et al. 1999b

Kheifets L I, Sussman S S, Preston-Martin S

Childhood brain tumors and residential electromagnetic fields (EMF)

In: Rev Environ Contam Toxicol, 159. Jg. (1999), S. 111.

ABSTRACT:
There are many recent comprehensive reviews of the residential EMF epidemiologic literature, but they do not attempt to cover the issue of childhood brain tumors and

EMF in depth. We present here background information on descriptive epidemiology of known or suspected causes of childhood brain tumors and a detailed review of studies that have examined the associations between EMF as represented by various surrogates, and childhood brain tumors. We evaluated nine studies of childhood brain tumors and residential exposure to EMF based on wire codes, distance, measurements, and modeling, and six studies that examined the use of appliances by children or their mothers during pregnancy. For each study we discussed analytical and methodological issues including choice of cutpoints, nonconcurrent control selection, random digit dialing, differential participation, and ability of a study to detect an association. On the basis of this comprehensive review of all available childhood brain cancer studies, we do not see support for an overall association between EMF and childhood brain cancer. This lack of support applied for all surrogates of past magnetic fields, including wire code, distance, measured or calculated fields, and use of appliances by either child or mother.

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Kheifets L I et al. 2001

Kheifets L I, Greenberg R S, Neutra R R, Hester G L, Poole C L, Rall D P, Lundell G

Electric and magnetic fields and cancer: case study

In: Am J Epidemiol, 154. Jg. (2001), H. 12 Suppl, S. 50.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Khillare B et al. 1998

Khillare B, Behari J

Effect of amplitude-modulated radiofrequency radiation on reproduction pattern in rats

In: Electro-Magnetobiology, 17. Jg. (1998), S. 43.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Kittel A et al. 1996

Kittel A, Siklow L, Thuroczy G, Somosy Z

Qualitative enzyme historchemistry and microanalysis revela changes in ultra-structural distribution of calcium and calcium activated ATPases after microwave irradiation of the medial habenula

In: Acta Neuropathol, 92. Jg. (1996), S. 362.

ABSTRACT:
The localization of calcium and calcium-activated ATPases was investigatedelectron microscopically in the medial habenula of mice after whole bodyirradiation with modulated microwaves. In non-irradiated animalscalcium-containing precipitates were seen in different subcellularcompartments and were often localized on the luminal side of membranes ofsynaptic vesicles in nerve terminals. At 1 h after 16-Hz modulatedmicrowave irradiation, the number of synaptic vesicles containing calciumprecipitates decreased, and reaction products appeared at new locations: inthe synaptic clefts and on non-synaptic surfaces of the neuronal plasmamembrane. This modified calcium distribution remained unchanged for 24 hfollowing irradiation. Calcium-activated 'ecto'-localized ATPase wasdetected as a punctuated-linear distribution of the reaction productoutlining whole areas of glial and neuronal plasma membrane in the habenulaof control animals. This pattern did not change on microwave irradiation.However, a quercetin-sensitive 'endo'-localizedCa2+-ATPase activity appeared in some nerve terminals24 h after irradiation. Thus, microwave irradiation can influence neuronalcalcium homeostasis by inducing Ca2+ redistributionacross the plasma membrane and by modifyingCa2+-ATPase activity. However, no direct correlationbetween these effects could be demonstrated by the present study.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Kleinerman R A et al. 1997

Kleinerman R A, Linet M S, Hatch E E, Wacholder S, Tarone R E, Severson R K, Kaune W T, Friedman D R, Haines C M, Muirhead C R, Boice jr. J D, Robison L

Magnetic field exposure assessment in a case-control study of childhood leukemia

In: Epidemiology, 8. Jg. (1997), S. 575.

ABSTRACT:
Epidemiologic evaluation of the relation between magnetic field exposures and cancer depends critically on study design, particularly the methods used for exposure assessment. We incorporated a complex magnetic field exposure assessment protocol into a large incident case-control study of childhood leukemia. We measured residential magnetic fields using a standard protocol in current and former homes of 638 cases and 620 controls and determined wire codes for 414 case-control pairs. We chose a time-weighted average of magnetic field measurements in each eligible home, weighted by the time the subject lived in each home as the main exposure metric for each subject. We found that 24-hour bedroom magnetic field measurements adequately characterize children's residential exposure and that measuring other rooms contributes only slightly to the estimate of average residential exposure to magnetic fields. Front door measured fields provide useful exposure information when interior measurements are missing. If feasible, measuring multiple homes in which the subject has resided is preferable to measuring a single home. A similar distribution of wire codes for controls agreeing or refusing to participate in our study implies that risk estimates derived from wire code data will not be influenced by response bias.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Kleinerman R A et al. 2000

Kleinerman R A, Kaune W T, Hatch E E, Wacholder S, Linet M S, Robison L L, Niwa S, Tarone R E

Are children living near high-voltage power lines at increased risk of acute lymphoblastic leukemia?

In: Am J Epidemiol, 161. Jg. (2000), S. 512.

ABSTRACT:
In the National Cancer Institute/Children's Cancer Group case-control study of childhood acute lymphoblastic leukemia (1989-1993), living in a home with a high-voltage wire code was not associated with disease risk. To further investigate risk near power lines, the authors analyzed distance to transmission and three-phase primary distribution lines within 40 m of homes and created an exposure index of distance and strength of multiple power lines (408 case-control pairs). Neither distance nor exposure index was related to risk of childhood acute lymphoblastic leukemia, although both were associated with in-home magnetic field measurements. Residence near high-voltage lines did not increase risk.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Kliukiene J et al. 1999

Kliukiene J, Tynes T, Martinsen J I, Blaasaas K G, Andersen A

Incidence of breast cancer in a Norwegian cohort of women with potential workplace exposure to 50 Hz magnetic fields

In: Am J Ind Med, 36. Jg. (1999), S. 147.

ABSTRACT:
BACKGROUND: The risk of breast cancer was investigated in a large dynamic population-based cohort of all 1.1 million economically active women in Norway with potential exposure to 50 Hz magnetic fields at the censuses of 1960, 1970, and 1980. METHODS: The follow-up period for the cohort was 1961-1992. For each woman, date of birth and census information on occupation and socioeconomic status were ascertained. These data were linked to the breast cancer morbidity information in the Cancer Registry of Norway. Exposure to magnetic fields was assessed a priori using two different approaches. In the first approach, hours per week in a potential magnetic field above background level (0.1 microT) were classified by an expert panel. In the second approach, measured magnetic fields from a separate study of men at work were allocated to the women's census job titles. In both approaches, exposure was cumulated over the years of employment (work hours and microT-years, respectively). RESULTS: The Poisson regression analysis showed a risk ratio (RR) of 1.14 (95% confidence interval (CI) = 1.10-1.19) in the highest exposure category compared to the lowest when using the first approach, and the corresponding RR was 1.08 (95% CI = 1.01-1.16) when using the second approach. For women younger than 50 years, RR was 1.20 (95% CI = 1.11-1.29) and 1.12 (95% CI = 0.98-1.28), respectively. CONCLUSIONS: The results give some support to the hypothesis that exposure to 50 Hz magnetic fields may increase the risk of breast cancer. However, since no direct information on exposure was available, no firm conclusions can be drawn.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Knave B et al. 1979

Knave B, Gamberale F, Bergstrom S, Birke E, Iregren A, Kolmodin-Hedman B, Wennberg A

Long-term exposure to electric fields. A cross-sectional epidemiologic investigation of occupationally exposed workers in high-voltage substations

In: Scand J Work Environ Health, 5. Jg. (1979), S. 115.

ABSTRACT:
In the present epidemiologic study, 53 workers with a long-term (more than five years) exposure to the electric field of 400 kV substations were examined and compared with a matched reference group of 53 nonexposed workers from the same power companies. Matching variables included age, geographic location and employment time. The aim of the study was to investigate the possibility of persistent, chronic health effects in the exposed group as a consequence of exposure. The investigation indluded the nervous system (neurasthenic symptoms, psychological tests, electroencephalography), the cardiovascular system (symptoms, blood pressure, electrocardiography), and the blood (hemoglobin, red blood cells, reticulocytes, white blood cells including differential count, thrombocytes, sedimentation rate). Fertility was also assessed. The results showed no differences between the exposed and reference groups as a consequence of the long-term exposure to the electric fields. The groups differed, however, in that the exposed group had (a) consistently better results on the psychological performance tests, (b) a fewer number of children, especially boys, and (c) somewhat higher education. The differences in test results were due to the higher education among the exposed. The difference in number of children was also thought to be related to factors other than exposure since it was found to be present already 10--15 years before the work in 400 kV substations began.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Knave B G et al. 1985

Knave B G, Wibom R I, Bergqvist U O, Carlsson L L, Levin M I, Nylen P R

Work with video display terminals among office employees. II. Physical exposure factors

In: Scand J Work Environ Health, 11. Jg. (1985), S. 467.

ABSTRACT:
This is the second report in a major epidemiologic health investigation on work with a video display terminal (VDT). The first study showed that VDT operators reported more eye discomfort than a reference group not employed in VDT work and that women reported more eye discomfort, musculoskeletal complaints, headache, and skin disorders than men, regardless of whether they worked with a VDT or not. The present report contains the results of the occupational hygiene measurements (indoor climate, lighting and electrostatic conditions). Considerable differences were found between VDT operators and referents and also between sexes. Indications were obtained of a possible relationship between eye discomfort and luminance ratios in the working field of vision. Otherwise, no association could be established between occupational exposure factors and subjective eye discomfort, musculoskeletal complaints, headache, or skin disorders.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; others

Knave B G et al. 1985a

Knave B G, Wibom R I, Voss M, Hedstrom L D, Bergqvist U O

Work with video display terminals among office employees. I. Subjective symptoms and discomfort

In: Scand J Work Environ Health, 11. Jg. (1985), S. 457.

ABSTRACT:
Subjective symptoms and discomfort were evaluated by means of a questionnaire and compared between approximately 400 video display terminal (VDT) operators and 150 selected referents. Previous and current illnesses, educational status, and smoking and drinking habits were also studied. The results showed the VDT operators to have more eye discomfort and possibly also more musculoskeletal discomfort in the shoulders, neck, and back than the referents. The VDT group also reported more skin disorders. In addition, women reported consistently more disorders than men, regardless of whether or not they were employed in VDT work. Women in general displayed greater morbidity than men. Eye discomfort, musculoskeletal discomfort, headache, and skin disorders were found to be significantly correlated in the material. The results also indicated that total daily workhours and time spent looking at the VDT screen were related to the degree of discomfort. Even when the subjects were divided into subgroups with reference to the various enterprises, the types of work and the makes of VDT, the differences obtained in the degree of discomfort appeared to be due to variations in the length of workhours.

SCHLAGWÖRTER:
epidemiology; cross-sectional; hf; others

Koc M et al. 2001

Koc M, Polat P

Epidemiology and aetiological factors of male breast cancer: a ten years retrospective study in eastern Turkey

In: Eur J Cancer Prev, 10. Jg. (2001), S. 531.

ABSTRACT:
The aim of this study was to assess the epidemiological

and aetiological factors of male breast carcinoma in eastern Turkey. For this purpose we evaluated breast carcinoma patients admitted to our regional hospital from 1990 to 2000. A total of 196 patients were admitted during that time, 11 of whom were male (5%). The average age at presentation was 60.7 +/- 7.5. Infiltrating ductal carcinoma was the most frequent histopathological type; lobular carcinoma was detected in only one of our cases. Right-sided male breast carcinoma was seen in 7 of 11 cases, left-sided in four cases. We detected gynaecomastia in two patients. Other factors were excessive alcohol consumption for 35 years in one patient, family history in one patient and exposure to electromagnetic fields (EMFs) and light at night in four patients. We demonstrated no risk factor in the other three cases. Of the patients in our study, the youngest was 45 years old--the patient with post-pubertal gynaecomastia. The overall rate of male breast carcinoma seen among people who had worked for the Turkish Institution of Electricity in eastern Turkey was 0.3%. In our study we demonstrated a close relation between exposure to EMFs and light at night and male breast carcinoma in eastern Turkey. We also supposed that not only exposure to EMFs but also the duration of the exposure could affect the risk of development of male breast carcinoma.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Koivisto M et al. 2000

Koivisto M, Revonsuo A, Krause C M, Haarala C, Sillanmoki L, Laine M, Homoloinen H

Effects of 902 MHz electromagnetic field emitted by cellular phones on response times in humans

In: NeuroReport, 11. Jg. (2000), S. 413.

ABSTRACT:
The present study examined possible influences of a 902 MHz electromagnetic field emitted by cellular telephones on cognitive functioning in 48 healthy humans. A battery of 12 reaction time tasks was performed twice by each participant in a counterbalanced order: once with and once without the exposure to the field. The results showed that the exposure to the electromagnetic field speeded up response times in simple reaction time and vigilance tasks and that the cognitive time needed in a mental arithmetics task was decreased. The results suggest that exposure to the electromagnetic field emitted by cellular telephones may have a facilitatory effect on brain functioning, especially in tasks requiring attention and manipulation of information in working memory.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Kolmodin-Hedman B et al. 1988

Kolmodin-Hedman B, Hansson Mild K, Hagberg M, Jonsson E, Andersson M C, Eriksson A

Health problems among operators of plastic welding machines and exposure to radiofrequency electromagnetic fields

In: Int Arch Occup Environ Health, 60. Jg. (1988), S. 243.

ABSTRACT:
To study possible medical effects of high radiofrequency radiation (RF), 113 Swedish men and women were studied by means of a structured interview and rating of subjective symptoms. A test session was included in order to examine coordination and muscular function of the hands. A neurological test concerning two-point discrimination (2-PD) was also done. As referents, 23 women, sewing machine operators and assembly workers, were chosen, interviewed and likewise tested. Exposure measurements were taken of the RF fields around the welding machines. The present Swedish ceiling value of 250 W/m2 for the equivalent power density was exceeded in more than 50% of the machines. The highest leakage fields, both for electric and magnetic fields, were found near machines used in factories for ready-made clothing, which gave a high exposure to the hands. Irritative eye symptoms were reported by 23% of the men and 40% of the women. A group of 27 persons was selected for a clinical eye examination and checked by photographs, and nine persons had modest conjunctivitis. A high prevalence of numbness in hands, especially among women, was found. A significantly impaired 2-PD was found in the exposed women as compared to the referent group. The pregnancy outcome for 305 female plastic welders during 1974-1984 did not show any significant differences with the Swedish average concerning malformation or prenatal mortality.

SCHLAGWÖRTER:
epidemiology; other type; hf; morbidity

Kolodynski A A et al. 1996

Kolodynski AA, Kolodynska VV

Motor and psychological functions of school children living in the area of the Skrunda Radio Location Station in Latvia

In: Sci Total Environ, 180. Jg. (1996), S. 87.

ABSTRACT:
This paper presents the results of experiments on school children living in the area of the Skrunda Radio Location Station (RLS) in Latvia. Motor function, memory and attention significantly differed between the exposed and control groups. Children living in front of the RLS had less developed memory and attention, their reaction time was slower and their neuromuscular apparatus endurance was decreased.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Krause C M et al. 2000

Krause C M, Sillanmöki L, Koivisto M, Höggqvist A, Saarela C, Revonsuo A, Laine M, Hömölöinen H
Krause C M, Sillanmoki L, Koivisto M, Hoggqvist A, Saarela C, Revonsuo A, Laine M, Homoloinen H

Effects of electromagnetic field emitted by cellular phones on the EEG during a memory task

In: NeuroReport, 11. Jg. (2000), S. 761.

ABSTRACT:
The effects of electromagnetic fields (EMF) emitted by cellular phones on the ERD/ERS of the 4-6 Hz, 6-8 Hz, 8-10 Hz and 10-12 Hz EEG frequency bands were studied in 16 normal subjects performing an auditory memory task. All subjects performed the memory task both with and without exposure to a digital 902 MHz EMF in counterbalanced order. The exposure to EMF significantly increased EEG power in the 8-10 Hz frequency band only. Nonetheless, the presence of EMF altered the ERD/ERS responses in all studied frequency bands as a function of time and memory task (encoding vs retrieval). Our results suggest that the exposure to EMF does not alter the resting EEG per se but modifies the brain responses significantly during a memory task.

SCHLAGWÖRTER:
medicine; experimentally; hf; biological effects

Kraut A et al. 1994

Kraut A, Tate R, Tran N

Residential electric consumption and childhood cancer in Canada (1971-1986)

In: Arch Environ Health, 49. Jg. (1994), S. 156.

ABSTRACT:
Concern has focused recently on the association between exposure to magnetic fields emanating from electrical equipment and the development of childhood cancer. An ecological study was undertaken to determine the correlation over time between childhood cancer rates and residential electric consumption (REC) in Canada. Significant increases in REC and in overall childhood cancer rates (0.14 cases/100,000 children.y) and brain

cancer (0.05 cases/100,000 children.y) were observed, but a similar increase in leukemia was not observed. The average of the yearly provincial ranking of REC and cancer rates was used to determine whether provinces that have, on the average, higher REC also have higher childhood cancer ranks. Stronger correlations were observed between provincial REC rank and brain cancer and leukemia ranks than with lymphoma and other cancer rankings. These findings are consistent with, but do not prove, a causal association between childhood brain cancer and leukemia and REC.

SCHLAGWÖRTER:
epidemiology; ecological; elf; cancer

Kristensen T S 1989

Kristensen T S

Cardiovascular disease and the work environment. A critical review of the epidemiologic literature on nonchemical factors

In: Scand J Work Environ Health, 15. Jg. (1989), S. 165.

ABSTRACT:
This is the first of two articles reviewing the epidemiologic research on cardiovascular diseases (CVD) and the work environment. It deals with a number of nonchemical factors, ie, physical inactivity at work, stressors at work, shift work, noise, cold, heat, and electromagnetic fields and waves. First the methodological quality of each of the empirical studies is assessed on the basis of epidemiologic criteria. Then the research literature on each of the aforementioned factors of the work environment is evaluated. It is concluded that the hypothesis of a causal relationship between physical inactivity at work and risk of CVD is substantially supported by the literature. As regards work stressors and shift work, several good studies have been published during the last 10 years strongly suggesting a causal relationship. Other studies have shown a relationship between noise and elevated blood pressure, but the quality of this literature is low. Heat and cold appear to have an acute effect on the incidence of CVD, but the possible chronic effect has seldom been investigated. Concerning electromagnetic fields and waves, it is concluded that more research is needed. The study of CVD and work ought to play a bigger role in research in the fields of occupational medicine and cardiovascular epidemiology in the future.

SCHLAGWÖRTER:
epidemiology; Review; elf; cvd

Kromhout H et al. 1997

Kromhout H, Loomis D P, Kleckner R C, Savitz D A

Sensitivity of the relation between cumulative magnetic field exposure and brain cancer mortality to choice of monitoring data grouping scheme

In: Epidemiology, 8. Jg. (1997), S. 442.

ABSTRACT:
We examined the effectiveness of alternative grouping strategies with respect to cumulative exposure to magnetic fields and brain cancer mortality among electric utility workers. We applied a statistically optimal job-exposure matrix to calculate cumulative exposure over full work histories. We studied the sensitivity of the exposure-disease relation by assigning an array of different quantitative exposure estimates based on six schemes for grouping exposure measurements. The quantitative relation between cumulative magnetic field exposure and brain cancer mortality appeared to be sensitive to the choice of grouping scheme, with the optimized grouping scheme indicating stronger relations than standard

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Kromhout H et al. 1999

Kromhout H, Loomis D P, Kleckner R C

Uncertainty in the relation between exposure to magnetic fields and brain cancer due to assessment and assignment of exposure and analytical methods in dose-response modeling

In: Ann NY Acad Sci, 895. Jg. (1999), S. 141.

ABSTRACT:
Incomplete scientific knowledge ensures that, in every study, uncertainty will enter the processes of exposure estimation and exposure-response modeling. In the light of the heated debate about the health effects of magnetic fields resulting from power production and usage, we undertook a sensitivity analysis to evaluate uncertainty related to key decisions in a previous study of brain cancer and occupational exposure to magnetic fields. The findings appeared to be relatively insensitive to most variations in the methods of exposure assessment, exposure assignment, and data analysis. The results can be visualized by defining bands of uncertainty about a best-bet estimate of the association based on our original study. These bands of methodological uncertainties were similar in magnitude to the conventional 95% confidence interval, but they provide a measure of the potential range of systematic bias in the results, rather than reflecting statistical variability alone. The methodology employed here can be applied to other studies, and other researchers are encouraged to conduct sensitivity analysis in order to estimate methodological uncertainty as an alternative to statistical confidence intervals.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Kues H A et al. 1985

Kues H A, Hirst L W, Lutty G A, D'Anna S A, Dunkelberger G R

Effects of 2.45-GHz microwaves on primate corneal endothelium

In: Bioelectromagnetics, 6. Jg. (1985), S. 177.

ABSTRACT:
Both eyes of anesthetized cynomolgus monkeys (Macaca fascicularis) were irradiated with 2.45-GHz microwaves, either pulsed or continuous wave. In vivo corneal endothelial abnormalities were observed by specular microscopy and confirmed through histologic techniques after a 16- to 48-hour postexposure period. Pulsed microwaves with an average power density of 10 mW/cm2 (equivalent to a specific absorption rate (SAR) = 2.6 W/kg) produced these effects, while levels of 20-30 mW/cm2 (equivalent to a SAR = 5.3 to 7.8 W/kg) with continuous wave irradiation were required to produce similar changes.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Kues H A et al. 1992

Kues H A, Monahan J C

Microwave-induced changes in the primate eye

In: Johns Hopkins APL Tech Dig, 13. Jg. (1992), S. 244.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Kues H A et al. 1992a

Kues H A, Monahan J C, D'Anna S A, McLeod D S, Lutty G A, Koslov S

Increased sensitivity of the non-human primate eye to microwave radiation following ophthalmic drug pretreatment

In: Bioelectromagnetics, 13. Jg. (1992), S. 379.

ABSTRACT:
Previous studies in our laboratory have established that pulsed microwaves at 2.45 GHz and 10 mW/cm2 are associated with production of corneal endothelial lesions and with disruption of the blood-aqueous barrier in the non-human primate eye. In the study reported here we examined ocular damage in monkeys (M. mulatta and M. fascicularis) following topical treatment with one of two ophthalmic drugs (timolol maleate and pilocarpine) that preceded exposure to pulsed microwaves. Anesthetized monkeys were sham exposed or exposed to pulsed, 2.45 GHz microwaves (10 microseconds, 100 pps) at average power densities of 0.2, 1, 5, 10, or 15 mW/cm2 4 h a day for 3 consecutive days (respective SARs were 0.052, 0.26, 1.3, 2.6, and 3.9 W/kg). Immediately before microwave exposure, one or both eyes were treated topically with one drop of 0.5% timolol maleate or of 2% pilocarpine. Following administration of a drug, we observed a significant reduction in the power-density threshold (from 10 to 1 mW/cm2) for induction of corneal endothelial lesions and for increased vascular permeability of the iris. Diagnostic procedures (in vivo specular microscopy and fluorescein iris angiography) were performed following each exposure protocol. In addition, increased vascular permeability was confirmed with horseradish peroxidase tracer techniques. Although we did not measure intraocular temperatures in experimental animals, the results suggest that a mechanism other than significant heating of the eye is involved. Our data indicate that pulsed microwaves at an average SAR of 0.26 W/kg, if administered after pretreatment with ophthalmic drugs, can produce significant ocular effects in the anesthetized primate.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Kues H A et al. 1999

Kues H A, D'Anna S A, Osiander R, Green, W R, Monahan J C

Absence of ocular effects after either single or repeated exposure to 10 mW/cm 2 from a 60 GHz CW source

In: Bioelectromagnetics, 20. Jg. (1999), S. 463.

ABSTRACT:
This study was designed to examine ocular effects associated with exposure to millimeter waves (60 GHz). Rabbits served as the primary experimental subjects. To confirm the results of the rabbit experiments in a higher species, the second phase of the study used nonhuman primates (Macaca mulatta). First, this study used time-resolved infrared radiometry to assess the field distribution patterns produced by different antennas operating at 60 GHz. These results allowed us to select an antenna that produced a uniform energy distribution and the best distance at which to expose our experimental subjects. The study then examined ocular changes after exposure at an incident power density of 10 mW/cm(2). Acute exposure of both rabbits and nonhuman primates consisted of a single 8 h exposure, and the repeated exposure protocol consisted of five separate 4 h exposures on consecutive days. One eye in each animal was exposed and the contralateral eye served as the sham-exposed control. After postexposure diagnostic examinations, animals were euthanized and the eyes were removed. Ocular tissue was examined by both light and transmission electron microscopy. Neither microscopic examinations nor the diagnostic procedures performed on the eyes of acute and repeatedly exposed rabbits found any ocular changes that could be attributed to millimeter-wave exposure at 10 mW/cm(2). Examination of the primates after comparable exposures also failed to detect any ocular changes due to exposure. On the basis of our results, we conclude that single or repeated exposure to 60 GHz CW radiation at 10 mW/cm(2) does not result in any detectable ocular damage.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Kuijten R R et al. 1992

Kuijten RR, Bunin GR, Nass CC, Meadows AT

Parental occupation and childhood astrocytoma: results of a case-control study

In: Cancer Res, 52. Jg. (1992), S. 782.

ABSTRACT:
Parental occupations were investigated as possible risk factors for astrocytoma, the most frequently occurring brain tumor in children. A case-control study of 163 pairs was performed. Cases under 15 years of age at diagnosis in 1980-1986 were identified through the tumor registries of eight hospitals in Pennsylvania, New Jersey, and Delaware. Controls were selected by random-digit dialing and were matched to cases on age, race, and telephone area code. Occupations before the child's conception, during the pregnancy, and after the child's birth were studied separately. We did not observe any strong associations. Significantly more fathers of cases were electrical or electronic repairmen, a subgroup of an occupational category previously associated with increased risk. An excess of case mothers employed as nurses was observed, which was significant for mothers of children diagnosed before 5 years of age. Elevated although not significant odds ratios were observed for some white collar and professional occupations in case parents; for paternal exposure to paint and paternal occupation in the paper and pulp mill industry, both in the period after the child's birth; and for maternal occupation as a hairdresser. The lack of strong associations may have resulted from low statistical power for some job groupings. Our study, unlike previous studies, focused on a single type of brain tumor: childhood astrocytoma. Thus our results suggest that some parental occupations associated with childhood brain tumors in previous studies may not be risk factors for childhood astrocytoma.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Kurppa K et al. 1985

Kurppa K, Holmberg P C, Rantala K, Nurminen T, Saxen L

Birth defects and exposure to video display terminals during pregnancy. A Finnish case-referent study

In: Scand J Work Environ Health, 11. Jg. (1985), S. 353.

ABSTRACT:
In a test of the widely publicized allegation that exposure to video display terminals causes birth defects, interview forms of mothers of 1 475 children reported consecutively to the Finnish Register of Congenital Malformations to have defects of the central nervous system, orofacial clefts, skeletal defects, or cardiovascular malformations and the forms of the same number of their paired referents were studied. The scrutiny revealed 490 mothers with occupational titles indicating potential exposure to video display terminals. Of the 490, 235 were case mothers and 255 were referents. Then, unaware of the case-referent status, three members of the research team perused the mothers' interview descriptions of workday activities for information indicating exposure to video display terminals. Work with such terminals during the first trimester of pregnancy was ascertained for 111 mothers. Of these, 51 were case mothers and 60 were referents. The comparison of the mothers exposed to video display terminals during the first trimester with those not exposed at all showed a crude odds-ratio point estimate of 0.9 with 95% confidence limits of 0.6 and 1.2. Adjustment for potential confounders by multivariate logistic regression methods did not materially affect the risk estimates. The results did not indicate a teratogenic risk for operators of video display terminals.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Kwee S et al. 1998

Kwee S, Raskmark P

Changes in cell proliferation due to environmental non-ionizing radiation. 2.

In: Microwave radiation. Bioelectrochem Bioenerg, 44. Jg. (1998), S. 251.

ABSTRACT:
Due to the use of mobile telephones, there is an increased exposure of theenvironment to weak radiofrequency (RF) electromagnetic fields, emitted bythese devices. This study was undertaken to investigate if the microwaveradiation from these fields will have a similar effect on cellproliferation as weak electromagnetic (ELF) fields. The field was generatedby signal simulation of the Global System for Mobile communications (GSM)of 960 MHz. Cell cultures, growing in microtiter plates, were exposed in aspecially constructed chamber, a Transverse Electromagnetic (TEM) cell. TheSpecific Absorption Rate (SAR) values for each cell well were calculatedfor this exposure system. Experiments were performed on cell cultures oftransformed human epithelial amnion cells (AMA), which were exposed to 960MHz microwave fields at three different power levels and three differentexposure times, respectively. It was found that cell growth in the exposedcells was decreased in comparison to that in the control and sham exposedcells. Cell proliferation during the period following exposure varied notonly with the various SAR levels, but also with the length of exposuretime. On the other hand, repeated periods of exposure did not seem tochange the effects. There was a general linear correlation between powerlevel and growth change. However, the exposure time required to obtain themaximum effect was not the same for the various power levels. It turned outthat at low power level, a maximum effect was first reached after a longerexposure time than at higher power level. A similar phenomenon wasregistered in the studies on ELF electromagnetic fields. Here, it was foundthat there was a linear correlation between the length of exposure time toobtain maximum effect and field strength.

SCHLAGWÖRTER:
bioassay; experimentally; elf; biological effects

Laden F et al. 2000

Laden F, Neas L M, Tolbert P E, Holmes M D, Hankinson S E, Spiegelman D, Speizer F E, Hunter D J

Electric blanket use and breast cancer in the Nurses' Health Study

In: Am J Epidemiol, 152. Jg. (2000), S. 41.

ABSTRACT:
Electric and magnetic fields (EMFs) have been hypothesized to increase the risk of breast cancer, and electric blankets represent an important source of exposure to EMFs. The authors examined the relation between electric blanket use and invasive breast cancer in the Nurses' Health Study. On the biennial questionnaire in 1992, 87,497 women provided information on this exposure during three consecutive time periods. In a prospective analysis with 301,775 person-years of follow-up through 1996 (954 cases), the relative risk for any electric blanket use was not elevated (relative risk (RR) = 1.08, 95% confidence interval (CI): 0.95, 1.24) after controlling for breast cancer risk factors. There was a weak association between breast cancer and electric blanket use at least 16 years before diagnosis and long-term use in age-adjusted analyses but not in multivariate models. In a retrospective analysis of 1,318,683 person-years of follow-up (2,426 cases), the multivariate relative risk associated with use before disease follow-up began was null (RR = 1.05, 95% CI: 0.95, 1.16). Similar results were obtained in analyses stratified by menopause and restricted to estrogen receptor-positive breast cancers. While 95% confidence intervals for these estimates did not exclude small risks, overall, results did not support an association between breast cancer risk and exposure to EMFs from electric blankets.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Lagorio S et al. 1997

Lagorio S, Rossi P, Vecchia P, DeSantis M, Bastianini L, Fusilli M, Ferrucci A, Desideri E, Comba P

Mortality of plastic-ware workers exposed to radiofrequencies

In: Bioelectromagnetics, 18. Jg. (1997), S. 418.

ABSTRACT:
The mortality experience of a cohort of Italian plastic-ware workers exposed to radiofrequency (RF)-electromagnetic fields generated by dielectric heat sealers was investigated. Follow-up extended from 1962 to 1992. The standardised mortality ratio (SMR) analysis was restricted to 481 women workers, representing 78% of the total person-years at risk. Mortality from malignant neoplasms was slightly elevated, and increased risks of leukemia and accidents were detected. The all-cancer SMR was higher among women employed in the sealing department, where exposure to RF occurred, than in the whole cohort. This study raises interest in a possible association between exposure to RF radiation and cancer risk. However, the study power was very small, and the possible confounding effects of exposure to solvents and vinyl chloride monomer (VCM) could not be ruled out. The hypothesis of an increased risk of cancer after radiofrequency exposure should be further explored by means of analytical studies characterised by adequate power and more accurate exposure assessment.

SCHLAGWÖRTER:
epidemiology; cohort; hf; mortality

Lai H 1992

Lai H

Research on the neurological effects of non-ionizing radiation at the University of Washington

In: Bioelectromagnetics, 13. Jg. (1992), S. 513.

ABSTRACT:
This paper reviews research on neurological effects of low-level microwave irradiation, which was performed at the University of Washington, during the decade of the 1980s. We studied in the rat the effects of microwave exposure on the actions of various psychoactive drugs, on the activity of cholinergic systems in the brain, and on the neural mechanisms involved. Our results indicate that endogenous opioids play an important mediating role in some of the neurological effects of microwaves, and that parameters of microwave exposure are important determinants of the outcome of the microwave effects.

SCHLAGWÖRTER:
bioassay; Review; hf; biological effects

Lai H et al. 1987

Lai H, Horita A, Chou C-K, Guy A W

Low-level microwave irradiation affects central cholinergic activity in the rat

In: J Neurochem, 48. Jg. (1987), S. 40.

ABSTRACT:
Sodium-dependent high-affinity choline uptake was measured in various regions of the brains of rats irradiated for 45 min with either pulsed or continuous-wave low-level microwaves (2,450 MHz; power density, 1 mW/cm2; average whole-body specific absorption rate, 0.6 W/kg). Pulsed microwave irradiation (2-microseconds pulses, 500 pulses/s) decreased choline uptake in the hippocampus and frontal cortex but had no significant effect on the hypothalamus, striatum, and inferior colliculus. Pretreatment with a narcotic antagonist (naloxone or naltrexone; 1 mg/kg i.p.) blocked the effect of pulsed

microwaves on hippocampal choline uptake but did not significantly alter the effect on the frontal cortex. Irradiation with continuous-wave microwaves did not significantly affect choline uptake in the hippocampus, striatum, and hypothalamus but decreased the uptake in the frontal cortex. The effect on the frontal cortex was not altered by pretreatment with narcotic antagonist. These data suggest that exposure to low-level pulsed or continuous-wave microwaves leads to changes in cholinergic functions in the brain.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1989

Lai H, Carino M A, Horita A, Guy A W

Low-level microwave irradiation and central nervous cholinergic systems

In: Pharmacol Biochem Behav, 33. Jg. (1989), S. 131.

ABSTRACT:
Our previous research showed that 45 min of exposure to low-level, pulsed microwaves (2450-MHz, 2-microseconds pulses, 500 pps, whole-body average specific absorption rate 0.6 W/kg) decreased sodium-dependent high-affinity choline uptake in the frontal cortex and hippocampus of the rat. The effects of microwaves on central cholinergic systems were further investigated in this study. Increases in choline uptake activity in the frontal cortex, hippocampus, and hypothalamus were observed after 20 min of acute microwave exposure, and tolerance to the effect of microwaves developed in the hypothalamus, but not in the frontal cortex and hippocampus, of rats subjected to ten daily 20-min exposure sessions. Furthermore, the effects of acute microwave irradiation on central choline uptake could be blocked by pretreating the animals before exposure with the narcotic antagonist naltrexone. In another series of experiments, rats were exposed to microwaves in ten daily sessions of either 20 or 45 min, and muscarinic cholinergic receptors in different regions of the brain were studied by 3H-QNB binding assay. Decreases in concentration of receptors occurred in the frontal cortex and hippocampus of rats subjected to ten 20-min microwave exposure sessions, whereas increase in receptor concentration occurred in the hippocampus of animals exposed to ten 45-min sessions. This study also investigated the effects of microwave exposure on learning in the radial-arm maze. Rats were trained in the maze to obtain food reinforcements immediately after 20 or 45 min of microwave exposure.(ABSTRACT TRUNCATED AT 250 WORDS)

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1989a

Lai H, Carino M A, Horita A, Guy A W

Low-level microwave irradiation and central cholinergic activity: a dose response study

In: Bioelectromagnetics, 10. Jg. (1989), S. 203.

ABSTRACT:
Rats were irradiated with circularly polarized, 2,450-MHz pulsed microwaves (2-microseconds pulses, 500 pulses per second [pps]) for 45 min in the cylindrical waveguide system of Guy et al:(Radio Sci 14:63-74, 1979). Immediately after exposure, sodium-dependent high-affinity choline uptake, an indicator of cholinergic activity in neural tissue, was measured in the striatum, frontal cortex, hippocampus, and hypothalamus. The power density was set to give average whole-body specific absorption rates (SAR) of 0.3, 0.45, 0.6, 0.75, 0.9, or 1.2 W/kg to study the dose-response relationship between the rate of microwave energy absorption and cholinergic activity in the different areas of the brain. Decrease in choline uptake was observed in the striatum at a SAR of 0.75 W/kg and above, whereas for the frontal cortex and hippocampus, decreases in choline uptake were observed at a SAR of 0.45 W/kg and above. No significant effect was observed in the hypothalamus at the irradiation power densities studied. The probit analysis was used to determine the SAR50 in each brain area, i.e., the SAR at which 50% of maximum response was elicited. SAR50 values for the striatum, frontal cortex, and hippocampus were 0.65, 0.38, and 0.44 W/kg, respectively.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1990

Lai H, Carino M, Horita A, Guy A W

Corticotropin-releasing factor antagonist blocks microwave induced decreases in high-affinity choline uptake in the rat brain

In: Brain Res Bull, 25. Jg. (1990), S. 609.

ABSTRACT:
Acute (45-min) irradiation with pulsed low-level microwaves (2450-MHz, 2 microseconds pulses at 500 pps, average power density of 1 mW/cm2, whole-body average specific absorption rate of 0.6 W/kg) decreased sodium-dependent high-affinity choline uptake (HACU) activity in the frontal cortex and hippocampus of the rat. These effects were blocked by pretreating the animals before exposure with intracerebroventricular injection of the specific corticotropin-releasing factor (CRF) receptor antagonist, alpha-helical-CRF9-41 (25 micrograms). Similar injection of the antagonist had no significant effect on HACU in the brain of the sham-exposed rats. These data suggest that low-level microwave irradiation activates CRF in the brain, which in turn causes the changes in central HACU.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1991

Lai H, Carino M A, Wen Y F, Horita A, Guy A W

Naltrexonew pretreatment blocks microwave-induced changes in central cholinergic receptors

In: Bioelectromagnetics, 12. Jg. (1991), S. 27.

ABSTRACT:
Repeated exposure of rats to pulsed, circularly polarized microwaves (2,450-MHz, 2-microseconds pulses at 500 pps, power density 1 mW/cm2, at an averaged, whole-body SAR of 0.6 W/kg) induced biphasic changes in the concentration of muscarinic cholinergic receptors in the central nervous system. An increase in receptor concentration occurred in the hippocampus of rats subjected to ten 45-min sessions of microwave exposure, whereas a decrease in concentration was observed in the frontal cortex and hippocampus of rats exposed to ten 20-min sessions. These findings, which confirm earlier work in the authors' laboratory, were extended to include pretreatment of rats with the narcotic antagonist naltrexone (1 mg/kg, IP) before each session of exposure. The drug treatment blocked the microwave-induced changes in cholinergic receptors in the brain. These data further support the authors' hypothesis that endogenous opioids play a role in the effects of microwaves on central cholinergic systems.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1994

Lai H, Horita A, Guy A W

Microwave irradiation affects radial-arm maze performance in the rat

In: Bioelectromagnetics, 15. Jg. (1994), S. 95.

ABSTRACT:
After 45 min of exposure to pulsed 2450 MHz microwaves (2 microseconds pulses, 500 pps, 1 mW/cm2, average whole body SAR 0.6 W/kg), rats showed retarded learning

while performing in the radial-arm maze to obtain food rewards, indicating a deficit in spatial "working memory" function. This behavioral deficit was reversed by pretreatment before exposure with the cholinergic agonist physostigmine or the opiate antagonist naltrexone, whereas pretreatment with the peripheral opiate antagonist naloxone methiodide showed no reversal of effect. These data indicate that both cholinergic and endogenous opioid neurotransmitter systems in the brain are involved in the microwave-induced spatial memory deficit.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1995

Lai H, Singh N P

Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells

In: Bioelectromagnetics, 16. Jg. (1995), S. 207.

ABSTRACT:
Levels of DNA single-strand break were assayed in brain cells from rats acutely exposed to low-intensity 2450 MHz microwaves using an alkaline microgel electrophoresis method. Immediately after 2 h of exposure to pulsed (2 microseconds width, 500 pulses/s) microwaves, no significant effect was observed, whereas a dose rate-dependent [0.6 and 1.2 W/kg whole body specific absorption rate (SAR)] increase in DNA single-strand breaks was found in brain cells of rats at 4 h postexposure. Furthermore, in rats exposed for 2 h to continuous-wave 2450 MHz microwaves (SAR 1.2 W/kg), increases in brain cell DNA single-strand breaks were observed immediately as well as at 4 h postexposure.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1996

Lai H, Singh N P

Single- and double-strand DNA breaks in rat brain cells after acute exposure to radiofrequency electromagnetic radiation

In: Int J Radiat Biol, 69. Jg. (1996), S. 513.

ABSTRACT:
We investigated the effects of acute (2-h) exposure to pulsed (2-micros pulse width, 500 pulses s(-1)) and continuous wave 2450-MHz radiofrequency electromagnetic radiation on DNA strand breaks in brain cells of rat. The spatial averaged power density of the radiation was 2mW/cm2, which produced a whole-body average-specific absorption rate of 1.2W/kg. Single- and double-strand DNA breaks in individual brain cells were measured at 4h post-exposure using a microgel electrophoresis assay. An increase in both types of DNA strand breaks was observed after exposure to either the pulsed or continuous-wave radiation, No significant difference was observed between the effects of the two forms of radiation. We speculate that these effects could result from a direct effect of radiofrequency electromagnetic energy on DNA molecules and/or impairment of DNA-damage repair mechanisms in brain cells. Our data further support the results of earlier in vitro and in vivo studies showing effects of radiofrequency electromagnetic radiation on DNA.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lai H et al. 1997

Lai H, Singh N P

Melatonin and a spin-trap compound block radiofrequency electromagnetic radiation- induced DNA strand breaks in rat brain cells

In: Bioelectromagnetics, 18. Jg. (1997), S. 445.

ABSTRACT:
Effects of in vivo microwave exposure on DNA strand breaks, a form of DNA damage, were investigated in rat brain cells. In previous research, we have found that acute (2 hours) exposure to pulsed (2 microseconds pulses, 500 pps) 2450-MHz radiofrequency electromagnetic radiation (RFR) (power density 2 mW/cm2, average whole body specific absorption rate 1.2 W/kg) caused an increase in DNA single- and double-strand breaks in brain cells of the rat when assayed 4 hours post exposure using a microgel electrophoresis assay. In the present study, we found that treatment of rats immediately before and after RFR exposure with either melatonin (1 mg/kg/injection, SC) or the spin-trap compound N-tert-butyl-alpha-phenylnitrone (PBN) (100 mg/kg/injection, i.p.) blocks this effects of RFR. Since both melatonin and PBN are efficient free radical scavengers it is hypothesized that free radicals are involved in RFR-induced DNA damage in the brain cells of rats. Since cumulated DNA strand breaks in brain cells can lead to neurodegenerative diseases and cancer and an excess of free radicals in cells has been suggested to be the cause of various human diseases, data from this study could have important implications for the health effects of RFR exposure.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lamble D et al. 1999

Lamble D, Kauranen T, Laakso M, Summala H

Cognitive load and detection in thresholds in car following situations: safety implications for using mobile (cellular) telephones while driving

In: Accid Anal Prev, 31. Jg. (1999), S. 617.

ABSTRACT:
This study was aimed at investigating drivers' ability to detect a car ahead decelerating, while doing mobile phone related tasks. Nineteen participants aged between 20 and 29 years, (2000-125000 km driving experience) drove at 80 km/h, 50 m behind a lead car, on a 30 km section of motorway in normal traffic. During each trial the lead car started to decelerate at an average of 0.47 m/s2 while the participant either looked at the car in front (control), continuously dialed series of three random integers on a numeric keypad (divided visual attention), or performed a memory and addition task (non-visual attention). The results indicated that drivers' detection ability was impaired by about 0.5 s in terms of brake reaction time and almost 1 s in terms of time-to-collision, when they were doing the non-visual task whilst driving. This impairment was similar to when the drivers were dividing their visual attention between the road ahead and dialing numbers on the keypad. It was concluded that neither a hands-free option nor a voice controlled interface removes the safety problems associated with the use of mobile phones in a car.

SCHLAGWÖRTER:
epidemiology; other type; none; others

Larsen A I 1991

Larsen A I

Congenital malformations and exposure to high-frequency electromagnetic radiation among Danish physiotherapists

In: Scand J Work Environ Health, 17. Jg. (1991), S. 318.

ABSTRACT:
A cluster initiated the present case-referent study to assess the relation between exposure to high-frequency electromagnetic radiation and congenital malformations. Through the linkage of a cohort formed from a union file of Danish physiotherapists with complete national registers of pregnancy outcome, cases (pregnancies terminated by the birth of a malformed child) and referents were identified. From responses in a blinded telephone interview without knowledge of case status, exposure to high-frequency electromagnetic radiation in the first month of pregnancy

was assessed. Indices reflecting duration of exposure ("time") and maximum level of exposure ("peak") were composed. After a 7% dropout 54 cases and 247 referents were interviewed. No statistically significant associations between pregnancy outcome and high-frequency electromagnetic radiation were found (odds ratio 1.7, 95% confidence interval 0.6-4.3).

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Larsen A I et al. 1991

Larsen A I, Olsen J, Svane O

Gender-specific reproductive outcome and exposure to high-frequency electromagnetic radiation among physiotherapists

In: Scand J Work Environ Health, 17. Jg. (1991), S. 324.

ABSTRACT:
The aim of this case-referent study was to investigate reproductive hazards other than congenital malformations after exposure to high-frequency electromagnetic radiation. Cases and referents were sampled from a cohort of pregnancies of members of the Union of Danish Physiotherapists through linkage of the union file with national medical registers. Case groups were spontaneous abortions and children with low birth-weight prematurity, and stillbirth/death within one year. Exposure to high-frequency electromagnetic radiation before and during pregnancy was assessed through telephone interviews. As referents to the 270 cases, 316 pregnancies were randomly sampled. A total of 8.4% did not participate. Only 23.5% of the children born by the highly exposed mothers were boys. This value is a statistically significantly altered gender ratio showing a dose-response pattern. High-frequency electromagnetic radiation was furthermore associated with low birthweight, but only for male newborns. The other outcomes were not statistically significantly associated with exposure to high-frequency electromagnetic radiation.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Lary J M et al. 1982

Lary J M, Conover D L, Foley E D, Hanser P L

Teratogenic effects of 27.12 MHz radiofrequency radiation in rats

In: Teratology, 26. Jg. (1982), S. 299.

ABSTRACT:
High-intensity 27.12 MHz radiofrequency (RF) radiation was determined to be teratogenic in rats during most of the gestation period. Eight groups of pregnant rats were exposed to a magnetic field strength of 55 amps/meter and an electric field strength of 300 volts/meter on gestation days 1, 3, 5, 7, 9, 11, 13, or 15. Exposures ceased once the dam's colonic temperature reached 43.0 degrees C (about 20-40 minutes' duration). Eight matching control groups were sham-irradiated for 30 minutes at 0 amps/meter and 0 volts/meter. An additional group of pregnant rats received no treatment. With one exception, no significant differences occurred between sham-irradiated and untreated control groups. RF exposure, however, caused a significant incidence of fetal malformations throughout the postimplantation period (days 7 through 15). It also caused a low but significant incidence of preimplantation malformations. Fetal weight and crown-rump length were reduced in all postimplantation exposure groups but were not affected by preimplantation exposure. The incidence of dead or resorbed fetuses was significantly increased in rats irradiated on days 7 or 9. The effects observed appeared to be caused by RF-induced hyperthermia in the treated dams. Since a number of industrial, scientific, and medical devices operating at or near 27.12 MHz can cause hyperthermia in humans, women of childbearing age should avoid exposure to RF-radiation levels that exceed current US occupational standards.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lary J M et al. 1983

Lary J M, Conover D L, Foley E D, Hanser P L

Teratogenicity of 27.12 MHz radiation in rats is related to duration of hyperthermia exposure

In: Bioelectromagnetics, 4. Jg. (1983), S. 249.

ABSTRACT:
Five groups of pregnant Sprague-Dawley rats were either sham exposed or were irradiated in a 27.12-MHz radiofrequency (RF) field at 55 A/m and 300 V/m on gestation day 9. The absorbed power (approximately 11 W/kg) caused a relatively rapid increase in the rat's colonic temperature. Rats in group I were sham irradiated for 2.5 h at 0 A/m, 0 V/m. In group II RF irradiation was terminated after the rat's colonic temperature reached 41.0 degrees C. In group III the 41.0- degrees C temperature was maintained an additional 2 h by manually varying the incident field strength. In group IV irradiation was terminated after the rat's colonic temperature reached 42.0 degrees C. In group V the 42.0- degrees C temperature was maintained an additional 15 min by varying the field strength. At both temperatures the teratogenic and embryotoxic effects of the RF-induced hyperthermia increased as the exposure duration increased, but the increase was especially noticeable at 42.0 degrees C. The results indicate that the teratogenic and embryotoxic effects of RF-induced hyperthermia are related to both the temperature of the dam during exposure and the length of time the dam's temperature remains elevated.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lary J M et al. 1987

Lary J M, Conover D

Teratogenic effects of radiofrequency radiation

In: IEEE Eng Med Biol Mag, Jg. 1987, S. 42.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lee G M et al. 2000

Lee G M, Neutra R R, Hristova L, Yost M, Hiatt R A

The use of electric bed heaters and the risk of clinically recognized spontaneous abortion

In: Epidemiology, 11. Jg. (2000), S. 406.

ABSTRACT:
We conducted a prospective cohort study to evaluate the relation of spontaneous abortion and electric bed heater use during the first trimester of pregnancy. Compared with non-users, rates of spontaneous abortion were lower for women who used electric bed heaters. The adjusted odds ratio and 95% confidence interval (CI) for the two major devices used, electric blankets (N = 524) and waterbeds (N = 796), were, respectively, 0.8 (95% CI = 0.5-1.1) and 0.9 (95% CI = 0.7-1.2). An increase of risk with increasing intensity (setting-duration combination) of use was not observed. Users of electric blankets at low settings for most of the night (N = 171) had lower risks of spontaneous abortion than non-users (adjusted odds ratio = 0.5; 95% CI = 0.3-1.0). Twenty women who used electric blankets at a high setting for 1 hour or less had an adjusted odds ratio of 3.0 (95% CI = 1.1-8.3), but we found no spontaneous abortions among the few women (N = 13) who used a high setting for 2 or more hours. We found that exposure rankings of the magnetic field time-weighted average and a rate of change metric did not correspond monotonically to the pattern of spontaneous abortion risks and that electric blankets contribute less to overnight time-weighted

average magnetic fields than has been thought.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Lee G M et al. 2002

Lee G M, Neutra R R, Hristova L, Yost M, Hiatt R A
A nested case-control study of residential and personal magnetic field measures and miscarriages
In: Epidemiology, 13. Jg. (2002), S. 21.

ABSTRACT:
We conducted a nested case-control study (177 cases, 550 controls) to assess the relation between retrospective magnetic field measures and clinical miscarriage among members of the northern California Kaiser Permanente medical care system. We also conducted a prospective substudy of 219 participants of the same parent cohort to determine whether 12-week and 30-week exposure assessments were similar. We evaluated wire codes, area measures, and three personal meter metrics: (1) the average difference between consecutive levels (a rate-of-change metric), (2) the maximum level, and (3) the time-weighted average. For wire codes and area measures we found little association. For the personal metrics (30 weeks after last menstrual period), we found positive associations. Each exposure was divided into quartiles, with the lowest quartile as referent. Starting with the highest quartile, adjusted odds ratios and 95% confidence intervals were 3.1 (95% CI = 1.6-6.0), 2.3 (95% CI = 1.2-4.4), and 1.5 (95% CI = 0.8-3.1) for the rate-of-change metric; 2.3 (95% CI = 1.2-4.4), 1.9 (95% CI = 1.0-3.5), and 1.4 (95% CI = 0.7-2.8) for the maximum value; and 1.7 (95% CI = 0.9-3.3), 1.7 (95% CI = 0.9-3.3), and 1.7 (95% CI = 0.9-3.3) for the time-weighted average. The odds ratio conveyed by being above a 24-hour time-weighted average of 2 milligauss was 1.0 (95% CI = 0.5-2.1). Exposure assessment measurements at 12 weeks were poorly correlated with those taken at 30 weeks. Nonetheless, the prospective substudy results regarding miscarriage risk were consistent with the nested study results.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Lerman Y et al. 2001

Lerman Y, Jacubovich R, Green M S
Pregnancy outcome following exposure to shortwaves among female physiotherapists in Israel
In: Am J Ind Med, 39. Jg. (2001), S. 499.

ABSTRACT:
BACKGROUND: The findings of the few epidemiological studies on the possible association between shortwave diathermy use by pregnant physiotherapists and adverse pregnancy outcome are inconsistent. We investigated such an association among physiotherapists in Israel. METHODS: Individualized data on exposure to shortwaves, ultrasound, and heavy lifting were collected by questionnaires and telephone interviews. RESULTS: The 434 studied women included 930 pregnancies: 175 ended in spontaneous abortions, 45 had fetal malformations, 47 were delivered prematurely, and 33 infants had low birth weight. The remaining 630 normal pregnancies comprised the control group. Univariate analysis showed that exposure to shortwaves was associated with a significantly increased odds ratio (O.R.) for congenital malformations (O.R. 2.24, CI 1.27-4.83, P =.006) and low birth weight (O.R. 2.99, CI 1.32-6,79, P =.006). This effect increased in a dose-related manner. After controlling for potential confounding variables, only low birth weight reached statistical significance (O.R. 2.75, CI 1.07-7.04, P =.03). From the potentially confounding variables tested, febrile disease during pregnancy was found to be significantly associated with low birth weight (O.R. 3.37, CI 1.38-8.25, P =.01). CONCLUSIONS: The findings of our study suggest that shortwaves have potentially harmful effects on pregnancy outcome, specifically low birth weight.

SCHLAGWÖRTER:
epidemiology; case-control; hf; others

Li C Y et al. 1997

Li C Y, Theriault G, Lin R S
Residential exposure to 60-Hertz magnetic fields and adult cancers in Taiwan
In: Epidemiology, 8. Jg. (1997), S. 25.

ABSTRACT:
We conducted a case-control study, using matching on date of birth, sex, and date of diagnosis, in northern Taiwan to evaluate the risks of adult leukemia, brain tumors, and female breast cancers in relation to residential exposure to 60-Hertz (Hz) magnetic fields. Cases were persons with newly diagnosed cancers reported to the cancer registry between 1987 and 1992, and controls were persons with cancers sites other than those previously suspected of being associated with magnetic fields. Magnetic fields in the residences occupied by the study subjects at the time of diagnosis were estimated from high-voltage transmission lines. The results were based on the separate analysis of 870 cases of leukemia, 577 brain tumors, and 1,980 female breast cancers. We estimated the risk of leukemia among those exposed to magnetic fields of > 0.2 microtesla (microT), relative to the risk among those exposed to fields of < 0.1 microT; the odds ratio was 1.4 [95% confidence interval (CI) = 1.0-1.9]. For distance < 50 meters relative to > or = 100 meters, the relative risk was 2.0 (95% CI = 1.4-2.9). For brain tumors and female breast cancers, the odds ratios were close to unity.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; cancer

Li C Y et al. 1998

Li C Y, Lee W C, Lin R S
Risk of leukemia in children living near high-voltage transmission lines
In: J Occup Environ Med, 40. Jg. (1998), S. 144.

ABSTRACT:
We conducted a study to examine the risk of leukemia between 1987 and 1992 among children living near high-voltage transmission lines (HVTL) in three urban districts of northern Taiwan. Twenty-eight cases of leukemia among some 120,696 children aged 14 years or less were reported to the national cancer registry between 1987 and 1992. Compared with children living in households more than 100 meters away from HVTL, children living in households less than 100 meters from HVTL experienced an essentially elevated risk of leukemia (7 versus 2.88, standardized incidence ratio [SIR] = 2.43, 95% confidence interval [CI] = 0.98-5.01). The elevated risk stands when compared with all children of Taiwan alternatively (7 versus 2.60, SIR = 2.69, 95% CI = 1.08-5.55). Such elevated risk was particularly noteworthy among children aged 5-9 years. The findings suggest that children living near HVTL tend to experience an elevated risk of leukemia. Further investigations are undoubtedly needed to unveil whether such tendency may have implied the putative association between exposure to elevated magnetic fields and risk of childhood leukemia.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; cancer

Li C Y et al. 2002

Li C Y, Chen P C, Sung F C, Lin R S
Residential exposure to power frequency magnetic field and sleep disorders among women in an urban community of northern Taiwan
In: Sleep, 25. Jg. (2002), S. 428.

ABSTRACT:
STUDY OBJECTIVES: To investigate relationships

between residential exposure to power frequency magnetic field and sleep initiation and maintenance disorders (SIAMD). DESIGN: A cross-sectional design conducted in an urban town of northern Taiwan in 1995-1996. SETTING/PATIENTS: A total of 5,078 married women aged 20-59. INTERVENTIONS: N/A. MEASUREMENTS: The residential magnetic field intensity was assessed using EMDEX II dosimeters. Trained interviewees collected self-reported information on SIAMD and other covariates. Three type-specific SIAMD were analyzed for associations with background, bedroom, and overall residential exposures. RESULTS: The prevalence rates of difficulty initiating sleep (DIS), difficulty maintaining sleep (DMS), and early morning awakening (EMA) were 29.5%, 38.17%, and 26.02%, respectively. The DIS prevalence was significantly associated with bedroom magnetic field exposure of 2 miliGauss (mG) (odds ratio (OR)=1.20, 95% confidence interval (CI)=1.02-1.40). The DMS prevalence was significantly higher for women with background exposure of 2 mG (OR=1.28, 95% CI=1.04-1.56). An elevated EMA prevalence was also significantly associated with all of the three exposure measures with excess risks ranging from 28% for overall exposure to 65% for background exposure. When magnetic field strength was analyzed as a continuous variable, background exposure, but not overall or bedroom exposure, showed a small but significant association with DMS and EMA (OR=1.05 per 1 mG increase, 95% CI=1.02-1.09). CONCLUSIONS: There is a modest association between residential exposures to elevated magnetic field intensity and insomnia complaints in women.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Li C Y et al. 2002a

Li C Y, Sung F C, Wu S C

Risk of cognitive impairment in relation to elevated exposure to electromagnetic fields

In: J Occup Environ Med, 44. Jg. (2002), S. 66.

ABSTRACT:
Occupational exposure to power-frequency electromagnetic fields (PF-EMF) has been suspected of being associated with adverse neurological outcomes. We performed a case-control study to assess the relationship between exposure to PF-EMF and the risk of cognitive impairment, an indication of certain adverse neurological diseases such as Alzheimer's disease and dementia. Among 2198 elderly individuals aged 65 years or older, 290 persons with score-based cognitive impairment were compared with 580 sex-matched controls to assess the risk of cognitive impairment in relation to PF-EMF exposure. Participants who were former electrical workers or living within 100 meters of high-voltage transmission lines were considered to have higher exposure. Compared with background exposure, the risk was equal or close to unity for participants with higher exposure from a previous occupation (odds ratio [OR], 1.3; 95% confidence interval [CI], 0.7 to 2.3), higher residential exposure (OR, 0.9; 95% CI, 0.3 to 2.6), or higher exposure in both occupation and residential environments (OR, 1.0; 95% CI, 0.2 to 4.6). Our findings provide little support for the link between PF-EMF and cognitive impairment. Nevertheless, the study results do not preclude the possible association between PF-EMF and any specific neurodegenerative disease previously investigated.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Li D K et al. 1995

Li D K, Checkoway H, Mueller B A

Electric blanket use during pregnancy in relation to the risk of congenital urinary tract anomalies among women with a history of subfertility

In: Epidemiology, 6. Jg. (1995), S. 485.

ABSTRACT:
To study the potential effect of prenatal exposure to electromagnetic fields on the occurrence of cogenital urinary tract anomalies (CUTAs) in offspring, we conducted a case-control study in western Washington State. CUTA cases without known chromosomal abnormalities were identified from the Washington Birth Defects Registry. Controls without birth defects were randomly selected from among infants born in five large hospitals in King County, WA. Mothers of cases and controls were interviewed to obtain information on prenatal use of electric blankets, electrically heated water beds, and video display terminals. After adjustment for potential confounders, the risk of CUTAs was found not to be materially associated with these prenatal exposures among all subjects. Among women with a history of subfertility, however, prenatal use of electric blankets was associated with a more than four-fold increase in the risk of CUTAs [adjusted odds ratio (OR) = 4.4; 95% confidence interval (CI) = 0.9-22.7]. The risk was greater if the exposure occurred during the first trimester (adjusted OR = 10.0; 95% CI = 1.2-85.5). The risk also appeared to increase with increasing duration of electric blanket use. Despite small numbers and the potential for recall bias, our study indicates that identifying a susceptible population may be required for detecting adverse reproductive effects of electromagnetic fields.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Li D K et al. 2002

Li D K, Odouli R, Wi S, Janevic T, Golditch I, Bracken T D, Senior R, Rankin R, Iriye R

A population-based prospective cohort study of personal exposure to magnetic fields during pregnancy and the risk of miscarriage

In: Epidemiology, 13. Jg. (2002), S. 9.

ABSTRACT:
To study the effect of magnetic fields on the risk of miscarriage, we conducted a population-based prospective cohort study among pregnant women within a large health maintenance organization. All women with a positive pregnancy test at less than 10 weeks of gestation and residing in the San Francisco area were contacted for participation in the study. We conducted in-person interviews to obtain information on risk factors for miscarriage and other potential confounders. All participants were also asked to wear a magnetic field-measuring meter for 24 hours and to keep a diary of their activities. Pregnancy outcomes were obtained for all participants by searching the health maintenance organization's databases, reviewing medical charts, and telephone follow-up. We used the Cox proportional hazard model for examining the magnetic field-miscarriage association. A total of 969 subjects were included in the final analyses. Although we did not observe an association between miscarriage risk and the average magnetic field level, miscarriage risk increased with an increasing level of maximum magnetic field exposure with a threshold around 16 milligauss (mG). The rate ratio (RR) associated with magnetic field exposure > or = 16 mG (vs <16 mG) was 1.8 [95% confidence interval (CI) = 1.2-2.7]. The risk remained elevated for levels (in tertiles) of maximum magnetic field exposure > or = 16 mG. The association was stronger for early miscarriages (<10 weeks of gestation) (RR = 2.2, 95% CI = 1.2-4.0) and among "susceptible" women with multiple prior fetal losses or subfertility (RR = 3.1, 95% CI = 1.3-7.7). After excluding women who indicated that their daily activity pattern during the measurements did not represent their typical daily activity during pregnancy, the association was strengthened; RR = 2.9 (95% CI = 1.6-5.3) for maximum magnetic field exposure > or = 16 mG, RR = 5.7 (95% CI = 2.1-15.7) for early miscarriage, and RR = 4.0 (95% CI = 1.4-11.5) among the susceptible women. Our findings

provide strong prospective evidence that prenatal maximum magnetic field exposure above a certain level (possibly around 16 mG) may be associated with miscarriage risk. This observed association is unlikely to be due to uncontrolled biases or unmeasured confounders.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Liburdy R P et al. 1987

Liburdy R P, Vanek P F Jr

Microwaves and the cell membrane. III. Protein shedding is oxygen and temperature dependent: evidence for cation bridge involvement

In: Radiat Res, 109. Jg. (1987), S. 382.

ABSTRACT:
Microwaves (2450 MHz, 60 mW/g) are shown to result in the release or shedding of at least 11 low-molecular-weight proteins (less than or equal to 31,000 Da) from rabbit erythrocytes maintained in physiological buffer. Protein release was detected by gel electrophoresis of cell-free supernatants using sensitive silver staining. This release is oxygen dependent and occurs in 30 min for exposures conducted within the special temperature region of 17-21 degrees C, which is linked to a structural or conformational transition in the cell membrane. Shedding of 26,000 and 24,000 Da proteins is unique to microwave treatment, with enhanced release of 28,000 and less than or equal to 15,000 Da species during microwave compared to sham exposures. Two-dimensional isoelectric focusing further reveals that proteins of less than or equal to 14,000 Da shed during microwave treatment exhibit a pI of 6.8-7.3 not seen in sham-treated cells. Treatment of erythrocytes with a serine-directed protease inhibitor does not prevent release of proteins. However, when erythrocytes are maintained at 17-21 degrees C by conventional heating in the absence of divalent cations, release of 28,000-31,000 and less than or equal to 14,000 Da components is detected. This indicates that cation-bridge stability may be important for release of these proteins. The above results provide evidence that microwaves alter erythrocyte protein composition at temperatures linked to a transition in the cell membrane and that destabilization of salt bridges may play a role in an interaction mechanism for protein release.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Liddle C G et al. 1994

Liddle C G, Putnam J P, Huey O P

Alteration in life span of mice chronically exposed to 2450 MHz CW microwaves

In: Bioelectromagnetics, 15. Jg. (1994), S. 177.

ABSTRACT:
Female CD1 mice were exposed from the thirty-fifth day of age for the remainder of their lives to 2.45 GHz, CW-microwave radiation at a power density of 3 or 10 mW/cm2 (SAR = 2.0 or 6.8 W/kg). Exposures took place 1 h/day, 5 day/week in an anechoic chamber at an ambient temperature of 22 degrees C and a relative humidity of 50%. There were 25 animals in each exposure group, and an equal number of controls were concurrently sham exposed. The average life span of animals exposed at 10 mW/cm2 was significantly shorter than that of sham-exposed controls (572 days vs. 706 days; P = .049; truncation > 20%). In contrast, the average lifespan of the animals exposed at 3 mW/cm2 was slightly, but not significantly, longer (738 days) than that of controls (706 days).

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lin Liu S et al. 1982

Lin Liu S, Adey W R

Low frequency amplitude modulated microwave fields change calcium efflux rates from synaptosomes

In: Bioelectromagnetics, 3. Jg. (1982), S. 309.

ABSTRACT:
Calcium (45Ca2+) efflux from preloaded synaptosomes was studied with a continuous perfusion technique and the rate constants of a two-phase efflux process calculated. When 16-Hz sinusoidally amplitude modulated 450-MHz microwave field (maximal incident intensity 0.5 mW/cm2, modulation depth 75%) was applied during the second phase, the rate constant increased by 38%. Unmodulated or 60-Hz modulated signals were not effective. This microwave field-induced change can be distinguished from CaCl2-stimulated 45Ca2+ efflux which is most probably derived intracellularly. These data suggest that the microwave-field induced change in calcium efflux probably did not involve intracellular calcium. Also, this change in the dynamic property of synaptosomes did not require gross anatomically intact tissue as a substrate for field-tissue interaction.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lin R S et al. 1985

Lin R S, Dischinger P C, Conde J, Farrell K P

Occupational exposure to electromagnetic fields and the occurrence of brain tumors. An analysis of possible associations

In: J Occup Med, 27. Jg. (1985), S. 413.

ABSTRACT:
To explore the association between occupation and the occurrence of brain tumor, an epidemiologic study was conducted using data from the death certificates of 951 adult white male Maryland residents who died of brain tumor during the period 1969 through 1982. Compared with the controls, men employed in electricity-related occupations, such as electrician, electric or electronic engineer, and utility company serviceman, were found to experience a significantly higher proportion of primary brain tumors. An increase in the odds ratio for brain tumor was found to be positively related to electromagnetic (EM) field exposure levels. Furthermore, the mean age at death was found to be significantly younger among cases in the presumed high EM-exposure group. These findings suggest that EM exposure may be associated with the pathogenesis of brain tumors, particularly in the promoting stage.

SCHLAGWÖRTER:
epidemiology; others; elf/hf; cancer

Lin R S et al. 1994

Lin R S, Lee W C

Risk of childhood leukemia in areas passed by high power lines

In: Rev Environ Health, 10. Jg. (1994), S. 97.

ABSTRACT:
There has been an emerging concern about possible health risks posed by exposure to extremely low frequency electromagnetic fields (EMF). The incidence of childhood leukemia near high-power transmission lines has only rarely been investigated. A total of 67 cases of childhood leukemia (aged 0-14 years) were reported to the Cancer Registration Center in Taiwan between 1979 and 1988 from the five districts in the Taipei Metropolitan Area, where at least one elementary school campus is passed over by a high power transmission line (69-345 KV). The standardized incidence ratio (SIR) of childhood leukemia in the five districts was found to be significantly elevated (SIR = 1.49, 95% confidence interval: 1.16-1.91). Younger children seemed more susceptible to EMF exposure as

indicated by the fact that children aged 0-4 years in two of the five districts showed significantly elevated SIRs compared to older ones. The unusually high SIRs for children of age 5-9 and 10-14 years in one of these districts (SIR = 4.38 and 3.68 respectively) deserves further investigation.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; cancer

Lindbohm M L et al. 1992

Lindbohm M L, Hietanen M, Kyyronen P, Sallmen M, von Nandelstadh P, Taskinen H, Pekkarinen M, Ylikoski M, Hemminki K

Magnetic fields of video display terminals and spontaneous abortion

In: Am J Epidemiol, 136. Jg. (1992), S. 1041.

ABSTRACT:
The aim of this study was to examine whether work with a video display terminal and exposure to the magnetic fields of video display terminals are related to spontaneous abortion. The study was conducted among women employed as bank clerks and clerical workers in three companies in Finland. The cases (191 spontaneous abortions) and controls (394 births) were identified from Finnish medical registers for the years 1975-1985. Use of video display terminals was defined using the workers' own reports and information provided by the companies. The assessment of exposure to the magnetic fields was based on measurements of the fields of video display terminals. The odds ratio for spontaneous abortion for working with video display terminals was not increased (odds ratio = 1.1, 95% confidence interval 0.7-1.6). However, the odds ratio for workers who had used a video display terminal with a high level of extremely low frequency magnetic fields (> 0.9 microT) was 3.4 (95% confidence interval 1.4-8.6) compared with workers using a terminal with a low level of these magnetic fields (< 0.4 microT). Adjustment for ergonomic factors and mental work load factors changed the odds ratio for magnetic field exposure only very slightly. The findings suggest the need for future studies with assessment of exposure to the magnetic fields in the actual working environment to confirm the possible risk.

SCHLAGWÖRTER:
epidemiology; case-control; hf; others

Linet M S et al. 1988

Linet MS, Malker HS, McLaughlin JK, Weiner JA, Stone BJ, Blot WJ, Ericsson JL, Fraumeni JF Jr.

Leukemias and occupation in Sweden: a registry-based analysis

In: Am J Ind Med, 14. Jg. (1988), S. 319.

ABSTRACT:
A linked-registry was used to examine systematically, on a national basis, the leukemia incidence in Swedish men by industry and occupation. New associations were observed for chronic lymphocytic leukemia among cloth and pattern cutters and for chronic myelocytic leukemia among brewery workers and motor mechanics. A number of additional findings were consistent with previous observations in other countries. Although etiologic inferences are limited when using linked-registry data, this hypothesis-generating study may provide new clues to the occupational determinants of specific forms of leukemia.

SCHLAGWÖRTER:
epidemiology; other type; none; cancer

Linet M S et al. 1997

Linet M S, Hatch E E, Kleinerman R A, Robison L L, Kaune W T, Friedman D R, Severson R K, Haines C M, Hartsock C T, Niwa S, Wacholder S, Tarone R E

Residential exposure to magnetic fields and acute lymphoblastic leukemia in children

In: N Engl J Med, 337. Jg. (1997), S. 1.

ABSTRACT:
BACKGROUND: Previous studies found associations between childhood leukemia and surrogate indicators of exposure to magnetic fields (the power-line classification since known as "wire coding"), but not between childhood leukemia and measurements of 60-Hz residential magnetic fields. METHODS: We enrolled 638 children with acute lymphoblastic leukemia (ALL) who were under 15 years of age and were registered with the Children's Cancer Group and 620 controls in a study of residential exposure to magnetic fields generated by nearby power lines. In the subjects' current and former homes, data collectors measured magnetic fields for 24 hours in the child's bedroom and for 30 seconds in three or four other rooms and outside the front door. A computer algorithm assigned wire-code categories; based on the distance and configuration of nearby power lines, to the subjects' main residences (for 416 case patients and 416 controls) and to those where the family had lived during the mother's pregnancy with the subject (for 230 case patients and 230 controls). RESULTS: The risk of childhood ALL was not linked to summary time-weighted average residential magnetic-field levels, categorized according to a priori criteria. The odds ratio for ALL was 1.24 (95 percent confidence interval, 0.86 to 1.79) at exposures of 0.200 mu T or greater as compared with less than 0.065 mu T. The risk of ALL was not increased among children whose main residences were in the highest wire-code category (odds ratio as compared with the lowest category, 0.88; 95 percent confidence interval, 0.48 to 1.63). Furthermore, the risk was not significantly associated with either residential magnetic-field levels or the wire codes of the homes mothers resided in when pregnant with the subjects. CONCLUSIONS: Our results provide little evidence that living in homes characterized by high measured time-weighted average magnetic-field levels or by the highest wire-code category increases the risk of ALL in children.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Linz K W et al. 1999

Linz K W, von Westphalen C, Streckert J, Hansen V, Meyer R

Membrane potential and currents of isolated heart muscle cells exposed to pulsed radio frequency fields

In: Bioelectromagnetics, 20. Jg. (1999), S. 497.

ABSTRACT:
The influence of radio frequency (RF) fields of 180, 900, and 1800 MHz on the membrane potential, action potential, L-type Ca(2+) current and potassium currents of isolated ventricular myocytes was tested. The study is based on 90 guinea-pig myocytes and 20 rat myocytes. The fields were applied in rectangular waveguides (1800 MHz at 80, 480, 600, 720, or 880 mW/kg and 900 MHz, 250 mW/kg) or in a TEM-cell (180 MHz, 80 mW/kg and 900 MHz, 15 mW/kg). Fields of 1800 and 900 MHz were pulsed according to the GSM-standard of cellular phones. The specific absorption rates were determined from computer simulations of the electromagnetic fields inside the exposure devices by considering the structure of the physiological test arrangement. The electrical membrane parameters were measured by whole cell patch-clamp. None of the tested electrophysiological parameters was changed significantly by exposure to RF fields. Another physical stimulus, lowering the temperature from 36 degrees C to 24 degrees C, decreased the current amplitude almost 50% and shifted the voltage dependence

of the steady state activation parameter d(infinity) and inactivation parameter f(infinity) of L-type Ca(2+) current by about 5 mV. However, at this lower temperature RF effects (900 MHz, 250 mW/kg; 1800 MHz, 480 mW/kg) on L-type Ca(2+) current were also not detected.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Litovitz T A et al. 1993

Litovitz T A, Krause D, Penafiel M, Elson E C, Mullins J M
The role of coherence time in the effect of microwaves on ornithine decarboxylase activity
In: Bioelectromagnetics, 14. Jg. (1993), S. 395.

ABSTRACT:
Previously, we demonstrated the requirements for a minimum coherence time of an applied, small amplitude (10 microT) ELF magnetic field if the field were to produce an enhancement of ornithine decarboxylase activity in L929 fibroblasts. Further investigation has revealed a remarkably similar coherence time phenomenon for enhancement of ornithine decarboxylase activity by amplitude-modulated 915 MHz microwaves of large amplitude (SAR 2.5 W/kg). Microwave fields modulated at 55, 60, or 65 Hz approximately doubled ornithine decarboxylase activity after 8 h. Switching modulation frequencies from 55 to 65 Hz at coherence times of 1.0 s or less abolished enhancement, while times of 10 s or longer provided full enhancement. Our results show that the microwave coherence effects are remarkably similar to those observed with ELF fields.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Litovitz T A et al. 1997

Litovitz T A, Penafiel M, Krause D, Zhang D, Mullins J M
The role of temporal sensing in bioelectromagnetic effects
In: Bioelectromagnetics, 18. Jg. (1997), S. 388.

ABSTRACT:
Experiments were conducted to see whether the cellular response to electromagnetic (EM) fields occurs through a detection process involving temporal sensing. L929 cells were exposed to 60 Hz magnetic fields and the enhancement of ornithine decarboxylase (ODC) activity was measured to determine cellular response to the field. In one set of experiments, the field was turned alternately off and on at intervals of 0.1 to 50 s. For these experiments, field coherence was maintained by eliminating the insertion of random time intervals upon switching. Intervals < or = 1 s produced no enhancement of ODC activity, but fields switched at intervals > or 10 s showed ODC activities that were enhanced by a factor of approximately 1.7. These data indicate that it is the interval over which field parameters (e.g., amplitude or frequency) remain constant, rather than the interval over which the field is coherent, that is critical to cellular response to an EMF. In a second set of experiments, designed to determine how long it would take for cells to detect a change in field parameters, the field was interrupted for brief intervals (25-200 ms) once each second throughout exposure. In this situation, the extent of EMF-induced ODC activity depended upon the duration of the interruption. Interruptions > or = 100 ms were detected by the cell as shown by elimination of field-induced enhancement of ODC. That two time constants (0.1 and 10 s) are involved in cellular EMF detection is consistent with the temporal sensing process associated with bacterial chemotaxis. By analogy with bacterial temporal sensing, cells would continuously sample and average an EM field over intervals of about 0.1 s (the "averaging" time), storing the averaged value in memory. The cell would compare the stored value with the current average, and respond to the EM field only when field parameters remain constant over intervals of approximately 10 s (the "memory" time).

SCHLAGWÖRTER:
bioassay; experimentally; elf; biological effects

Litovitz T A et al. 1997a

Litovitz T A, Penafiel L M, Farrel J M, Krause D, Meister R, Mullins J M
Bioeffects induced by exposure to microwaves are mitigated by superposition of ELF noise
In: Bioelectromagnetics, 18. Jg. (1997), S. 422.

ABSTRACT:
We have previously demonstrated that microwave fields, amplitude modulated (AM) by an extremely low-frequency (ELF) sine wave, can induce a nearly twofold enhancement in the activity of ornithine decarboxylase (ODC) in L929 cells at SAR levels of the order of 2.5 W/kg. Similar, although less pronounced, effects were also observed from exposure to a typical digital cellular phone test signal of the same power level, burst modulated at 50 Hz. We have also shown that ODC enhancement in L929 cells produced by exposure to ELF fields can be inhibited by superposition of ELF noise. In the present study, we explore the possibility that similar inhibition techniques can be used to suppress the microwave response. We concurrently exposed L929 cells to 60 Hz AM microwave fields or a 50 Hz burst-modulated DAMPS (Digital Advanced Mobile Phone System) digital cellular phone field at levels known to produce ODC enhancement, together with band-limited 30-100 Hz ELF noise with root mean square amplitude of up to 10 microT. All exposures were carried out for 8 h, which was previously found to yield the peak microwave response. In both cases, the ODC enhancement was found to decrease exponentially as a function of the noise root mean square amplitude. With 60 Hz AM microwaves, complete inhibition was obtained with noise levels at or above 2 microT. With the DAMPS digital cellular phone signal, complete inhibition occurred with noise levels at or above 5 microT. These results suggest a possible practical means to inhibit biological effects from exposure to both ELF and microwave fields.

SCHLAGWÖRTER:
bioassay; experimentally; elf/hf; biological effects

Liu D-S et al. 1990

Liu D-S, Astumian R D, Tsong T Y
Activation of Na + and K + pumping modes of (Na, K)-ATPase by an oscillating electric field
In: J Biol Chem, 265. Jg. (1990), S. 7260.

ABSTRACT:
Serpersu and Tsong (Sepersu, E. H., and Tsong, T. Y. (1983) J. Membr. Biol. 74, 191-201; (1984) J. Biol. Chem. 259, 7155-7162) reported activation of a K+ pumping mode of (Na,K)-ATPase by an oscillating electric field (20 V/cm, 1.0 kHz). Their attempts to activate Na+ pumping at the same frequency were unsuccessful. We report here activation of a Na+ pumping mode with an oscillating electric field of the same strength as used previously (20 V/cm) but at a much higher frequency (1.0 MHz). At 3.5 degrees C and the optimal amplitude and frequency, the field-induced, ouabain-sensitive (0.2 mM ouabain incubated for 30 min) Rb+ influx ranged between 10 and 20 amol/red blood cell/h, and the corresponding Na+ efflux ranged between 15 and 30 amol/red blood cell/h, varying with the source of the erythrocytes. No Rb+ efflux nor Na+ influx was stimulated by the applied field in the frequency range 1 Hz to 10 MHz. These results indicate that only those transport modes that require ATP splitting under the physiological condition were affected by the applied electric fields, although the field-stimulated Rb+ influx and Na+ efflux did not depend on the cellular ATP concentration in the range 5 to 800 microM. Computer simulation of a four-state enzyme electroconformationally coupled to an alternating electric field (Tsong, T. Y., and Astumian, R. D. (1986) Bioelectrochem. Bioenerg. 15, 457-

476; Tsong, T. Y. (1990) Annu. Rev. Biophys. Biophys. Chem. 19, 83-106) reproduced the main features of the above results.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lloyd D C et al. 1984

Lloyd D C, Saunders R D, Finnon P, Kowalczuk C

No clastogenic effect from in vitro microwave irradiation of G 0 human lymphocytes

In: Int J Radiat Biol, 46. Jg. (1984), S. 135.

ABSTRACT:
Specimens of human blood were exposed at specific energy absorption rates of 104 or 193 W kg-1 to 2.45 GHz microwave radiation at temperatures below 36 degrees C. Cultured lymphocytes were examined for induced unstable chromosome and chromatid aberrations and sister chromatid exchanges. The amount of chromosome damage observed did not exceed that found in controls.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Lloyd D C et al. 1986

Lloyd D C, Saunders R D, Moquet J E, Kowalczuk C I

Absence of chromosomal damage in human lymphocytes exposed to microwave radiation with hyperthermia

In: Bioelectromagnetics, 7. Jg. (1986), S. 235.

ABSTRACT:
Specimens of human blood were exposed to 0, 4, 40, 100, and 200 Wkg-1 of 2.45 GHz microwave radiation for 20 minutes. The blood temperature was carefully controlled so that it rose from 37 to 40 degrees C. Cultured lymphocytes were examined for induced chromosomal damage but no effect in excess of background was observed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

London S J et al. 1991

London S J, Thomas D C, Bowman J D, Sobel E, Cheng T C, Peters J M

Exposure to residential electric and magnetic fields and risk of childhood leukemia

In: Am J Epidemiol, 134. Jg. (1991), S. 923.

ABSTRACT:
The relation between exposure to electric and magnetic fields in the home, as assessed by measurements, wiring configuration, and self-reported appliance use, and risk of leukemia was investigated in a case-control study among children from birth to age 10 years in Los Angeles County, California. Cases were ascertained through a population-based tumor registry from 1980 to 1987. Controls were drawn from friends and by random digit dialing. Interviews were obtained from 232 cases and 232 controls. Available for analysis were measurements of the magnetic field in the child's bedroom over 24 hours or longer (164 cases and 144 controls), spot measurements of magnetic and electric fields (140 cases and 109 controls), and wiring configuration (219 cases and 207 controls). No clear associations between leukemia risk and measured magnetic or electric fields were seen. An association between the Denver Wertheimer-Leeper wiring configuration and childhood leukemia risk was observed (odds ratio for very high relative to very low current and underground configuration combined = 2.15, 95% confidence interval 1.08-4.28; p for trend = 0.008) and was not substantially altered by adjustment for potential confounding factors. Cases were more likely than controls to report use of several appliances that produce high electric and magnetic fields. Our results support an association between childhood leukemia risk and wiring configuration, but not direct measurements of electric and magnetic fields.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

London S J et al. 1994

London S J, Bowman J D, Sobel E, Thomas D C, Garabrant D H, Pearce N, Bernstein L, Peters J M

Exposure to magnetic fields among electrical workers in relation to leukemia risk in Los Angeles County

In: Am J Ind Med, 26. Jg. (1994), S. 47.

ABSTRACT:
To address the hypotheses that electrical workers are exposed to higher magnetic fields and are at higher risk of leukemia than nonelectrical workers, we performed a registry-based case-control study among men aged 20-64 years with known occupation who were diagnosed with cancer in Los Angeles County between 1972 and 1990. Controls were men with cancers other than those of the central nervous system or leukemia. Magnetic field measurements on workers in each electrical occupation and in a random sample of occupations presumed to be nonelectrical were used to estimate magnetic field exposures for each occupation. Among men in electrical occupations, 121 leukemias were diagnosed. With the exception of electrical engineers, magnetic field exposures were higher among workers in electrical occupations than in nonelectrical occupations. A weakly positive trend in leukemia risk across average occupational magnetic field exposure was observed (odds ratio [OR] per 10 milligauss increase in average magnetic field = 1.2, 95% confidence interval [CI] 1.0-1.5). A slightly stronger association was observed for chronic myloid leukemia, although only 28 cases occurred among electrical workers (OR 10 milligauss increase = 1.6, 95% CI = 1.2-2.0). The results were not materially altered by adjustment for exposure to several agents known or suspected to cause leukemia. Although not conclusive, these results are consistent with findings from studies based on job title alone that electrical workers may be at slightly increased risk of leukemia.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf/hf; cancer

Loomis A et al. 1998

Loomis A, Kromhout H, Kleckner R C, Savitz D A

Effects of the analytical treatment of exposure data on associations of cancer and occupational magnetic field exposure

In: Am J Ind Med, 34. Jg. (1998), S. 49.

ABSTRACT:
Epidemiological studies of cancer among workers exposed to magnetic fields have yielded inconsistent results. This variability may be partly explained by differences in study methods. To assess sensitivity to such methods, data from a previous study of brain cancer and leukemia among electric power company workers were reanalyzed using alternative models, which incorporated uncertainty about the intensity of historical exposures, alternative cut points for categorizing the exposure variable for analysis, and a range of lags for describing cancer latency. Mortality rate ratios for leukemia ranged from 0.8-1.5. For brain cancer, increasing cumulative magnetic field exposure was associated with increasing mortality in virtually all models, with rate ratios between 1.3-3.4 for the most exposed workers. These rate ratios are consistent with previous analyses suggesting a 1.5-3.0-fold increase in the risk of brain cancer but no association with leukemia, and confirm that the previous results are not dependent on arbitrary decisions in applying the exposure data.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Loomis D et al. 1994

Loomis D P, Peipins L A, Browning S R, Howard R L, Kromhout H, Savitz D A

Organization and classification of work history data in industry-wide studies: an application to the electric power industry

In: Am J Ind Med, 26. Jg. (1994), S. 413.

ABSTRACT:
Industry-based cohort studies require systems for organizing work history data. Although the ultimate goal may be to assess the hazards of specific exposures, classification of the job titles that comprise work histories serves an important descriptive purpose in itself and is often necessary before exposure data can be obtained. A system we have created for organizing jobs in a study of 135,000 workers at five electric power companies highlights conceptual and practical issues in managing work history data for epidemiological studies. Job characteristics including function, location, and authority were used to develop a system of 28 occupational categories. Comprehensibility, flexibility, and efficiency were important criteria in designing the system. Assessment of exposures was an implicit goal; the same categories will define job-exposure matrices for numerous agents. A combination of computer algorithms and expert judgment was used to assign individual job titles to the categories. This system facilitates examining the effects of various agents and controlling for confounding. The 28 categories can be collapsed and regrouped to analyze disease risks in relation to exposures to magnetic fields and other agents; even exposures not previously considered could be brought into the study with this generic system for organizing the electric power industry.

SCHLAGWÖRTER:
epidemiology; other type; none; others

Loomis D et al. 1999

Loomis D, Lagorio S, Salvan A, Comba P

Update of evidence on the association of childhood leukemia and 50/60 Hz magnetic field exposure

In: J Expo Anal Environ Epidemiol, 9. Jg. (1999), S. 99.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Loomis D P et al 1990

Loomis D P, Savitz D A

Mortality from brain cancer and leukaemia among electrical workers

In: Br J Ind Med, 47. Jg. (1990), S. 633.

ABSTRACT:
The relation of brain cancer and mortality from leukaemia to electrical occupations was investigated in a case-control study based on all deaths in 1985 and 1986 in the 16 states in the United States that report occupational data from death certificates to the national vital statistics registry. The case series comprised all 2173 men who died of primary brain cancer (International Classification of Diseases-9 ((ICD-9) code 191) and all 3400 who died of leukaemia (ICD-9 codes 204-208). Each was matched with 10 controls who died of other causes in the same year. Men employed in any electrical occupation had age race adjusted odds ratios (ORs) of 1.4 (95% confidence interval (CI) 1.1-1.7) for brain cancer and 1.0 (95% CI 0.8-1.2) for leukaemia, compared with men in all other occupations. Brain cancer odds ratios were larger for electrical engineers and technicians (OR 2.7, 95% CI 2.1-3.4), telephone workers (OR 1.6, 95% CI 1.1-2.4), electric power workers (OR 1.7, 95% CI 1.1-2.7), and electrical workers in manufacturing industries (OR 2.1, 95% CI 1.3-3.4). There was some evidence of excess leukaemia among the same groups (ORs of 1.1-1.5) despite absence of an association for all electrical workers. The excess of deaths from brain cancer was concentrated among men aged 65 or older, whereas leukaemia was associated with electrical work only among younger decedents and those with acute lymphocytic leukaemia. These results from a large and geographically diverse population corroborate reports of increased mortality from brain cancer among electrical workers, but gives only limited support to suggestions of excess deaths from leukaemia.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Loomis D P et al. 1994

Loomis D P, Savitz D A, Ananth C V

Breast cancer mortality among female electrical workers in the United States

In: J Natl Cancer Inst, 86. Jg. (1994), S. 921.

ABSTRACT:
BACKGROUND: Previous epidemiologic studies have suggested that exposure to electric or magnetic fields in occupational and residential environments may cause cancer. Recent experimental findings provide some support for the hypothesis that exposure to extremely low-frequency electromagnetic fields reduces the pineal gland's nocturnal production of the hormone melatonin, thereby increasing susceptibility to sex hormone-related cancers such as breast cancer. PURPOSE: Our purpose was to assess the evidence that cancer of the female breast might be associated with exposure to extremely low-frequency electromagnetic fields. METHODS: Records of women who had breast cancer as the underlying cause of their death (ICD-9 174) and control subjects (four per case) were selected from computer files of U.S. mortality data for the years 1985-1989. Women 20 years and older at the time of their death were eligible for inclusion if they were residents of and died in one of the 24 states that provided death certification records with occupation and industry codes to the National Center for Health Statistics for at least 1 year during the study interval. Data from death certificates were used to classify the case and control subjects with regard to potential occupational exposure to electric and magnetic fields. Control subjects were a random sample of women who died of any other underlying cause, excluding leukemia and brain cancer. RESULTS: The data analysis contrasted 68 women with breast cancer and 199 controls, all with electrical occupations, with 27,814 women with breast cancer and 110,750 controls, all of whom had other occupations. Electrical workers had excess mortality from breast cancer relative to other employed women [odds ratio (OR) = 1.38; 95% confidence interval (CI) = 1.04-1.82]). Adjusted ORs for specific electrical occupations were 1.73 (95% CI = 0.92-3.25) for electrical engineers, 1.28 (95% CI = 0.79-2.07) for electrical technicians, and 2.17 (95% CI = 1.17-4.02) for telephone installers, repairers, and line workers. There was no excess of breast cancer, however, in seven other occupations held more frequently by women and also involving potentially elevated electrical exposures, including telephone operators, data keyers, and computer operators and programmers. CONCLUSIONS: In light of the limitations inherent in death certification data and the design of this study, any conclusions regarding the hypothesis that exposure to extremely low-frequency electromagnetic fields causes breast cancer among women must be limited. Nevertheless, our findings are broadly consistent with that hypothesis and encourage further investigation with improvements in study design and data quality.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Lovely R H et al. 1994

Lovely R H, Buschbom R L, Slavich A L, Anderson L E, Hansen N H, Wilson B W

Adult leukemia risk and personal appliance use: a preliminary study

In: Am J Epidemiol, 140. Jg. (1994), S. 510.

ABSTRACT:
The hypothesis that use of personal electric appliances may be associated with increased risk of acute nonlymphocytic leukemia in adults was tested using interview data from a previously completed case-control study of 114 cases and 133 controls conducted between 1981 and 1984. Cases were obtained from a population-based cancer registry in western Washington state, and controls were obtained from the same area by random digit dialing. Of 32 electrical home appliances for which data on use were available for adult acute nonlymphocytic leukemia cases and controls, three motor-driven personal appliances (electric razors, hair dryers, and massage units) were selected a priori because their use represents exposure to higher peak magnetic fields than that from most other home appliances. When compared on an "ever used" versus "never used" basis, use of one or more of these appliances was not associated with increased risk of leukemia in the population studied (odds ratio (OR) = 0.71, 95% confidence interval (CI) 0.41-1.24). When the appliances were considered individually, massage units were more likely to have been used by cases than by controls (OR = 3.00, 95% CI 1.43-6.32), while hair dryers were more likely to have been used by controls than cases (OR = 0.38, 95% CI 0.22-0.66). There was a nonsignificant tendency for electric razor use to differentiate the cases from controls (OR = 1.33, 95% CI 0.80-2.23). When reported daily time of use was stratified, there was no overall increased risk with increased time of use except for electric razors ($p < 0.05$). In addition to the analysis of appliance use data from the case-control study, the authors obtained several models of these motor-driven personal appliances and characterized the magnetic fields they produce. Magnetic field flux density, or the B-field, and spectral measurements showed that partial body exposure from such appliances may exceed 0.5 mTesla (root mean squared) at rates-of-change exceeding 10 Tesla/sec. These epidemiologic data must be interpreted cautiously because the number of cases is limited and because of proxy reporting of appliance use for deceased cases. Nevertheless, the authors believe these data indicate that peak magnetic field exposure from personal appliances warrants further investigation as a possible risk factor for acute nonlymphocytic leukemia in adults.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Lu S T et al. 2000

Lu S T, Mathur S P, Stuck B, Zwick H, D'Andrea J M, Merritt J H, Lutty G, Mcleod D S, Johnson M

Effects of high peak power microwaves on the retina of the rhesus monkey

In: Bioelectromagnetics, 21. Jg. (2000), S. 1.

ABSTRACT:
We studied the retinal effects of 1.25 GHz high peak power microwaves in Rhesus monkeys. Preexposure fundus photographs, retinal angiograms, and electroretinograms (ERG) were obtained to screen for normal ocular structure and function and, after exposure, as endpoints of the study. Histopathology of the retina was an additional endpoint. Seventeen monkeys were randomly assigned to receive sham exposure or pulsed microwave exposures. Microwaves were delivered anteriorly to the face at 0, 4.3, 8.4, or 20.2 W/kg spatially and temporally averaged retinal specific absorption rates (R-SAR). The pulse characteristics were 1.04 MW (approximately 1.30 MW/kg temporal peak R-SAR), 5.59 micros pulse length at 0, 0.59, 1. 18, and 2.79 Hz pulse repetition rates. Exposure was 4 h per day and 3 days per week for 3 weeks, for a total of nine exposures. The preexposure and postexposure fundus pictures and angiograms were all within normal limits. The response of cone photoreceptors to light flash was enhanced in monkeys exposed at 8.4 or 20.2 W/kg R-SAR, but not in monkeys exposed at 4.3 W/kg R-SAR. Scotopic (rod) response, maximum (combined cone and rod) response, and Naka-Rushton R(max) and log K of scotopic b-waves were all within normal range. Retinal histopathology revealed the presence of enhanced glycogen storage in photoreceptors among sham (2/5), 8.4 W/kg (3/3), and 20.2 W/kg (2/5) exposed monkeys, while enhanced glycogen storage was not observed in the 4.3 W/kg (0/4) exposed group. Supranormal cone photoreceptor b-wave was R-SAR dependent and may be an early indicator of mild injury. However no evidence of degenerative changes and ERG depression was seen. We concluded that retinal injury is very unlikely at 4 W/kg. Functional changes that occur at higher R-SAR are probably reversible since we saw no evidence of histopathologic correlation with ERG changes.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Mack W et a. 1991

Mack W, Preston-Martin S, Peters J M

Astrocytoma risk related to job exposure to electric and magnetic fields

In: Bioelectromagnetics, 12. Jg. (1991), S. 57.

ABSTRACT:
To investigate the association between occupational exposure to low-frequency electric and magnetic (EM) fields and risk of brain tumors, a study was performed in Los Angeles County on 272 male adults with primary intracranial gliomas or meningiomas and 272 neighborhood controls. Complete occupational histories were collected. Risk associated with employment for more than 10 years in jobs that are presumed to entail exposure to EM fields was computed for various histological groupings. A nonsignificantly elevated risk of 1.7 was found for gliomas (all types pooled: 95% confidence interval 0.7-4.4), and a nonsignificantly reduced risk of 0.3 (95% confidence interval 0.03-3.2) was found for meningiomas. For astrocytomas, which form a subtype of the gliomas, a significantly elevated risk of 10.3 (95% confidence interval 1.3-80.8) was found; a significant upward trend (P = .01) of tumor incidence with increasing length of employment was observed. Most astrocytoma patients who worked in occupations involving exposure to EM fields were electricians or electrical engineers.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Maes A et al. 1993

Maes A, Verschaeve L, Arroyo A, De Wagter C, Vercruyssen L

In vitro cytogenetic effects of 2450 MHz waves on human peripheral blood lymphocytes

In: Bioelectromagnetics, 14. Jg. (1993), S. 495.

ABSTRACT:
Cytogenetic analyses were performed on human peripheral blood lymphocytes exposed to 2450 MHz microwaves during 30 and 120 min at a constant temperature of 36.1 degrees C (body temperature). The temperature was kept constant by means of a temperature probe put in the blood sample which gives feedback to a microcomputer that controls the microwave supply. We found a marked increase in the frequency of chromosome aberrations (including dicentric chromosomes and acentric fragments) and micronuclei. On the other hand the microwave exposure did not influence the cell kinetics nor the sister chromatid exchange (SCE) frequency.

SCHLAGWÖRTER:

bioassay; experimentally; hf; biological effects

Maes A et al. 1995

Maes A, Collier M, Slaets D, Verschaeve L
Cytogenetic effects of microwaves from mobile communication frequencies (954 MHz)
In: Electro-Magnetobiology, 14. Jg. (1995), S. 91.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Maes A et al. 1996

Maes A, Collier M, Slaets D, Verschaeve L
954 MHz microwaves enhance the mutagenic properties of mitomycin C
In: Environ Mol Mutagen, 28. Jg. (1996), S. 26.

ABSTRACT:
This paper focuses on the combined effects of microwaves from mobilecommunication frequencies and a chemical DNA damaging agent mitomycin C(MMC). The investigation was performed in vitro by exposing whole bloodsamples to a 954 MHz emitting antenna from a GSM (Global System for MobileCommunication) base station, followed by lymphocyte cultivation in thepresence of MMC. A highly reproducible synergistic effect was observed asbased on the frequencies of sister chromatid exchanges in metaphasefigures.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Maes A et al. 1997

Maes A, Collier M, Van Gorp U, Vandoninck S, Verschaeve L
Cytogenetic effects of 935.2-MHz (GSM) microwaves alone and in combination with mitomycin C
In: Mutat Res, 393. Jg. (1997), S. 151.

ABSTRACT:
This paper focuses on the genetic effects of microwaves from mobile communication frequencies (935.2 MHz) alone and in combination with a chemical DNA-damaging agent (mitomycin C). Three cytogenetic endpoints were investigated after in vitro exposure of human whole blood cells. These endpoints were the 'classical' chromosome aberration test, the sister chromatid exchange test and the alkaline comet assay. No direct cytogenetic effect was found. The combined exposure of the cells to the radiofrequency fields followed by their cultivation in the presence of mitomycin C revealed a very weak effect when compared to cells exposed to mitomycin C alone.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Maes A et al. 2001

Maes A, Collier M, Verschaeve L
Cytogenetic effects of 900 MHz (GSM) microwaves in human lymphocytes
In: Bioelectromagnetics, 22. Jg. (2001), S. 91.

ABSTRACT:
The cytogenetic effects of 900 MHz radiofrequency fields were investigated with the chromosome aberration and sister chromatid exchange frequency methods. Three different modes of exposure (continuous, pseudo-random and dummy burst) were studied for different power outputs (0, 2, 8, 15, 25, 50 W). The specific absorption rates varied between 0 and 10 W/kg. We investigated the possible effects of the 900 MHz radiation alone as well as of combined exposure to the chemical or physical mutagens mitomycin C and X-rays. Overall, no indication was found of a mutagenic, and/or co-mutagenic/synergistic effect of this kind of nonionizing

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Magras I N et al. 1997

Magras I N, Xenos T D
RF radiation-induced changes in the prenatal development of mice
In: Bioelectromagnetics, 18. Jg. (1997), S. 455.

ABSTRACT:
The possible effects of radiofrequency (RF) radiation on prenatal development has been investigated in mice. This study consisted of RF level measurements and in vivo experiments at several places around an "antenna park." At these locations RF power densities between 168 nW/cm2 and 1053 nW/cm2 were measured. Twelve pairs of mice, divided in two groups, were placed in locations of different power densities and were repeatedly mated five times. One hundred eighteen newborns were collected. They were measured, weighed, and examined macro- and microscopically. A progressive decrease in the number of newborns per dam was observed, which ended in irreversible infertility. The prenatal development of the newborns, however, evaluated by the crown-rump length, the body weight, and the number of the lumbar, sacral, and coccygeal vertebrae, was improved.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Malyapa R S et al 1997

Malyapa R S, Ahern E W, Straube W L, Moros E G, Pickard W F, Roti Roti J L
Measurement of DNA damage following exposure to 2450 MHz electromagnetic radiation
In: Radiat Res, 148. Jg. (1997), S. 608.

ABSTRACT:
Recent reports suggest that exposure to 2450 MHz electromagnetic radiation causes DNA single-strand breaks (SSBs) and double-strand breaks (DSBs) in cells of rat brain irradiated in vivo (Lai and Singh, Bioelectromagnetics 16, 207-210, 1995; Int. J. Radiat. Biol. 69, 513-521, 1996). Therefore, we endeavored to determine if exposure of cultured mammalian cells in vitro to 2450 MHz radiation causes DNA damage. The alkaline comet assay (single-cell gel electrophoresis), which is reportedly the most sensitive method to assay DNA damage in individual cells, was used to measure DNA damage after in vitro 2450 MHz irradiation. Exponentially growing U87MG and C3H 10T1/2 cells were exposed to 2450 MHz continuous-wave (CW) radiation in specially designed radial transmission lines (RTLs) that provided relatively uniform microwave exposure. Specific absorption rates (SARs) were calculated to be 0.7 and 1.9 W/kg. Temperatures in the RTLs were measured in real time and were maintained at 37 +/- 0.3 degrees C. Every experiment included sham exposure(s) in an RTL. Cells were irradiated for 2 h, 2 h followed by a 4-h incubation at 37 degrees C in an incubator, 4 h and 24 h. After these treatments samples were subjected to the alkaline comet assay as described by Olive et al. (Exp. Cell Res. 198, 259-267, 1992). Images of comets were digitized and analyzed using a PC-based image analysis system, and the "normalized comet moment" and "comet length" were determined. No significant differences were observed between the test group and the controls after exposure to 2450 MHz CW irradiation. Thus 2450 MHz irradiation does not appear to cause DNA damage in cultured mammalian cells under these exposure conditions as measured by this assay.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Malyapa R S et al. 1997a

Malyapa R S, Ahern E W, Straube W L, Moros E G, Pickard W F, Roti Roti J L

Measurement of DNA damage following exposure to electromagnetic radiation in the cellular communications frequency band (835.62 and 847.74 MHz)

In: Radiat Res, 148. Jg. (1997), S. 618.

ABSTRACT:
Mouse C3H 10T1/2 fibroblasts and human glioblastoma U87MG cells were exposed to cellular phone communication frequency radiations to investigate whether such exposure produces DNA damage in in vitro cultures. Two types of frequency modulations were studied: frequency-modulated continuous-wave (FMCW), with a carrier frequency of 835.62 MHz, and code-division multiple-access (CDMA) centered on 847.74 MHz. Exponentially growing (U87MG and C3H 10T1/2 cells) and plateau-phase (C3H 10T1/2 cells) cultures were exposed to either FMCW or CDMA radiation for varying periods up to 24 h in specially designed radial transmission lines (RTLs) that provided relatively uniform exposure with a specific absorption rate (SAR) of 0.6 W/kg. Temperatures in the RTLs were monitored continuously and maintained at 37 +/- 0.3 degrees C. Sham exposure of cultures in an RTL (negative control) and 137Cs gamma-irradiated samples (positive control) were included with every experiment. The alkaline comet assay as described by Olive et al. (Exp. Cell Res. 198, 259-269, 1992) was used to measure DNA damage. No significant differences were observed between the test group exposed to FMCW or CDMA radiation and the sham-treated negative controls. Our results indicate that exposure of cultured mammalian cells to cellular phone communication frequencies under these conditions at an SAR of 0.6 W/kg does not cause DNA damage as measured by the alkaline comet assay.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Malyapa R S et al. 1998

Malyapa R S, Ahern E W, Bi C, Straube W L, LaRegina M, Pickard W F, Roti Roti J L

DNA damage in rat brain cells after in vivo exposure to 2450 MHz electromagnetic radiation and various methods of euthanasia

In: Radiat Res, 149. Jg. (1998), S. 637.

ABSTRACT:
The present study was done to confirm the reported observation that low-intensity acute exposure to 2450 MHz radiation causes DNA single-strand breaks (Lai and Singh, Bioelectromagnetics 16, 207-210, 1995). Male Sprague-Dawley rats weighing approximately 250 g were irradiated with 2450 MHz continuous-wave (CW) microwaves for 2 h at a specific absorption rate of 1.2 W/kg in a cylindrical waveguide system (Guy et al., Radio Sci. 14, 63-74, 1979). There was no associated rise in the core body temperature of the rats. After the irradiation or sham treatments, rats were euthanized by either CO2 asphyxia or decapitation by guillotine (eight pairs of animals per euthanasia group). After euthanasia the brains were removed and immediately immersed in cold Ames medium and the cells of the cerebral cortex and the hippocampus were dissociated separately and subjected to the alkaline comet assay. Irrespective of whether the rats were euthanized by CO2 asphyxia or decapitated by guillotine, no significant differences were observed between either the comet length or the normalized comet moment of cells from either the cerebral cortex or the hippocampus of sham-treated rats and those from the irradiated rats. However, the data for the rats asphyxiated with CO2 showed more intrinsic DNA damage and more experiment-to-experiment variation than did the data for rats euthanized by guillotine. Therefore, the guillotine method of euthanasia is the most appropriate in studies relating to DNA damage. Furthermore, we did not confirm the observation that DNA damage is produced in cells of the rat cerebral cortex or the hippocampus after a 2-h exposure to 2450 MHz CW microwaves or at 4 h after the exposure.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Manikowska-Czerska E et al. 1985

Manikowska-Czerska E, Czerski P, Leach WM

Effects of 2.45 GHz microwaves on meiotic chromosomes of male CBA/CAY mice

In: J Hered, 76. Jg. (1985), S. 71.

ABSTRACT:
Male CBA/CAY mice were exposed daily (6 days a week) for 30 minutes in an environmentally controlled waveguide to continuous 2.45 GHz microwave radiation for 2 weeks at average whole body absorbed dose rates of 0.05, 0.5, 10, and 20 mW/g. Shan exposed animals served as controls. Chain translocations were observed at diakinesis at metaphase I in microwave exposed animals. The yield of translocations increased with exposure, and varied nonlinearly with dose rate. An increase in incidence of univalents was seen after exposure at 10 and 20 mW/g. The findings are interpreted to indicate interference with normal spermatogenesis during the exposure period.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Mann K et al. 1996

Mann K, Roschke J

Effects of pulsed high-frequency electromagnetic fields on human sleep

In: Neuropsychobiology, 33. Jg. (1996), S. 41.

ABSTRACT:
In the present study we investigated the influence of pulsed high-frequency electromagnetic fields of digital mobile radio telephones on sleep in healthy humans. Besides a hypnotic effect with shortening of sleep onset latency, a REM suppressive effect with reduction of duration and percentage of REM sleep was found. Moreover, spectral analysis revealed qualitative alterations of the EEG signal during REM sleep with an increased spectral power density. Knowing the relevance of REM sleep for adequate information processing in the brain, especially concerning mnestic functions and learning processes, the results emphasize the necessity to carry out further investigations on the interaction of this type of electromagnetic fields and the human organism.

SCHLAGWÖRTER:
medicine; experimentally; hf; others

Marcer M et al. 1984

Marcer M, Musatti G, Bassett C A

Results of pulsed electromagnetic fields (PEMFs) in ununited fractures after external skeletal fixation

In: Clin Orthop, 190. Jg. (1984), S. 260.

ABSTRACT:
Of 147 patients with fractures of the tibia, femur and humerus, in whom an average of 3.3 operations had failed to produce union, all were treated with external skeletal fixation in situ and pulsed electromagnetic fields (PEMFs). Of the 147, 107 patients united for an overall success rate of 73%. Union of the femur occurred in 81% and the tibia in 75%. Only five of 13 humeri united. Failure to achieve union with PEMFs was most closely associated with very wide fracture gaps and insecure skeletal fixation devices.

SCHLAGWÖRTER:
medicine; other type; hf; others

Marcickiewitcz J et al. 1986

Marcickiewitcz J, Chazan B, Niemiek T, Sokolska G, Troszynski M, Luczak M, Szmiegielski S

Microwave radiation enhances teratogenic effect of cytosine arabinoside in mice

In: Biol Neonate, 50. Jg. (1986), S. 75.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Marcus M 1990

Marcus M

Epidemiologic studies of VDT use and pregnancy outcome

In: Reprod Toxicol, 4. Jg. (1990), S. 51.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; hf; others

Marino A A 1995

Marino A A

Time-dependent hematological changes in workers exposed to electromagnetic fields

In: Am Ind Hyg Assoc J, 56. Jg. (1995), S. 189.

ABSTRACT:
A World War II-era study, involving the effects of electromagnetic fields (EMFs) emanating from radars and high-frequency radios on the blood of exposed workers, was analyzed for evidence of the effect of time in the manifestation of changes in the hematological system. Statistically significant correlations between increasing white blood cell count and average daily exposure, months of exposure, and total duration of exposure to EMFs were found. Changes in cell count were within the normal range, and thus their relation to epidemiological studies linking EMFs and leukemia, if any, is unclear. Results suggest that the time of exposure may be an additional factor (along with field strength, and perhaps frequency) in ascertaining the safety of EMF exposure.

SCHLAGWÖRTER:
epidemiology; ecological; hf; others

Marsh J L et al. 1982

Marsh J L, Armstrong T J, Jacobson A P, Smith R G

Health effect of occupational exposure to steady magnetic fields

In: Am Ind Hyg Assoc J, 43. Jg. (1982), S. 387.

ABSTRACT:
An observational cross sectional study was conducted to determine if long term exposure to steady magnetic fields of up to 200 Oersteds could be related, on a dose-response basis, to findings of medical examinations. Health data were obtained for 320 workers who spent a major portion of their workday in the magnetic fields produced by the direct current through large electrolytic cells. These data were compared to those for a control group of 186 workers. The vertical and horizontal components of the magnetic fields were measured in each cell room and the time weighted average exposure to magnetic fields was calculated for each job classification. The leukocyte count and the monocyte percent were found to decrease, while the lymphocyte percent was found to increase with increased exposure to the horizontal component of the magnetic field. A slight tendency of both the systolic and diastolic blood pressures to increase with increasing exposure to the vertical component of the magnetic field was found in the black workers in the study. No such effect was found in the other racial groups. No other signs or symptoms were found to depend on magnetic field exposure.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Maskarinec G et al. 1994

Maskarinec G, Cooper J, Swygert L

Investigation of increased incidence in childhood leukemia near radio towers in Hawaii: preliminary observations

In: J Environ Pathol Toxicol Oncol, 13. Jg. (1994), S. 33.

ABSTRACT:
Twelve children from the Waianae Coast, Hawaii, were diagnosed with acute leukemia from 1979 to 1990. The standardized incidence ratio (SIR) of 2.09 (95% confidence interval (CI) 1.08 to 3.65) indicates a significant increase. Seven cases occurred between 1982 and 1984 and were unusual in terms of sex, age, and type of leukemia. A case-control study (12 cases, 48 matched controls) explored risk factors, including parents' occupation, X-ray exposure, domestic smoking, family and medical histories, and distance of children's residence locations to low frequency radio towers. The odds ratio (OR) for having lived within 2.6 miles of the radio towers before diagnosis was 2.0 (95% CI 0.06 to 8.3). The clustering may have been a chance event, but because of its peculiar characteristics, we feel it should be noted.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Matanoski G M et al. 1993

Matanoski G M, Elliott E A, Breysse P N, Lynberg M C

Leukemia in telephone linemen

In: Am J Epidemiol, 137. Jg. (1993), S. 609.

ABSTRACT:
This case-control study examines potential associations between telephone linework and the occurrence of leukemia except chronic lymphocytic leukemia in a primarily retired population of American Telephone and Telegraph Company (AT&T) workers. Cases died between 1975 and 1980. Exposure is defined both by job title and, for workers with complete job histories, by a lifetime exposure score based on industrial hygiene personal monitoring measurements of line and nonline jobs. When the time-weighted average mean for each job is accumulated into a lifetime exposure score, workers with scores above the median for the population show an excess of leukemia 2.5 times higher than workers below the median (95% confidence interval (CI) 0.7-8.6). Those individuals with long duration of employment in jobs with intermittent peak exposures may be at higher risk of leukemia than those with a constant exposure level. Analyses that allow for a latent period suggest the risk is associated with exposures that occurred 10 or more years before death. Workers with peak exposure scores above the median have odds ratios of 2.4 (95% CI 0.7-9.0) and 6.6 (95% CI 0.7-58) for latent periods of 10 and 15 years, respectively. The data suggest an increasing risk with increasing exposure (p for trend = 0.05) when cumulated scores are based on peak exposure scores. Peak exposures tended to occur in cable splicing work and in old telephone switching offices. The numbers in this study are small and observed differences may be due to chance.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

McBride M L et al. 1999

McBride M L, Gallagher R P, Theriault G, Armstrong B G, Tamaro S, Spinelli J J, Deadman J E, Fincham S, Robson D, Choi W

Power-frequency electric and magnetic fields and risk of childhood leukemia in Canada

In: Am J Epidemiol, 149. Jg. (1999), S. 831.

ABSTRACT:
In a case-control study of childhood leukemia in relation to

exposure to power-frequency electric and magnetic fields (EMF), 399 children resident in five Canadian provinces who were diagnosed at ages 0-14 years between 1990 and 1994 (June 1995 in British Columbia and Quebec) were enrolled, along with 399 controls. Exposure assessment included 48-hour personal EMF measurement, wire coding and magnetic field measurements for subjects' residences from conception to diagnosis/reference date, and a 24-hour magnetic field bedroom measurement. Personal magnetic fields were not related to risk of leukemia (adjusted odds ratio (OR) = 0.95, p for trend = 0.73) or acute lymphatic leukemia (OR = 0.93, p for trend = 0.64). There were no clear associations with predicted magnetic field exposure 2 years before the diagnosis/reference date or over the subject's lifetime or with personal electric field exposure. A statistically nonsignificant elevated risk of acute lymphatic leukemia was observed with very high wiring configurations among residences of subjects 2 years before the diagnosis/reference date (OR = 1.72 compared with underground wiring, 95% confidence interval 0.54-5.45). These results provide little support for a relation between power-frequency EMF exposure and risk of childhood leukemia.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

McCredie M et al. 1994

McCredie M, Maisonneuve P, Boyle P

Perinatal and early postnatal risk factors for malignant brain tumours in New South Wales children

In: Int J Cancer, 56. Jg. (1994), S. 11.

ABSTRACT:
A population-based case-control study of incident primary malignant brain tumours diagnosed during 1985-1989 in children aged 0 to 14 years was carried out in the coastal conurbation of New South Wales comprising Sydney, Wollongong and Newcastle in the period 1988 to 1990. Personal interviews were conducted using a structured questionnaire with mothers of 82 cases and 164 control children individually matched to the cases by sex and age. Among the hypotheses examined were those related to: N-nitroso compounds (sources included diet, dummies, medications, tobacco smoke); factors associated with the birth of the child; trauma to the head; and irradiation (X-rays and electromagnetic radiation through electric blankets or water beds). Reported ever-use of a dummy increased the risk of childhood brain tumours (OR = 2.9, 95% CI 1.6 to 5.4), although there did not appear to be any consistent indication of rising risk with reported increased levels of use. Compared with children who had never used a dummy, categories of use during the first year of life of a maximum of "no more than 1 hour per day or night", "several hours per day or night", and "most of the day or night" had statistically significant odds ratios of 2.6, 3.4, and 2.7 respectively. Consumption of fruit by the child before the age of one appeared to be protective. No association was found between childhood brain tumours and birth weight, being the first-born child, or factors linked with the child's birth; head injuries; exposure to X-rays; contact with horses, or living on a farm; pesticide treatment of the house during the child's lifetime; or exposure to burning incense.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

McCredie M et al. 1994a

McCredie M, Maisonneuve P, Boyle

Antenatal risk factors for malignant brain tumours in New South Wales children

In: Int J Cancer, 56. Jg. (1994), S. 6.

ABSTRACT:
A population-based case-control study of incident primary malignant brain tumours diagnosed during 1985 to 1989 in children aged 0 to 14 years was carried out in the coastal conurbation of New South Wales comprising Sydney, Wollongong and Newcastle in the period 1988 to 1990. Personal interviews were conducted using a structured questionnaire with mothers of 82 cases and 164 control children individually matched to the cases by sex and age. Among the hypotheses being examined were those related to exposure to parental tobacco smoke, N-nitroso compounds and possible protection from sources of vitamin C. No link was found with tobacco smoking by the mother before or during pregnancy. While exposure during pregnancy of the mother to tobacco smoke of the father appeared to double the risk of childhood brain tumours and a similar risk was found for father (but not mother) smoking before the index pregnancy, there was no "dose-response" and the increased risk was confined to data supplied by the mother (rather than the father himself). The risk of childhood brain tumours rose with reported increasing consumption, during pregnancy, of cured meats, which have high levels of N-nitroso compounds (or their precursors), and fell with rising consumption of vegetables. No association was found between the risk of childhood brain tumours and family history of epilepsy, cancer, or tumours of the nervous system, parental irradiation, previous miscarriage or procedures carried out during pregnancy, maternal consumption of antihistamines, barbiturates or diuretics, or maternal contact with cats or farm-life during pregnancy.

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

McCurdy A L et al. 2001

McCurdy A L, Wijnberg L, Loomis D, Savitz D, Nylander-French L A

Exposure to extremely low frequency magnetic fields among working women and homemakers

In: Ann Occup Hyg, 45. Jg. (2001), S. 643.

ABSTRACT:
Given concerns with potential health effects of exposure to magnetic fields, the goal of this study was to examine the magnitude and sources of occupational and residential exposure to extremely low frequency (primarily 60 Hz) magnetic fields among women. Exposure to 60 Hz magnetic fields was surveyed among cases and controls recruited for a study of breast cancer in 25 counties in North Carolina. The 273 women who participated wore an integrating personal magnetic-field exposure meter (AMEX 3-D) that measured their time-weighted average (TWA) exposure. A questionnaire was administered to determine the duration and frequency of electric appliance and machinery use. The geometric mean (GM) of the TWA exposure for employed women was 0.138 microT (range 0.022-3.636 microT) and for homemakers 0.113 microT (range 0.022-0.403 microT). Women working in manufacturing and industrial facilities had the highest exposure (GM 0.265 microT, range 0.054-3.436 microT), while nurses and health technicians (GM 0.134 microT, range 0.032-0.285 microT) and teachers and school administrators (GM 0.099 microT, range 0.035-0.673 microT) had the lowest exposures. Job titles, unless very limited in scope and/or environment, self-reported information about equipment use, potential exposure sources, time, and distance were not good predictors of magnetic-field exposure. Furthermore, the results show that occupations previously observed to have increased risk of breast cancer, such as teachers, nurses, administrative support, and housewives, did not have elevated average magnetic field exposures. Therefore, it is questionable whether exposure to power frequency magnetic fields is the cause of the increased breast cancer risk seen in these occupations.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

McDonald A D et al. 1986

McDonald A D, Cherry N M, Delorme C, McDonald J C

Visual display units and pregnancy: evidence from the Montreal survey

In: J Occup Med, 28. Jg. (1986), S. 1226.

ABSTRACT:
Data on 56,012 current and 48,608 previous pregnancies were obtained by interview in 11 Montreal hospitals, 1982 to 1984, after delivery or spontaneous abortion. In 17,632 pregnancies in occupations with substantial use of visual display units (VDUs), users and nonusers had similar rates of congenital defects in both current and previous pregnancies and of abortions in previous pregnancies. In current pregnancies there was an excess of abortions in users which could have been due to biased recall. In a further analysis of all 42 occupational groups ranked according to percentage use of VDUs, the risk of spontaneous abortion in both current and previous pregnancies was the same irrespective of the amount of VDU use. Thus, the study does not support the suggestion that work with a VDU in pregnancy increases the risk of congenital defect or spontaneous abortion.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

McDonald A D et al. 1988

McDonald A D, McDonald J C, Armstrong B, Cherry N, Nolin A D, Robert D

Work with visual display units in pregnancy

In: Br J Ind Med, 45. Jg. (1988), S. 509.

ABSTRACT:
Data from the Montreal survey on occupational factors in pregnancy were used to test the hypothesis that visual display units (VDUs) constitute a hazard to reproduction. Use of a VDU was recorded in 4712 current and 2164 previous pregnancies of women in full time employment at time of conception. After allowance for seven confounding variables, the risk of spontaneous abortion in current pregnancies relative to all working women was 1.19 (90% CI 1.09-1.30) and in previous pregnancies, 0.97. In an analysis by occupational title, in which 60 occupational groups were aggregated into eight categories according to use of VDUs, the relative risk for spontaneous abortion was 1.06 (90% CI 0.8-1.4) in current pregnancies and 1.01 (90% CI 0.7-1.3) in previous pregnancies. This suggests that the small excess of spontaneous abortions among individual women reporting the use of VDUs in current pregnancies may have been due to recall bias. Relative risks for stillbirth, preterm birth, and low birth weight all had 90% confidence limits which included unity. In an analysis of congenital defects the number of pregnancies was increased to include women who worked 15 or more hours a week. In all but one of nine groups of congenital defect examined confidence limits for the relative risk included unity in both current and previous pregnancies. The relative risks for the renal urinary group of defects were raised in both current (1.84, 90% CI 1.07-3.15) and previous pregnancies (1.66, 90% CI 0.82-3.25). There being no prior reason to suspect a causal link with this type of defect, interpretation remains open to question.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

McDowall M E 1986

McDowall M E

Mortality of persons resident in the vicinity of electricity transmission facilities

In: Br J Cancer, 53. Jg. (1986), S. 271.

ABSTRACT:
Several studies have raised the possibility that exposure to electrical and/or magnetic fields may be injurious to health in particular by the promotion or initiation of cancer. To investigate whether the electricity transmission system presents a long term hazard to public health, the mortality of nearly 8,000 persons, identified as living in the vicinity of electrical transmission facilities at the time of the 1971 Population Census, has been followed to the end of 1983. All identified transmission installations within pre-defined areas were included in the study with the result that the greater part of the study group were believed to be resident near relatively low voltage sub-stations. Overall mortality was lower than expected and no evidence of major health hazards emerged. The only statistically significant excess mortality was for lung cancer (in women overall, and in persons living closest to the installations); this result is difficult to interpret in the absence of smoking data, and is not supported by other evidence but does not appear to be due to the social class distribution of the study group. The study did not support previously reported associations of exposure to electro-magnetic fields with acute myeloid leukaemia, other lymphatic cancers and suicide.

SCHLAGWÖRTER:
epidemiology; ecological; elf; mortality

McElroy J A et al. 2001

McElroy J A, Newcomb P A, Remington P L, Egan K M, Titus-Ernstoff L, Trentham-Dietz A, Hampton J M, Baron J A, Stampfer M J, Willett W C

Electric blanket or mattress cover use and breast cancer incidence in women 50-79 years of age

In: Epidemiology, 12. Jg. (2001), S. 613.

ABSTRACT:
Previous research has demonstrated inconsistent associations between electromagnetic radiation, especially from electric blanket use, and breast cancer. Breast cancer risk according to electric blanket or mattress cover use was examined as part of a multicenter population-based case-control study. Breast cancer patients 50-79 years of age (N = 1949) were identified from statewide tumor registries in Massachusetts, New Hampshire, and Wisconsin from the period June 1994 to July 1995. Women of similar age were randomly selected from population lists as controls. Information regarding electric blanket and mattress cover use and breast cancer risk factors was obtained through telephone interviews. After adjustment for age, body mass index, and other breast cancer risk factors, the risk of breast cancer was similar among ever-users (relative risk = 0.93; 95% confidence interval = 0.82-1.06) and lower among current users than among never-users (relative risk = 0.79; 95% confidence interval = 0.66-0.95). There was no evidence of a dose-response relation with increasing number of months that electric blankets had been used. This study provides evidence against a positive association between electric blanket or mattress cover use and breast cancer.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

McElroy J A et al. 2002

McElroy J A, Newcomb P A, Trentham-Dietz A, Hampton J M, Kanarek M S, Remington P L

Endometrial cancer incidence in relation to electric blanket use

In: Am J Epidemiol, 156. Jg. (2002), S. 262.

ABSTRACT:
Investigators have posited that electromagnetic fields may influence cancer risk through estrogenic hormonal mechanisms; however, there have been no studies reporting on electric blanket exposure in relation to endometrial cancer. The authors examined this possible association between endometrial cancer risk and electric blanket or mattress cover use as part of a population-based, case-control study. This analysis included incident endometrial cancer cases 40-79 years of age, interviewed during 1994 (n = 148; response rate, 87%) and identified from the Wisconsin tumor registry. Female controls of

similar age were randomly selected from population lists (n = 659; response rate, 85%). Information regarding electric blanket and mattress cover use and endometrial cancer risk factors was obtained through structured telephone interviews approximately 1 year after diagnosis. After adjustment for age, body mass index, and postmenopausal hormone use, the risk of endometrial cancer was similar among ever users (odds ratio = 1.04, 95% confidence interval: 0.70, 1.55) and among current users (odds ratio = 0.87, 95% confidence interval: 0.49, 1.54) as compared with never users. Despite its small size and potential misclassification of exposure, this study provides evidence against an association between electric blanket or mattress cover use and endometrial cancer.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

McKenzie D R et al. 1998

McKenzie D R, Yin Y, Morrell S

Childhood incidence of acute lymphoblastic leukemia and exposure to broadcast radiation in Sydney - a second look

In: Aust NZ J Public Health, 22. Jg. (1998), H. Suppl, S. 360.

ABSTRACT:
INTRODUCTION: Recent findings of an apparent association between incidence of childhood leukaemia and radio frequency radiation (RFR) from television transmission antennas in Sydney, NSW, are examined. METHODS: Incidence of childhood (0-14 years) acute lymphoblastic leukaemia (ALL) at the local government area (LGA) level is related to estimated exposure levels of RFR from television transmission antennas, using Poisson regression techniques. RESULTS: Most of the association between ALL incidence and television transmission RFR is shown to be the result of an influential observation: one of the highly exposed LGAs contributes all the excess, while in a similarly exposed LGA childhood ALL incidence was found to be no higher than the rate expected for NSW. With the influential observation excluded from the analysis, no positive correlation between exposure to RFR and leukaemia is evident. Conversely, under the assumption of an association with RFR, the low probability of the observed incident cases in LGAs under conditions of relatively high exposure to RFR conflicts with the assumption of an effect. CONCLUSION: The apparent association between childhood ALL incidence and RFR radiation from television towers is weaker when an LGA-level analysis is conducted.

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

McKnight A J et al. 1993

McKnight A J, McKnight A S

The effect of cellular phones use upon driver attention

In: Accid Anal Prev, 25. Jg. (1993), S. 259.

ABSTRACT:
In this study, 150 subjects observed a 25-minute video driving sequence containing 45 highway traffic situations to which they were expected to respond by manipulation of simulated vehicle controls. Each situation occurred under five conditions of distraction: placing a cellular phone call, carrying on a causal cellular phone conversation, carrying on an intense cellular phone conversation, tuning a radio, and no distraction. All of the distractions led to significant increases in the proportion of situations to which subjects failed to respond. However, significant age differences of nonresponse appeared. Among subjects over age 50, nonresponses increased by about one-third under all of the telephone distractions. The response rate of younger subjects increased by a lesser degree except under intense conversation. Results were not influenced by gender or prior experience with cellular phones. The authors conclude that older drivers might reduce their accident risk during attention-demanding traffic conditions by avoiding use of cellular phones and that other drivers might do so by refraining from calls involving intense conversation.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

McMahan S et al 1994

McMahan S, Ericson J, Meyer J

Depressive symptomatology in women and residential proximity to high-voltage transmission lines

In: Am J Epidemiol, 139. Jg. (1994), S. 58.

ABSTRACT:
A number of epidemiologic studies indicate an association between depression and proximity to high-voltage transmission lines. These studies have been criticized, however, for using surrogate measures of electromagnetic fields and unstandardized measures of depression. In an effort to overcome these limitations, the authors administered the Center for Epidemiological Studies Depression scale (CES-D) in 1992 to 152 women in Orange County, California, who lived either adjacent to a transmission line or one block away. The results indicated that the average magnetic field level is 4.86 mG at the front door of homes adjacent to transmission lines and 0.68 mG at the front door of homes one block away. There was no significant difference in CES-D scores between the groups when demographic variables were controlled for. The homogeneity of the study population may limit the generalizability of findings.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

McMahan S et al. 1995

McMahan S, Meyer J

Symptom prevalence and worry about high voltage transmission lines

In: Environ Res, 70. Jg. (1995), S. 114.

ABSTRACT:
Few studies have documented public perceptions of environmental health risks from exposure to overhead transmission lines. In particular, little information has been provided on the impact of worry on symptom prevalence in residents living adjacent to high voltage transmission lines. The current study assessed symptom prevalence and worry in 152 Orange County female residents living either adjacent to overhead transmission lines or one block away. Forty-five percent of the respondents were either very worried or somewhat worried about the transmission lines and 55% were slightly worried or not worried at all. Results indicated that for those who did not live on the easement level of worry did not affect the prevalence of health problems. For those who lived on the easement, the most worried respondents were more likely to report health problems. Disclosure of health problems may depend more on individuals' level of worry about rather than proximity to overhead transmission lines. Possible limitations of this study include personality variables such as hypochondriasis which were not assessed, recall bias, and social desirability. The homogeneity of subjects may also limit the generalizability of findings.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

McRee D I 1980

McRee D I

Soviet and Eastern European research on biological effects of microwave radiation

In: Proc IEEE, 68. Jg. (1980), S. 84.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:

bioassay; Review; hf; biological effects

McRee D I et al. 1979

McRee D I, Elder J A, Gage M I, Reiter L W, Rosenstein L S, Shore M L, Galloway W D, Adey W R, Guy A W
Effects of nonionizing radiation on the central nervous system, behavior and blood: a progress report
In: Environ Health Perspect, 30. Jg. (1979), S. 123.

ABSTRACT:
This paper presents a progress report on the U. S. research which has been designated as collaborative research with the Soviet Union to study the biological effects of nonionizing radiation on the central nervous system, behavior, and blood. Results of investigations to study the effects of microwaves on isolated nerves, synaptic function, transmission of neural impulses, electroencephalographic recordings, behavior, and on chemical, cytochemical and immunological properties of the blood are presented. Specifically, the effects of microwave exposure on chick brain and cat spinal cords, on EEG patterns of rats, on behavioral of neonatal rats exposed during development, on behavior of adult rats, on behavior of rhesus monkeys and on the pathology, hematology, and immunology of rabbits will be reported in a summary format. Much of the information is new and has not been published previously.

SCHLAGWÖRTER:
bioassay; Review; hf; others

McRee D I et al. 1980

McRee D I, Wachtel
The effects of microwave radiation on the vitality of isolated frog sciatic nerves
In: Radiat Res, 82. Jg. (1980), S. 536.

ABSTRACT:
Isolated frog sciatic nerves were exposed to 2.45-GHz CW microwave radiation in a waveguide exposure system. The nerves were exposed to specific absorption rates (SARs) ranging from 0 to 100 mW/g. The effect of the microwaves on vitality of the nerves as measured in terms of the ability of the nerves to sustain a high firing rate over prolonged periods without suffering appreciable changes in the characteristics of the compound action potential (CAP). The nerves were stimulated using twin pulses separated by a 5-msec interval at a repetition rate of 50 pulses/sec. For SARs equal to or greater than 10 mW/g, the exposed nerves first underwent a prolongation of their refractory period and, later in the exposure, severe decreases in the maximal CAP. Although the time at which changes began to occur differed in each pair of nerves due to normal biological differences in nerves from different frogs, a prolongation of their refractory period and decrease in the second CAP usually were observable after 20 to 30 min of exposure. These effects appear to be microwave specific since they occurred when temperature was held constant but not when an increase in temperature without microwaves was produced. The effects were also irreversible since the nerves did not revitalize or increase their activity on termination of exposure. No significant effects on vitality of the nerves were observed for an SAR of 5 mW/g in this series of experiments.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

McRee D I et al. 1981

McRee D I, MacNichols G, Livingston G
Incidence of sister chromatid exchange in bone marrow cellsof the mouse following microwave exposure
In: Radiat Res, 85. Jg. (1981), S. 340.

ABSTRACT:
The measurement of sister chromatid exchange (SCE) constitutes the most sensitive indicator yet developed for detecting cytogenetic effects of mutagens and carcinogens. This sensitive assay was utilized to investigate potential mutagenic bioeffects of microwave (2450-MHz) radiation by comparing the incidence of SCE in bone marrow cells of sham mice, standard control mice, and irradiated mice following a 28-day exposure to 20 mW/cm2 incident power density. The average specific absorption rate (SAR) was determined to be approximately 21 mW/g. No statistically significant differences in the numbers of SCEs were detected between the exposed group and the control groups. Approximately 3 SCEs per cell were observed in all study groups.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Meinert R et al. 1996

Meinert R, Michaelis J
Meta-analyses of studies on the association between electromagnetic fields and childhood cancer
In: Radiat Environ Biophys, 35. Jg. (1996), S. 11.

ABSTRACT:
During the last 15 years several studies have investigated a possible relationship between exposure to electromagnetic fields (EMF) and childhood cancer. There is considerable variation between these studies with respect to methods of exposure assessment and reported results. Methods of exposure assessment range from simple visual criteria to costly and time consuming measurements or estimations of electric flux density. Additional individual refinements further hinder the comparability of results. We carried out several meta-analyses of data published so far taking into account the heterogeneity between studies as far as possible. Our particular interest was to investigate a potential dose-response-like relationship by comparing analyses for different cut-off points of exposure. Our meta-analyses suggest a marginal association between all cancer diagnoses combined and EMF exposure assessed by the two-level wire code (odds ratio, OR = 1.37, 95% confidence interval, CI: 0.94-2.00). Based on this criterion a significant effect was found for bases of leukemia (OR = 1.66, CI: 1.11-2.49) but not for central nervous system (CNS) tumors (OR = 1.5, CI: 0.69-3.26) or lymphomas (OR = 1.32, CI: 0.52-3.37). A significant increase in overall cancer risk with increasing stages of the four-level wire code (P = 0.003) could not be confirmed when data of the initial study performed by Wertheimer and Leeper were excluded (P = 0.17). When the exposure criterion was based on distance to the transmission line, estimated ORs for all cancers combined and for leukemias increased with distances decreasing from 100 to 25 m. Those analyses incorporating data on measured or calculated EMFs demonstrated also an increase of overall cancer risk with higher cut-off points. However, regarding individual diagnoses, this finding was reflected only in the group of brain tumors. One possible explanation for the high degree of heterogeneity between studies--especially with respect to methods of exposure assessment and choice of the respective cutpoint relevant for an increase in cancer risk--could be that published cut-off points were not always chosen in advance, but were selected because in exploratory analyses the most striking results were obtained with these specific cut-off values. Should this speculation be true at least partially, any meta-analysis will yield a false-positive finding. Further results of comparable studies with strictly a priori planned analyses are necessary to properly investigate a possible link between EMF and childhood cancer.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Meltz M L et al. 1987

Meltz M L, Walker K A, Erwin D N

Radiofrequency (microwave) radiation exposure of mammalian cells during UV-induced DNA repair synthesis

In: Radiat Res, 110. Jg. (1987), S. 255.

ABSTRACT:
The effect of continuous-wave (CW) and pulsed-wave (PW) radiofrequency radiation (RFR) in the microwave range on UV-induced DNA repair has been investigated in MRC-5 normal human diploid fibroblasts. RFR exposure at power densities of 1 (or 5) and 10 mW/cm2 gave a maximum specific absorption rate (SAR) (at 10 mW/cm2) of 0.39 +/- 0.15 W/kg for 350 MHz RFR, 4.5 +/- 3.0 W/kg for 850 MHz RFR, and 2.7 +/- 1.6 W/kg for 1.2 GHz RFR. RFR exposures for 1 to 3 h at 37 degrees C, in either continuous-wave or pulsed-wave modes, had no effect on the rate of repair replication label incorporated into preexisting UV-damaged DNA. RFR exposures (PW), with a constant medium temperature of 39 degrees C at 350 and 850 MHz during the repair period after UV damage, also had no effect. Assay for induction of repair synthesis by RFR exposure alone in non-UV irradiated cells was negative for the 350-, 850-, and 1200-MHz CW and PW RFR at 37 degrees C and the 350- and 850-MHz PW RFR at 39 degrees C. RFR does not induce DNA repair under these exposure conditions. In preliminary experiments--with the tissue culture medium maintained at 39 degrees C and RFR exposures (PW) at the frequencies of 350, 850, and 1200 MHz--no effect on incorporation of [3H]thymidine into DNA undergoing semiconservative synthesis was observed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Meltz M L et al. 1989

Meltz M L, Eagan P, Erwin D N

Absence of mutagenic interaction between microwaves and mitomycin C in mammalian cells

In: Environ Mol Mutagen, 13. Jg. (1989), S. 294.

ABSTRACT:
Evidence in the literature from in vitro and in vivo studies as to whether or not radiofrequency radiation (RFR) in the microwave range is mutagenic is predominantly negative, with some positive reports. No evidence is available as to whether RFR will alter the mutagenic activity of genotoxic chemicals during a simultaneous exposure, a likely real-life situation. Two hypotheses have been proposed: a) that RFR by itself can cause mutations in a mammalian cell in vitro assay system; and b) that a simultaneous exposure to RFR during a chemical treatment of the cells with a known genotoxic agent, mitomycin C (MMC), will alter the extent of mutagenesis induced by the treatment of the cells by the chemical alone. These studies were performed using the forward mutation assay at the thymidine kinase locus in L5178Y mouse leukemic cells. The pulsed wave RFR was broadcast from an antenna horn at a frequency of 2.45 GHz. The power density was 48.8 mW/cm2 and the measured specific absorption rate (SAR) in this system was 30 W/kg (600 W forward power), which is well above current safety guidelines. The conclusions from five different experiments, employing three different concentrations of MMC, were that a) RFR exposure alone, at moderate power levels which resulted in a temperature increase in the cell culture medium of less than 3 degrees C, is not mutagenic; and b) when cells are simultaneously treated with MMC and RFR at these same moderate power levels, the RFR does not affect either the inhibition of cell growth or the extent of mutagenesis resulting from the treatment with the chemical MMC alone.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Meltz M L et al. 1990

Meltz M L, Eagan P, Erwin D N

Proflavin and microwave radiation: absence of a mutagenic interaction

In: Bioelectromagnetics, 11. Jg. (1990), S. 149.

ABSTRACT:
The potential ability of radiofrequency electromagnetic radiation (RFR) in the microwave range to induce mutagenesis, chromosomal aberrations, and sister chromatid exchanges in mammalian cells is being explored in our laboratories. In addition, we have also been examining the ability of simultaneous exposure to RFR and chemical mutagens to alter the genotoxic damage induced by chemical mutagens acting alone. We have performed experiments to determine whether there is an interaction between 2.45-GHz, pulsed-wave, RFR and proflavin, a DNA-intercalating drug. The endpoint studied was forward mutation at the thymidine kinase locus in L5178Y mouse leukemic cells. Any effect on the size distribution of the resulting colonies of mutated cells was also examined. The exposures were performed at net forward powers of 500 or 600 W, resulting in a specific absorption rate (SAR) of approximately 40 W/kg. The culture-medium temperature reached a 3 degrees C maximal increase during the 4-h exposure; appropriate 37 degrees C and convection-heating temperature controls (TC) were performed. In no case was there any indication of a statistically significant increase in the induced mutant frequency due to the simultaneous exposure to RFR and proflavin, as compared with the proflavin exposures alone. There was also no indication of any change in the colony-size distribution of the resulting mutant colonies, neither, and there was no evidence in these experiments of any mutagenic action by the RFR exposure alone.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Merritt J H et al. 1977

Merritt J H, Chamness A F, Hartzell R H, Allen S J

Orientation effects on microwave-induced hyperthermia and neurochemical correlates

In: J Microwave Power, 12. Jg. (1977), S. 167.

ABSTRACT:
This paper describes the effect of field orientation on the hyperthermia produced by microwave irradiation. Rats exposed in the E-orientation (long-axis of animal parallel to E-field) to 1600 tmhz radiation become significantly hotter than those exposed in the H-field at the same power density. Norepinephrine and dopamine, but not serotonin content of the basal hypothalamus is reduced as a concomitant of microwave-induced brain hyperthermia.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Merritt J H et al. 1982

Merritt J H, Shelton WW, Chamness A F

Attempts to alter Ca-45 2+ binding to brain tissue with pulse-modulated microwave energy

In: Bioelectromagnetics, 3. Jg. (1982), S. 457.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Mezei G et al. 2001

Mezei G, Kheifets L I, Nelson L M, Mills K M, Iriye R, Kelsey J L

Household appliance use and residential exposure to 60-hz magnetic fields

In: J Expo Anal Environ Epidemiol, 11. Jg. (2001), S. 41.

ABSTRACT:
We characterized the distribution of exposure to magnetic fields (MFs) during daily activities and during household appliance use, and estimated the relative contribution of various activities and appliances to total daily exposure. One hundred sixty-two subjects provided information on their patterns of appliance use and wore personal monitors for 24 h to collect MF exposure data. Of total exposure, 27% accumulated while subjects were in bed; 41% while at home but not in bed; 9% at work; and 24% elsewhere. Less than 2% of the total MF exposure accumulated during the use of each of the eight individual appliances considered, except computers, during the use of which 9% of the total exposure accumulated. Of the time subjects spent at exposure levels higher than 2 microT, 8% accumulated while they were using microwave ovens, and 4% and 3% while using computers and electric stoves, respectively. Mean MF measurements tended to be lowest when subjects were in bed and highest at work and during the use of microwave ovens, coffee grinders, hair dryers, and electric shavers. Results from questionnaires on household appliance use in the past year were not useful in predicting the total mean exposure level and over-threshold exposures measured by 24-h personal monitors. Significant MF exposure accumulates at home, at work, and elsewhere; therefore, accurate exposure assessment needs to consider residential, occupational, and other sources together. Questionnaire-based information on appliance use has limited value in the assessment of average and over-threshold exposure to MFs.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Michaelis J et al. 1997

Michaelis J, Schuz J, Meinert R, Menger M, Grigat J P, Kaatsch P, Kaletsch U

Childhood leukemia and electromagnetic fields: results of a population-based case-control study in Germany

In: Cancer Causes Control, 8. Jg. (1997), S. 167.

ABSTRACT:
The investigation of an association between increased exposure to residential extremely-low frequency electromagnetic fields (ELF-EMF) and childhood leukemia was part of a population-based case-control study carried out between 1992 and 1995 in the northwestern part of Germany. A total of 129 children with leukemia and 328 controls participated in the EMF-study. Exposure assessment comprised measurements of the magnetic field over 24 hours in the child's bedroom at the residence where the child had been living for the longest period before the date of diagnosis, and spot measurements at all residences where the child had been living for more than one year. The median of the 24h-measurement in the child's bedroom was regarded as the most valid exposure variable. For children exposed to more than 0.2 microT, an elevated but not significant odds ratio (OR) was observed (OR = 3.2, 95 percent confidence interval = 0.7-14.9). These figures are based on only four leukemia cases and three controls since only 1.5 percent of the study population was classified as highly exposed. Exploratory analyses revealed ORs that were not statistically significantly increased for other characteristics of the magnetic field at varying cut-points. The results are comparable with those from other studies. Although not statistically significant, they may indicate a positive association between EMF and childhood leukemia.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Michaelis J et al. 1998

Michaelis J, Schuz J, Meinert R, Zemann E, Grigat J P, Kaatsch P, Kaletsch U, Miesner A, Brinkmann K, Kalkner W, Karner H

Combined risk estimates for two German population-based case-control studies on residential magnetic fields and childhood acute leukemia

In: Epidemiology, 9. Jg. (1998), S. 92.

ABSTRACT:
From 1992 to 1996, we obtained electromagnetic field measurements in two population-based case-control studies on childhood leukemia in the northwestern part of Germany and in Berlin. Exposure assessment comprised residential 24-hour measurements and short-term measurements. We obtained 24-hour measurements for a total of 176 cases and 414 controls. We compared subjects exposed to median 24-hour measurements of 0.2 microT or more with those exposed to lower amounts. Multivariate regression analysis revealed an odds ratio of 2.3 (95% confidence interval = 0.8-6.7).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Michaelson S M 1991

Michaelson S M

Household magnetic fields and childhood leukemia: a critical analysis

In: Pediatrics, 88. Jg. (1991), S. 630.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Michelozzi P et al. 2002

Michelozzi P, Capon A, Kirchmayer U, Forastiere F, Biggeri A, Barca A, Perucci C A

Adult and Childhood Leukemia near a High-Power Radio Station in Rome, Italy

In: Am J Epidemiol, 155. Jg. (2002), S. 1029.

ABSTRACT:
Some recent epidemiologic studies suggest an association between lymphatic and hematopoietic cancers and residential exposure to high-frequency electromagnetic fields (100 kHz to 300 GHz) generated by radio and television transmitters. Vatican Radio is a very powerful station located in a northern suburb of Rome, Italy. In the 10-km area around the station, with 49,656 residents (in 1991), leukemia mortality among adults (aged >14 years; 40 cases) in 1987-1998 and childhood leukemia incidence (eight cases) in 1987-1999 were evaluated. The risk of childhood leukemia was higher than expected for the distance up to 6 km from the radio station (standardized incidence rate = 2.2, 95% confidence interval: 1.0, 4.1), and there was a significant decline in risk with increasing distance both for male mortality (p = 0.03) and for childhood leukemia (p = 0.036). The study has limitations because of the small number of cases and the lack of exposure data. Although the study adds evidence of an excess of leukemia in a population living near high-power radio transmitters, no causal implication can be drawn. There is still insufficient scientific knowledge, and new epidemiologic studies are needed to clarify a possible leukemogenic effect of residential exposure to radio frequency radiation.

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

Mickley G A et al. 1994

Mickley G A, Cobb B L, Mason P A, Farrell S

Disruption of a putative working memory task and selective expression of brain c-fos following microwave-induced hyperthermia

In: Physiol Behav, 55. Jg. (1994), S. 1029.

ABSTRACT:
To discern the effects of hyperthermia on working memory, we recorded the ability of rats to discriminate between objects following microwave radiation exposure. Memory changes were evaluated by measuring relative exploration time of a familiar vs. a new stimulus object. A subject that extensively reexplores a stimulus with which it has previous experience is presumed to exhibit memory loss associated with that object. Between training and testing, rats were exposed to various doses of microwave radiation, were sham irradiated, or remained in their home cage. Brain (dural) and rectal temperatures were recorded. To discern brain regions activated or possibly damaged by microwave exposure, we also used immunocytochemistry techniques to identify sites of c-fos protein expression in the brains of several irradiated/sham-irradiated subjects. Rats exposed to > 5 W/kg exhibited hyperthermia when compared to nonirradiated controls. Normothermic control subjects (sham-irradiated rats and rats exposed to 0.1 W/kg) showed a distinct preference for the new object although other microwave-exposed rats (1, 5, 8.5, 9.3, 10 W/kg) did not. Microwave hyperthermia evoked prominent c-fos expression in periventricular strata, hypothalamic nuclei, amygdala, and several areas of the cortex. These data suggest that performance on a putative working memory task may be disrupted by a sufficiently intense microwave-induced hyperthermia. The pattern of expression of the early proto-oncogene c-fos may suggest candidate brain nuclei that mediate the behavioral changes we observed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Milham S 1985

Milham S

Mortality in workers exposed to electromagnetic fields

In: Environ Health Perspect, 62. Jg. (1985), S. 297.

ABSTRACT:
In an occupational mortality analysis of 486,000 adult male death records filed in Washington State in the years 1950-1982, leukemia and the non-Hodgkin's lymphomas show increased proportionate mortality ratios (PMRs) in workers employed in occupations with intuitive exposures to electromagnetic fields. Nine occupations of 219 were considered to have electric or magnetic field exposures. These were: electrical and electronic technicians, radio and telegraph operators, radio and television repairmen, telephone and power linemen, power station operators, welders, aluminum reduction workers, motion picture projectionists and electricians. There were 12,714 total deaths in these occupations. Eight of the nine occupations had PMR increases for leukemia [International Classification of Diseases (ICD), seventh revision 204] and seven of the nine occupations had PMR increases for the other lymphoma category (7th ICD 200.2, 202). The highest PMRs were seen for acute leukemia: (67 deaths observed, 41 deaths expected; PMR 162), and in the other lymphomas (51 deaths observed, 31 deaths expected; PMR 164). No increase in mortality was seen for Hodgkin's disease or multiple myeloma. These findings offer some support for the hypothesis that electric and magnetic fields may be carcinogenic.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; mortality

Milham S 1988

Milham S

Increased mortality in amateur radio operators due to lymphatic and haematopoietic malignancies

In: Am J Epidemiol, 127. Jg. (1988), S. 50.

ABSTRACT:
To search for potentially carcinogenic effects of electromagnetic field exposures, the author conducted a population-based study of mortality in US amateur radio operators. Ascertainment of Washington State and California amateur radio operators (67,829 persons) was done through the 1984 US Federal Communications Commission Amateur Radio Station and/or Operator License file. A total of 2,485 deaths were located for the period from January 1, 1979 through December 31, 1984, in a population of amateur radio operators which accumulated 232,499 person-years at risk. The all-cause standardized mortality ratio (SMR) was 71, but a statistically significant increased mortality was seen for cancers of the other lymphatic tissues (SMR = 162), a rubric which includes multiple myeloma and non-Hodgkin's lymphomas. The all-leukemia standardized mortality ratio was slightly, but nonsignificantly, elevated (SMR = 124). However, mortality due to acute myeloid leukemia was significantly elevated (SMR = 176).

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Milham S 1996

Milham S

Increased incidence of cancer in a cohort of office workers exposed to strong magnetic fields

In: Am J Ind Med, 30. Jg. (1996), S. 702.

ABSTRACT:
A small cohort of 410 office workers (263 men and 147 women, ever employed) exposed to strong magnetic fields by three 12 kV transformers located beneath their first-floor office developed eight incident cancers over a 15 year exposure period. Only one cancer was ascertained in the 254 workers employed for less than 2 years, compared to seven cancer cases ascertained in the 156 workers employed for 2 years or more ($p = 0.0057$; Fisher's exact test). An analysis of linear trend of cancer incidence using average years employed as an exposure score was positive ($p = 0.00337$) with an odds ratio of 15.1 in workers employed over 5 years. A positive trend of cancer cases with duration of employment is seen for males and females separately and together ($p < 0.05$). For workers employed more than 2 years, the standardized cancer incidence ratio was 389 (95% confidence interval 156-801). Cumulative magnetic field exposure may be of etiologic importance in explaining the cancer incidence pattern in this cohort.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Milham S et al. 2001

Milham S, Ossiander E M

Historical evidence that residential electrification caused the emergence of the childhood leukemia peak

In: Med Hypotheses, 56. Jg. (2001), S. 290.

ABSTRACT:
A peak in childhood leukemia, ages two through four, emerged de novo in the 1920s in the United Kingdom and slightly later in the United States (US). Electrification in US farm and rural areas lagged behind urban areas until 1956. In recent years, childhood leukemia has been associated with residential electromagnetic fields. During 1928-1932, in states with above 75% of residences served by electricity, leukemia mortality increased with age for single years 0-4, while states with electrification levels below 75% showed a decreasing trend with age ($P = 0.009$). During 1949-1951, all states showed a peak in leukemia mortality

at ages 2-4. At ages 0-1, leukemia mortality was not related to electrification levels. At ages 2-4, there was a 24% (95% confidence interval (CI), 8%-41%) increase in leukemia mortality for a 10% increase in percent of homes served by electricity. The childhood leukemia peak of common acute lymphoblastic leukemia may be attributable to electrification.

SCHLAGWÖRTER:
epidemiology; ecological; elf; cancer

Millar D B et al. 1984

Millar D B, Christopher J P, Hunter J, Yeandle S S
The effect of exposure of acetylcholinesterase to 2450 MHz microwave radiation
In: Bioelectromagnetics, 5. Jg. (1984), S. 165.

ABSTRACT:
The effect of 2,450-MHz pulsed microwave radiation on the enzyme activity of membrane-free acetylcholinesterase was studied while the enzyme was in the microwave field. We found no significant effect of microwave radiation on enzyme activity using a wide variety of power densities, pulse widths, repetition rates, and duty cycles. This suggests that simple, direct modification by microwave energy of acetylcholinesterase structure and enzymic activity is not related to microwave alteration of acetylcholinesterase central nervous system levels.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Miller A B et al. 1996

Miller A B, To T, Agnew DA , Wall C, Green L M
Leukemia following occupational exposure to 60-Hz electric and magnetic fields among Ontario electric utility workers
In: Am J Epidemiol, 144. Jg. (1996), S. 150.

ABSTRACT:
In a nested case-control study of 1,484 cancer cases and 2,179 matched controls from a cohort of 31,543 Ontario Hydro male employees, the authors evaluated associations of cancer risk with electric field exposure and reevaluated the previously reported findings for magnetic fields. Pensioners were followed from January 1, 1970, and active workers (including those who left the corporation) from January 1, 1973, with both groups followed through December 31, 1988. Exposures to electric and magnetic fields and to potential occupational confounders were estimated through job exposure matrices. Odds ratios were elevated for hematopoietic malignancies with cumulative electric field exposure. After adjustment, the odds ratio for leukemia in the upper tertile was 4.45 (95% confidence interval (CI) 1.01-19.7). Odds ratios were also elevated for acute nonlymphoid leukemia, acute myeloid leukemia, and chronic lymphoid leukemia. For cumulative magnetic field exposure, there were similar elevations that fell with adjustment. Evaluation of the combined effect of electric and magnetic fields for leukemia showed significant elevations of risk for high exposure to both, with a dose-response relation for increasing exposure to electric fields and an inconsistent effect for magnetic fields. There was some evidence of a nonsignificant association for brain cancer and benign brain tumors with magnetic fields. For lung cancer, the odds ratio for high exposure to electric and magnetic fields was 1.84 (95% CI 0.69-4.94).

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Minder C E et al. 2001

Minder C E, Pfluger D H
Leukemia, brain tumors, and exposure to extremely low frequency electromagnetic fields in Swiss railway employees
In: Am J Epidemiol, 153. Jg. (2001), S. 825.

ABSTRACT:
Railway engineers provide excellent opportunities for studying the relation between exposure to extremely low frequency magnetic fields and leukemia or brain tumors. In a cohort study of Swiss railway personnel with 2.7 x 10(5) person-years of follow-up (1972--1993), the authors compared occupations with high average exposures (line engineers: 25.9 microT) to those with medium and low exposures (station masters: 1 microT). The mortality rate ratio for leukemia was 2.4 (95% confidence interval (CI): 1.0, 6.1) among line engineers (reference category: station masters). The mortality rate ratio for brain tumors was 1.0 (95% CI: 0.2, 4.6) among line engineers and 5.1 (95% CI: 1.2, 21.2) among shunting yard engineers (compared with station masters). Two exposure characteristics were evaluated: cumulative exposure in microT-years and years spent under exposure to magnetic fields of > or =10 microT. There was a significant increase in leukemia mortality of 0.9% (95% CI: 0.2, 1.7) per microT-year of cumulative exposure to extremely low frequency magnetic fields. The increase by years spent under exposure of > or =10 microT was even stronger: 62% per year (95% CI: 15, 129). Brain cancer risk did not show a dose-response relation. This study contributes to the evidence for a link between heavy exposure to extremely low frequency magnetic fields and leukemia. Its strengths include reliable measurements and reliable historical reconstruction of exposures.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Mitchell C L et al. 1988

Mitchell C L, McRee D I, Peterson J, Tilson H A
Some behavioral effects of short-term exposure of rats to 2.45 GHz microwave radiation
In: Bioelectromagnetics, 9. Jg. (1988), S. 259.

ABSTRACT:
Rats were tested for neurobehavioral alterations immediately after exposure to 2.45-GHz (CW) microwave radiation at 10 mW/cm2 for 7 h. Behavioral tests used were locomotor activity, startle to an acoustic stimulus and acquisition and retention of a shock-motivated passive avoidance task. Both horizontal and vertical components of locomotor activity were assessed in 5-min epochs for a period of 30 min using photoelectric detectors. Microwave-exposed animals exhibited less activity than sham-exposed animals. This was most evident during the last 10-15 min of the 30-min test session. Twenty identical acoustical stimuli (8 KHz, 110 dB) were delivered to each rat at 40-s intervals. The microwave-exposed animals were less responsive to the stimuli than sham-exposed animals. Microwave exposure had no effect on the retention of a passive avoidance procedure when tested at 1 week after training. Both the locomotor activity and acoustic startle data demonstrate that, under the conditions of this experiment, microwave exposure may alter responsiveness of rats to novel environmental conditions or stimuli.

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Mitchell C L et al. 1989

Mitchell C L, McRee D I, Peterson N J, Tilson H A, Shandala M G, Rudnev M I, Varetskii V V, Navakatikyan M I

Results of a United States and Soviet Union joint project on nervous system effects of microwave radiation

In: Environ Health Perspect, 81. Jg. (1989), S. 201.

ABSTRACT:
During the course of a formal program of cooperation between the United States and the Soviet Union concerning the biological effects of physical factors in the environment, it was concluded that duplicate projects should be initiated with the general goal of determining the most sensitive and valid test procedures for evaluating the effects of microwave radiation on the central nervous system. This report details an initial step in this direction. Male rats of the Fischer 344 strain were exposed or sham exposed to 10 mW/cm2 continuous wave microwave radiation at 2.45 GHz for a period of 7 hr. Animals were subjected to behavioral, biochemical, or electrophysiological measurements during and/or immediately after exposure. Behavioral tests used were passive avoidance and activity in an open field. Biochemical measurements were ATPase (Na+, K+; Mg2+, Ca2+) and K+ alkaline phosphatase activities. Electrophysiological measurements consisted of EEG frequency analysis. Neither group observed a significant effect of microwave irradiation on open field activity. Both groups observed changes in variability of the data obtained using the passive avoidance procedure, but not in the same parameters. The U.S. group, but not the USSR group, found significantly less Na+,K+-ATPase activity in the microwave-exposed animals compared to the sham exposed animals. Both groups found incidences of statistically significant effects in the power spectral analysis of EEG frequency, but not at the same frequency. The failure of both groups to substantiate the results of the other reinforces our contention that such duplicate projects are important and necessary.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Mitchell D S et al. 1977

Mitchell D S, Switzer W G, Bronaugh E L

Hyperactivity and disruption of operant behavior in rats after multiple exposures to microwave exposure

In: Radio Sci, 12. Jg. (1977), S. 263.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; others

Modak A T et al. 1981

Modak A T, Stavinoha W B, Dean U P

Effect of short electromagnetic pulses on brain acetylcholine content and spontaneous motor activity in mice

In: Bioelectromagnetics, 2. Jg. (1981), S. 89.

ABSTRACT:
Mice were exposed to a single 15-ms or 25-ms pulse of 2,450-MHz microwaves which increased brain temperature by 2 degrees C or 4 degrees C, respectively. Immediately after exposure, the mice became hypokinetic but began recovering within 5 minutes. The 25-ms pulse (18.7 j deposited in the brain) caused a significant decrease in acetylcholine content of the whole brain, probably owing to increased permeability of the membrane.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Moe K E et al. 1976

Montaigne K, Pickard W F

Offset of the vacuolar potential of Characean cells in response to electromagnetic radiation over the range 250 Hz -- 250 kHz

In: Bioelectromagnetics, 5. Jg. (1976), S. 31.

ABSTRACT:
Measurements were made of the small, transient offsets of vacuolar potential produced in single cells of Nitella flexilis and Chara braunii by isolated bursts of audio frequency electromagnetic radiation. The offsets increased in magnitude with decreasing frequency of the electromagnetic radiation and, below about 6 kHz, seemed to approach a low-frequency asymptote. This frequency dependence for the offset is shown to be in accordance with a previously developed model in which the incident radiation is weakly rectified by the cell's membrane system.

SCHLAGWÖRTER:
bioassay; experimentally; elf; biological effects

Moen B E et al. 1995

Moen B E, Drablos P A, Pedersen S, Sjoen M, Thommesen G

Symptoms of the musculoskeletal system and exposure to magnetic fields in an aluminium plant

In: Occup Environ Med, 52. Jg. (1995), S. 524.

ABSTRACT:
OBJECTIVE--The study was performed to examine the influence of the exposure to magnetic fields in the potrooms of an electrolysis plant on the occurrence of musculoskeletal symptoms among the employees. The study was performed after much discussion and worry in the aluminium industry about this issue. METHODS--A retrospective cohort study was performed at an aluminium plant. The occurrence of musculoskeletal symptoms registered at health controls performed by the occupational health care unit in 1986 and 1991 was assessed from employees exposed to magnetic fields in the potrooms (n = 342) and from a control group (n = 277). The data were collected before the discussion about the effects of magnetic fields started. The exposure to static magnetic fields was found to be 3-20 mT inside the potrooms. Ripple components (alternating currents (AC fields)) were registered as well. RESULTS--No difference between the exposed and unexposed groups was found for the reported musculoskeletal symptoms in 1986 or in 1991. CONCLUSIONS--There seems to be no relation between work in potrooms with exposure to static magnetic fields and the occurrence of musculoskeletal symptoms.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Moen B E et al. 1996

Moen B E, Drablos P A, Pedersen S, Sjoen M, Thommesen G

Absence of relation between sick leave caused by musculoskeletal disorders and exposure to magnetic fields in an aluminum plant

In: Bioelectromagnetics, 17. Jg. (1996), S. 37.

ABSTRACT:
This is a study of the relationship between occupational exposure to magnetic fields in pot rooms and occurrence of sick leave caused by musculoskeletal disorders. The average exposure to static magnetic fields was 8 mT in the pot rooms. Ripple fields were recorded as well. A cohort of 342 exposed workers and 222 unexposed workers from the same electrolysis plant was retrospectively followed for 5 years. The reference group had a type of work similar to the exposed group except for the exposure to magnetic fields. The occurrence of sick leave and the diagnoses causing the sick leave were obtained from the Occupational Health Care Unit: these data were stored in

their computer files. The data were complete. No relationship between the occurrence of sick leave caused by musculoskeletal disorders and exposure to magnetic fields was found. This was the case for both the annual number of periods of sick leave and the total number of days with sick leave. The results must be interpreted with caution due to limitations in the design and available data. Also, static magnetic fields constituted the major exposure, and the results may be different when related to work in other types of magnetic-field exposure.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Morgan R W et al. 2000

Morgan R W, Kelsh M A, Zhao K, Exuzides A, Heringer S, Negrete W

Radiofrequency exposure and mortality from cancer of the brain and lymphatic/hematopoietic systems

In: Epidemiology, 11. Jg. (2000), S. 118.

ABSTRACT:
The proliferation of wireless communication technologies has raised public concern regarding potential health effects of radiofrequency (RF) exposures. This is the first report of findings from a large-cohort mortality study among employees of Motorola, a manufacturer of wireless communication products. We examined all major causes of mortality, with brain cancers, lymphomas, and leukemias as a priori outcomes of interest. Using job titles, we classified workers into high, moderate, low, and background RF exposure groups. A total of 195,775 workers contributed 2.7 million person-years during the 1976-1996 period. Using external comparisons, the standardized mortality ratios for RF-exposed workers were 0.53 [95% confidence interval (CI) = 0.21-1.09] and 0.54 (95% CI = 0.33-0.83) for central nervous system/brain cancers and all lymphomas/leukemias. Rate ratios calculated from Poisson regression models based on internal comparisons were near 1.0 for brain cancers and below 1.0 for all lymphomas and leukemias. These findings were consistent across cumulative, peak, and usual exposure classifications. We did not observe higher risk with increased exposure duration or latency. Although this study is limited by the use of a qualitative exposure matrix and the relatively young age of the cohort, our findings do not support an association between occupational RF exposure and brain cancers or lymphoma/leukemia.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Moulder J E et al. 1999

Moulder J E, Erdreich L S, Malyapa R S, Merritt J, Pickard W F, Vijayalaxmi D Z

Cell phones and cancer: what is the evidence for a connection?

In: Radiat Res, 151. Jg. (1999), S. 513.

ABSTRACT:
There have been allegations in the media and in the courts that cell phones and other types of hand-held transceivers are a cause of cancer. There have also been numerous public objections to the siting of TV, radio and cell phone transmission facilities because of a fear of cancer induction. A recent publication in Radiation Research by Repacholi et al. (147, 631-640, 1997) which suggests that exposure to radiofrequency (RF) radiation may increase lymphoma incidence in mice has contributed to this controversy. The goal of this review is to provide biomedical researchers a brief overview of the existing RF radiation-cancer studies. This article begins with a brief review of the physics and technology of cell phones. It then reviews the existing epidemiological studies of RF radiation, identifying gaps in our knowledge. Finally, the review discusses the cytogenetics literature on RF radiation and the whole-animal RF-radiation carcinogenesis studies. The epidemiological evidence for an association between RF radiation and cancer is found to be weak and inconsistent, the laboratory studies generally do not suggest that cell phone RF radiation has genotoxic or epigenetic activity, and a cell phone RF radiation-cancer connection is found to be physically implausible. Overall, the existing evidence for a causal relationship between RF radiation from cell phones and cancer is found to be weak to nonexistent.

SCHLAGWÖRTER:
epidemiology; Review; hf; cancer

Muhm J M 1992

Muhm J M

Mortality investigation of workers in an electromagnetic pulse test program

In: J Occup Med, 34. Jg. (1992), S. 287.

ABSTRACT:
A standardized mortality ratio study of 304 male employees of an electromagnetic pulse (EMP) test program was conducted. Outcomes were ascertained by two methods: the World Health Organization's underlying cause of death algorithm; and the National Center for Health Statistics' algorithm to identify multiple listed causes of death. In the 3362 person-years of follow-up, there was one underlying cause of death due to leukemia compared with with 0.2 expected (standard mortality ratio [SMR] = 437, 95% confidence interval [CI] = 11-2433), and two multiple listed causes of death due to leukemia compared with 0.3 expected (SMR = 775, 95% CI = 94-2801). Although the study suggested an association between death due to leukemia and employment in the EMP test program, firm conclusions could not be drawn because of limitations of the study. The findings warrant further investigation in an independent cohort.

SCHLAGWÖRTER:
epidemiology; cohort; hf; mortality

Mur J M et aql. 1998

Mur J M, Wild P, Rapp R, Vautrin J P, Coulon J P

Demographic evaluation of the fertility of aluminium industry workers: influence of exposure to heat and static magnetic fields

In: Hum Reprod, 13. Jg. (1998), S. 2016.

ABSTRACT:
A demographic analysis of the fertility of French aluminium industry workers was performed in order to evaluate the potential effects on male fertility of occupational exposure to heat and static magnetic fields occurring in certain workshops. Two groups of aluminium workers were studied: one group of 692 potroom workers exposed to heat and to static magnetic fields, and a control group of 588 workers from the same plants, who had not been exposed to these factors. The birthrate was significantly higher in the 'exposed' group than in the 'control' group. The relative birthrate ratio ('exposed' versus 'control') was 1.1 ($P < 0.001$). These results do not show any decrease in the fertility of potroom workers exposed to heat and static magnetic fields, when compared to other workers in the aluminium producing industry.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Muscat J E et al. 2000

Muscat J E, Malkin MG , Thompson S, Shore R E, Stellman S D, McRee D, Neugut A I, Wynder E L

Handheld cellular telephone use and risk of brain cancer

In: JAMA, 284. Jg. (2001), S. 3001.

ABSTRACT:
CONTEXT: A relative paucity of data exist on the possible health effects of using cellular telephones. OBJECTIVE: To test the hypothesis that using handheld cellular

telephones is related to the risk of primary brain cancer. DESIGN AND SETTING: Case-control study conducted in 5 US academic medical centers between 1994 and 1998 using a structured questionnaire. PATIENTS: A total of 469 men and women aged 18 to 80 years with primary brain cancer and 422 matched controls without brain cancer. MAIN OUTCOME MEASURE: Risk of brain cancer compared by use of handheld cellular telephones, in hours per month and years of use. RESULTS: The median monthly hours of use were 2.5 for cases and 2.2 for controls. Compared with patients who never used handheld cellular telephones, the multivariate odds ratio (OR) associated with regular past or current use was 0.85 (95% confidence interval [CI], 0.6-1.2). The OR for infrequent users (<0. 72 h/mo) was 1.0 (95% CI, 0.5-2.0) and for frequent users (>10.1 h/mo) was 0.7 (95% CI, 0.3-1.4). The mean duration of use was 2.8 years for cases and 2.7 years for controls; no association with brain cancer was observed according to duration of use (P =.54). In cases, cerebral tumors occurred more frequently on the same side of the head where cellular telephones had been used (26 vs 15 cases; P =.06), but in the cases with temporal lobe cancer a greater proportion of tumors occurred in the contralateral than ipsilateral side (9 vs 5 cases; P =.33). The OR was less than 1.0 for all histologic categories of brain cancer except for uncommon neuroepitheliomatous cancers (OR, 2.1; 95% CI, 0.9-4.7). CONCLUSIONS: Our data suggest that use of handheld cellular telephones is not associated with risk of brain cancer, but further studies are needed to account for longer induction periods, especially for slow-growing tumors with neuronal features.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Muscat J E et al. 2002

Muscat J E, Malkin M G, Shore R E, Thompson S, Neugut A I, Stellman S D, Bruce J

Handheld cellular telephones and risk of acoustic neuroma

In: Neurology, 58. Jg. (2002), S. 1304.

ABSTRACT:
The hypothesis that intracranial energy deposition from handheld cellular telephones causes acoustic neuroma was tested in an epidemiologic study of 90 patients and 86 control subjects. The relative risk was 0.9 (p = 0.07) and did not vary significantly by the frequency, duration, and lifetime hours of use. In patients who used cellular telephones, the tumor occurred more often on the contralateral than ipsilateral side of the head. Further efforts should focus on potentially longer induction periods.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Mutnick A et al. 1997

Mutnick A, Muscat J E

Primary brain cancer in adults and the use of common household appliances: a case-control study

In: Rev Environ Health, 12. Jg. (1997), S. 59.

ABSTRACT:
Increasing attention has been paid to whether low frequency non-ionizing radiation causes human cancers. In an ongoing case-control study of primary malignant brain cancer in adults, we examined the risk associated with common household appliances. Subjects were questioned about their use of personal computers, electric heaters, electric hair dryers, electric razors, and other appliances. No risk of brain cancer was observed with regular use of any of these items. Although magnetic field exposures were not measured, this study does not implicate the use of electric appliances in adult astroglial cancers.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Myers A et al. 1990

Myers A, Clayden A D, Cartwright R A, Cartwright S C

Childhood cancer and overhead powerlines: a case-control study

In: Br J Cancer, 62. Jg. (1990), S. 1008.

ABSTRACT:
A case-control study has been carried out to examine the occurrence of childhood cancer in relation to the proximity of overhead power lines to a child's home address at birth and to the calculated magnetic field at the address. The study included 374 cases diagnosed in the Yorkshire Health Region between 1970 and 1979, together with 588 matched controls. Magnetic-field strengths at the birth addresses due to the load currents of overhead power lines were calculated on the basis of line-network maps and load records. The results indicate no association between the occurrence of childhood malignancies and either the proximity or the magnetic fields of overhead lines, although the statistical power of the study was limited by the small numbers of children living close to overhead power lines.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Nasca P C et al. 1988

Nasca P C, Baptiste M S, MacCubbin P A, Metzger B B, Carlton K, Greenwald P, Armbrustmacher V W, Earle K M, Waldman J

An epidemiologic case-control study of central nervous system tumors in children and parental occupational exposures

In: Am J Epidemiol, 128. Jg. (1988), S. 1256.

ABSTRACT:
A population-based case-control study was conducted with 338 patients less than 15 years of age who were diagnosed with a primary tumor of the central nervous system from January 1968 through December 1977 in 53 contiguous New York counties. The study also included 676 controls who were selected from the birth certificate files of the New York State Department of Health. Parental occupational exposures at the time of each child's birth and at the time of tumor diagnosis were derived from maternal interviews. The current data set failed to show any consistent association between childhood central nervous system tumor risk and paternal occupational exposures to hydrocarbons or to electromagnetic fields, or employment in the aerospace industry or pulp and paper manufacturing. Findings for occupational exposures to ionizing radiation were also inconsistent. A positive association was observed between central nervous system tumor risk and paternal exposures to ionizing radiation based on industrial codes. Odds ratios ranged from 1.71 to 2.15. This association was not observed when paternal occupational titles were used to define exposure (range of odds ratios, 1.01-1.10). Maternal exposures to ionizing radiation were not related to risk regardless of the classification scheme used.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Nelson B K et al. 1991

Nelson B K, Conover D L, Brightwell W S, Shaw P B, Werren D, Edwards R M, Lary J M

Marked increase in the teratogenicity of the combined administration of the industrial solvent 2-methoxyethanol and radiofrequency radiation in rats

In: Teratology, 43. Jg. (1991), S. 621.

ABSTRACT:
Limited published animal research reports synergistic teratogenic effects following combined hyperthermia (induced by elevated ambient temperature) and administration of chemical teratogens. Radiofrequency

(RF) radiation is widely used in occupational environments. Since RF radiation also elevates the body temperature of, and is teratogenic to, exposed animals, concurrent RF radiation and chemical agent administration may enhance teratogenicity. The present exploratory study, consisting of preliminary dose-finding studies and the primary study, was designed to investigate whether concurrent exposure of rats to RF radiation and the industrial solvent 2-methoxyethanol (2ME) can enhance the developmental toxicity of either agent acting alone. Preliminary dose-finding studies using small numbers of rats investigated the ability of various RF radiation conditions and doses of 2ME to produce external malformations (primarily of the paws) when administered on gestation day 13. Based on these preliminary studies, RF radiation exposure [sufficient to elevate rectal temperature to 42.0 degrees C (4 degrees C above normal for rats) for 30 min] and 2ME administration (150 mg/kg) were selected for the primary study. In the primary study, groups of 18 to 27 pregnant rats were administered RF radiation exposure and distilled water gavage, 2ME gavage and sham RF exposure, RF radiation exposure and 2ME gavage concurrently, or sham RF exposure and distilled water gavage. Pregnant rats were sacrificed on gestation day 20, and the offspring were examined for external malformations. Combined exposures enhanced the adverse effects produced by either experimental agent alone (no malformations were detected in the double sham group). Mean fetal malformations/litter increased from 14% after 2ME and sham RF (15/26 litters affected, with an average of 2 fetuses/litter malformed) and 30% after RF radiation and water gavage (10/18 litters affected, with an average of 4 fetuses/litter malformed), to 76% after the combined treatment (18/18 litters affected, with an average of 12 fetuses/litter malformed). In addition to a significant increase in the frequency of malformations, the severity of malformations also was enhanced by the combination treatment (on a relative severity ranking scale, the 2ME severity score was less than 1, the RF score was 3, and the combination score was 6). This study provided evidence of synergism between RF radiation and 2ME administration, but additional research will be required to characterize the extent of synergism between these two agents. Potential interactive effects between chemical and physical agents need to be investigated to determine the extent to which such interactions should impact occupational exposure standards.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Neubauer C et al. 1990

Neubauer C, Phelan A M, Kues H, Lange D G
Microwave irradiation of rats at 2.45 GHz activates pinocytotic-like uptake of tacers by capillary endothelial cells of cerebral cortex

In: Bioelectromagnetics, 11. Jg. (1990), S. 261.

ABSTRACT:
Far-field exposures of male albino rats to 2.45-GHz microwaves (10-microseconds pulses, 100 pps) at a low average power density (10 mW/cm2; SAR approximately 2 W/kg) and short durations (30-120 min) resulted in increased uptakes of tracer through the blood-brain barrier (BBB). The uptake of systemically administered rhodamine-ferritin complex by capillary endothelial cells (CECs) of the cerebral cortex was dependent on power density and on duration of exposure. At 5 mW/cm2, for example, a 15-min exposure had no effect. Near-complete blockade of uptake resulted when rats were treated before exposure to microwaves with a single dose of colchicine, which inhibits microtubular function. A pinocytotic-like mechanism is presumed re

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Nilsson R et al. 1989

Nilsson R, Hamnerius Y, Mild K H, Hansson H A, Hjelmqvist E, Olanders S, Persson L I
Microwave effects on the central nervous system--a study of radar mechanics

In: Health Phys, 56. Jg. (1989), S. 777.

ABSTRACT:
Seventeen radar mechanics and engineers and 12 unexposed referents were examined, using extensive neurological, psychometric and neuropsychiatric techniques to determine whether there were any indications of central nervous system effects of microwave exposure. Pathological neurological findings were not more common in the exposed group than among the referents. In addition, the psychometric tests and the psychiatric rating scales did not reveal any statistically significant adverse effects of microwave exposure. The frequency of the occurrence of an increased protein band with an isoelectric point of 4.5 in the cerebrospinal fluid was higher among the men exposed to microwaves than among the referents. The nature and clinical significance of this or these proteins are still unclear. The time derivative of the magnetic flux density close to some of the transmitter units was surprisingly high (up to 350 T s-1).

SCHLAGWÖRTER:
medicine; other type; hf; others

Nordstrom S et al. 1983

Nordstrom S, Birke E, Gustavsson L
Reproductive hazards among workers at high voltage substations

In: Bioelectromagnetics, 4. Jg. (1983), S. 91.

ABSTRACT:
A retrospective study on reproductive hazards was performed among 542 employees at Swedish power plants. Questionnaires were answered by 89% of the employees. Data on pregnancies were checked by studying hospital case records. There was a statistically significant, decreased frequency of "normal" pregnancy outcome, almost exclusively due to an increased frequency of congenital malformations, when the father was a high-voltage switchyard worker. The differences in pregnancy outcome could not be explained by any of the confounding factors analyzed. The total number of children with malformations (26) and the total number of pregnancies in this study, however, were very small.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Novoselova E G et al. 1999

Novoselova E G, Fesenko E E, Makar V R, Sadovnikov V B
Microwaves and cellular immunity. II. Immunostimulating effects of microwaves and naturally occurring antioxidant nutrients

In: Bioelectrochem Bioenerg, 49. Jg. (1999), S. 37.

ABSTRACT:
The effect of 8.15-18 GHz (1 Hz within) microwave radiation at a power density of 1 microW/cm2 on the tumor necrosis factor (TNF) production and immune response was tested. A single 5 h whole-body exposure induced a significant increase in TNF production in peritoneal macrophages and splenic T cells. The mitogenic response in T lymphocytes increased after microwave exposure. The activation of cellular immunity was observed within 3 days after exposure. The diet containing lipid-soluble nutrients (beta-carotene, alpha-tocopherol and ubiquinone Q9) increased the activity of macrophages and T cells from irradiated mice. These results demonstrate that irradiation with low-power density microwaves stimulates the immune potential of macrophages and T cells, and the antioxidant treatment enhances the effect of microwaves, in particular at later terms, when the effect of irradiation is reduced.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Nurminen T et al. 1988

Nurminen T, Kurppa K

Office employment, work with video display terminals, and course of pregnancy. Reference mothers' experience from a Finnish case-referent study of birth defects

In: Scand J Work Environ Health, 14. Jg. (1988), S. 293.

ABSTRACT:
In an examination of the possible harmful effects of work in an office environment and the use of a video display terminal (VDT) on the course of pregnancy, the experience of 1,475 reference mothers from a Finnish case-referent study of birth defects was analyzed. The study was based on the national Register of Congenital Malformations, whose data were supplemented with special interviews on mothers' work conditions. The group which worked in an office environment consisted of 239 women, of whom 60 had worked with video display terminals; 805 mothers had not worked in an office. Only mothers who had worked during most of their pregnancy and who had a singleton birth were included; hence 431 women were excluded from the analysis. The information on threatened abortion, length of gestation, birthweight, placental weight, and maternal blood pressure was analyzed. Office work involved no elevated risk of threatened abortion when compared with nonoffice work, and among the VDT users the proportion with symptoms related to an impending early termination of pregnancy was similar to that of other office workers. No unfavorable effects on the length of gestation were observed between the compared groups, and there were no differences in the birthweight of the babies when adjustment was made for gestational age or the other aspects under consideration. Thus the results did not suggest that office employment or work with video display terminals would be harmful for pregnancy.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; others

Nyman KG et al. 1985

Nyman KG, Knave BG, Voss M

Work with video display terminals among office employees. IV. Refraction, accommodation, convergence and binocular vision

In: Scand J Work Environ Health, 11. Jg. (1985), S. 483.

ABSTRACT:
The present study is the fourth of a major epidemiologic health investigation on work with a video display terminal (VDT). The other studies showed that VDT operators replying to questionnaires have more eye discomfort than a reference group of office employees not employed in VDT work and that women have more eye discomfort, musculoskeletal complaints, headache, and skin disorders than men. Routine ophthalmologic examinations failed to establish any appreciable differences between the groups; for example, the prevalence of myopia was the same. In the present study, the VDT operators and referents were examined before and at the end of work sessions for changes in refraction, accommodation, convergence capacity, and binocular vision such as heterophoria and fusion range. No differences could be established between the VDT operators and the referents.

SCHLAGWÖRTER:
epidemiology; cohort; hf; others

O'Connor M E 1980

O'Connor M E

Mammalain teratogenesis and radio-frequency fields

In: Proc IEEE, 68. Jg. (1980), S. 56.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
other field; other type; hf; others

O'Connor M E 1999

O'Connor M E

Intrauterine effects in animals exposed to radiofrequency and microwave fields

In: Teratology, 59. Jg. (1999), S. 287.

ABSTRACT:
The animal studies dealing with intrauterine exposure to radiofrequency (RF) fields have used only a few RF frequencies. More of the studies have used acute high exposures rather than low-level chronic exposures. Most studies have used considerably higher fields than are recommended for maximum permissible exposures for human occupational or environmental exposure. All studies in which effects have been observed have been above recommended maximum permissible exposure levels. Even at high levels, consistent morphological or organ abnormalities have not been reported. The most common observation at high exposures is a decrease in fetal mass which, by itself, may or may not have clinical importance. Research regarding teratogenic effects did not consistently produce effects that would lead investigators to suspect that RF exposure at or below the maximum permissible exposures to have embryopathic or teratogenic effects. Many other RF effects could be studied, but questions regarding teratogenic effects constitute one of the only areas in RF research that has been answered; namely, that RF exposure that have been studied present no teratogenic risk from exposures that do not exceed maximum permissible guidelines that are far below experimental teratogenic exposures to RF that have been reported.

SCHLAGWÖRTER:
bioassay; Review; hf; biological effects

Olsen J H et al. 1993

Olsen J H, Nielsen A, Schulgen G

Residence near high voltage facilities and risk of cancer in children

In: BMJ, 307. Jg. (1993), S. 891.

ABSTRACT:
OBJECTIVE--To investigate whether residence before and after birth near 50 Hz high voltage installations increases a child's risk of cancer and whether risk correlates with the strength of the magnetic field. DESIGN--A population based case-control study. SETTING--Denmark. SUBJECTS--1707 children under the age of 15 with leukaemia, tumour of the central nervous system, or malignant lymphoma diagnosed in 1968-86 and 4788 children taken from the central population register. MAIN OUTCOME MEASURES--Proximity before and after birth to existing or former 50-400 kV electrical transmission connections and substations and associated historical electromagnetic fields calculated on the basis of current load on line, phase ordering of line, and distance from the dwelling. RESULTS--A significant association was seen between all major types of childhood cancer combined and exposure to magnetic fields from high voltage installations of > or = 0.4 microT (odds ratio 5.6). At > or = 0.25 microT no significant association was seen (odds ratio 1.5). A possible association was also seen with cases of Hodgkin's disease separately at > or = 0.1 microT. CONCLUSIONS--On the basis these results and additional descriptive data on electricity consumption and incidence of childhood cancer in Denmark since the 1940s it was concluded that the proportion of childhood cancer possibly caused by 50 Hz electromagnetic fields must be small.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Olshan A F et al. 1999

Olshan A F, De Roos A J, Teschke K, Neglia J P, Stram D O, Pollock B H, Castleberry R P

Neuroblastoma and parental occupation

In: Cancer Causes Control, 10. Jg. (1999), S. 539.

ABSTRACT:
OBJECTIVES: We evaluated parental occupation and the risk of neuroblastoma using data from a large case-control study conducted by the Children's Cancer Group and the Pediatric Oncology Group. METHODS: We compared the distribution of 73 paternal and 57 maternal occupational groups among 504 newly diagnosed cases of neuroblastoma and individually matched controls obtained by telephone random digit dialing in the United States and Canada. RESULTS: An increased risk of neuroblastoma was found for fathers employed as broadcast, telephone and dispatch operators (odds ratio [OR] = 6.1; 95% confidence interval [CI] = 0.7-50.9), electrical power installers and power plant operators (OR = 2.7; CI = 0.9-8.1), landscapers and groundskeepers (OR = 2.3; CI = 1.0-5.2), and painters (OR = 2.1; CI = 0.9-4.8). Elevated odds ratios were found for mothers employed as farmers and farm workers (OR = 2.2; CI = 0.6-8.8), florists and garden store workers (OR = 2.4; CI = 0.6-9.9), hairdressers and barbers (OR = 2.8; CI = 1.2-6.3), electric power installers and power plant operators, and sailors, fishers, and railroad workers. No increase in risk was found for other paternal occupations previously associated, including electricians, electrical equipment assemblers and repairers (OR = 1.1; CI = 0.6-2.0), or welders (OR = 0.5; CI = 0.1-1.6). CONCLUSION: The study reinforced some prior evidence of increased risks in electrical, farming and gardening, and painting occupations, but failed to confirm other previously reported associations. Further analyses of exposure to electromagnetic fields, metals, solvents, and pesticides are currently under way.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Oppenheimer M et al. 2002

Oppenheimer M, Preston-Martin S

Adult onset acute myelogenous leukemia and electromagnetic fields in Los Angeles County: Bed-heating and occupational exposures

In: Bioelectromagnetics, 23. Jg. (2002), S. 411.

ABSTRACT:
In a large matched population-based case-control study of acute myelogenous leukemia (AML), we did not find incident AML in Los Angeles County (1987-1994) to be associated with previous exposure to electric blankets, electrically heated waterbeds, or occupations with presumed high exposure to electromagnetic fields

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Oscar K J et al. 1977

Oscar K J, Hawkins T D

Microwave alteration of the blood-brain barrier system of rats

In: Brain Res, 126. Jg. (1977), S. 281.

ABSTRACT:
Rats were exposed to 1.3 gHz microwave energy to assess the uptake of several neutral polar substances in certain areas of the brain. A quantitative, radioactive isotope method, which uses an internal standard, was employed to measure the loss of test substances to brain tissue. Single, 20 min exposure, to either pulsed or continuous wave (CW) microwave energy induced an increase in the uptake of D-mannitol at average power densities of less than 3.0 mW/sp. cm. The permeability change was greatest in the medulla, followed, in decreasing order, by the cerebellum and hypothalamus, with small or negligible changes in the hippocampus and cortex. Permeability increases were observed for mannitol and inulin but not for dextran. Increased permeability was observed both immediately and 4 h after exposure, but not 24 h after exposure. After an initial rise, the permeability of cerebral vessels to saccharides decreased with increasing microwave power. Differences in the level of uptake occurred between CW energy and pulsed energy of the same average power. Microwaves of the same average power but different pulse characteristics also produced different uptake levels. Our findings suggest that microwaves induce a temporary change in the permeability for small molecular weight saccharides in the blood-brain barrier system of rats.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Ouellet-Hellstrom R et al. 1993

Ouellet-Hellstrom R, Stewart W

Miscarriages among female physical therapists who report using radio- and microwave-frequency electromagnetic radiation

In: Am J Epidemiol, 138. Jg. (1993), S. 775.

ABSTRACT:
Physical therapists are exposed to radio- and microwave-frequency electromagnetic radiation by operating shortwave and microwave diathermy units. Recent studies suggest that use of shortwave diathermy is associated with an excess risk of birth defects, perinatal deaths, and late spontaneous abortions among the offspring of exposed female therapists. To assess the impact of occupational use of microwave and shortwave diathermy at the time of conception, the authors mailed questionnaires to 42,403 physical therapists in 1989. Both occupational and reproductive histories were obtained. Exposures to shortwave and microwave diathermy were both assessed in the same fashion and were examined in relation to early recognized fetal loss in a nested case-control design. A total of 1,753 case pregnancies (miscarriages) were matched to 1,753 incidence density control pregnancies (other pregnancies except ectopic pregnancies). A pregnancy was considered "exposed" if the mother reported using microwave or shortwave diathermy anytime during the 6 months prior to the first trimester or during the first trimester. Pregnancies of mothers reporting microwave use 6 months prior to the pregnancy or during the first trimester were more likely to result in miscarriage (odds ratio (OR) = 1.28, 95% confidence interval (CI) 1.02-1.59). The odds ratio increased with increasing level of exposure (chi 2 = 7.25, $p < 0.005$). The odds ratio in the highest exposure group (20 or more exposures/month) was 1.59. The overall odds ratio was slightly lower after it was controlled for prior fetal loss (OR = 1.26, 95% CI 1.00-1.59), but the exposure-response effect remained (chi 2 = 5.17, $p < 0.01$). The risk of miscarriage was not associated with reported use of shortwave diathermy equipment (OR = 1.07, 95% CI 0.91-1.24). The odds ratio in the highest exposure group was 0.87.

SCHLAGWÖRTER:
epidemiology; case-control; hf; others

Owen R D 2000

Owen R D

Possible health risks of radiofrequency exposure from mobile telephones

In: Epidemiology, 11. Jg. (2000), S. 99.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Pachocki K A et al. 1991

Pachocki K A, Gajewski A K

Exposure to electromagnetic fields and risk of leukemia

In: Rocz Panstw Zakl Hig, 42. Jg. (1991), S. 217.

ABSTRACT:
Using the data from a case-control study performed in 958 age, sex and place of residence matched pairs of adult inhabitants of Polish towns, the risk of leukemia related to work in electromagnetic fields. Information concerning exposure to electromagnetic fields for 958 cases and corresponding number of nonionizing electromagnetic fields were mainly: short-wave diathermy, heat sealer, capacitor discharge welder and induction welder. For workers exposed to electromagnetic fields, the odds ratio (OR) was not significantly elevated all leukemias (p greater than 0.05).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Pakhomova O N et al. 1997

Pakhomova O N, Pakhomov A G, Akyel Y

Effect of millimeter waves on UV-induced recombination and mutagenesis in yeast

In: Bioelectrochem Bioenerg, 43. Jg. (1997), S. 227.

ABSTRACT:
Effects of millimeter waves (MMW) on cell survival and ultraviolet- inducedreciprocal and non-reciprocal recombination and mutagenesis were studied inthe diploid D7 strain of the yeast Saccharomyces cerevisiae. MMW exposureslasted for 30 min (0.13 mW cm-2, 61.02-61.42 GHz) andwere followed in 60 min by a 100 J m-2 close of 254nm ultraviolet (UV) radiation. The effect of the exposures was evaluatedfrom the colony-forming ability of the cells on complete and selectivemedia, and from the number of aberrant colonies formed. The MMWpretreatment did not alter cell survival or the frequency of reversemutations. The incidence of conversions was higher in most cases in theMMW-treated cells ($p < 0.05$). MMW also increased the scores ofcrossovers and colored aberrants in isolated experiments, though theaverage increase for all experiments (performed with different MMWfrequencies) was not statistically significant. The results suggested thatthe MMW irradiation did not alter the UV-induced mutagenesis, but couldfacilitate recombinagenic processes.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Parazzini F et al. 1993

Parazzini F, Luchini L, La Vecchia C, Crosignani P G

Video display terminal use during pregnancy and reproductiveoutcome - a meta-analysis

In: J Epidemiol Community Health, 47. Jg. (1993), S. 265.

ABSTRACT:
STUDY OBJECTIVE--The aim was to obtain quantitative information from published data on the potential association between video display terminal (VDT) use during pregnancy and the outcome. DESIGN--Results of nine published case-control studies (or cohort studies analysed as case-control) on the relation between VDT exposure during pregnancy and the outcome were sought by reviewing reference lists in relevant reports and by conducting manual and computer searches of the reports published in English. MEASUREMENTS AND MAIN RESULTS--The nine reviewed reports included information on about 9000 cases of spontaneous miscarriages, 1500 of low birth weight, 2000 of congenital malformation, and 50,000 controls. The results of these studies on each outcome of pregnancy examined were reduced to a single 2 x 2 table (cases/controls--exposed/unexposed). Pooled odds ratio (OR) estimates were computed separately for miscarriage, low birth weight, and congenital malformation. Seven studies analysed the relation between VDT exposure in pregnancy and the risk of miscarriage: the estimates' crude OR of spontaneous abortion ranged from 0.9-1.2 and the pooled OR was 1.0 (95% confidence interval (CI) 0.9, 1.0). No consistent evidence of increasing risk with duration of exposure to VDT was found. Two studies analysed the relation between VDT use and risk of having a low birth weight infant: the OR estimates in the individual studies were 1.0 and 1.1. Likewise, no relation emerged from the five studies providing information on congenital malformations and VDT use: the pooled OR was 1.0 (95% CI 0.9, 1.2). No specific malformation pattern emerged. CONCLUSIONS--This meta-analysis provides reassuring evidence on the absence of any major risk of adverse pregnancy outcome as a result of exposure to a VDT. With the number of cases reviewed, it was possible to exclude excess risk of 20% for spontaneous abortion, low birth weight, and congenital malformations.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Pearce N et al. 1989

Pearce N, Reif J, Fraser J

Case-control studies of cancer in New Zealand electrical workers

In: Int J Epidemiol, 18. Jg. (1989), S. 51.

ABSTRACT:
A series of reports, including a New Zealand case-control study, have suggested that electrical workers are at increased risk of leukaemia. We report here a further series of case-control studies based on the New Zealand Cancer Registry. These involved 19,904 male patients registered with cancer for the period 1980-1984 who were aged 20 years or more at time of registration. For each cancer site, the registrations for other sites formed the control group. Three main findings emerged. First, there is an elevated leukaemia risk in New Zealand electrical workers (odds ratio (OR) = 1.62, 95% confidence interval (CI) 1.04-2.52), but little evidence of increased risks for other cancer sites. Second, contrary to other published studies, the increased risk was primarily for chronic leukaemia (OR = 2.12) rather than acute leukaemia (OR = 1.25), and for lymphatic leukaemia (OR = 1.73) rather than myeloid leukaemia (OR = 1.22). Third, the increased risk was strongest for certain categories of electrical work including radio and television repairers (OR = 7.86, 95% CI 2.20-28.09), electricians (OR = 1.68, 95% CI = 0.75-3.79), linemen (OR = 2.35, 95% CI 0.97-5.70) and power station operators (OR = 3.89, 95% CI 1.00-15.22).

SCHLAGWÖRTER:
epidemiology; others; elf; cancer

Pederson G F et al. 1999

Pederson G F, Anderson J B

RF and ELF exposure from cellular phone handsets: TDMA and CDMA systems

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 131.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Penafiel L M et al. 1997

Penafiel L M, Litovitz T, Krause D, Desta A, Mullins J M

Role of modulation on the effect of microwaves on ornithine decarboxylase activity in L929 cells

In: Bioelectromagnetics, 18. Jg. (1997), S. 132.

ABSTRACT:
The effect of 835 MHz microwaves on the activity of ornithine decarboxylase (ODC) in L929 murine cell was

investigated at an SAR of approximately 2.5 W/kg. The results depended upon the type of modulation employed. AM frequencies of 16 Hz and 60 Hz produced a transient increase in ODC activity that reached a peak at 8 h of exposure and returned to control levels after 24 h of exposure. In this case, ODC was increased by a maximum of 90% relative to control levels. A 40% increase in ODC activity was also observed after 8 h of exposure with a typical signal from a TDMA digital cellular telephone operating in the middle of its transmission frequency range (approximately 840 MHz). This signal was burst modulated at 50 Hz, with approximately 30% duty cycle. By contrast, 8 h exposure with 835 MHz microwaves amplitude modulated with speech produced no significant change in ODC activity. Further investigations, with 8 h of exposure to AM microwaves, as a function of modulation frequency, revealed that the response is frequency dependent, decreasing sharply at 6 Hz an 600 Hz. Exposure with 835 MHz microwaves, frequency modulated with a 60 Hz sinusoid, yielded no significant enhancement in ODC activity for exposure times ranging between 2 and 24 h. Similarly, exposure with a typical signal from an AMPS analog cellular telephone, which uses a form of frequency modulation, produced no significant enhancement in ODC activity. Exposure with 835 MHz continuous wave microwaves produced no effects for exposure times between 2 and 24 h, except for a small but statistically significant enhancement in ODC activity after 6 h of exposure. Comparison of these results suggests that effects are much more robust when the modulation causes low-frequency periodic changes in the amplitude of the microwave carrier.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Pennes H H 1948

Pennes H H
Analysis of tissue and arterial blood temperature in the resting human forearm
In: J Appl Physiol, 1. Jg. (1948), S. 92.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
medicine; other type; none; others

Perry F S et al. 1981

Perry F S, Reichmanis M, Marino A A, Becker R O
Environmental power-frequency magnetic fields and suicide
In: Health Phys, 41. Jg. (1981), S. 267.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Perry G F 1995

Perry G F
What occupations have been associated with brain cancer, and, more specifically, what is the connection between brain cancer and electric utility work?
In: J Occup Environ Med, 37. Jg. (1995), S. 1067.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Perry S et al. 1989

Perry S, Pearl L, Binns R
Power frequency magnetic field; depressive illness and myocardial infarction
In: Public Health, 103. Jg. (1989), S. 177.

ABSTRACT:
Surveys were made to determine whether susceptibility to depressive illness and to myocardial infarction of people living in Wolverhampton was related to the intensity of 50 Hz magnetic field outside their homes. Comparing case with control addresses it was found that the field strength was significantly higher for depressive illness (P = 0.033) but not for myocardial infarction.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; others

Petridou E et al. 1997

Petridou E, Trichopoulos D, Kravaritis A, Pourtsidis A, Dessypris N, Skalkidis Y, Kogevinas M, Kalmanti M, Koliouskas D, Kosmidis H, Panagiotou J P, Piperopoulou F, Tzortzatou F, Kalapothaki V
Electrical power lines and childhood leukemia: a study from Greece
In: Int J Cancer, 73. Jg. (1997), S. 345.

ABSTRACT:
Residential proximity to electrical power lines of different voltage in relation to childhood leukemia was investigated through a case-control study undertaken in Greece during 1993-1994. The study comprised 117 incident cases of childhood leukemia and 202 age-, gender- and place-of-residence-matched controls. Four measures of exposure to magnetic fields were developed, using data provided by the Public Power Corporation of Greece: Voltage (V) divided by the distance (d), V/d2, V/d3 and an adaptation of the Wertheimer-Leeper code. Conditional-logistic-regression modeling was used to adjust for potential confounding influences of 18 variables. No significant trends of childhood leukemia risk with increasing exposure levels were noted, nor were there statistically significant elevations of disease risk at the higher exposure levels in each measure of exposure. These results do not support a causal link between residential proximity to electrical high-voltage wires and childhood leukemia risk, but in themselves do not refute a weak empirical association.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Phelan A M et al. 1992

Phelan A M, Lange D G, Kues H A, Lutty G A
Modification of membrane fluidity in melanin-containing cells by low-level microwave radiation
In: Bioelectromagnetics, 13. Jg. (1992), S. 131.

ABSTRACT:
The treatment of a B16 melanoma cell line with 2.45-GHz pulsed microwaves (10 mW/cm2, 10-microseconds pulses at 100 pps, 1-h exposure; SAR, 0.2 W/kg) resulted in changes of membrane ordering as measured by EPR (electron paramagnetic resonance) reporter techniques. The changes reflected a shift from a more fluid-like phase to a more solid (ordered) state of the cell membrane. Exposure of artificially prepared liposomes that were reconstituted with melanin produced similar results. In contrast, neither B16 melanoma cells treated with 5-Bromo-2-Deoxyuridine (3 micrograms/day x 7 days) to render them amelanotic, nor liposomes prepared without melanin, exhibited the microwave-facilitated increase of ordering. Inhibition of the ordering was achieved by the use of superoxide dismutase (SOD), which strongly implicates oxygen radicals as a cause of the membrane changes. The data indicate that a significant, specific alteration of cell-membrane ordering followed microwave exposure. This alteration was unique to melanotic membranes and

was due, at least in part, to the generation of oxygen radicals.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Philippova T M et al. 1994

Philippova T M, Novoselov V I, Alekseev S I

Influence of microwaves on different types of receptors and the role of peroxidation of lipids on receptor-protein shedding

In: Bioelectromagnetics, 15. Jg. (1994), S. 183.

ABSTRACT:
The effects of a continuous wave or pulse-modulated, 900 MHz microwave field were studied by in vitro assays of rat chemoreceptors. The pulsed field was modulated as rectangular waves at rates of 1, 6, 16, 32, 75, or 100 pps. The pulse-period to pulse-duration ratio was 5 in all cases, and specific absorption rates (SARs) ranged from 0.5 to 18 W/kg. Binding of ligands to cell membranes was differentially affected by exposure to microwaves. For example, binding of H3-glutamic acid to hippocampal cells was not altered by a 15 min exposure to a continuous wave field at 1 W/kg, but binding of H3-dihydroalprenolol to liver-cell membranes of neonates underwent a fivefold decrease under the same field conditions. This effect was not dependent on modulation or on a change in the constant of stimulus-receptor binding but depended on a shedding of the membrane's receptor elements into solution. The magnitude of inhibition correlated with the oxygen concentration in the exposed suspension. Antioxidants (dithiothreitol and ionol) inhibited the shedding of receptor elements. The microwave exposure did not cause an accumulation of products from the peroxidation of lipids (POL). Ascorbate-dependent or non-enzymatic POL was not responsible for the inhibition, and POL was not found in other model systems. However, enzymatic POL mechanisms in localized areas of receptor binding remain a possibility.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Phillips J L et al. 1998

Phillips J L, Ivaschuk O, Ishida-Jones T, Jones R A, Campbell-Beachler M, Haggren W

DNA damage in Molt-4 T-lymphoblastoid cells exposed to cellular telephone radiofrequency fields in vitro

In: Bioelectrochem Bioenerget, 45. Jg. (1998), S. 103.

ABSTRACT:
Molt-4 T-lymphoblastoid cells have been exposed to pulsed signals atcellular telephone frequencies of 813.5625 MHz (iDEN® signal) and836.55 MHz (TDMA signal). These studies were performed at low SAR (average= 2.4 and 24 ?W g-1 for iDEN® and 2.6 and 26?W g-1 for TDMA) in studies designed to look forathermal RF effects. The alkaline comet, or single cell gelelectrophoresis, assay was employed to measure DNA single-strand breaks incell cultures exposed to the radiofrequency (RF) signal as compared toconcurrent sham-exposed cultures. Tail moment and comet extent werecalculated as indicators of DNA damage. Statistical differences in thedistribution of values for tail moment and comet extent between exposed andcontrol cell cultures were evaluated with the Kolmogorov-Smirnoffdistribution test. Data points for all experiments of each exposurecondition were pooled and analyzed as single groups. It was found that: 1)exposure of cells to the iDEN® signal at an SAR of 2.4 ?Wg-1 for 2 h or 21 h significantly decreased DNAdamage; 2) exposure of cells to the TDMA signal at an SAR of 2.6 ?Wg-1 for 2 h and 21 h significantly decreased DNAdamage; 3) exposure of cells to the iDEN® signal at an SAR of 24/?Wg-1 for 2 h and 21 h significantly increased DNAdamage; 4) exposure of cells to the TDMA signal at an SAR of 26 ?Wg-1 for 2 h significantly decreased DNA damage. Thedata indicate a need to study the effects of exposure to RF signals ondirect DNA damage and on the rate at which DNA damage is repaired.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Phillips L P et al. 1999

Phillips L P, Blackwell D B, Clancy C J, Donner M D, Tice R T, Hook G H, McRee D M

Genotoxicity of radio frequency radiation fields generated from analog, TDMA, CDMA and PCS technology evaluated using a three test in vitro battery

In: Environ Mol Mutagen, 33. Jg. (1999), H. Suppl 30, S. 49.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Pollan M et al. 2001

Pollan M, Gustavsson P, Floderus B

Breast cancer, occupation, and exposure to electromagnetic fields among Swedish men

In: Am J Ind Med, 39. Jg. (2001), S. 276.

ABSTRACT:
BACKGROUND: Investigations of breast cancer among men may provide clues for environmental and occupational risk factors that may be difficult to study in women, because of confounding or effect modification from reproductive female characteristics. The objective was to estimate occupation-specific risks of male breast cancer and to assess the effect of occupational exposure to extremely low-frequency magnetic fields (ELFMF). METHODS: Standardized incidence ratios were computed for the period 1971-1989 among Swedish men who were 25-59 years of age at start of follow-up and gainfully employed in 1970. Log-linear Poisson models were fitted to adjust for geographical area. A job exposure matrix was used to classify occupational ELFMF exposure. RESULTS: A marked and consistent excess risk was found for machinery repairers. Increased relative risks based on few cases were also noted for librarians/archivists/curators, bank employees, non-specified clerical workers, metal processing workers, tanners/fur dressers, policemen, and custom surveillance officials. The relative risk among subjects with an estimated ELFMF exposure above the first quartile (0.12 microT) was 1.31 (95% confidence interval = 0.94-1.81), without a clear exposure-response pattern. Indications of an exposure-response relationship were found in workers with intermittent ELFMF exposure. CONCLUSIONS: The findings give no clear evidence for an etiological role of ELFMF in the development of breast cancer in men, but suggest that large variations in exposure over the work-day may be associated with an increased risk.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Poole C et al. 1991

Poole C, Trichopoulos D

Extremely low-frequency electric and magnetic fields and cancer

In: Cancer Causes Control, 2. Jg. (1991), S. 41.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Poole C et al. 1993

Poole C, Kavet R, Funch D P, Donelan K, Charry J M, Dreyer N A

Depressive symptoms and headaches in relation to proximity of residence to an alternating-current transmission line right-of-way

In: Am J Epidemiol, 137. Jg. (1993), S. 318.

ABSTRACT:
Electric power transmission lines have become objects of public controversy. Hypotheses have linked neurobehavioral effects to the electric and magnetic fields that these lines produce. The authors conducted a telephone interview survey in November 1987 to assess the prevalence of depressive symptoms and headache in relation to proximity of residence to an alternating-current transmission line in the United States. Proximity to the line, defined as residing on a property abutting the right-of-way or being able to see the towers from one's house or yard, was positively associated with a measure of depressive symptoms. The association was not explained by demographic variables associated with depression or by attitudes about power lines or other environmental issues. The estimated prevalence odds ratio was 2.8 (95% confidence interval (CI) 1.6-5.1). The estimate did not change appreciably when the definitions of depressive symptoms or of proximity to the line were altered. Nonmigraine headaches had a weaker association with proximity to the line (odds ratio = 1.5, 95% CI 0.76-2.8), and self-reported migraine headaches exhibited no association (odds ratio = 0.99, 95% CI 0.29-3.4). Additional studies of psychological and behavioral measures should be conducted in relation to electric and magnetic fields, with a strong emphasis on improved exposure assessment.

SCHLAGWÖRTER:
epidemiology; cross-sectional; elf; subjective complaints

Poole C et al. 1996

Poole C, Ozonoff D

Magnetic fields and childhood cancers - An investigation of dose response analyses

In: IEEE Eng Med Biol Mag, 15. Jg. (1996), S. 41.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Prausnitz S et al. 1962

Prausnitz S, Susskind C

Effects of chronic microwave irradiation on mice

In: IRE Trans Biomed Electron, 9. Jg. (1962), S. 104.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Preece A W et al. 1999

Preece A W, Iwi G, Davies-Smith A, Wesnes K, Butler S, Lim E, Varey A

Effect of a 915-MHz simulated mobile phone signal on cognitive function in man

In: Int J Radiat Biol, 75. Jg. (1999), S. 447.

ABSTRACT:
PURPOSE: To examine whether a simulated mobile telephone transmission at 915 MHz has an effect on cognitive function in man. MATERIALS AND METHODS: Thirty-six subjects in two groups were each given two training sessions and then three test sessions in a randomized three-way cross-over design. About 1 W mean power at 915 MHz from a quarter-wave antenna mounted on a physical copy of an analogue phone, as a sine wave, or modulated at 217 Hz with 12.5% duty cycle, or no power, was applied to the left squamous temple region of the subjects while they undertook a series of cognitive function tests lasting approximately 25-30 min. The second group was investigated for sleep, consumption of alcohol and beverages, and any other substances that might affect performance. RESULTS: In both groups, the only test affected was the choice reaction time and this showed as an increase in speed (a decrease in reaction time). There were no changes in word, number or picture recall, or in spatial memory. While an effect of visit-order was evident suggesting a learning effect of repeat tests, the design of the study allowed for this. Additionally, there was no systematic error introduced as a result of consumption of substances or sleep time. CONCLUSIONS: There was evidence of an increase in responsiveness, strongly in the analogue and less in the digital simulation, in choice reaction time. This could be associated with an effect on the angular gyrus that acts as an interface between the visual and speech centres and which lies directly under and on the same side as the antenna. Such an effect could be consistent with mild localized heating, or possibly a non-thermal response, which is nevertheless power-dependent.

SCHLAGWÖRTER:
epidemiology; experimentally; hf; others

Preece A W et al. 1999a

Preece A W, Kaune W T, Grainger P, Golding J

Assessment of Human Exposure to Magnetic Fields Produced by Domestic Appliances

In: Radiat Prot Dosimetry, 83. Jg. (1999), S. 21.

ABSTRACT:
A study of 50 homes and their appliances examined whether a detailedappliance-use questionnaire and survey would yield data comparable withdirect personal monitoring. This was coupled with direct measurement of theappliances in use to determine the field at 50 cm and 1 m. The findingswere that individual time-weighted average (TWA) exposures calculated fromquestionnaire and activity diaries in conjunction with the appliancemagnetic field were unrelated to actual personal exposure measurement. Itwas concluded that questionnaires are of little or no value for TWAestimation. However, peak exposure and short-term temporal variabilitycould be modelled in subjects spending at least 15 min per day within 1 mof an operating microwave cooker or conventional cooker. This method couldbe extended to other appliances.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Preskorn S H et al. 1978

Preskorn S H, Edwards W D, Justesen D

Retarded tumor growth and greater longevity in mice after fetal irradiation by 2450 MHz microwaves

In: J Surg Oncol, 10. Jg. (1978), S. 483.

ABSTRACT:
In the first of two studies, 48 mice of the conventional CFW strain were sham-radiated or radiated in utero for 20 minutes daily by 2,450-MHz microwaves at a dose rate, respectively, of 0 or 35 mW/g during days 11-14 of gestation. All 48 mice were implanted with a homogenate of a lymphoreticular cell sarcoma on the 16th day postpartum and then, commencing on the 19th day, they underwent a series of 36 daily exposures to the sham- or to the microwave-radiation. Fetal exposure to radiation, which elevated dams colonic temperatures by an average of 2.24°C, was associated with a lower incidence of tumors (13% vs 46% for fetally sham-radiated mice) as verified histologically at necropsy on the 93rd day postpartum. In the second study, 84 CFW mice received the four radiation treatments in utero; 60 mice were sham-radiated in utero and served as controls. Postnatal

radiation was not administered. All 144 mice were implanted with the homogenate on the 16th day postpartum and then were observed for nearly 36 months for development of palpable tumors and for longevity. Tumors initially developed at a lower rate in fetally radiated mice and 2.5 months after implantation the respective percentages of 'takes' in sham- and microwave-irradiated mice were comparable to those observed at termination of the first study. Subsequently the rate of tumor induction in radiated mice accelerated, and after the fourth month the final percentage of radiated mice with tumors (46%) slightly exceeded that of controls (40%). Both tumor-bearing and tumor-free animals that had been radiated as fetuses lived longer on the average than respective controls. Long-term augmentation of immunocompetency by in utero hyperthermia is believed to be responsible for the delayed induction of tumors and for enhancement of survival.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Preston-Martin S et al. 1988

Preston-Martin S, Peters J M, Yu M C, Garabrant D H, Bowman J D

Myelogenous leukemia and electric blanket use

In: Bioelectromagnetics, 9. Jg. (1988), S. 207.

ABSTRACT:
In a case-control study of adult acute and chronic myelogenous leukemia in Los Angeles County, we tested the hypothesis that excess exposure to electromagnetic fields from electric blankets was associated with risk of leukemia. We did this by studying 116 cases of acute myelogenous leukemia (AML) and 108 cases of chronic myelogenous leukemia (CML) along with matched neighborhood controls. The cases and controls were queried as to electric blanket use and the risks computed. For AML the risk was 0.9 (95% CI 0.5-1.6) and for CML the risk was 0.8 (95% CI 0.4-1.6). Cases did not differ from controls by duration of use, year of first regular use, year since last use, or socioeconomic status. Our best estimates of exposure indicate that electric blanket use increases overall exposure to electric fields by less than 50% and magnetic fields by less than 100%. We conclude that there is no major leukemogenic risk associated with electric blanket use in Los Angeles County.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Preston-Martin S et al. 1989

Preston-Martin S, Mack W, Henderson B E

Risk factors for gliomas and meningiomas in males in Los Angeles County

In: Cancer Res, 49. Jg. (1989), S. 6137.

ABSTRACT:
Detailed job histories and information about other suspected risk factors were obtained during interviews with 272 men aged 25-69 with a primary brain tumor first diagnosed during 1980-1984 and with 272 individually matched neighbor controls. Separate analyses were conducted for the 202 glioma pairs and the 70 meningioma pairs. Meningioma, but not glioma, was related to having a serious head injury 20 or more years before diagnosis [odds ratio (OR) = 2.3; 95% confidence interval (CI) = 1.1-5.4], and a clear dose-response effect was observed relating meningioma risk to number of serious head injuries (P for trend = 0.01; OR for greater than or equal to 3 injuries = 6.2; CI = 1.2-31.7). Frequency of full-mouth dental X-ray examinations after age 25 related to both glioma (P for trend = 0.04) and meningioma risk (P for trend = 0.06). Glioma, but not meningioma risk, related to duration of prior employment in jobs likely to involve high exposure to electric and magnetic fields (P for trend = 0.05). This risk was greatest for astrocytoma (OR for employment in such jobs for greater than 5 years = 4.3; CI = 1.2-15.6). More glioma cases had worked in the rubber industry (discordant pairs 6/1) and more worked in hot processes using plastics (9/1). More meningioma cases had jobs that involved exposure to metal dusts and fumes (discordant pairs 13/5), and six of these cases and two controls worked as machinists. Finally, there was a protective effect among glioma pairs relating to frequency of use of vitamin C and other vitamin supplements (P for trend = 0.004); the OR for use at least twice a day was 0.4 (CI = 0.2-0.8).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Preston-Martin S et al. 1996

Preston-Martin S, Gurney J G, Pogoda J M, Holly E A, Mueller B A

Brain tumor risk in children in relation to use of electric blankets and water bed heaters. Results from the United States West Coast Childhood Brain Tumor Study

In: Am J Epidemiol, 143. Jg. (1996), S. 1116.

ABSTRACT:
The possible relation between the occurrence of brain tumors in children and exposure to electric blankets or electrically heated water beds was investigated in a multicenter, population-based case-control study conducted on the West Coast of the United States. Information on maternal exposure during pregnancy or direct exposure to the subject child was collected by in-person interview from the mothers of 540 case children and 801 control children. Cases were 19 years of age or younger and were diagnosed between 1984 and 1991. Controls were recruited using a random digit dialing procedure. The risk of brain tumor occurrence from in utero exposure to either electric blankets (odds ratio (OR) = 0.9, 95% confidence interval (Cl) 0.6-1.2) or heated water beds (OR = 0.9, 95% Cl 0.6-1.3) was not elevated. Brain cancer risk did not vary by use in any trimester of pregnancy, and children with mothers who reported use throughout their pregnancy had no increased risk. Similar results were observed for exposure to the child, in that no association between brain cancer and use of electric blankets (OR = 1.0, 95% Cl 0.6-1.7) or heated water beds (OR = 1.2, 95% Cl 0.7-2.0) was observed. Risks did not vary significantly by age, sex, race, socioeconomic status, or histologic category for either in utero exposure or child's exposure. This study provides no evidence to support the hypothesis that there is a relation between brain cancer occurrence in children and 50-/60-Hz magnetic field exposure from the use of electric blankets and heated water beds.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Preston-Martin S et al. 1996a

Preston-Martin S, Navidi W, Thomas D, Lee P J, Bowman J, Pogoda J

Los Angeles study of residential magnetic fields and childhood brain tumors

In: Am J Epidemiol, 143. Jg. (1996), S. 105.

ABSTRACT:
A measurement study of residential magnetic fields and brain tumors in children that was added onto an ongoing case-control interview study in Los Angeles County, California, include 298 children under age 20 years with a primary brain tumor diagnosed from 1984 to 1991 and 298 control children identified by random digit dialing. Magnetic fields were determined for all Los Angeles homes where these 596 children lived from conception to diagnosis (1,131 homes) by mapping and coding the wiring configurations outside the home and by taking a series of exterior spot and profile measurements. In addition, for a subset of subjects (35%; 211 homes) 24-hour measurements were taken in the child's room and one other room. Although measured fields are consistently

highest in the highest of the five wire code categories, fields in homes in this category are much lower in Los Angeles than in Denver, where the code originated. Brain tumor risk appears not to relate to measured fields inside (p for trend for child's room = 0.98) or outside (p for trend for front wall = 0.82) the home. An apparent increase in risk among children living at diagnosis in homes with underground wiring appears to be an artifact introduced by using current controls for historical cases because this apparent excess risk disappeared in an analysis restricted to the later years of the study when cases and controls were accrued concurrently. Our study does not show an overall association of pediatric brain tumors with measured fields, with "very high" wiring configurations, or with any of several other potential sources of exposure, such as use of various electrical appliances, but the prevalence of high fields (> 2 mG) and very high fields (> 3 mG) in Los Angeles homes was too low to detect a moderate effect of the magnitude reported in other studies.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Ptitsyna N G et al. 1996

Ptitsyna N G, Villoresi G, Kopytenko Y A, Kudrin V A, Tyasto M I, Kopytenko E A, Iucci N, Voronov P M, Zaitsev D B

Coronary heart diseases: assessment of risk associated with work exposure to ultralow-frequency magnetic fields

In: Bioelectromagnetics, 17. Jg. (1996), S. 436.

ABSTRACT:
The present analysis was stimulated by previous findings on the possible influence of natural ultralow-frequency (ULF; 0.001-10 Hz) geomagnetic field variations on the cardiovascular system and indications of an effect of man-made ULF magnetic fields on the rate of myocardial infarction. In the present study, we considered the occupational health hazards of the strongest ULF magnetic fields in densely populated urban areas. Measurements of ULF magnetic field fluctuations produced by trains powered by DC electricity were performed by means of a computer-based, highly sensitive, three-component magnetometer. We found that the magnitude of magnetic field pulses inside the driver's cab of electric locomotives (ELs) could be > or = 280 microT in the horizontal component perpendicular to the rails and up to approximately 130 microT in the vertical component, and, in the driver's compartment of electric motor unit (EMU) trains, they were approximately 50 and 35 microT, respectively. We have investigated the relationships between the occupational exposure to ULF magnetic field fluctuations produced by electric trains and cardiovascular diseases (CVDs) among railroad workers in the former Soviet Union. We have analyzed medical statistical data for a period of 3 years for approximately 45,000 railroad workers and 4,000 engine drivers. We have also analyzed 3 years of morbidity data for three subgroups of engine drivers (approximately 4,000 in each group) operating different types of trains. We find that EL drivers have a twofold increase in risk (2.00 +/- 0.27) of coronary heart diseases (CHDs) compared with EMU drivers. Because our analysis of major CVDs shows that the examined subpopulations of drivers can be considered to have had equal exposure to all known risk factors, the elevated CHD risk among EL drivers could be attributed to the increased occupational exposure to ULF magnetic fields.

SCHLAGWÖRTER:
epidemiology; other type; elf; cvd

Pu J S et al. 1997

Pu J S, Chen J, Yang Y H, Bai Y Q

The effects of 3000-MHz microwave irradiation on electroencephalic energy and energy meatbolism in mouse brain

In: Electro-Magnetobiology, 16. Jg. (1997), S. 243.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Redelmeier D A et al. 1997

Redelmeier D A, Tibshirani, R J

Association between cellular-telephone calls and motor vehicle collisions

In: N Engl J Med, 336. Jg. (1997), S. 453.

ABSTRACT:
BACKGROUND: Because of a belief that the use of cellular telephones while driving may cause collisions, several countries have restricted their use in motor vehicles, and others are considering such regulations. We used an epidemiologic method, the case-crossover design, to study whether using a cellular telephone while driving increases the risk of a motor vehicle collision. METHODS: We studied 699 drivers who had cellular telephones and who were involved in motor vehicle collisions resulting in substantial property damage but no personal injury. Each person's cellular-telephone calls on the day of the collision and during the previous week were analyzed through the use of detailed billing records. RESULTS: A total of 26,798 cellular-telephone calls were made during the 14-month study period. The risk of a collision when using a cellular telephone was four times higher than the risk when a cellular telephone was not being used (relative risk, 4.3; 95 percent confidence interval, 3.0 to 6.5). The relative risk was similar for drivers who differed in personal characteristics such as age and driving experience; calls close to the time of the collision were particularly hazardous (relative risk, 4.8 for calls placed within 5 minutes of the accident, as compared with 1.3 for calls placed more than 15 minutes before the accident; P<0.001); and units that allowed the hands to be free (relative risk, 5.9) offered no safety advantage over hand-held units (relative risk, 3.9; P not significant). Thirty-nine percent of the drivers called emergency services after the collision, suggesting that having a cellular telephone may have had advantages in the aftermath of an event. CONCLUSIONS: The use of cellular telephones in motor vehicles is associated with a quadrupling of the risk of a collision during the brief time interval involving a call. Decisions about regulation of such telephones, however, need to take into account the benefits of the technology and the role of individual responsibility.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Reichmanis M et al. 1979

Reichmanis M, Perry F S, Marino A A, Becker R O

Relation between suicide and the electromagnetic field of overhead power lines

In: Physiol Chem Phys, 11. Jg. (1979), S. 395.

ABSTRACT:
Laboratory studies have shown that electromagnetic fields similar to those from high-voltage transmission lines can produce biological effects. Surveys of the actual effects of such lines on exposed individuals usually have been hampered by complicating factors tending to blur the data. By means of a new approach, however, correlation has been established between the presence of transmission-line fields and the occurrence of suicides in part of the Midlands of England.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Reid S W et al. 1998

Reid S W, Gettinby G

Radio-frequency electromagnetic field from mobile phones

In: Lancet, 352. Jg. (1998), S. 576.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Reif J S et al. 1989

Reif JS, Pearce N, Fraser J

Occupational risks for brain cancer: a New Zealand Cancer Registry-based study

In: J Occup Med, 31. Jg. (1989), S. 863.

ABSTRACT:
Occupational risks for brain cancer were evaluated in a New Zealand Cancer Registry-based case-control study. The case subjects were 452 men aged 20 years or older registered under classifications 191 (Cancer of the brain) and 192 (Cancer of other and unspecified parts of the nervous system) of the International Classification of Disease (9th ed) from 1980 to 1984 for whom occupational information was available. The remaining 19,452 men with other cancers registered during an excess of professional and technical workers. An increased risk among workers in agriculture, forestry, and fishing was due to an excess of brain cancer in farmers, with the highest risk found for livestock farmers. Although many comparisons have been made, some of the findings support previous studies and several new hypotheses are suggested

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

Reif J S et al. 1995

Reif J S, Lower K S, Ogilvie G K

Residential exposure to magnetic fields and risk of canine lymphoma

In: Am J Epidemiol, 141. Jg. (1995), S. 352.

ABSTRACT:
A hospital-based case-control study was conducted to determine whether residential exposure to magnetic fields increased risk for canine lymphoma in pet dogs. Cases were patients at a veterinary teaching hospital with histologically confirmed lymphoma diagnosed between 1987 and 1990. Hospital controls with other forms of cancer were obtained by frequency matching on zip code and year of diagnosis. Information regarding the dog's activity patterns, residence history, and exposure to potential confounders was obtained by telephone interview. Wire codes and magnetic fields were measured at the homes at diagnosis of 93 cases and 137 controls. When exposure was categorized into two levels (high or very high wire codes compared with low, very low, or buried lines), the risk was elevated (odds ratio (OR) = 1.6, 95% confidence interval (CI) 0.9-2.9) and increased (OR = 1.8, 95% CI 0.9-3.4) after adjustment for potential confounders. Dogs that lived in homes with very high current codes had the highest risk (OR = 6.8, 95% CI 1.6-28.5). Moderate, imprecise increases in risk (odds ratios of 1.5-1.9) were found for residence in a home with a sidewalk (plumbing), backyard, or front yard magnetic field of 2.0 mG or greater, but not for indoor measurements at this level. Risk increased among dogs that spent more than 25% of the day outdoors. Laboratory and observational studies of dogs as an animal model for the effects of magnetic fields are recommended.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Reiser H et al. 1995

Reiser H, Dimpfel W, Schober F

The influence of electromagnetic fields on human brain activity

In: Eur J Med Res, 1. Jg. (1995), S. 27.

ABSTRACT:
Possible effects of electromagnetic fields on human brain activity were studied. In a single-blind, cross-over-designed and placebo-controlled study 36 volunteers were exposed firstly to an electromagnetic field originating form a MediLine "MEGA-WAVE 150/1" therapy instrument and secondly to a field originating from a mobile, digital tetlephone as used for wireless telecommunication. All volunteers also underwent a control experiment with no field exposure. Application of the MEGA-WAVE instrument caused an increase in EEG power in the frequency bands Alpha2, Beta1 and Beta2 during and after field exposure. Operation of the mobile telephone caused an increase in the same frequency bands with a delay of approximately 15 minutes after exposure.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Reiter R J 1991

Reiter R J

Pineal melatonin: cell biology of its synthesis and of its physiological interactions

In: Endocr Rev, 12. Jg. (1991), S. 151.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; Review; none; others

Reiter R J 1993

Reiter R J

The melatonin rhythm - both a clock and a calendar

In: Experientia, 49. Jg. (1993), S. 654.

ABSTRACT:
The paper briefly reviews the data which shows that the circadian production and secretion of melatonin by the pineal gland can impart both daily, i.e., clock, and seasonal, i.e., calendar, information to the organism. The paper summarizes the 3 patterns of nocturnal melatonin production that have been described. Clearly, regardless of the pattern of nocturnal melatonin production a particular species normally displays, the duration of nightime elevated melatonin is proportional to the duration of the night length. Since daylength under natural conditions changes daily the melatonin rhythm, which adjusts to the photoperiod sends time of year information to the organism. The melatonin receptors which subserve the clock message sent by the pineal gland in the form of a melatonin cycle may reside in the biological clock itself, namely, the suprachiasmatic nuclei (SCN). The melatonin receptors that mediate seasonal changes in reproductive physiology are presumably those that are located on the pars tuberalis cells of the anterior pituitary gland. Besides these receptors which likely mediate clock and calendar information, melatonin receptors have been described in other organs. Interestingly, the distribution of melatonin receptors is highly species-specific. Whereas the clock and calendar information that the melatonin cycle imparts to the organism relies on cell membrane receptors, a fact that is of some interest considering the high lipophilicity of melatonin, recent studies indicate that other functions of melatonin may require no receptor whatsoever.

SCHLAGWÖRTER:
bioassay; Review; none; others

Repacholi M H 1998

Repacholi M H

Low level exposure to radiofrequency electromagnetic fields: health effects and research needs

In: Bioelectromagnetics, 19. Jg. (1998), S. 1.

ABSTRACT:
The World Health Organization (WHO), the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the German and Austrian Governments jointly sponsored an international seminar in November of 1996 on the biological effects of low-level radiofrequency (RF) electromagnetic fields. For purposes of this seminar, RF fields having frequencies only in the range of about 10 MHz to 300 GHz were considered. This is one of a series of scientific review seminars held under the International Electromagnetic Field (EMF) Project to identify any health hazards from EMF exposure. The scientific literature was reviewed during the seminar and expert working groups formed to provide a status report on possible health effects from exposure to low-level RF fields and identify gaps in knowledge requiring more research to improve health risk assessments. It was concluded that, although hazards from exposure to high-level (thermal) RF fields were established, no known health hazards were associated with exposure to RF sources emitting fields too low to cause a significant temperature rise in tissue. Biological effects from low-level RF exposure were identified needing replication and further study. These included in vitro studies of cell kinetics and proliferation effects, effects on genes, signal transduction effects and alterations in membrane structure and function, and biophysical and biochemical mechanisms for RF field effects. In vivo studies should focus on the potential for cancer promotion, co-promotion and progression, as well as possible synergistic, genotoxic, immunological, and carcinogenic effects associated with chronic low-level RF exposure. Research is needed to determine whether low-level RF exposure causes DNA damage or influences central nervous system function, melatonin synthesis, permeability of the blood brain barrier (BBB), or reaction to neurotropic drugs. Reported RF-induced changes to eye structure and function should also be investigated. Epidemiological studies should investigate: the use of mobile telephones with hand-held antennae and incidence of various cancers; reports of headache, sleep disturbance, and other subjective effects that may arise from proximity to RF emitters, and laboratory studies should be conducted on people reporting these effects; cohorts with high occupational RF exposure for changes in cancer incidence; adverse pregnancy outcomes in various highly RF exposed occupational groups; and ocular pathologies in mobile telephone users and in highly RF exposed occupational groups. Studies of populations with residential exposure from point sources, such as broadcasting transmitters or mobile telephone base stations have caused widespread health concerns among the public, even though RF exposures are very low. Recent studies that may indicate an increased incidence of cancer in exposed populations should be investigated further.

SCHLAGWÖRTER:
epidemiology; Review; hf; others

Repacholi M H et al. 1997

Repacholi M H, Basten A, Gebski V, Noonan D, Finnie J, Harris A W

Lymphomas in EÁ-Pim1 transgenic mice exposed to pulsed 900 MHz electromagnetic fields

In: Radiat Res, 147. Jg. (1997), S. 631.

ABSTRACT:
Whether radiofrequency (RF) fields are carcinogenic is controversial; epidemiological data have been inconclusive and animal tests limited. The aim of the present study was to determine whether long-term exposure to pulse-modulated RF fields similar to those used in digital mobile telecommunications would increase the incidence of lymphoma in E mu-Pim1 transgenic mice, which are moderately predisposed to develop lymphoma spontaneously. One hundred female E mu-Pim1 mice were sham-exposed and 101 were exposed for two 30-min periods per day for up to 18 months to plane-wave fields of 900 MHz with a pulse repetition frequency of 217 Hz and a pulse width of 0.6 ms. Incident power densities were 2.6-13 W/m2 and specific absorption rates were 0.008-4.2 W/kg, averaging 0.13-1.4 W/kg. Lymphoma risk was found to be significantly higher in the exposed mice than in the controls (OR = 2.4. P = 0.006, 95% CI = 1.3-4.5). Follicular lymphomas were the major contributor to the increased tumor incidence. Thus long-term intermittent exposure to RF fields can enhance the probability that mice carrying a lymphomagenic oncogene will develop lymphomas. We suggest that such genetically cancer-prone mice provide an experimental system for more detailed assessment of dose-response relationships for risk of cancer after RF-field exposure.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Repacholi M H et al. 1997a

Repacholi M H, Cardis E

Criteria for EMF health risk assessment

In: Radiat Prot Dosimetry, 72. Jg. (1997), S. 305.

ABSTRACT:
The International EMF Project was established at WHO in 1996 to provide aforum for a coordinated international response to health concerns raised byexposure to electromagnetic fields (EMF). Research on EMF has been ad hocand in many cases uncoordinated. Unreplicated research has been placed atthe same level as high quality research that establishes results in ascientifically valid manner. Because of this the EMF issues have nowreached a high level of concern among the general public and workers. Thisneeds to be addressed at the international level, since the problem istruly global in nature. Research objectives are needed with a clear focuson improving our database of science used for health risk assessments. Thispaper indicates how the International EMF Project will evaluate scientificreports, identify the scientific database needed to make health riskassessments, and assess health hazards using criteria given in IARCmonographs.

SCHLAGWÖRTER:
epidemiology; other type; none; others

Resnekov L 1981

Resnekov L

Noise, radio frequency radiation and the cardiovascular system

In: Circulation, 63. Jg. (1981), S. 264A.

ABSTRACT:
It seems useful to postulate that noise acting as an inducer of stress could produce widespread cardiovascular effects through the central nervous mechanism. As already documented, measurable changes have been reported on blood pressure, circulating hormone levels and urinary catecholamine excretion, serum cholesterol and even platelet aggregation (in experimental animals). The majority of the studies have been concerned with short-term effects in man and in animals, and data relating to long-term effects of noise on the cardiovascular system is not available. At the present time there is very little information about any quantitative relationship between the magnitude of short-term physiological changes produced by intermittent exposure to noise and the rate of increase of atherosclerosis, or the development of hypertension, let alone any added risk of precipitating myocardial infarction or stroke. Future studies might focus on: 1) acute changes in the cardiovascular system produced by exposure to noise, 2) the risks in various population groups, and 3)

longterm deleterious effects that could result from chronic short-term exposure to high levels of noise. Thus, further study is needed to determine the circumstances under which noise exposure produces increases in blood pressure and to define susceptible population groups. The relationship between noise exposure at specified levels and duration and the development of chronic established hypertension and cardiovascular disease could be explored. In the past, most studies on the physiological effects of noise have dealt with noise as an occupational hazard. Additional information about the effects of noise on the health of the population as a whole is needed. With respect to radio frequency radiation, there is insufficient data in animals or man to provide a clear picture of the cardiovascular risks. Moreover, the variety of exposure patterns (acute, chronic, periodic, low level) makes it difficult to determine unsafe levels on a scientific basis. This area has been largely ignored by western scientists and deserves investigation.

SCHLAGWÖRTER:
epidemiology; Review; hf; cvd

Reynolds P et al. 2001

Reynolds P, Elkin E, Scalf R, Von Behren J, Neutra R R
A case-control pilot study of traffic exposures and early childhood leukemia using a geographic information system
In: Bioelectromagnetics, 22. Jg. (2001), S. 58.

ABSTRACT:
The scientific debate on risk relationships between proximity to electric and magnetic fields and the development of childhood leukemia has recently focused on the role of other factors that may be strongly correlated with power lines. Proximity to high traffic density, as defined by major roadways or automobile counts, and associated socioeconomic neighborhood characteristics have been suggested as potentially important confounders. For traffic or socioeconomic status (SES) to confound any EMF effect these factors would need to have their own independent impact on leukemia risk. This study was designed to use geographic information system (GIS) technology to empirically examine the relationship between traffic density and socioeconomic indicators to early childhood leukemia in an urban area of California. Ninety cases of childhood leukemia diagnosed under the age of five between 1988 and 1994 among children born in San Diego County were matched by gender and birth date to a total of 349 children also born in the county and not known to have developed any cancer. Case-control differences were assessed via conditional logistic regression. No significant differences were observed for the neighborhood median family income of the birth residences. When comparing neighborhoods with median annual income > or = $56,000 to those with incomes < or = $18,000 the odds ratio was 0.86 (95% confidence interval 0.31, 2.38). Traffic density was measured using a variety of methods, including information on average daily traffic counts and road characteristics. None of the measures of traffic were associated with case status. Neither SES or traffic density near the birth address as assessed with GIS methods are strong enough risk factors for leukemia to be confounders which could totally explain the effect of another variable (such as wire code). Associations with the diagnosis address or with more direct exposure measures may differ from those reported here.

SCHLAGWÖRTER:
epidemiology; ecological; none; cancer

Richardson S et al. 1992

Richardson S, Zittoun R, Bastuji-Garin S, Lasserre V, Guihenneuc C, Cadiou M, Viguie F, Laffont-Faust I
Occupational risk factors for acute leukaemia: a case-control study
In: Int J Epidemiol, 21. Jg. (1992), S. 1063.

ABSTRACT:
A case-control study has been performed for occupational risk factors of acute leukaemia, based on 185 cases more than 30 years old and 513 matched controls. There was a significant excess of polyvalent farming and electronic engineers among professions of cases, and, in addition of metal workers when considering the professions pursued for more than 5 years. The corresponding exposures were analysed through a detailed questionnaire, and assessed by an industrial hygienist after blinding the case-control status. The odds ratios (OR) were computed after adjustment on matching variables and prior chemo- or radiotherapy treatment, and after stratification for the level and total duration of exposure. There was no excess of professional exposure to ionizing radiation among cases. A significant relationship was observed between acute leukaemia and high or medium exposure to benzene, as well as over 10 years high or medium exposure to exhaust gas. In addition a significant relationship was observed with exposure to pesticides--insecticides and/or weed killers--and to electric and magnetic fields (EMF). The relationship with pesticides was significant when considering high or medium exposure to weed killers and more than 10 years exposure to both subtypes of pesticides. The relationship with pesticides and EMF remained significant when confounding factors were taken into consideration and after adjustment on co-exposure to benzene. The cytological studies showed that acute leukaemias following exposure to benzene (high or medium) and to EMF were only of myelogenous subtypes, whereas those following exposure to pesticides were divided between lymphoblastic and myeloblastic subtypes. Cytogenetic studies failed to show increased frequency of chromosomal abnormalities, as described in acute leukaemias secondary to anti-cancer treatments. Our study adds credence to the hypothesis that pesticides and EMF are leukaemogenic agents, together with benzene.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Richter E et al. 2000

Richter E, Berman T, Ben-Michael E, Laster R, Westin J B
Cancer in radar technicians exposed to radiofrequency/microwave radiation: sentinel episodes
In: Int J Occup Environ Health, 6. Jg. (2000), S. 187.

ABSTRACT:
Controversy exists concerning the health risks from exposures to radiofrequency/microwave irradiation (RF/MW). The authors report exposure-effect relationships in sentinel patients and their co-workers, who were technicians with high levels of exposure to RF/MW radiation. Information about exposures of patients with sentinel tumors was obtained from interviews, medical records, and technical sources. One patient was a member of a cohort of 25 workers with six tumors. The authors estimated relative risks for cancer in this group and latency periods for a larger group of self-reported individuals. Index patients with melanoma of the eye, testicular cancer, nasopharyngioma, non-Hodgkin's lymphoma, and breast cancer were in the 20-37-year age group. Information about work conditions suggested prolonged exposures to high levels of RF/MW radiation that produced risks for the entire body. Clusters involved many different types of tumors. Latency periods were extremely brief in index patients and a larger self-reported group. The findings suggest that young persons exposed to high levels of RF/MW radiation for long periods in settings where preventive measures were lax were at increased risk for cancer. Very short latency periods suggest high risks from high-level exposures. Calculations derived from a linear model of dose-response suggest the need to prevent exposures in the range of 10-100 microw/cm(2).

SCHLAGWÖRTER:

epidemiology; other type; hf; cancer

Robert E 1999

Robert E

Intrauterine effects of electromagnetic fields - (low frequency, mid-frequency RF, and microwave): review of epidemiologic studies

In: Teratology, 59. Jg. (1999), S. 292.

ABSTRACT:
Electromagnetic radiations are named according to frequency or to wavelength (which is inversely proportional to frequency) and create electromagnetic fields (EMFs). Frequencies widely vary according to sources: high-voltage power lines, electrically heated beds, MRI, VDTs, microwave ovens, satellite, and radio/TV transmissions or cellular phone transmitters/receivers. Public concern has increased about the potential health effects of EMFs. There are arguments in favour of EMFs being biologically active, but no mechanism has been identified that explains the link between EMFs and bioeffects. Human data reviewed concern the potential reproductive effects (mainly spontaneous abortions, low birthweight and congenital malformations) of exposure to sources of EMFs: maternal residence, electrically heated beds, occupational exposure (mainly video display terminals), and medical exposures. The available epidemiologic studies all have limitations that prevent to draw clearcut conclusions on the effects of EMFs on human reproduction. EMFs are ubiquitous and unavoidable exposures. The matter of possible effects cannot be considered closed, but until our understanding of the biologic important parameters of EMFs exposures is stronger,design of new studies will be difficult and small epidemiologic studies are unlikely to provide definitive answers and should not be given high priority. No conclusion can be drawn for radiofrequencies and microwaves because of lack of data. There is no convincing evidence today that EMFs of the sort pregnant women or potential fathers meet in occupational or daily life exposures does any harm to the human reproductive process.

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; others

Robert E et al. 1996

Robert E, Harris J A, Robert O, Selvin S

Case-control study on maternal residential proximity to high voltage power lines and congenital anomalies in France

In: Paediatr Perinat Epidemiol, 10. Jg. (1996), S. 32.

ABSTRACT:
The literature indicates that exposure to electro-magnetic fields (EMF) may result in an increased incidence of cancer and spontaneous abortion. The aim of the present study was to determine whether living closer to high voltage power lines (HVPL) increased the risk of congenital anomalies. We studied residential exposure in any municipality in the Central-East Region of France where there was at least one residence within 500 metres of a HVPL. This was a matched case-control design. The cases consisted of all children with congenital anomalies, identified to the population-based registry in Central-East France between 1988-91. We chose two random controls, matched for birth year and municipality, for each case. For every case and control, we measured the distance from the HVPL to the maternal residence at the time of birth of the child as a surrogate for EMF exposure. Using 100 metres from an HVPL as the cut-point between exposure and non-exposure to electro-magnetic fields produced by HVPL, yielded an odds ratio of 0.95 (95% (confidence interval) CI: 0.45-2.03). Using 50 metres as the cut-point, yielded an OR of 1.25 (95% CI: 0.49-3.22). Among the 11 cases within 100 metres, there were 2 children with chromosomal anomalies, but otherwise there was no pattern in the occurrence of specific anomalies. These data indicate a lack of association between distance to HVPL and the total number of congenital anomalies. This study does not have enough statistical power to determine whether the prevalence of a specific congenital anomaly is significantly increased as a result of living near a HVPL.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Roberti B et al. 1975

Roberti B, Heebels G H, Hendrix J C M, De Greef A H A M, Wolhuis O L

Preliminary investigations of the effects of low-level microwave radiation on spontaneous motor activity in rats

In: Ann NY Acad Sci, 247. Jg. (1975), S. 417.

ABSTRACT:
Male rats were irradiated with microwaves of 10.7 GHz (cw), 3 GHz (cw), or 3 GHz (pw) for 185 hr with power densities of approximately 1 mW/cm-2. Spontaneous activity was automatically measured and analyzed in five amplitude classes, after irradiation had ceased. No differences were found between the irradiated and the similarly treated nonirradiated control rats. A few rats were exposed for 17 days to 3 GHz (pw) at 25 mW/cm-2. Here, again, the spontaneous motor activity was not affected. Before irradiation, these rats had been trained to constant peak performance in a 2-m long runway. Their running times remained unchanged by this treatment regimen and did not differ from those of nonirradiated control rats. So far, no deleterious effects of the microwave radiation used has been detected.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Roberts N J et al. 1986

Roberts N J Jr, Michaelson S M, Lu S-T

The biological effects of radiofrequency radiation: a critical review and recommendations

In: Int J Radiat Biol, 50. Jg. (1986), S. 379.

ABSTRACT:
Exposure of the general public and in particular certain occupational groups to radiofrequency radiation (RFR) is ubiquitous and of growing concern. No clear and widely accepted understanding of the biological effects and health implications of such RFR exposure has emerged. This paper reviews the data available, including reports of RFR effects on single cells or cell components, on genetic composition or development, on developed organs, tissues, or cell systems, and on integrative and regulatory biological systems. Reports of RFR effects on the immunological system, with consideration of the influence of neuroendocrine responses, are critically reviewed in greater detail to illustrate important points regarding data acquisition and assessment, and understanding and application of the RFR bioeffects literature in general. Factors affecting RFR bioeffects research are reviewed, and recommendations for future studies are provided.

SCHLAGWÖRTER:
epidemiology; Review; hf; biological effects

Robinette C D et al. 1980

Robinette C D, Silverman C, Jablon S

Effects upon health of occupational exposure to microwave radiation (radar)

In: Am J Epidemiol, 112. Jg. (1980), S. 39.

ABSTRACT:
The effects of occupational experience with microwave radiation (radar) on the health of US enlisted Naval personnel were studied in cohorts of approximately 20,000 men with maximum opportunity for exposure (electronic equipment repair) and 208000 with minimum potential for exposure (equipment operation) who served during the Korean War period. Potential exposure was assessed in terms of occupational duties, length of time in occupation

and power of equipment at the time of exposure. Actual exposure to members of each cohort could not be established. Mortality by cause of death, hospitalization during military service, later hospitalization in Veterans Administration (VA) facilities, and VA disability compensation were the health indexes studied, largely through the use of automated record systems. No adverse effects were detected in these indexes that could be attributed to potential microwave radiation exposures during the period 1950-1954. Functional and behavioral changes and ill-defined conditions, such as have been reported as microwave effects, could not be investigated in this study but subgroups of the living study population can be identified for expanded follow-up.

SCHLAGWÖRTER:
epidemiology; cohort; hf; mortality

Robinson C F et al. 1991

Robinson C F, Lalich N R, Burnett C A, Sestito J P, Frazier T M, Fine L J

Electromagnetic field exposure and leukemia mortality in the United States

In: J Occup Med, 33. Jg. (1991), S. 160.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Robinson C F et al. 1999

Robinson C F, Petersen M, Palu S

Mortality patterns among electrical workers employed in the U.S. construction industry, 1982-1987

In: Am J Ind Med, 36. Jg. (1999), S. 630.

ABSTRACT:
BACKGROUND: Studies of electrical workers in the utility and manufacturing industries have reported excess site-specific cancer. No previous studies of electrical workers in the construction industry have been conducted. METHODS: Our study evaluated the mortality patterns of 31,068 U.S. members of the International Brotherhood of Electrical Workers who primarily worked in the construction industry and died 1982-1987. RESULTS: Comparison to the U.S. population by using the NIOSH life table showed significantly elevated proportionate mortality for many causes. Excess mortality for leukemia (proportionate mortality ratio (PMR)=115) and brain tumors (PMR=136) is similar to reports of electrical workers with occupational exposure to electric and magnetic fields in the electric utility or manufacturing industry. Excess deaths due to melanoma skin cancer (PMR=123) are consistent with findings of other PCB-exposed workers. A significantly elevated PMR was observed for the diseases caused by asbestos: lung cancer (PMR=117), asbestosis (PMR=247), and malignant mesothelioma (PMR=356) and from fatal injuries, particularly electrocutions (PMR=1180). The findings of statistically significant excess deaths for prostate cancer (PMR=107), musculoskeletal disease (PMR=130), suicide (PMR=113), and disorders of the blood-forming organs (PMR=141) were unexpected. CONCLUSIONS: Results suggest that more detailed investigations of occupational risk factors and evaluation of preventive practices are needed to prevent excess mortality in this hazardous occupation.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; mortality

Robinson J P et al. 2000

Robinson J P, Silvers A

Measuring potential exposure to environmental pollutants: time spent with soil and time spent outdoors

In: J Expo Anal Environ Epidemiol, 10. Jg. (2000), S. 341.

ABSTRACT:
In 1994-1995, the Electric Power Resource Institute (EPRI) undertook a major national survey of time in microenvironments with 1200 respondents aged 18 and older. It did so using a methodology that minimized the problems of respondent recall and reporting by the use of a "time diary," in which survey respondents reported in detail about their actual activities "yesterday" including time spent outdoors. In addition, respondents were asked questions about the extent of contact with soil they had on that day. Significant proportions (20%) of the American public reported coming in direct contact with soil on a typical day and those who did come in contact were exposed for about 1.7 h per day; some 6% of the public reported being exposed for more than 2 h on the day in question, mainly by hand (although 3% of respondents reported soil contact with their head or face). As expected, men reported far more soil contact than women; surprisingly few consistent differences were found by age, or by marital status, parental status or employment status. Contrary to expectations, higher contact was not reported by minorities, or by less educated or less affluent respondents. Moreover, these patterns generally remained unchanged after adjustment for other demographic predictors. More as expected, higher exposure was reported in the Spring months, on weekends, and in rural areas and in the South and West regions of the country, patterns again largely unaffected by multivariate controls for other predictors. In general, while certain predictors of soil exposure were much the same for time spent outdoors, there were some notable exceptions.

SCHLAGWÖRTER:
epidemiology; cross-sectional; none; others

Rodvall Y et al. 1998

Rodvall Y, Ahlbom A, Stenlund C, Preston-Martin S, Lindh T, Spannare B

Occupational exposure to magnetic fields and brain tumours in central Sweden

In: Eur J Epidemiol, 14. Jg. (1998), S. 563.

ABSTRACT:
Occupations with exposure to magnetic fields were studied in a population-based case-control study of male glioma and meningioma in Central Sweden. The study included 84 cases of glioma, 20 cases of meningioma and 155 controls. Information about job titles was obtained by means of a questionnaire. Three different methods were used to classify exposure 1) 'electrical occupations', 2) assessment of magnetic fields by an electrical engineer, 3) job values based on magnetic field measurements at work sites for occupational groups. When analyses were based on 'electrical occupations' a relative risk (RR) of 1.0 (95% CI: 0.4-2.4) was seen for glioma and 1.8 (95% CI: 0.3-3.6) for meningioma. When analyses were based on measurements a relative risk of 1.9 (95% CI: 0.8-5.0) was seen for glioma and 1.6 (95% CI: 0.3-10.2) for those ever in an exposed job of an average mean value of > 0.4 microT. A larger number of individuals was classified as exposed, when exposure was based on measurements. Information was available regarding several potential confounders, but none of them seemed to be of any importance. Our conclusion is that the results based on magnetic field measurements give some support to the hypothesis that magnetic fields exposure may play a role in the development of brain tumours.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Ronneberg A et al. 1999

Ronneberg A, Haldorsen T, Romundstad P, Andersen A

Occupational exposure and cancer incidence among workers from an aluminum smelter in western Norway

In: Scand J Work Environ Health, 25. Jg. (1999), S. 207.

ABSTRACT:
OBJECTIVES: This study investigated the associations between specific cancers and occupational exposure to polycyclic aromatic hydrocarbons (PAH), asbestos, electromagnetic fields, and heat in a cohort of workers from a Norwegian aluminum smelter. METHODS: Cancer incidence between 1953 and 1993 was observed for 2647 male short-term workers and 2 cohorts of men with at least 4 years' employment (2888 production workers and 373 maintenance workers). Standardized incidence ratios (SIR) were calculated from the national male cancer incidence, and associations with cumulative exposure were investigated by stratified analysis. Cumulative exposure in 15-year time windows was used as an alternative dose indicator. RESULTS: Investigation of the a priori hypotheses in the production cohort revealed a positive association between bladder cancer and PAH exposure 30 years or more before observation. The results also suggested an association between PAH and pancreatic cancer, although not statistically significant. No association was seen between exposure to PAH and cancers of the lungs or between magnetic field exposure and lymphatic and hematopoietic cancer. In the maintenance cohort there was a positive association between employment as an electrician and lymphatic and hematopoietic cancer and a statistically nonsignificant association between PAH and lung cancer. The short-term workers showed a statistically significant excess of lung cancer. CONCLUSIONS: The results support previous findings of an association between exposure to PAH and bladder cancer.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Roschke J et al. 1997

Roschke J, Mann

No short-term effects of digital mobile radio telephone on the awake human electroencephalogram

In: Bioelectromagnetics, 18. Jg. (1997), S. 172.

ABSTRACT:
A recent study reported the results of an exploratory study of alterations of the quantitative sleep profile due to the effects of a digital mobile radio telephone. Rapid eye movement (REM) was suppressed, and the spectral power density in the 8-13 Hz frequency range during REM sleep was altered. The aim of the present study was to illuminate the influence of digital mobile radio telephone on the awake electroencephalogram (EEG) of healthy subjects. For this purpose, we investigated 34 male subjects in a single-blind cross-over design experiment by measuring spontaneous EEGs under closed-eyes condition from scalp positions C3 and C4 and comparing the effects of an active (0.05 mW/cm2) and an inactive digital mobile radio telephone (GSM) system. During exposure of nearly 3.5 min to the 900 MHz electromagnetic field pulsed at a frequency of 217 Hz and with a pulse width of 580 microseconds, we could not detect any difference in the awake EEGs in terms of spectral power density measures.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Rosenbaum P F et al. 1994

Rosenbaum P F, Vena J E, Zielezny M A, Michalek A M

Occupational exposures associated with male breast cancer

In: Am J Epidemiol, 139. Jg. (1994), S. 30.

ABSTRACT:
The role of occupational exposure to heat and electromagnetic fields was investigated in a case-control study of male breast cancer. Seventy-one cases reported to the New York State Tumor Registry between 1979 and 1988 were compared with 256 healthy male controls. Controls were frequency matched to cases by race, year of diagnosis, and age in 5-year intervals. Unconditional logistic regression modeling indicated that males with occupations that involved heat exposure had an elevated risk for the disease. The age- and county-adjusted odds ratio was 2.3 (95% confidence interval (CI) 0.95-5.3). Exposure to heat on the job could influence testicular function. No increase in disease risk was observed for males believed to have occupational exposure to electromagnetic fields (odds ratio = 0.7, 95% CI 0.3-1.9)

SCHLAGWÖRTER:
epidemiology; elf/hf; case-control; cancer

Rothman K J et al. 1996

Rothman K J, Loughlin J E, Funch D P, Dreyer N A

Overall mortality of cellular telephone customers

In: Epidemiology, 7. Jg. (1996), S. 303.

ABSTRACT:
Unlike mobile cellular telephones, in which the antenna is not part of the handset, a portable cellular telephone exposes the user's head to radio frequency energy transmitted from the antenna. This exposure has prompted concerns about potential biological effects, including brain cancer. As a first step in a record-based mortality surveillance of cellular telephone customers, we report on overall mortality of a cohort of more than 250,000 portable and mobile telephone customers during 1994. We found age-specific rates to be similar for users of the two types of telephones. For customers with accounts at least 3 years old, the ratio of mortality rates in 1994 for portable telephone users, compared with mobile telephone users, was 0.86 (90% confidence interval = 0.47-1.53).

SCHLAGWÖRTER:
epidemiology; cohort; hf; mortality

Rotkovska D et al. 1993

Rotkovska D, Moc J, Kautska J, Bartonicknov A, Keprtova J, Hofer M

Evaluation of the biological effects of police radar RAMER 7E

In: Environ Health Perspect, 101. Jg. (1993), S. 134.

ABSTRACT:
This paper presents results of experiments on the effects of electromagnetic radiation in the millimeter range (frequency 34.0 +/- 0.1 GHz, power density 20 muW/cm2) emitted by a police radar device. Considering the physical properties of the radiation in millimeter range (skin effects), the experiments were carried out on hairless mice. The main physiological parameters tested were body mass, body temperature, peripheral blood, and mass and cellularity of several important organs. Critical organs, the skin, and cornea were examined by electron microscopy. Differentiation ability of hematopoietic cells, progenitors of granulocytes and macrophages, and DNA synthesis in the cornea were compared in irradiated and nonirradiated animals. None of the parameters tested was affected to an extent that would indicate the start of a pathological process or the risk of damage to genetic material.

SCHLAGWÖRTER:
epidemiology; other type; hf; biological effects

Sahl J D 1994

Sahl J D

Viral contacts confound studies of childhood leukemia and high-voltage transmission lines

In: Cancer Causes Control, 5. Jg. (1994), S. 279.

ABSTRACT:
Studies of childhood leukemia have reported a link with residential proximity to electric utility facilities. This paper elaborates on the hypothesis that residential proximity to electric utility transmission-systems is a surrogate for viral contacts, a potential confounder in these studies. While the causal implications of increased viral contacts is not established, the assumption made here is that a significant

component of childhood leukemia has an infectious etiology. Increased viral contacts can result from residential mobility, being first born, or use of community childcare facilities. Re-analysis of existing studies should look specifically for the interaction between childhood leukemia, markers for viral contacts (e.g., residential mobility, birth order, use of outside childcare facilities), and residential proximity to high-voltage transmission lines. New study designs should include parameters to test directly for a virus-related infectious model for childhood leukemia.

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Sahl J D et al. 1993

Sahl J D, Kelsh M A, Greenland

Cohort and nested case-control studies of hematopoietic cancers and brain cancer among electric utility workers

In: Epidemiology, 4. Jg. (1993), S. 104.

ABSTRACT:
Recent studies have raised concern about the potential health effects of occupational exposures to power frequency electric and magnetic fields. We evaluated cancer mortality for leukemia, brain cancer, and lymphoma from 1960 to 1988 in a cohort of 36,221 electric utility workers using cohort analyses and three nested case-control studies. From a volunteer sample of the current workforce that represented a variety of different occupations and work locations, we collected 776 days of magnetic field measurements. We derived exposure information from company job history information and developed exposure scores by linking job history data to measured magnetic fields. In job title analyses, we compared "electrical workers" with other field and craft occupations, office, and technical support staff. Age-specific cancer rates for electrical and reference workers were similar. "Electrical workers" had rate ratios or odds ratios ranging from 0.7 to 1.4. Most ratios were close to 1.0. Lymphomas were slightly elevated compared with leukemias and brain cancers (ratios of 0.9-1.4 vs 0.7-1.2, respectively). Odds ratios for magnetic field exposure indices, based on scores for the mean, median, 99th percentile, and fractions exceeding 10 milligauss and 50 milligauss, were all close to or less than 1.0. The interval estimates indicate no strong association but are somewhat limited by imprecision.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Salford L G et al. 1993

Salford L G, Brun A, Persson B R R, Eberhardt J

Experimental studies of brain tumour development during exposure to continuous and pulsed 915 MHz radiofrequency radiation

In: Bioelectrochem Bioenerget, 30. Jg. (1993), S. 313.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; Review; hf; biological effects

Salford L G et al. 1994

Salford L G, Brun A, Sturesson K, Eberhardt J, Persson B R R

Permeability of the blood brain barrier induced by 915 MHz electromagnetic radiation, continuous wave and modulated at 8, 16, 50, 200 Hz

In: Microscopy Res Tech, 27. Jg. (1994), S. 535.

ABSTRACT:
Biological effects of electromagnetic fields (EMF) on the blood-brain barrier (BBB) can be studied in sensitive and specific models. In a previous investigation of the permeability of the blood-brain barrier after exposure to the various EMF-components of proton magnetic resonance imaging (MRI), we found that the exposure to MRI induced leakage of Evans Blue labeled proteins normally not passing the BBB of rats [Salford et al. (1992), in: Resonance Phenomena in Biology, Oxford University Press, pp. 87-91]. In the present investigation we exposed male and female Fischer 344 rats in a transverse electromagnetic transmission line chamber to microwaves of 915 MHz as continuous wave (CW) and pulse-modulated with repetition rates of 8, 16, 50, and 200 s-1. The specific energy absorption rate (SAR) varied between 0.016 and 5 W/kg. The rats were not anesthetized during the 2-hour exposure. All animals were sacrificed by perfusion-fixation of the brains under chloral hydrate anesthesia about 1 hour after the exposure. The brains were perfused with saline for 3-4 minutes, and thereafter fixed in 4% formaldehyde for 5-6 minutes. Central coronal sections of the brains were dehydrated and embedded in paraffin and sectioned at 5 microns. Albumin and fibrinogen were demonstrated immunohistochemically. The results show albumin leakage in 5 of 62 of the controls and in 56 of 184 of the animals exposed to 915 MHz microwaves. Continuous wave resulted in 14 positive findings of 35, which differ significantly from the controls (P = 0.002).(ABSTRACT TRUNCATED AT 250 WORDS)

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Salzberg M R et al. 1992

Salzberg M R, Farish S J, Delpizzo

An analysis of associations between social class and ambient magnetic fields in metropolitan Melbourne

In: Bioelectromagnetics, 13. Jg. (1992), S. 163.

ABSTRACT:
In the course of a study on residential magnetic-field exposure, some incidental data were obtained that bear on the issue of confounding of magnetic field exposure by social class. We have explored the possibility that the magnetic flux density of 50 Hz fields measured in Melbourne streets is correlated with a number of variables that index the socio-economic status of the neighborhood. We have examined also for a correlation between field-intensity levels and sums of some or all of the indicators, which were weighted to provide an overall score on socio-economic status. Although some of the indexes were weakly, but significantly, correlated with environmental levels of magnetic fields, the combined indices were not. These results indicate that socio-economic status is not likely to be a confounder in epidemiological studies of residential exposure to ELF magnetic fields in Melbourne.

SCHLAGWÖRTER:
epidemiology; ecological; elf; others

Sandstrom M et al. 2001

Sandstrom M, Wilen J, Oftedal G, Hansson Mild K

Mobile phone use and subjective symptoms. Comparison of symptoms experienced by users of analogue and digital mobile phones

In: Occup Med, 51. Jg. (2001), S. 25.

ABSTRACT:
In 1995 many people reported symptoms such as headaches, feelings of discomfort, warmth behind/around or on the ear and difficulties concentrating while using mobile phones. The number of complaints was higher for people using the digital (GSM) system, i.e. with pulse modulated fields, than for those using the analogue (NMT) system. Our main hypothesis was that GSM users experience more symptoms than NMT users. An epidemiological investigation was initiated including 6379 GSM users and 5613 NMT 900 users in Sweden, and 2500 from each category in Norway. The adjusted odds ratio did not indicate any increased risk for symptoms for GSM users compared with NMT 900 users. Our hypothesis was therefore disproved. However, we

observed a statistically significant lower risk for sensations of warmth on the ear for GSM users compared with NMT 900 users. The same trend was seen in Norway for sensations of warmth behind/around the ear and in Sweden for headaches and fatigue. Factors distinguishing the two systems (radio frequency emission, phone temperatures and various ergonomic factors) may be responsible for these results, as well as for a secondary finding: a statistically significant association between calling time/number of calls per day and the prevalence of warmth behind/around or on the ear, headaches and fatigue.

SCHLAGWÖRTER:
epidemiology; other type; hf; subjective complaints

Santini R et al. 1988

Santini R, Honsi M, Deschaux P, Pacheco H
B16 melanoma development in black mice exposed to low-level microwave radiation
In: Bioelectromagnetics, 9. Jg. (1988), S. 105.

ABSTRACT:
The effect of low-level microwave exposure, 2,450 MHz, at a power density of 1 mW/cm2 and specific absorption rate of 1.2 mW/g, continuous waves (CW) or pulsed waves (PW), 2.5 h/day, 6 sessions/week until death (up to 690 h of irradiation), has been studied in black C57/6J mice with B16 melanoma. The results show that no significant effects are observed on tumor development or on survival times compared to controls, or between CW- and PW-treated animals.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Sanza J N et al. 1977

Sanza J N, de Lorge
Fixed interval behavior of rats exposed to mcirowaves at low power densities
In: Radio Sci, 12. Jg. (1977), S. 273.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Sarkar S et al. 1994

Sarkar S, Ali S, Behari J
Effect of low power microwave on the mouse genome: a direct DNA analysis
In: Mutat Res, 320. Jg. (1994), S. 141.

ABSTRACT:
The potential mutagenic effect of low power microwave at the DNA sequence level in the mouse genome was evaluated by direct DNA analysis. Animals were exposed to microwave at a power density of 1 mW/cm2 for 2 h/day at a frequency of 2.45 GHz over a period of 120, 150 and 200 days. HinfI digested DNA samples from testis and brain of control and exposed animals were hybridized with a synthetic oligo probe (OAT 36) comprising nine repeats of 5'-GACA-3'. As compared to control animals, band patterns in exposed animals were found to be distinctly altered in the range of 7-8 kb which was also substantiated by densitometric analysis. Though the mechanism of this rearrangement is not yet clear, the results obtained at the present dose are of significance. This dose, which has been set as the safe limit for general public exposure by the Non-Ionizing Radiation Committee of the International Radiation Protection Association, may imply a need for (re)evaluation of the mutagenic potential of microwaves at the prescribed safe limit for the personnel and people who are being exposed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Saunders R D et al. 1981

Saunders R D, Kowalczuk C I
Effect of 2450 MHz microwave radiation and heat on mouse spermatogenic epithelium
In: Int J Radiat Biol, 40. Jg. (1981), [Seitenangaben fehlen!]

ABSTRACT:
The rear halves of the bodies of anaesthetized male C3H mice were exposed for 30 min to 2.45 GHz microwave radiation and the effects on the testes were compared to those produced by direct heating. Effects were observed which are consistent with the hypothesis that heat damage is the primary effect of microwave exposure. Damage measured six days after exposure ranged in severity from depletion of the spermatocytes to extensive necrosis of the germinal epithelium. Temperature-sensitive probes implanted in the testes revealed a threshold effect for depletion of the spermatocytes of approximately 39 degrees C and an LD50 6 (50 per cent cell death after 6 days) of about 41 degrees C after microwave exposure or direct heating. The corresponding effective threshold effect and LD50 6 expressed in terms of absorbed microwave power were 20 W kg-1 and 30 W kg-1. However, it is probable that a conscious animal is better able to regulate testicular temperature and hence adjust to higher dose-rates.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Saunders R D et al. 1983

Saunders R D, Darby S C, Kowalcazuk C I
Dominant lethal studies in male mice after exposure to 2450 MHz microwave radiation
In: Mutat Res, 117. Jg. (1983), S. 345.

ABSTRACT:
Adult male mice had the lower halves of their bodies exposed in a waveguide system to 2.45 GHz microwave radiation for 30 min. The half body dose-rate of 43 W kg-1 had been shown in a previous study [7] to deplete severely the heat-sensitive stages of sperm production. The males were mated at intervals to adult hybrid females over the following 8-10 weeks. There was no significant reduction in post-implantation survival, suggesting that the microwave exposure did not have a mutagenic effect on the male germ cells. However, pregnancy rate was significantly reduced in weeks 3, 4, 5 and 6; reaching a minimum of about 10% of the control value in weeks 4 and 5. The occurrence of low values in weeks 4 and 5 correlated well with the expected reductions in sperm count due to the pattern of depletion of the spermatogenic epithelium of the testes. Thus it was concluded that the reduced pregnancy rate resulted from reduced male fertility. Pre-implantation survival can also be affected by reduced sperm count [8] and was significantly reduced in this study but it correlated less well with the anticipated heat response. A further study is in progress looking at the contribution of sperm count and sperm abnormality to the results.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Saunders R D et al. 1988

Saunders R D, Kowalczuk C I, Beechey C V, Dunford R
Studies of the induction of dominant lethals and translocations in male mice after chronic exposure to microwave radiation
In: Int J Radiat Biol, 53. Jg. (1988), S. 983.

ABSTRACT:
Male C3H mice were exposed to 100 W m-2 of 2.45 GHz continuous-wave microwave radiation for 6 h per day for a total of 120 h over an 8-week period. The exposure level was chosen so that the specific energy absorption rate

(SAR) would be approximately equal to the level of 4 W kg-1 which is considered by a number of organizations to be a threshold for adverse biological effects. At the end of the treatment period the mice were mated with a different group of (C3H x 101) F1 hybrid females each week for the following 8 weeks. There was no significant reduction in pregnancy rate, preimplantation survival or postimplantation survival in the exposed group compared to sham-exposed controls. At the end of the mating period a cytogenetic analysis was carried out of meiotic chromosome preparations of testicular tissue, thus sampling cells that were stem cell spermatogonia during the treatment regime. The results showed no difference in the frequency of reciprocal translocations between the sham and treated groups, or in the frequency of cells with autosome or sex chromosome univalents. Low levels of fragments and exchanges were found in both groups. It is concluded that there is no evidence in this experiment to show that chronic exposure of male mice to 2.45 GHz microwave radiation induces a mutagenic response in male germ cells. This conclusion is in agreement with the observations of Berman et al. (1980), who reported a lack of male germ cell mutagenesis after repetitive or chronic exposure of rats to 2.45 GHz.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Savitz D A et al. 1988

Savitz D A, Wachtel H, Barnes F A, John E M, Tvrdik J G
Case-control study of childhood cancer and exposure to 60-Hz magnetic fields
In: Am J Epidemiol, 128. Jg. (1988), S. 21.

ABSTRACT:
Concern with health effects of extremely low frequency magnetic fields has been raised by epidemiologic studies of childhood cancer in relation to proximity to electric power distribution lines. This case-control study was designed to assess the relation between residential exposure to magnetic fields and the development of childhood cancer. Eligible cases consisted of all 356 residents of the five-county 1970 Denver, Colorado Standard Metropolitan Statistical Area aged 0-14 years who were diagnosed with any form of cancer between 1976 and 1983. Controls were selected by random digit dialing to approximate the case distribution by age, sex, and telephone exchange area. Exposure was characterized through in-home electric and magnetic field measurements under low and high power use conditions and wire configuration codes, a surrogate measure of long-term magnetic field levels. Measured magnetic fields under low power use conditions had a modest association with cancer incidence; a cutoff score of 2.0 milligauss resulted in an odds ratio of 1.4 (95% confidence interval (CI) = 0.6-2.9) for total cancers and somewhat larger odds ratios (ORs) for leukemias (OR = 1.9), lymphomas (OR = 2.2), and soft tissue sarcomas (OR = 3.3). Neither magnetic fields (OR = 1.0) nor electric fields (OR = 0.9) under high power use conditions were related to total cancers. Wire codes associated with higher magnetic fields were more common among case than control homes. The odds ratio to contrast very high and high to very low, low, and buried wire codes was 1.5 (95% CI = 1.0-2.3) for total cases, with consistency across cancer subgroups except for brain cancer (OR = 2.0) and lymphomas (OR = 0.8). Contrasts of very high to buried wire code homes produced larger, less precise odds ratios of 2.3 for total cases, 2.9 for leukemias, and 3.3 for lymphomas. Adjusted estimates for measured fields and wire codes did not differ from crude results, indicating an absence of confounding. Limitations to the study are nonresponse (especially for field measurements), differential mobility of cases and controls, and a presumably nondifferential exposure misclassification from the use of imperfect surrogates for long-term magnetic field exposure history. In spite of these concerns, the results encourage further examination of the carcinogenic potential from this form of nonionizing radiation.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Savitz D A et al. 1993

Savitz D A, Kaune W T
Childhood cancer in relation to a modified residential wire code
In: Environ Health Perspect, 101. Jg. (1993), S. 76.

ABSTRACT:
Several studies have found associations between wire configuration codes, a proxy for historical residential magnetic field exposure, and childhood cancer. The Wertheimer-Leeper coding method was modified by eliminating the distinction between thick and thin primaries, distinguishing only between open and spun secondaries, and reducing the number of categories from five to three. The association between the modified code and measured magnetic fields was similar to the association with the original wire code. The modified code was used to reanalyze data from a case-control study of childhood cancer in the Denver metropolitan area. In the original study, cases were diagnosed from 1976 to 1983 among children under age 15 and compared to controls selected through random digit dialing. Wire codes for the residence at diagnosis yielded imprecise elevations of two and above for very high current configuration homes or modest 1.5-fold elevations for a dichotomous wire code. In contrast, the modified Wertheimer-Leeper code generated risk estimates that were both precise and markedly elevated for the high wire code (HWC) compared to low wire code (LWC) classifications, with medium wire code (MWC) showing little or no increase in risk. High wire code yielded odds ratios of 1.9 for total cancers (95% CI: 1.1-3.2), 2.9 for leukemias (95% CI: 1.5-5.5), and 2.5 for brain cancer (95% CI: 1.1-5.5) that were not confounded by measured potential risk factors for childhood cancer. These risk estimates are larger than the dichotomized results and more precise than those from the original five-level wire code, though limitations in the original study remain, particularly potential control selection bias.(ABSTRACT TRUNCATED AT 250 WORDS)

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Savitz D A et al. 1993a

Savitz D A, Pearce N, Poole C
Update on methodological issues in the epidemiology of electromagnetic fields and cancer
In: Epidemiol Rev, 15. Jg. (1993), S. 558.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; elf/hf; cancer

Savitz D A et al. 1994

Savitz D A, Boyle C A, Holmgreen
Prevalence of depression among electrical workers
In: Am J Ind Med, 25. Jg. (1994), S. 165.

ABSTRACT:
To address the possible association between electric and magnetic field exposure and depression, we analyzed data from the Vietnam Experience Study. In order to compare the risk of diagnosed depression, depressive symptoms, and elevations in personality scales indicative of depression, we classified employed participants as electrical workers (N = 183) and nonelectrical workers (N = 3,861) and compared their scores on the Diagnostic Interview Survey (DIS) and the Minnesota Multiphasic Personality Inventory (MMPI). Electrical workers in the aggregate showed little evidence of increased risk, with the

possible exception of an increase in elevated MMPI depression scores among short-term workers. Data on electricians yielded indications of increased risk for several markers of depression. Despite the limited number of electrical workers, uncertainty regarding exposure, and our inability to address other workplace exposures, these results suggest that electrical workers in general are not at increased risk for depression. However, our results encourage further evaluation of depression among electricians.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Savitz D A et al. 1995

Savitz D A, Loomis D P

Magnetic field exposure in relation to leukemia and brain cancer mortality among electric utility workers

In: Am J Epidemiol, 141. Jg. (1995), S. 123.

ABSTRACT:
Reports of leukemia and brain cancer among men in electrical occupations suggest a small increase in risk, but most previous studies have failed to classify magnetic field exposure accurately or to consider potential confounders. The authors conducted an historical cohort mortality study of 138,905 men employed at five large electric power companies in the United States between 1950 and 1986 with at least 6 months of work experience. Exposure was estimated by linking individual work histories to data from 2,842 workshift magnetic field measurements. Mortality follow-up identified 20,733 deaths based on 2,656,436 person-years of experience. Death rates were analyzed in relation to magnetic field exposure history with Poisson regression. Total mortality and cancer mortality rose slightly with increasing magnetic field exposure. Leukemia mortality, however, was not associated with indices of magnetic field exposure except for work as an electrician. Brain cancer mortality was modestly elevated in relation to duration of work in exposed jobs and much more strongly associated with magnetic field exposure indices. Brain cancer risk increased by an estimated factor of 1.94 per microtesla-year of magnetic field exposure in the previous 2-10 years, with a mortality rate ratio of 2.6 in the highest exposure category. In contrast to other studies, these data do not support an association between occupational magnetic field exposure and leukemia but do suggest a link to brain cancer.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Savitz D A et al. 1997

Savitz D A, Dufort V, Armstrong B, Theriault G

Lung cancer in relation to employment in the electrical utility industry and exposure to magnetic fields

In: Occup Environ Med, 54. Jg. (1997), S. 396.

ABSTRACT:
OBJECTIVES: A recent study found that lung cancer may be associated with exposures encountered in the electrical utility industry. To further evaluate this possibility, data were collected and analysed from five large electrical utility companies in the United States. METHODS: A cohort of 138905 male workers employed between 1950 and 1986 was followed up for mortality to the end of 1988, with 20733 deaths identified of which 1692 were due to lung cancer. Mortality from lung cancer was examined in relation to the duration of employment in specific jobs thought to have high exposure to 60 Hz magnetic fields and to an index of cumulative exposure to magnetic fields based on personal measurements. Exposure to pulsed electromagnetic fields (PEMFs) as estimated from another study was also considered. Poisson regression generated rate ratios for categories of exposure based on comparisons within the cohort adjusted for age, calendar year, race, socioeconomic status, work status, and estimated exposure to asbestos. RESULTS: Mortality rose modestly with duration of work as an electrician or power plant operator reaching rate ratios of 1.4 with > or = 20 years in those jobs but not with duration of work as a lineman or a combination of jobs thought to have high exposures to 60 Hz magnetic fields or PEMFs. Cumulative indices of exposure to 60 Hz magnetic fields and PEMFs were both associated with rate ratios of 1.2-1.3 in the highest intervals. CONCLUSIONS: These data suggest that lung cancer is not strongly associated with duration of employment in specific jobs associated with high potential exposure to 60 Hz magnetic fields or to PEMFs. Small associations of lung cancer with indices of both 60 Hz magnetic fields and PEMFs leave open the possibility that larger associations have been diluted through exposure misclassification. Refined exposure assessment, especially to PEMFs, would be required to evaluate that possibility.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Savitz D A et al. 1998

Savitz D A, Checkoway H, Loomis D P

Magnetic field exposure and neurodegenerative disease mortality among electric utility workers

In: Epidemiology, 9. Jg. (1998), S. 398.

ABSTRACT:
Several recent reports indicate that occupational exposure to electric and magnetic fields may be associated with increased risk of neurodegenerative diseases. To address that hypothesis, we analyzed data from a cohort study of electric utility workers. We examined exposure to magnetic fields, assessed as duration of work in exposed jobs and through an index of cumulative exposure based on magnetic field measurements, in relation to mortality from Alzheimer's disease, Parkinson's disease, and amyotrophic lateral sclerosis, considering both underlying and all mentioned causes of death. Adjusted mortality rate ratios based on Poisson regression models indicate no association between magnetic fields and Parkinson's disease and little support for an association with Alzheimer's disease mortality. Mortality from amyotrophic lateral sclerosis was positively associated with duration of work in exposed jobs [rate ratio = 2.0, 95% confidence interval (CI)= 0.7-6.0; and rate ratio = 3.1, 95% CI = 1.0-9.8, based on underlying cause for 5 - < 20 years and > or = 20 years vs < 5 years, respectively], as well as with cumulative magnetic field exposure with a > or = 20-year lag (rate ratio = 2.3, 95% CI = 0.8-6.6; and rate ratio = 3.0, 95% CI = 1.0-9.2, for exposure in the middle and upper intervals relative to the lowest interval, respectively).

SCHLAGWÖRTER:
epidemiology; cohort; elf; mortality

Savitz D A et al. 1998a

Savitz D A, Loomis D P, Tse C K

Electrical occupations and neurodegenerative disease: analysis of U.S. mortality data

In: Arch Environ Health, 53. Jg. (1998), S. 71.

ABSTRACT:
Investigators have hypothesized that occupations involving electric and magnetic field exposure are associated with a variety of health problems, including neurological disease. The authors conducted a case-control study, and they used U.S. death certificates with occupational coding to compare male cases of Alzheimer's disease (n = 256), Parkinson's disease (n = 168), and amyotrophic lateral sclerosis (n = 114) with controls matched for age and calendar time. The authors selected controls in a 3:1 ratio to cases from persons who died of causes other than leukemia, brain cancer, and breast cancer. Overall associations with electrical occupations were modest (i.e., adjusted odds ratios of 1.2, 1.1, and 1.3 for Alzheimer's disease, Parkinson's disease, and amyotrophic lateral sclerosis, respectively). Individual electrical occupations

were associated more strongly with disease than overall electrical occupations, particularly amyotrophic lateral sclerosis, for which relative risks ranged from 2 to 5 across several job categories. The largest associations with all three diseases occurred for power plant operators.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; mortality

Savitz D A et al. 1999

Savitz D A, Liao D, Sastre A, Kleckner R C, Kavet R

Magnetic field exposure and cardiovascular disease mortality among electric utility workers

In: Am J Epidemiol, 149. Jg. (1999), S. 135.

ABSTRACT:
Laboratory studies suggest that electric and magnetic field exposure may affect heart rate and heart rate variability. Epidemiologic evidence indicates that depressed heart rate variability is associated with reduced survival from coronary heart disease as well as increased risk of developing coronary heart disease. The authors examined mortality from cardiovascular disease in relation to occupational magnetic field exposure among a cohort of 138,903 male electric utility workers from five US companies over the period 1950-1988. Cardiovascular disease deaths were categorized as arrhythmia related (n = 212), acute myocardial infarction (n = 4,238), atherosclerosis (n = 142), or chronic coronary heart disease (n = 2,210). Exposure was classified by duration of work in jobs with elevated magnetic field exposure and indices of cumulative magnetic field exposure. Adjusting for age, year, race, social class, and active work status, longer duration in jobs with elevated magnetic field exposure was associated with increased risk of death from arrhythmia-related conditions and acute myocardial infarction. Indices of magnetic field exposure were consistently related to mortality from arrhythmia and acute myocardial infarction, with mortality rate ratios of 1.5-3.3 in the uppermost categories. No gradients in risk were found for atherosclerosis or for chronic coronary heart disease. These data suggest a possible association between occupational magnetic fields and arrhythmia-related heart disease.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cvd

Savitz D A et al. 2000

Savitz D A, Cai J, van Wijngaarden E, Loomis D, Mihlan G, Dufort V, Kleckner R C, Nylander-French L, Kromhout H, Zhou H

Case-cohort analysis of brain cancer and leukemia in electric utility workers using a refined magnetic field job-exposure matrix

In: Am J Ind Med, 38. Jg. (2000), S. 417.

ABSTRACT:
BACKGROUND: The potential association between occupational electric and magnetic field exposure and cancer is well documented in the literature, but there is uncertainty regarding a causal relation. METHODS: Using data from a completed cohort study, we sought to refine the job-exposure matrix in a case-cohort analysis by regrouping jobs into more homogeneous groups, but without making additional measurements. From the original cohort, we selected the 164 men who died of leukemia, 145 men who died of brain cancer, and a random subcohort of 800 men (0.6% of the cohort). Erroneous job assignments were corrected and job groups were subdivided based on differences in work environments or tasks performed. RESULTS: Magnetic field exposure remained unrelated to leukemia mortality and positively associated with brain cancer mortality based on both cumulative and average magnetic field indices. Although not monotonic across the middle intervals, increased risk of brain cancer was found in relation to career exposure, with risk ratios of 1.8 (95% CI = 0.7-4.7) and 2.5 (95% CI = 1.0-6.3) in the uppermost categories for cumulative and average exposure, stronger for exposure 2-10 years past. CONCLUSIONS: Improvements in exposure assignment based only on reassignment of job titles to occupational categories had little impact on the measured associations of magnetic fields with leukemia or brain cancer.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Savitz D A et al. 2001

Savitz D A, Poole C

Do studies of wire code and childhood leukemia point towards or away from magnetic fields as the causal agent?

In: Bioelectromagnetics, 22. Jg. (2001), S. 69.

ABSTRACT:
A long-standing point of controversy in the epidemiologic literature concerns the meaning of a wire code-childhood leukemia association for assessing the role of magnetic field exposure. Six studies of wire codes and childhood leukemia in North America were examined, three of which reported positive associations and all of which found some relation between wire codes and measured magnetic fields. Supporting magnetic fields as the basis for the wire code associations are the correspondence between those wire code levels which predict distinct magnetic fields and those which predict leukemia risk in the positive studies. Geographic locations and methods that refine wire codes as magnetic fields predictors also tend to strengthen the association with leukemia. Opposing arguments are based on the failure of the wire code-magnetic field association to predict the strength of association across studies, including the unexplained lack of association between wire codes and leukemia in the Midwest and in Canada. Alternatives to magnetic fields are less supported; residential mobility, social class, and neighborhood characteristics are unlikely to explain a wire code effect. Ambiguity persists because of the modest strength of the wire code-leukemia association, the complexity of the relation between wire codes and magnetic fields, lack of knowledge of risk factors for childhood leukemia, and the limited evaluation of wire code correlates other than magnetic fields.

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Scarfy M R et al. 1996

Scarfy M R, Lioi M B, d'Ambrosio G, Massa R, Zeni O, De Pietro R, De Berardino D

Genotoxic effects of mitomycin-C and microwave radiation on bovine lymphocytes

In: Electro-Magnetobiology, 15. Jg. (1996), S. 99.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Schlehofer B et al. 1990

Schlehofer B, Kunze S, Sachsenheimer W, Blettner M, Niehoff D, Wahrendorf J

Occupational risk factors for brain tumors: results from a population-based case-control study in Germany

In: Cancer Causes Control, 1. Jg. (1990), S. 209.

ABSTRACT:
In a population-based case-control study in the Rhein-Neckar-Odenwald area (containing 1.3 million inhabitants) of the Federal Republic of Germany (FRG), risk factors were assessed for brain tumor development in 226 cases with primary brain tumors (ICD-9 191, 192.1, 192.0) and 418 population controls, interviewed by a standardized questionnaire. The analysis of occupational risk factors and smoking is presented. No elevated risk was found for smoking. Similarly, no significant effects were found for

most occupations. Five specific occupational groups were examined because of a priori determination that they were of interest. Some categories showed slightly elevated risks but in none was the elevation statistically significant. A significant increase in risk for brain tumor development was found associated with working in electrical occupations for women (relative risk [RR] = 5.2; 95 percent confidence interval [CI] 1.4-20.1) but not for men (RR = 0.9, 95 percent CI 0.3-2.3).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Schnorr T M et al. 1991

Schnorr T M, Grajewski B A, Hornung R W, Thun M J, Egeland G M, Murray W E, Conover D L, Halperin W E

Video display terminals and the risk of spontaneous abortion

In: N Engl J Med, 324. Jg. (1991), S. 727.

ABSTRACT:
BACKGROUND. The relation between spontaneous abortion and the use of video display terminals (VDTs) is of great public health concern. Previous investigators of this issue have reported inconsistent findings. METHODS. To determine whether electromagnetic fields emitted by VDTs are associated with an increased risk of spontaneous abortion, a cohort of female telephone operators who used VDTs at work was compared with a cohort of operators who did not use VDTs. To obtain reliable estimates of exposure, we determined the number of hours of VDT use per week from company records and measured electromagnetic fields at VDT workstations and, for purposes of comparison, at workstations without VDTs. Operators who used VDTs had higher abdominal exposure to very-low-frequency (15 kHz) electromagnetic fields (workstations without VDTs did not emit very-low-frequency energy). Abdominal exposure to extremely-low-frequency fields (45 to 60 Hz) was similar for both operators who used VDTs and those who did not. Among 2430 women interviewed, there were 882 pregnancies that met our criteria for inclusion in the study. RESULTS. We found no excess risk of spontaneous abortion among women who used VDTs during the first trimester of pregnancy (odds ratio = 0.93; 95 percent confidence interval, 0.63 to 1.38), and no dose-response relation was apparent when we examined the women's hours of VDT use per week (odds ratio for 1 to 25 hours per week = 1.04; 95 percent confidence interval, 0.61 to 1.79; odds ratio for greater than 25 hours per week = 1.00; 95 percent confidence interval, 0.61 to 1.64). There continued to be no risk associated with the use of VDTs when we accounted for multiple pregnancies, conducted separate analyses of early abortion, late abortion, and all fetal losses, or limited our analyses to spontaneous abortions for which a physician was consulted. CONCLUSIONS. The use of VDTs and exposure to the accompanying electromagnetic fields were not associated with an increased risk of spontaneous abortion in this study

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Scholl D M et al. 1979

Scholl D M, Allen S J

Skilled visual-motor performance by monkeys in a 1.2-GHz microwave field

In: Radio Sci, 14. Jg. (1979), S. 247.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Schrader S M et al. 1998

Schrader S M, Langford R E, Turner T W, Breitenstein M J, Clark J C, Jenkins B L, Lundy D O, Simon S D, Weyandt T B

Reproductive function in relation to duty assignments among military personnel

In: Reprod Toxicol, 12. Jg. (1998), S. 465.

ABSTRACT:
As a follow-up to the pilot study of semen quality of soldiers with various military assignments a larger, more complete study was conducted. Soldiers were recruited at Fort Hood, Texas. Thirty-three men were exposed to radar as part of their duty assignment in the Signal Corps, 57 men were involved with firing the 155 mm howitzer (potential lead exposure), and 103 soldiers had neither lead nor radar exposure and served as the comparison control group. Both serum and urinary follicle-stimulating hormone and luteinizing hormone and serum, salivary, and urine testosterone levels were determined in all men. A complete semen analysis was conducted on each soldier. For statistical analysis, the primary study variables were: sperm concentration, sperm/ejaculate, semen volume, percent normal morphology, percent motile, percent viable (both vital stain and hypoosmotic swelling), curvilinear velocity, straight-line velocity, linearity, sperm head length, width, area, and perimeter. Variables were adjusted for significant confounders (e.g., abstinence, sample age, race). No statistical differences ($P < 0.05$) were observed in any measurement. While these results are in agreement with two previous studies assessing soldiers firing the 155-mm howitzer, they contradict our previous report indicating that radar exposure caused a significant decrease in sperm numbers. A possible explanation is that the radar exposure in this study was that used in Signal Corps operations while the men in the previous study were using different radar as part of military intelligence operations. The data presented here in men firing the 155-mm howitzer combined with the results from the previous studies confirms that there are no deficits in semen quality in these men. The contradiction between the results of the radar exposure studies indicates that more data are needed to evaluate the relationship of military radar and male reproductive health.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Schreiber G H et al. 1993

Schreiber G H, Swaen G M, Meijers J M, Slangen J J, Sturmans F

Cancer mortality and residence near electricity transmission equipment: a retrospective cohort study

In: Int J Epidemiol, 22. Jg. (1993), S. 9.

ABSTRACT:
Several studies in recent years have raised the possibility that exposure to extreme low frequency (ELF) electromagnetic fields may be hazardous to human health, in particular by the promotion or initiation of leukaemia and other cancers. To determine if this exposure creates a long-term hazard to the public, the mortality of a group of people identified as having lived in an urban quarter of Maastricht in which two 150 kiloVolt (kV) powerlines and one transformer substation are located was investigated. Using the Dutch population registry it was possible to identify retrospectively 3549 inhabitants of the quarter who lived there for at least 5 years between 1956 and 1981. Of these 1552 study subjects lived within 100 m of the electricity transmission equipment and were exposed to magnetic field intensity of 1.0-11.0 milliGauss. The overall standardized mortality ratio and cancer mortality ratios were either not or only slightly elevated. The study does not support previously reported associations of exposure to ELF electromagnetic fields with leukaemia, brain cancer and breast cancer.

SCHLAGWÖRTER:
epidemiology; ecological; elf; cancer

Schroeder J C et al. 1997

Schroeder J C, Savitz D A
Lymphoma and multiple myeloma mortality in relation to magnetic field exposure among electric utility workers
In: Am J Ind Med, 32. Jg. (1997), S. 392.

ABSTRACT:
Associations between occupational magnetic field exposure and non-Hodgkin's lymphoma (NHL), Hodgkin's disease, and multiple myeloma mortality were evaluated in 138,905 electrical utility workers. A job-exposure matrix based on measured magnetic fields was used to derive individual exposure estimates. There was a small positive association between all NHL and low-grade NHL and duration of employment in any magnetic field-exposed job, but only up to 20 years. Cumulative magnetic field exposure was associated with a rising, then falling, risk of NHL. Rate ratios for intermediate/high-grade lymphoma were increased for the highest levels of lifetime cumulative exposure (RR = 3.7 and RR = 2.3), and were most pronounced for those exposures occurring 10-20 years previously. Hodgkin's disease and multiple myeloma mortality did not appear to be associated with exposure. Associations were stronger for NHL subgroups, suggesting that further analysis by subgroup may be warranted, but the absence of dose-response gradients diminishes the likelihood that associations represent causal relationships.

SCHLAGWÖRTER:
epidemiology; cohort; elf/hf; cancer

Schrot J et al. 1980

Schrot J, Thomas J R, Banvard R A
Modification of the repeated acquisition of response sequences in rats by low-level microwave exposure
In: Bioelectromagnetics, 1. Jg. (1980), S. 89.

ABSTRACT:
The acute effects of microwave exposure on a repeated acquisition baseline were investigated in three rats. Each session the animals acquired a different four-member response sequence. Each of the first three correct responses advanced the sequence to the next member, and the fourth correct response produced food reinforcement. Incorrect responses produced a three-second timeout. Baseline and control sessions were characterized by a decrease in errors within each session. The animals were acutely exposed to a 2.8 GHz pulsed-microwave field prior to test sessions, with average power densities ranging from 0.25 to 10 mW/cm2. In comparison to control sessions, 1/2 hour of exposure to microwave radiation at power densities of 5 and 10 mW/cm2 increased errors and altered the pattern of within-session acquisition. Exposure to the 10 mW/cm2 power density decreased the rate of sequence completion in all animals. The results of exposures at 0.25, 0.5, and 1 mW/cm2 power densities were generally within the control range. The results are interpreted as indicating a disruption in the discriminative stimulus control of the repeated acquisition behavior.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Schuz J et al. 2001

Schuz J, Grigat J P, Brinkmann K, Michaelis J
Residential magnetic fields as a risk factor for childhood acute leukaemia: results from a German population-based case-control study
In: Int J Cancer, 91. Jg. (2001), S. 728.

ABSTRACT:
Our objective was to investigate whether exposure to residential power-frequency (50 Hz) magnetic fields above 0.2 microT increases a child's risk of leukaemia and to confirm or reject a finding from a previous German study on this topic, which reported increased leukaemia risk with exposure to stronger magnetic fields during the night. A population-based case-control study was used, covering the whole of the former West Germany. Residential magnetic fields were measured over 24 hr for 514 children with acute leukaemia identified by the German Childhood Cancer Registry and 1,301 control children taken from population registration files. Magnetic fields above 0.2 microT were relatively rare in Germany (only 1.5% of the study population). Childhood leukaemia and 24 hr median magnetic fields were only weakly related (OR = 1.55, 95% CI 0.65-3.67). A significant association was seen between childhood leukaemia and magnetic field exposure during the night (OR = 3.21, 95% CI 1.33-7.80). A dose-response-relationship was observed after combining the data of all German studies on magnetic fields and childhood leukaemia. The evidence for an association between childhood leukaemia and magnetic field exposure in our study comes from a measure of exposure during the night. Despite the large size of our study, the results are based on small numbers of exposed children. If the observed association stands, the effect on a population level in Germany would be small.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Schuz J et al. 2001a

Schuz J, Grigat J P, Brinkmann K, Michaelis J
Childhood acute leukaemia and residential 16.7 Hz magnetic fields in Germany.
In: Br J Cancer, 84. Jg. (2001), S. 697.

ABSTRACT:
We observed a moderate but statistically non-significant association between magnetic fields (MF) and childhood leukaemia. This is the first such study to cover residential exposure to 16.7 Hz (railway frequency) MF though based on few exposed subjects. Our study does not exclude a small excess risk, but the attributable risk must be very low. It is reassuring that neglecting 16.7 Hz MF in childhood cancer studies appears to have little effect on findings.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Schuz J et al. 2001b

Schuz J, Michaelis J
Epidemiologie nicht-ionisierender elektromagnetischer Felder - eine Übersicht / Epidemiology of Non-Ionising Radiation - An Overview
In: Umweltmed Forsch Prax, 6. Jg. (2001), S. 67.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; hf; others

Seaman R L et al. 1978

Seaman R L, Wachtel H
Slow and rapid responses to CW and pulsed microwave radiation by individual Aplysia pacemakers
In: J Microwave Power, 13. Jg. (1978), S. 77.

ABSTRACT:
Specific absorption rates (SARs) of microwave energy that altered firing rates were determined for individual pacemaker neurons in the abdominal ganglion of Aplysia californica. A stripline apparatus provided both for artifact-free recording of transmembrane potentials and for precise determination of the rate of absorption of microwave energy. Exposure for two to three minutes at an SAR of only a few mW/g was capable of changing the firing rate of some pacemakers. Two types of responses were

observed. The response that was seen in all neurons developed slowly, reaching a steady state in one to three minutes. The other response was seen in a few neurons and occurred within five seconds from the onset of irradiation. Similar responses were obtained for two microwave frequencies, 1.5 and 2.45 GHz. Pulsed radiation induced rapid changes of firing rate more readily than did CW radiation at the same SAR. A convective heating scheme was used to study the effects of temperature changes on the pacemakers' firing rates. Since all of the responses are not readily explained by general heating of the preparation, alternate mechanisms are suggested for the observed effects.

SCHLAGWÖRTER:
physics; experimentally; hf; others

Seaman R L et al. 1989

Seaman R L, Lebovitz R M

Thresholds of cat cochlear nucleus neurons to microwave pulses

In: Bioelectromagnetics, 10. Jg. (1989), S. 147.

ABSTRACT:
Action potentials of neurons in cat dorsal and posteroventral cochlear nuclei were recorded extracellularly with glass microelectrodes while the head of the cat was exposed to microwave pulses at 915 MHz using a diathermy applicator. Response thresholds to acoustic tones, acoustic clicks, and microwave pulses were determined for auditory units with characteristic frequencies (CFs) from 278 Hz to 39.2 kHz. Tests with pulsatile stimuli were performed for durations of 20-700 mus, principally 20, 70, and 200 mus. Brainstem midline specific absorption rate (SAR) threshold was as small as 11.1 mW/g per pulse, and specific absorption (SA) threshold was a small as 0.6 muJ/g per pulse. Microwave thresholds were generally lower for CF less than 9 kHz, as were most acoustic thresholds. However, microwave threshold was only weakly related to click threshold and CF-tone threshold of each unit.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Selvin S et al. 1992

Selvin S, Schulman J, Merrill D W

Distance and risk measures for the analysis of spatial data: a study of childhood cancers

In: Soc Sci Med, 34. Jg. (1992), S. 769.

ABSTRACT:
Three statistical approaches, used to detect spatial clusters of disease associated with a point source exposure, are applied to childhood cancer data for the city of San Francisco (1973-88). The distributions of incident cases of leukemia (51 cases), brain cancer (35 cases), and lymphatic cancer (37 cases) among individuals less than 21 years of age are described using three measures of clustering: distance on a geopolitical map, distance on a density equalized transformed map, and relative risk. The point source of exposure investigated is a large microwave tower located southwest of the center of the city (Sutro Tower). The three analytic approaches indicate that the patterns of the major childhood cancers are essentially random with respect to the point source. These results and a statistical model for spatial clustering are used to explore distance and risk measures in the analysis of spatial data. Both types of measures of spatial clustering are shown to perform similarly when a specific area of exposure can be defined.

SCHLAGWÖRTER:
epidemiology; ecological; hf; cancer

Severson R K et al. 1988

Severson R K, Stevens R G, Kaune W T, Thomas D B, Heuser L, Davis S, Sever L E

Acute nonlymphocytic leukemia and residential exposure to power frequency magnetic fields

In: Am J Epidemiol, 128. Jg. (1988), S. 10.

ABSTRACT:
Recent research has suggested that nonionizing radiation in the form of power-frequency magnetic fields may play some role in carcinogenesis in general and in acute nonlymphocytic leukemia in particular. Much of the epidemiologic evidence is preliminary in nature and the methods of previous studies have been criticized. In order to further evaluate this hypothesis, a population-based case-control study of adult acute nonlymphocytic leukemia and residential exposure to power-frequency magnetic fields was carried out in western Washington state. Analyses were based on 114 cases who were newly diagnosed from 1981 to 1984 and identified from a population-based cancer registry, and 133 controls who were chosen from the study area by random digit dialing. Magnetic field exposure was estimated from external electrical wiring configurations within 140 ft (42.7 m) of each subject's residence. In addition, magnetic fields were measured inside the subject's residence at the time of interview. Neither the directly measured magnetic fields nor the surrogate values based on the wiring configurations were associated with acute nonlymphocytic leukemia.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Shacklett D E et al. 1975

Shacklett DE, Tredici TJ, Epstein DL

Evaluation of possible microwave-induced lens changes in the United States Air Force

In: Aviat Space Environ Med, 46. Jg. (1975), S. 1403.

ABSTRACT:
An Air Force examination team performed ophthalmologic examinations on 817 subjects in a double blind fashion. The subjects included 477 workers in the microwave radiation field and 340 control subjects with no known history of occupational exposure to microwave radiation. The intent of the study was to determine if a significant difference existed between the two groups for the presence of three lenticular findings equated with early cataract formation. No significant difference was found. Thus, this study does not support the contention that microwave exposure in the military environment is causing human cataracts at levels permitted by U.S. Safety Standards.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Shandala M G et al. 1979

Shandala M G, Dumanskii U D, Rudnev M I, Ershova L K, Los I P

Study of nonionizing microwave radiation effects upon the central nervous system and behavior reactions

In: Environ Health Perspect, 30. Jg. (1979), S. 115.

ABSTRACT:
The biologic effect of an electromagnetic field of a frequency of 2375 +/- 50 MHz was studied in rats and rabbits in specially constructed absorbant chambers. The results of the investigations have shown that microwave radiation of 10, 50, 500 mu W/cm2 for 30 days, 7 hr/day, causes a number of changes in bioelectric brain activity and also in behavioral immunological, and cytochemical reactions. It was found that levels of 10 and 50 mu W/cm2 stimulate the electric brain activity at the initial stage of irradiation, while a level of 500 mu W/cm2 causes its suppression, as seen from the increase of slow, high

amplitude delta-waves. At 500 mu W/cm2 a decrease in capacity of work, in value of unconditioned feeding stimulus, in investigating activity, electronic irradiation threshold, and in inhibition of cellular and humoral immunity were also observed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Shaw G M et al. 1999

Shaw G M, Nelson V, Todoroff K, Wasserman C R, Neutra R R

Maternal periconceptional use of electric bed-heating devices and risk for neural tube defects and orofacial clefts

In: Teratology, 60. Jg. (1999), S. 124.

ABSTRACT:
Electric and magnetic fields are of concern as risk factors for adverse reproductive outcomes, including congenital anomalies. Among residential exposures to electric and magnetic fields, electric bed-heating devices such as electric blankets may be a substantial source of such exposures, and their use is fairly common. Two population-based case-control studies were analyzed to investigate whether the periconceptional use of electric blankets, bed warmers, or electrically heated waterbeds increased the risk of women to deliver infants or fetuses with neural tube defects (NTDs) or orofacial clefts. We obtained information on bed-heating devices from 538 NTD cases and their 539 controls in one study, and 265 NTD cases and 481 controls and 652 orofacial cleft cases and their 734 controls from another study. Our results revealed a few modestly elevated risks of certain anomaly phenotypes with maternal use of certain bed-heating devices, but risks tended to be imprecise. In general, women who reported more frequent use of a bed-heating device, or longer duration of use, did not appear to have a higher risk for delivering offspring with anomalies than were women who reported less frequent or shorter-duration use.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Shelton W W et al. 1981

Shelton W W Jr, Merritt J H

In vitro study of microwave effects on calcium efflux in rat brain tissue

In: Bioelectromagnetics, 2. Jg. (1981), S. 161.

ABSTRACT:
In this study we investigated the prospect of microwave-induced alteration of 45Ca2+ efflux from rat neural tissue at low pulse repetition frequencies and low power densities under in vitro conditions. Rat cerebral tissue, preloaded with 45Ca2+, was exposed to pulsed-microwave radiation (1-GHz carrier frequency) according to one of several PRF-power density exposure schemes: 16 Hz at 0.5, 1.0, 2.0, or 15 mW/cm2, or 32 Hz at 1.0 or 2.0 mW/cm2 average power density. Measurements of radioactivity in the efflux medium and in the tissue sample were used to calculate an efflux value for each sample. The results indicate that the radiation conditions used did not alter calcium efflux in rat brain tissue.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Sheppard A R et al. 1979

Sheppard A R, Bawin S M, Adey W R

Models of long-range order in cerebral macromolecules: effects of sub-ELF and of modulated VHF and UHF fields

In: Radio Sci, 14. Jg. (1979), S. 141.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; elf/hf; biological effects

Sienkiewicz Z J et al. 2000

Sienkiewicz Z J, Blackwell R P, Haylock R G E, Saunders R D, Cobb B L

Low-level exposure to pulsed900 MHz microwave radiation does not cause deficits in the performance of a spatial memory task in mice

In: Bioelectromagnetics, 21. Jg. (2000), S. 151.

ABSTRACT:
There is some concern that short-term memory loss or other cognitive effects may be associated with the use of mobile cellular telephones. In this experiment, the effect of repeated, acute exposure to a low intensity 900 MHz radiofrequency (RF) field pulsed at 217 Hz was explored using an appetitively-motivated spatial learning and working memory task. Adult male C57BL/6J mice were exposed under far field conditions in a GTEM cell for 45 min each day for 10 days at an average whole-body specific energy absorption rate (SAR) of 0.05 W/kg. Their performance in an 8-arm radial maze was compared to that of sham-exposed control animals. All behavioral assessments were performed without handlers having knowledge of the exposure status of the animals. Animals were tested in the maze immediately following exposure or after a delay of 15 or 30 min. No significant field-dependent effects on performance were observed in choice accuracy or in total times to complete the task across the experiment. These results suggest that exposure to RF radiation simulating a digital wireless telephone (GSM) signal under the conditions of this experiment does not affect the acquisition of the learned response. Further studies are planned to explore the effects of other SARs on learned behavior.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Skidmore W D et al. 1974

Skidmore W D, Baum S J

Biological effects in rodents exposed to 10 8 pulses of electromagnetic radiation

In: Health Phys, 26. Jg. (1974), S. 391.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Skotte J et al. 1991

Skotte J, Larsen A I

Can exposure to electromagnetic radiation in diathermy operators be estimated from interview data? A pilot study

In: Am J Ind Med, 19. Jg. (1991), S. 51.

ABSTRACT:
As preparation for a case-control study dealing with possible teratogenic property of short waves, a pilot study was conducted in order to compare exposure assessment from different sources. In 11 physiotherapy clinics, exposure assessments based on interviews within 1 week among the exposed physiotherapists were compared with exposure assessments based on observations including measurements. It was possible to discriminate between recent high and low peak exposure. Furthermore, an interview index reflecting the duration of the exposure correlated to some extent with the corresponding measurements.

SCHLAGWÖRTER:
epidemiology; other type; hf; others

Skotte J H et al. 1997

Skotte J H, Hjollund H I

Exposure of welders and other metal workers to ELF magnetic fields

In: Bioelectromagnetics, 18. Jg. (1997), S. 470.

ABSTRACT:
This study assessed exposure to extremely low frequency (ELF) magnetic fields of welders and other metal workers and compared exposure from different welding processes. Exposure to ELF magnetic fields was measured for 50 workers selected from a nationwide cohort of metal workers and 15 nonrandomly selected full-time welders in a shipyard. The measurements were carried out with personal exposure meters during 3 days of work for the metal workers and I day of work for the shipyard welders. To record a large dynamic range of ELF magnetic field values, the measurements were carried out with "high/low" pairs of personal exposure meters. Additional measurements of static magnetic fields at fixed positions close to welding installations were done with a Hall-effect fluxmeter. The total time of measurement was 1273 hours. The metal workers reported welding activity for 5.8% of the time, and the median of the work-period mean exposure to ELF magnetic fields was 0.18 microT. DC metal inert or active gas welding (MIG/MAG) was used 80% of the time for welding, and AC manual metal arc welding (MMA) was used 10% of the time. The shipyard welders reported welding activity for 56% of the time, and the median and maximum of the workday mean exposure to ELF magnetic fields was 4.70 and 27.5 microT, respectively. For full-shift welders the average workday mean was 21.2 microT for MMA welders and 2.3 microT for MIG/MAG welders. The average exposure during the effective time of welding was estimated to be 65 microT for the MMA welding process and 7 microT for the MIG/MAG welding process. The time of exposure above 1 microT was found to be a useful measure of the effective time of welding. Large differences in exposure to ELF magnetic fields were found between different groups of welders, depending on the welding process and effective time of welding. MMA (AC) welding caused roughly 10 times higher exposure to ELF magnetic fields compared with MIG/MAG (DC) welding. The measurements of static fields suggest that the combined exposure to static and ELF fields of MIG/MAG (DC) welders and the exposure to ELF fields of MMA (AC) welders are roughly of the same level.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Smialowicz R J et al. 1983

Smialowicz R J, Rogers R R, Garner R J, Riddle M M, Luebke R W, Towe D G

Microwaves (2,450 MHz) suppress murine natural killer cell activity

In: Bioelectromagnetics, 4. Jg. (1983), S. 371.

ABSTRACT:
The effect of 2,450-MHz CW microwaves on natural killer (NK) cell activity and lymphocyte responsiveness to mitogen stimulation was studied in mice. Groups of mice were irradiated at power densities of 5, 15, or 30 mW/cm2 (SAR = 3.5, 10.5, and 21 W/kg respectively) for 1.5 h on 2 or 9 consecutive days. NK cell activity was determined using an in vitro 51Cr release cytotoxicity assay and an in vivo tumor-cell clearance assay. No consistent change was observed in the mitogen response of spleen cells from sham compared with irradiated mice. A significant suppression of NK cell activity measured in vitro was observed for mice irradiated at 30 mW/cm2, but not at 15 or 5 mW/cm2. A significant suppression of NK cell activity, as determined using the in vivo tumor clearance assay, was also observed at 30 mW/cm2. NK cell activity, as determined using the in vitro assay, returned to normal within 24 h following the last irradiation. Treatment of mice with hydrocortisone caused suppression of NK cell activity measured in vitro and in vivo. Paradoxically, peritoneal macrophage phagocytosis was enhanced following irradiation at 30 mW/cm2, the power density at which NK activity was suppressed. The possible role that microwave heating plays in producing these effects is discussed.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Smith E M et al. 1997

Smith E M, Hammonds-Ehlers M, Clark M K, Kirchner H L, Fuortes L

Occupational exposures and risk of female infertility

In: J Occup Environ Med, 39. Jg. (1997), S. 138.

ABSTRACT:
This study examined the association between occupational chemical and radiation exposures and risk of medically diagnosed infertility in 281 women compared with 216 fertile women. After adjustment for age and exposures that occurred before case/referent ascertainment, there was an increased risk of infertility among those women exposed to volatile organic solvents (odds ratio [OR], 1.74; 95% confidence interval [CI], 1.11 to 2.71), chemical dusts (OR, 2.66; CI, 1.17 to 6.05), pesticides (OR, 3.02; CI, 1.10 to 8.29), and video display terminals (OR, 2.21, CI, 1.22, to 4.01). Among the medically diagnosed causes of infertility, the adjusted risk associated with having an ovulatory factor increased among those women exposed to solvents (OR, 1.75; CI, 1.03 to 2.98), dusts (OR, 3.00; CI, 1.19 to 7.52), or pesticides (OR, 3.82; 1.28 to 11.42). Solvents and dusts also were associated with a higher risk of tubal-factor infertility (solvents; OR, 1.95; CI, 1.08 to 3.52; dusts: OR, 2.87; CI, 1.05 to 7.88) and endometriosis (solvents: OR, 2.13; CI, 0.96 to 4.72; dusts: OR, 3.63; CI, 0.99 to 13.28). Video display terminal exposure was more likely to be found among those women diagnosed with endometriosis (OR, 3.69; CI, 1.50 to 9.13) and cervical-factor infertility (OR, 2.65; CI, 0.99 to 7.12). Results suggest that among women with a medically confirmed diagnosis, fertility may be adversely affected by a variety of occupational chemical exposures.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Smulevich V B et al. 1999

Smulevich V B, Solionova L G, Belyakova S V

Parental occupation and other factors and cancer risk in children: II. Occupational factors

In: Int J Cancer, 83. Jg. (1999), S. 718.

ABSTRACT:
A population-based case-control study was conducted on 593 cancer cases in children from 0 to 14 years of age diagnosed in Moscow from 1986 to 1988. The study included 1181 healthy controls matched by age, gender and residence. Parental exposures prior to conception, including exposures to petroleum products, organic solvents, unspecified chemicals, soldering aerosols, ionizing radiation, electromagnetic fields (EMF), visual display units (VDU) and high temperature in the work environment, were significantly more frequent among the cases than among the controls ($p < 0.05$). Leukemia risk was associated with paternal exposure to ionizing radiation [odds ratio (OR) 6.7; 95% confidence interval (CI) 2.8-15.8], EMF (OR 4.6; 95% CI 1.8-11.9), VDU (OR 2.4; 95% CI 1.0-5.8) and unspecified chemicals (OR 2.0; 95% CI 1.02-4.1). Leukemia risk was also higher when mothers were exposed to solvents (OR 3.1; 95% CI 1.5-6.3), unspecified chemicals (OR 2.0; 95% CI 1.0-4.3), ionizing radiation (OR 10.3; 95% CI 1.3-83.4) and EMF (OR 5.2; 95% CI 1.6-16.8). Increased risk of non-Hodgkin's lymphoma was shown to be related to maternal exposure to oil products (OR 3.3; 95% CI 1.01-10.7) and unspecified chemicals (OR 3.3; 95% CI 1.01-10.7). Exposure to VDU was found to be associated with increased risk of neuroblastoma (6/1; OR 13.8; 95% CI

1.9-100.0).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Sobel E et al. 1995

Sobel E, Davanipour Z, Sulkava R, Erkinjuntti T, Wikstrom J, Henderson V W, Buckwalter G, Bowman J D, Lee P J

Occupations with exposure to electromagnetic fields: a possible risk factor for Alzheimer's disease

In: Am J Epidemiol, 142. Jg. (1995), S. 515.

ABSTRACT:
The authors present analyses of data from three independent clinical series and controls indicating an association between working in occupations with probable medium to high exposure to extremely low frequency (< 300 Hz) electromagnetic fields and sporadic Alzheimer's disease. Case-control analyses were carried out using data from patients examined at the following locations: the Department of Neurology, University of Helsinki, Helsinki, Finland, 1982-1985; the Koskela Hospital in Helsinki, 1977-1978; and the University of Southern California site of the Alzheimer's Disease Research Center of Los Angeles and Orange Counties, 1984-1993. The predominant occupations among medium (2-10 mG or > 10 mG intermittently) to high (> 10 mG or > 100 mG intermittently) exposed cases were seamstress, dressmaker, and tailor. The results appear to be independent of education, and the sex-combined odds ratios for the three series are quite homogeneous: 2.9, 3.1, and 3.0. The odds ratio for the three series analyzed together is 3.0 ($p < 0.001$), with a 95% confidence interval of 1.6-5.4. The odds ratio for women is 3.8 ($p < 0.001$), with a 95% confidence interval of 1.7-8.6. The most obvious, possibly etiologically relevant exposure is that of electromagnetic fields, which may have biologic plausibility because they may adversely influence calcium homeostasis and/or inappropriately activate immune system cells such as microglial cells, initiating events that result in neuronal degeneration.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Sobel E et al. 1996

Sobel E, Dunn M, Davanipour Z, Qian Z, Chui H C

Elevated risk of Alzheimer's disease among workers with likely electromagnetic field exposure

In: Neurology, 47. Jg. (1996), S. 1477.

ABSTRACT:
We conducted a case-control study of the possible association of occupations with likely exposure to electromagnetic fields and Alzheimer's disease (AD) with patients from the Alzheimer Disease Treatment and Diagnostic Center, Rancho Los Amigos Medical Center, Downey, CA. Patients with definite or probable AD were the case subjects (86 male, 240 female). Patients with cognitive impairment/dementia other than vascular dementia were control subjects (76 male, 76 female). The study was limited to patients who were at least age 65 at the time of their first examination at Rancho Los Amigos. The odds ratio for both sexes combined was adjusted for sex, education, and age at onset. The odds ratio for males was adjusted only for age at onset, and the odds ratio for females was adjusted for both education and age at onset. The adjusted odds ratio for both sexes was 3.93 ($p = 0.006$), 95% CI = (1.5 to 10.6). For males the adjusted odds ratio was 4.90 ($p = 0.01$), 95% CI = (1.3 to 7.9), and for females the adjusted odds ratio was 3.40 ($p = 0.10$), 95% CI = (0.8 to 16.0). These results are consistent with previous findings regarding the hypothesis that electromagnetic field exposure is etiologically associated with the occurrence of AD.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Soderberg K C et al. 2002

Soderberg K C, Naumburg E, Anger G, Cnattingius S, Ekbom A, Feychting M

Childhood leukemia and magnetic fields in infant incubators

In: Epidemiology, 13. Jg. (2002), S. 45.

ABSTRACT:
In studies of magnetic field exposure and childhood leukemia, power lines and other electrical installations close to the children's homes constitute the most extensively studied source of exposure. We conducted a study to assess whether exposure to magnetic fields in infant incubators is associated with an increased leukemia risk. We identified all children with leukemia born in Sweden between 1973 and 1989 from the national Cancer Registry and selected at random one control per case, individually matched by sex and time of birth, from the study base. We retrieved information about treatment in infant incubators from medical records. We made measurements of the magnetic fields inside the incubators for each incubator model kept by the hospitals. Exposure assessment was based on measurements of the magnetic field level inside the incubator, as well as on the length of treatment. For acute lymphoblastic leukemia, the risk estimates were close to unity for all exposure definitions. For acute myeloid leukemia, we found a slightly elevated risk, but with wide confidence intervals and with no indication of dose response. Overall, our results give little evidence that exposure to magnetic fields inside infant incubators is associated with an increased risk of childhood leukemia.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Sorahan T et al. 1999

Sorahan T, Hamilton L, Gardiner K, Hodgson J T, Harrington J M

Maternal occupational exposure to electromagnetic fields before, during, and after pregnancy in relation to risks of childhood cancers: findings from the Oxford Survey of Childhood Cancers, 1953-1981 deaths

In: Am J Ind Med, 35. Jg. (1999), S. 348.

ABSTRACT:
BACKGROUND: The concern that maternal exposure to electromagnetic fields (EMF) might be related to childhood cancer risks, particularly leukemia risks. METHODS: Maternal occupational data already collected as part of the Oxford Survey of Childhood Cancers have been reviewed. Information on occupations held before, during, and after the pregnancy was sought for 15,041 children dying of cancer in Great Britain in the period 1953-1981, and for an equal number of matched controls. Each period of working was classified under one of five headings: (1) sewing machinist; (2) textile industry workers (other than sewing machinists) with likely exposures to EMF; (3) other machinists and other jobs with likely "higher" EMF exposure; (4) other jobs with likely exposure to some EMF, and (5) jobs with little potential for EMF exposure. RESULTS: Relative to risks in the children of mothers who held occupations with little potential for EMF exposure during pregnancy (a category that included housewives), risks of all childhood cancers were close to unity both for the children of sewing machinists (22 case and 31 control mothers, RR 0.72, 95% CI 0.42 to 1.25) and for the children of other machinists with likely "higher" EMF exposures (44 case and 47 control mothers, RR 0.93, 95% CI 0.61 to 1.41). Corresponding risks for all childhood leukemias and for all childhood brain cancers were similarly unexceptional. Simultaneous adjustment for social class, maternal age at birth of child, and sibship position had little effect. CONCLUSIONS: The study findings did not indicate that maternal occupational exposure to EMF during pregnancy is a risk factor for childhood leukemias, childhood brain cancers, or the generality of all childhood cancers.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Sorahan T et. al. 2001

Sorahan T, Nichols L, van Tongeren M, Harrington J M
Occupational exposure to magnetic fields relative to mortality from brain tumours: updated and revised findings from a study of United Kingdom electricity generation and transmission workers, 1973-97
In: Occup Environ Med, 58. Jg. (2001), S. 626.

ABSTRACT:
OBJECTIVE: To investigate whether risk of brain tumour is related to occupational exposure to magnetic fields. METHODS: The mortality experienced by a cohort of 83 997 employees of the former Central Electricity Generating Board of England and Wales was investigated for the period 1973-97. All workers were employed for at least 6 months with some employment in the period 1973-82. Computerised work histories were available for 79 972 study subjects for the period 1971-93. Detailed calculations had been performed by others to enable a novel assessment to be made of exposures to magnetic fields. Two analytical approaches were used, indirect standardisation (n=83 997) and Poisson regression (n=79 972). RESULTS: Based on serial mortalities for England and Wales, deaths from brain cancer were close to expectation (observed 158, expected 146.4). No significant positive trends were shown for risks of brain tumours either with lifetime cumulative exposure to magnetic fields or with such exposures received in the most recent 5 years. CONCLUSIONS: There are no discernible excess risks of brain tumours as a consequence of occupational exposure to magnetic fields in United Kingdom electricity generation and transmission workers.

SCHLAGWÖRTER:
epidemiology; cohort; elf; mortality

Spalding J F et al. 1971

Spalding J F, Freyman R W, Holland L M
Effects of 800 MHz electromagnetic radiation on body weight, activity, haematopoiesis and life span in mice
In: Health Phys, 20. Jg. (1971), S. 421.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Speers M A et al. 1988

Speers M A, Dobbins J G, Miller V S
Occupational exposures and brain cancer mortality: a preliminary study of east Texas residents
In: Am J Ind Med, 13. Jg. (1988), S. 629.

ABSTRACT:
The relationship between various occupational exposures and brain cancer was investigated in a case-control study using mortality data from 202 males who died in East Texas from gliomas in 1969-1978 and 238 male controls randomly selected from all deaths in East Texas in 1969-1978. Using the occupational classification scheme of the U.S. Bureau of the Census, the risk for brain cancer was significantly increased for male workers employed in the transportation, communication, and utilities industries [odds ratio (OR) = 2.26, confidence intervals (CI) = 1.18-4.32]. Further examination of this finding showed that male workers employed in occupations associated with electricity or electromagnetic (EM) fields had an elevated risk for brain cancer (OR = 3.94, CI = 1.52-10.20). In addition, there was a linear relationship between the probability of exposure to EM fields and brain cancer. Significantly elevated risk for brain cancer was also found among male workers in the trucking industry.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Spitz M R et al. 1985

Spitz M R, Johnson C C
Neuroblastoma and paternal occupation. A case-control analysis
In: Am J Epidemiol, 121. Jg. (1985), S. 924.

ABSTRACT:
The peak incidence of neuroblastoma during early infancy suggests that prezygotic or prenatal exposures to carcinogens could be implicated. Several recent epidemiologic studies have suggested an association between parental exposure to petrochemicals and ionizing radiation and the development of cancer in the offspring. This paper is a population-based case-control analysis of the birth certificate data of 157 children who died in Texas from neuroblastoma in 1964-1978 and 314 controls randomly selected from all live births in Texas. Children of fathers employed in occupations with electromagnetic field exposure were at significantly increased risk (odds ratio = 2.13). The odds ratio was 11.75 for children of fathers who reported themselves to be electronics workers (6 cases, 1 control).

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Stagg R B et al. 1997

Stagg R B, Thomas W J, Jones R A, Adey W R
DNA synthesis and cell proliferation in C6 glioma and primary glial cvells exposed to a 836.55 MHz modulated radiofrequency field
In: Bioelectromagnetics, 18. Jg. (1997), S. 230.

ABSTRACT:
We have tested the hypothesis that modulated radiofrequency (RF) fields may act as a tumor-promoting agent by altering DNA synthesis, leading to increased cell proliferation. In vitro tissue cultures of transformed and normal rat glial cells were exposed to an 836.55 MHz, packet-modulated RF field at three power densities: 0.09, 0.9, and 9 mW/cm2, resulting in specific absorption rates (SARs) ranging from 0.15 to 59 muW/g. TEM-mode transmission-line cells were powered by a prototype time-domain multiple-access (TDMA) transmitter that conforms to the North American digital cellular telephone standard. One sham and one energized TEM cell were placed in standard incubators maintained at 37 degrees C and 5% CO2. DNA synthesis experiments at 0.59-59 muW/g SAR were performed on log-phase and serum-starved semiquiescent cultures after 24 h exposure. Cell growth at 0.15-15 muW/g SAR was determined by cell counts of log-phase cultures on days 0, 1, 5, 7, 9, 12, and 14 of a 2 week protocol. Results from the DNA synthesis assays differed for the two cell types. Sham-exposed and RF-exposed cultures of primary rat glial cells showed no significant differences for either log-phase or serum-starved condition. C6 glioma cells exposed to RF at 5.9 muW/g SAR (0.9 mW/cm2) exhibited small (20-40%) significant increases in 38% of [3H]thymidine incorporation experiments. Growth curves of sham and RF-exposed cultures showed no differences in either normal or transformed glial cells at any of the power densities tested. Cell doubling times of C6 glioma cells [sham (21.9 +/- 1.4 h) vs. field (22.7 +/- 3.2 h)] also demonstrated no significant differences that could be attributed to altered DNA synthesis rates. Under these conditions, this modulated RF field did not increase cell proliferation of normal or transformed cultures of glial origin.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Stang A et al. 2001

Stang A, Anastassiou G, Ahrens W, Bromen K, Bornfeld N, Jockel K H

The possible role of radiofrequency radiation in the development of uveal melanoma

In: Epidemiology, 12. Jg. (2001), S. 7.

ABSTRACT:
There are few epidemiologic studies dealing with electromagnetic radiation and uveal melanoma. The majority of these studies are exploratory and are based on job and industry titles only. We conducted a hospital-based and population-based case-control study of uveal melanoma and occupational exposures to different sources of electromagnetic radiation, including radiofrequency radiation. We then pooled these results. We interviewed a total of 118 female and male cases with uveal melanoma and 475 controls matching on sex, age, and study regions. Exposure to radiofrequency-transmitting devices was rated as (a) no radiofrequency radiation exposure, (b) possible exposure to mobile phones, or (c) probable/certain exposure to mobile phones. Exposures were rated independently by two of the authors who did not know case or control status. We used conditional logistic regression to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs). We found an elevated risk for exposure to radiofrequency-transmitting devices (exposure to radio sets, OR = 3.0, 95% CI = 1.4-6.3; probable/certain exposure to mobile phones, OR = 4.2, 95% CI = 1.2-14.5). Other sources of electromagnetic radiation such as high-voltage lines, electrical machines, complex electrical environments, visual display terminals, or radar units were not associated with uveal melanoma. This is the first study describing an association between radiofrequency radiation exposure and uveal melanoma. Several methodologic limitations prevent our results from providing clear evidence on the hypothesized association.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Stark K D C et al. 1997

Stark K D C, Krebs T, Altpeter E, Manz B, Griot C, Abelin T

Absence of chronic effect of exposure to short-wave radio broadcast signal on salivary melatonin concentrations in dairy cattle

In: J Pineal Res, 22. Jg. (1997), S. 171.

ABSTRACT:
A pilot study was conducted to investigate the influence of electromagnetic fields in the short-wave range (3-30 MHz) radio transmitter signals on salivary melatonin concentration in dairy cattle. The hypothesis to be tested was whether EMF exposure would lower salivary melatonin concentrations, and whether removal of the EMF source would be followed by higher concentration levels. For this pilot study, a controlled intervention trial was designed. Two commercial dairy herds at two farms were compared, one located at a distance of 500 m (exposed), the other at a distance of 4,000 m (unexposed) from the transmitter. At each farm, five cows were monitored with respect to their salivary melatonin concentrations over a period of ten consecutive days. Saliva samples were collected at two-hour intervals during the dark phase of the night. As an additional intervention, the short-wave transmitter was switched off during three of the ten days (off phase). The samples were analyzed using a radioimmunoassay. The average nightly field strength readings were 21-fold greater on the exposed farm (1.59 mA/m) than on the control farm (0.076 mA/m). The mean values of the two initial nights did not show a statistically significant difference between exposed and unexposed cows. Therefore, a chronic melatonin reduction effect seemed unlikely. However, on the first night of re-exposure after the transmitter had been off for three days, the difference in salivary melatonin concentration between the two farms (3.89 pg/ml, CI: 2.04, 7.41) was statistically significant, indicating a two- to seven-fold increase of melatonin concentration. Thus, a delayed acute effect of EMF on melatonin concentration cannot completely be excluded. However, results should be interpreted with caution and further trials are required in order to confirm the results.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Stenlund C et al. 1997

Stenlund C, Floderus B

Occupational exposure to magnetic fields in relation to male breast cancer and testicular cancer: a Swedish case-control study

In: Cancer Causes Control, 8. Jg. (1997), S. 184.

ABSTRACT:
Occupational exposure to extremely low-frequency magnetic fields (MF) was studied in 56 male subjects with breast cancer (adenocarcinoma) diagnosed in 1985-91, and 144 subjects with testicular cancer (seminoma and non-seminoma), diagnosed in 1985-87. The cases were compared with 1,121 control subjects from a previous case-control study on MF and cancer. Exposure assessment was based on the job held longest during the decade before diagnosis linked to a job exposure matrix based on MF measurements. The results refer to an estimated average mean of > 0.28 microT (Q4) and > 0.40 microT (P90, part of Q4) with < or = 0.15 microT (Q1) as reference. For breast cancer, the odds ratios (OR) and the 95 percent confidence intervals (CI) were 0.7 (CI = 0.3-1.9) and 0.7 (CI = 0.2-2.3), respectively. For men 60 years or younger, the corresponding estimates were OR = 0.9 (CI = 0.2-4.5) and 1.5 (CI = 0.3-8.3). For testicular cancer, the ORs were 1.3 (CI = 0.7-2.5) and 2.1 (CI = 1.0-4.3), and for men 40 years or younger the ORs were 1.9 (CI = 0.8-4.4) and 3.9 (CI = 1.4-11.2). The results were mainly attributable to non-seminoma, the more malignant type of testicular cancer. Our conclusion is that the results for male breast cancer, based on limited numbers, fail to support the suggested association with MF exposure. The results for testicular cancer gave some support to the hypothesis of a hormonal link between MFs and cancer, and should be further explored.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Stern R M 1987

Sern R M

Cancer incidence among welders: possible effects of exposure to extremely low frequency electromagnetic radiation (ELF) and to welding fumes

In: Environ Health Perspect, 76. Jg. (1987), S. 221.

ABSTRACT:
Epidemiological studies of cancer incidence among welders disclose a pooled total of 146 cases of leukemia observed versus 159.46 expected, a risk ratio of 0.92, and 40 cases of acute leukemia observed versus 43.39 expected, a risk ratio of 0.92. For respiratory tract cancer, the pooled total is 1789 cases observed versus 1290.7 expected, a risk ratio of 1.39. Most electric welders are exposed to extremely low frequency electromagnetic radiation (ELF) (magnetic flux densities of up to 100,000 microT), a suspected leukemogen, and to concentrated metallic aerosols (up to 200 mg/m3), which can contain the putative respiratory tract carcinogens Cr(VI) and Ni. The two exposures are usually coincident, since welding with an electric current produces welding fumes. The observation of an excess risk for respiratory tract cancer strongly suggests significant exposure both to fumes and to ELF. The absence of increased risk for all leukemia or for acute leukemia among ELF-exposed welders does not support the hypothesis that the observed excess risk for leukemia or acute leukemia among workers in the electrical

trades is due to their ELF exposure, which on the average is lower than that of welders.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Stevens R G 1987

Stevens R G
Electric power use and breast cancer: a hypothesis
In: Am J Epidemiol, 125. Jg. (1987), S. 556.

ABSTRACT:
no abstract avaliable

SCHLAGWÖRTER:
epidemiology; Review; elf; cancer

Strayer D L et al. 1999

Strayer D L, Johnston W A, Grison S
Strayer D L, Johnston W A, Grison S
Driven to distraction: studies of driving and cellular phone use
In: Abs Psychonomic Soc, 4. Jg. (1999), H. conference abstract, S. 16.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; Review; none; others

Swanson G M et al. 1995

Swanson GM, Burns PB
Cancer incidence among women in the workplace: a study of the association between occupation and industry and 11 cancer sites
In: J Occup Environ Med, 37. Jg. (1995), S. 282.

ABSTRACT:
Few studies of the occupational etiology of cancer have focused upon the risks that women experience in the workplace. In this case-referent study of 11 cancer sites (lung, colon, rectum, bladder, esophagus, liver, salivary gland, stomach, eye, melanoma of the skin, mesothelioma), 7686 women in the Detroit area were interviewed to obtain lifetime histories of employment, tobacco use, and adult health, as well as demographic information. The results provide both methodologic and substantive leads for future investigations of the association between women's employment and their risk of cancer. We found that 63% of respondents had a usual occupation of housewife. Methodologic issues are discussed about the implications of this finding for sample size and statistical analysis when conducting such studies. New observations that merit further investigation include an association between salivary gland cancer and employment in hairdressing shops, esophageal cancer and employment in restaurants, and bladder cancer and employment in computer manufacturing. Further research is needed to understand the occupational etiology of cancer among women; such studies must consider specific methodologic issues.

SCHLAGWÖRTER:
epidemiology; other type; none; cancer

Szmigielski S 1993

Szmigielski S
Electromagnetic fields and neoplasms with special reference to extremely low frequencies
In: Bioelectrochem Bioenerg, 30. Jg. (1993), S. 253.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Szmigielski S 1996

Szmigielski S
Cancer mortality in subjects occupationally exposed to high-frequency (radiofrequency and microwaves) electromagnetic radiation
In: Sci Total Environ, 180. Jg. (1996), S. 9.

ABSTRACT:
Cancer morbidity was registered in the whole population of military career personnel in Poland during a period of 15 years (1971-1985). Subjects exposed occupationally to radiofrequencies (RF) and microwaves (MW) were selected from the population on the basis of their service records and documented exposures at service posts. The population size varied slightly from year to year with a mean count of about 128,000 persons each year; each year about 3700 of them (2.98%) were considered as occupationally exposed to RF/MW. All subjects (exposed and non-exposed to RF/MW) were divided into age groups (20-29, 30-39, 40-49 and 50-59). All newly registered cases of cancer were divided into 12 types based on localisation of the malignancy; for neoplasms of the haemopoietic system and lymphatic organs an additional analysis based on diagnosis was performed. Morbidity rates (per 100,000 subjects annually) were calculated for all of the above localisations and types of malignancies both for the whole population and for the age groups. The mean value of 15 annual rates during 1971-1985 represented the respective morbidity rate for the whole period. Morbidity rates in the non-exposed groups of personnel were used as 'expected' (E) rates for the exposed subjects, while the real morbidity rates counted in the RF/MW-exposed personnel served as 'observed' (O) rates. This allowed the calculation of the observed/expected ratio (OER) representing the odds ratio for the exposed groups. The cancer morbidity rate for RF/MW-exposed personnel for all age groups (20-59 years) reached 119.1 per 100,000 annually (57.6 in non-exposed) with an OER of 2.07, significant at $P < 0.05$. The difference between observed and expected values results from higher morbidity rates due to neoplasms of the alimentary tract (OER = 3.19-3.24), brain tumours (OER = 1.91) and malignancies of the haemopoietic system and lymphatic organs (OER = 6.31). Among malignancies of the haemopoietic/lymphatic systems, the largest differences in morbidity rates between exposed and non-exposed personnel were found for chronic myelocytic leukaemia (OER = 13.9), acute myeloblastic leukaemia (OER = 8.62) and non-Hodgkin lymphomas (OER = 5.82).

SCHLAGWÖRTER:
epidemiology; cohort; hf; mortality

Szmigielski S et al. 1982

Szmigielski S, Szudzinski A, Pietraszek A, Bielec M, Wrembel J K
Accelerated development of spontaneous and benzopyrene-induced skin cancer in mice exposed to 2450-MHz microwave radiation
In: Bioelectromagnetics, 3. Jg. (1982), S. 179.

ABSTRACT:
C3H/HeA mice with high incidence of spontaneous breast cancerand Balb/c mice treated with 3,4-benzopyrene (BP) (by painting of the skinresulting in the development of skin cancer) were irradiated with 2,450-MHzmicrowaves (MW) in an anechoic chamber at 5 or 15 mW/cm2 (2 hdaily, 6 sessions per week). C3H/HeA mice were irradiated fromthe 6th week of life, up to the 12th month of life. Balb/c mice treatedwith BP were irradiated either prior to (over 1 or 3 months) orsimultaneously with BP treatment (over 5 months). The appearance ofpalpable tumors in C3H/HeA mice and of skin cancer in BP-treatedBalb/c mice was checked every 2 weeks for 12 months. Two additional groupsof mice were exposed to chronic stress caused by confinement or tosham-irradiation in an anechoic chamber; these served as controls.Irradiation with MWs at either 5

or 15 mW/cm2 for 3 monthsresulted in a significant lowering of natural antineoplastic resistance(mean number of lung neoplastic colonies was 2.8 ± 1.6 (SD) incontrols, 6.1 ± 1.8 in mice exposed at 5 mW/cm2 and 10.8± 2.1 in those irradiated at 15 mW/cm2) and accelerationof development of BP-induced skin cancer (285 days in controls, 230 daysfor 5 mW/cm2 and 160 days for 15 mW/cm2).Microwave-exposed C3H/HeA mice developed breast tumors earlierthan controls (322 days in controls, 261 days for 5 mW/cm2 and219 days for 15 mW/cm2). A similar acceleration was observed inthe development of BP-induced skin cancer in mice exposed simultaneously toBP and MWs (285 days in controls, 220 day for 5 mW/cm2 and 121days for 15 mW/cm2). The acceleration of cancer development inall tested systems and lowering of natural antineoplastic resistance wassimilar in mice exposed to MW at 5 mW/cm2 or to chronic stresscaused by confinement but differed significantly from the data obtained onanimals exposed at 15 mW/cm2, where local thermal effects ('hotspots) were possible.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Szmigielski S et al. 1998

Szmigielski S, Bortkiewicz A, Gadzicka E, Zmyslony M, Kubacki R

Alteration of diurnal rhythms of blood pressure and heart rate to workers exposed to radiofrequency electromagnetic fields

In: Blood Press Monit, 3. Jg. (1998), S. 323.

ABSTRACT:
BACKGROUND: In previous studies we found measurable effects on variability of heart rate and on blood-pressure parameters of workers exposed to radiofrequency electromagnetic fields (EMF)compared with a control population, but none of the effects could be assigned clinical significance. In general, the obtained results strongly suggested that dysregulation of the autonomic control of the circulatory system was occurring. Therefore, it seemed logical that analysis of diurnal rhythms of blood pressure and heart rate, on the basis of data from 24 h recordings, might further support the above hypothesis. OBJECTIVE: The aim of this study was to determine the course of diurnal rhythms of blood pressure and heart rate in a group of workers exposed to various intensities of radiofrequency electromagnetic fields. METHODS: In the study we used 61 healthy workers (aged 30-50 years) who had been exposed to radiofrequency EMF of 0.738-1.503 Mhz and 42 healthy workers at radio-line stations (aged 28-49 years), who had not been exposed to EMF occupationally. The work patterns of these two groups were identical (12 h day working shift, 24 h interval, 12 h night shift and then 48 h rest). During the second day of the rest period 24 h ambulatory blood pressure (ABP) was recorded. For analysis of diurnal rhythms the group of exposed workers was divided into two subgroups: group A of 38 subjects exposed to low intensities of radiofrequency EMF (20-180 V/m) and group B of 23 subjects exposed to high intensities of radiofrequency EMF (200-550 V/m). Parameters of diurnal rhythms of blood pressure and heart rate (acrophase, amplitude and mean) were calculated by performing a least-square fit of a 24 h cosinor (single cosinor analysis) at $P < 0.05$. RESULTS: Healthy men aged 28-49 years, working on a pattern of 12-24-12-48 h, exhibited typical, well-preserved diurnal rhythms of blood pressure and heart rate with two maxima (at about 1400 and 1700-1800 h) and one minimum (at about 0200-0400 h). For workers exposed to radiofrequency EMF we noted a significant lowering of the amplitudes of rhythms of blood pressure and heart rate ($P < 0.01$) and a shift of the acrophase to an earlier time (1100-1200 h; $P < 0.05$). These changes were more pronounced among workers exposed to high intensities of radiofrequency EMF. CONCLUSIONS: Occupational exposure to radiofrequency EMF can result in changes of the diurnal rhythms of blood pressure and heart rate with lowering of their amplitudes and a shift of the acrophase. The clinical relevance of the present finding needs to be investigated in further studies.

SCHLAGWÖRTER:
epidemiology; other type; hf; cvd

Szudzinski A et al. 1982

Szudzinski A, Pietraszek A, Janiak M, Wrembel J, Kalczek M, Szmigielski S

Acceleration of the development of benzopyrene-induced skin cancer in mice by microwave radiation

In: Arch Dermatol Res, 274. Jg. (1982), S. 303.

ABSTRACT:
Development and growth of skin cancer may be affected by various physical and chemical factors present in human environment. Of these factors electromagnetic radiation of radio- and microwave spectra are among the most common. In the present study Balb/c mice were exposed to chemical carcinogen, 3,4-benzopyrene, painted on the skin every 2nd day for a total of 6 months, and simultaneously irradiated with athermal (5 mW/cm2) or subthermal (15 mW/cm2) doses of 2,450 MHz microwaves. The other group of animals was preirradiated with microwaves at 10 mW/cm2 power level for 1, 2, or 3 months and then treated with benzopyrene, as above. Control mice were exposed for 6 months to benzopyrene, resulting in the development of baso- or spinocellular skin carcinoma within approximately 9 months, and sham-irradiated with microwaves. The growth of the tumour was assessed according to a self-designed 7-range macroscopic scale, supported by microscopical examinations of skin sections. All protocols of microwave irradiations resulted in a significant acceleration of the development of benzopyrene-induced skin cancer and in shortening of life span of the tumour-bearing hosts. This effect seemed to be dose-dependent since subthermal doses (15 mV/cm2) and longer (3 months) expositions to microwaves were more efficient as compared to athermal doses (5 mW/cm2) and shorter preirradiations. In addition, low-level, long-lasting exposure to microwaves led to a marked suppression of delayed hypersensitivity of mice treated with benzopyrene, as assessed by their reactivity to dinitrofluorbenzene (DNFB). It is suggested that the observed co-carcinogenic effect of microwave radiation may, at least in part, result from the inhibitory action of microwaves on cellular immune reactions of exposed animals.

SCHLAGWÖRTER:
bioassay; experimentally; hf; cancer

Takashima S et al. 1979

Takashima S, Onaral B, Schwan H P

Effects of modulated RF energy on the EEG of mammalian brains

In: Radiat Environ Biophys, 16. Jg. (1979), S. 15.

ABSTRACT:
The effects of modulated radio frequency fields on mammalian EEGs were investigated using acute and chronic irradiations at non-thermal level. The EEG signals were computer processed to obtain power spectra. Rabbits were exposed to the field for 2 h a day for 6 weeks at 1-10 MHz (15 Hz modulation) at the level of 0.5-1 kV/M. Silver electrodes placed on the skull surface were used for recording of the EEG. Usually they were removed immediately after initial recordings of the EEG and reinserted before the final and intermediate EEG recordings. With this arrangement, modulated RF fields produced a change in EEG patterns by enhancing the low frequency components and decreasing high frequency activities. On the other hand, acute irradiations did not produce noticeable changes in the EEG at the level of 0.5-1 kV/M (1-30 MHz, 60 Hz modulation) as long as the use

of intracranial electrodes was avoided.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Tardon A et al. 2002

Tardon A, Velarde H, Rodriguez P, Moreno S, Raton M, Munoz J, Fidalgo A R, Kogevinas M
Exposure to extremely low frequency magnetic fields among primary school children in Spain
In: J Epidemiol Community Health, 56. Jg. (2002), S. 432.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Tarone R E et al. 1998

Tarone R E, Kaune W T, Linet M S, Hatch E E, Kleinerman R A, Robison L L, Boice Jr J D, Wacholder S
Residential wire codes: reproducibility and relation with measured magnetic fields
In: Occup Environ Med, 55. Jg. (1998), S. 333.

ABSTRACT:
OBJECTIVES: To investigate the reproducibility of wire codes to characterise residential power line configurations and to determine the extent to which wire codes provide a proxy measure of residential magnetic field strength in a case-control study of childhood leukaemia conducted in nine states within the United States. METHODS: Misclassification of wire codes was assessed with independent measurements by two technicians for 187 residences. The association between categories of wire code and measured level of magnetic field was evaluated in 858 residences with both a wire code measurement and a 24 hour measurement of the magnetic field in the bedroom. The strength of the association between category of wire code and risk of leukaemia was examined in two regions with different average levels of magnetic field in homes with high categories of wire code. RESULTS: The reproducibility of any of three different classifications of wire codes was excellent (kappa > or = 0.89). Mean and median magnetic fields, and the percentage of homes with high magnetic fields increased with increasing category for each of the wire code classification schemes. The size of the odds ratios for risk of leukaemia and high categories of wire code did not reflect the mean levels of the magnetic field in those categories in two study regions. CONCLUSION: Misclassification of categories of wire code is not a major source of bias in the study. Wire codes provide a proxy measure of exposure to residential magnetic fields. If magnetic fields were a risk factor for leukaemia, however, there would be some attenuation of risk estimates based on wire codes because of misclassification of exposure to magnetic fields at both extremes of the wire code range. The lack of an association between high categories of wire code and risk of leukaemia cannot be explained by a failure of the wire code classification schemes to estimate exposure to magnetic fields in the study area.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Taskinen H et al. 1990

Taskinen H, Kyyronen P, Hemminki K
Effects of ultrasound, shortwaves and physical exertion on pregnancy
outcome in physiotherapists
In: J Epidemiol Community Health, 44. Jg. (1990), S. 196.

ABSTRACT:
STUDY OBJECTIVE--The aim of the study was to investigate whether occupational exposure among physiotherapists is associated with spontaneous abortion or congenital malformation in the offspring. DESIGN--The study was a retrospective nested case-control study, where the pregnancy outcome data were based on the medical registers. SETTING--All registered physiotherapists in Finland who had become pregnant during the study period were included in the study. SUBJECTS--Cases were defined as women who had been treated for spontaneous abortion during 1973-1983 or had delivered a malformed child during 1973-1982. One pregnancy per woman was randomly selected for the study. Three age matched (+/- 18 months) controls were selected for each abortion case and five for each malformation case. The final study population was 204 cases and 483 controls in the spontaneous abortion study, and 46 cases and 187 controls in the congenital malformation study. MEASUREMENTS AND MAIN RESULTS--Exposure information was collected by mailed questionnaires from 1329 women. The response rate was 92% in the spontaneous abortion study, and 89% in the congenital malformation study. Heavy lifting (including patient transfers) was associated significantly with spontaneous abortion. Exposure to ultrasound and shortwaves showed about threefold odds ratios for spontaneous abortions occurring after the 10th week of gestation but in analysis where potential confounding variables were controlled, neither reached statistical significance. Deep heat therapies together, and shortwaves alone, were associated significantly with congenital malformations, but the increase was found in the lower exposure category only. From the potential confounding variables, previous abortion (spontaneous or induced) was associated significantly with spontaneous abortion, and febrile disease in early pregnancy was associated with congenital malformation. CONCLUSION--Physical exertion during early pregnancy seems to be a risk factor for spontaneous abortion. The findings raise suspicion of the potential harmful effect of shortwaves and ultrasound on the pregnancy, but no firm conclusion can be drawn on the bases of these results alone.

SCHLAGWÖRTER:
epidemiology; case-control; none; others

Taylor E M et al. 1974

Taylor E M, Ashleman B T
Analysis of central nervous system involvement in the microwave auditory effect
In: Brain Res, 74. Jg. (1974), S. 201.

ABSTRACT:
9 cats were prepared for the recording of potentials in 3 brain sites evoked by acoustic and microwave stimuli. Loci in which potentials were observed were: 8th cranial nerve, medial geniculate nucleus and primary auditory cortex. The effect of cochlear disablement on these potentials was evaluated. Potentials at all sites were abolished by cochlear damage. There were no differences between acoustic and microwave stimuli in this regard. Data are interpreted as supporting the contention that the microwave auditory effect is mediated at the periphery as are the effects of conventional acoustic stimuli.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Tenforde T S et al. 1988

Tenforde T S, Liburdy R P
Magnetic deformation of phospholipid bilayers: effects on liposome shape and solute permeability at prophase transition temperatures
In: J Theoret Biol, 133. Jg. (1988), S. 385.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; elf; biological effects

Theriault G et al. 1994

Theriault G, Goldberg M, Miller A B, Armstrong B, Guenel P, Deadman J, Imbernon E, To T, Chevalier A, Cyr D, et al.
Cancer risks associated with occupational exposure to magnetic fields among electric utility workers in Ontario and Quebec, Canada, and France: 1970-1989
In: Am J Epidemiol, 139. Jg. (1994), S. 550.

ABSTRACT:
To determine whether occupational exposure to magnetic fields of 50-60 Hz was associated with cancer among electric utility workers, the authors used a case-control design nested within three cohorts of workers at electric utilities: Electricite de France--Gaz de France, 170,000 men; Ontario Hydro, 31,543 men; and Hydro-Quebec, 21,749 men. During the observation period, 1970-1989, 4,151 new cases of cancer occurred. Each participant's cumulative exposure to magnetic fields was estimated based on measurements of current exposure of 2,066 workers performing tasks similar to those in the cohorts using personal dosimetry. Estimates were also made of past exposure based on knowledge of current loading, work practices, and usage. Workers who had more than the median cumulative exposure to magnetic fields (3.1 microtesla (microT)-years) had a higher risk for acute nonlymphoid leukemia (odds ratio (OR) = 2.41, 95% confidence interval (CI) 1.07-5.44). The same observation holds for acute myeloid leukemia (OR = 3.15, 95% CI 1.20-8.27). There was also an elevated risk for mean exposure above 0.2 microT (acute nonlymphoid leukemia, OR = 2.36, 95% CI 1.00-5.58; acute myeloid leukemia, OR = 2.25, 95% CI 0.79-6.46). However, there were no clear dose-response trends with increasing exposure and no consistency among the three utilities. Men whose cumulative exposure to magnetic fields was above the 90th percentile (15.7 microT-years) had an elevated risk for brain cancer (OR = 1.95, 95% CI 0.76-5.00) that was not statistically significant. No association with magnetic fields was observed for any of the other 29 types of cancer studied, including skin melanoma, male breast cancer, and prostate cancer. Controlling for potential confounding factors did not change the results.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Thomas D C et al. 1999

Thomas D C, Bowman J D, Jiang L, Jiang F, Peters J M
Residential magnetic fields predicted from wiring configurations: II. Relationships To childhood leukemia
In: Bioelectromagnetics, 20. Jg. (1999), S. 414.

ABSTRACT:
Case-control data on childhood leukemia in Los Angeles County were reanalyzed with residential magnetic fields predicted from the wiring configurations of nearby transmission and distribution lines. As described in a companion paper, the 24-h means of the magnetic field's magnitude in subjects' homes were predicted by a physically based regression model that had been fitted to 24-h measurements and wiring data. In addition, magnetic field exposures were adjusted for the most likely form of exposure assessment errors: classic errors for the 24-h measurements and Berkson errors for the predictions from wire configurations. Although the measured fields had no association with childhood leukemia (P for trend=.88), the risks were significant for predicted magnetic fields above 1.25 mG (odds ratio=2.00, 95% confidence interval=1.03-3.89), and a significant dose-response was seen (P for trend=.02). When exposures were determined by a combination of predictions and measurements that corrects for errors, the odds ratio (odd ratio=2.19, 95% confidence interval=1.12-4.31) and the trend (p =.007) showed somewhat greater significance. These findings support the hypothesis that magnetic fields from electrical lines are causally related to childhood leukemia but that this association has been inconsistent among epidemiologic studies due to different types of exposure assessment error. In these data, the leukemia risks from a child's residential magnetic field exposure appears to be better assessed by wire configurations than by 24-h area measurements. However, the predicted fields only partially account for the effect of the Wertheimer-Leeper wire code in a multivariate analysis and do not completely explain why these wire codes have been so often associated with childhood leukemia. The most plausible explanation for our findings is that the causal factor is another magnetic field exposure metric correlated to both wire code and the field's time-averaged magnitude.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Thomas T L et al. 1987

Thomas T L, Stolley P D, Stemhagen A, Fontham E T H, Bleecker M L, Stewart P A, Hoover R N
Brain tumor mortality risk among men with electrical and electronics jobs: a case--control study
In: J Natl Cancer Inst, 79. Jg. (1987), S. 233.

ABSTRACT:
Brain tumor risk associated with electrical and electronics jobs and with occupational exposure to microwave and radiofrequency (MW/RF) electromagnetic radiation was evaluated with the use of data from a death certificate-based case-control study of brain tumors and occupational risk factors in northern New Jersey, Philadelphia, PA, and southern Louisiana. Next-of-kin of 435 white men who died of a primary brain tumor and of 386 controls who died from other causes were interviewed to obtain information on lifetime occupational history and other factors that might be related to excess brain tumor risk. The relative risk (RR) for all brain tumors was elevated among men exposed to MW/RF radiation [RR = 1.6; 95% confidence interval (CI) = 1.0, 2.4] and was significantly elevated among men exposed for 20 or more years. All of the excess risk for MW/RF radiation-exposed subjects was derived from jobs that involved the design, manufacture, repair, or installation of electrical or electronic equipment (RR = 2.3; 95% CI = 1.3, 4.2), while risk of brain tumors among MW/RF radiation-exposed subjects who never worked in electrical or electronics jobs was not elevated (RR = 1.0; 95% CI = 0.5, 1.9). Furthermore, risk was elevated for electronics workers who were considered to have no exposure to MW/RF radiation. Among electrical and electronics workers, risk was highest for engineers, teachers, technicians, repairers, and assemblers combined (RR = 3.9; 95% CI = 1.6, 9.9) and was limited to excess risk from astrocytic tumors (RR = 4.6; 95% CI = 1.9, 12.2). Risk of astrocytic tumors among these electronics manufacture and repair workers increased with duration of exposure to tenfold among those employed for 20 or more years. Among electricians and power and telephone linemen combined (electrical tradesmen), the RR for astrocytic tumors was slightly elevated, but not statistically significant (RR = 1.8), and showed no consistent evidence of a duration-response relationship. Electrical tradesmen are exposed to extremely low frequency electromagnetic radiation, while men in some jobs associated with electronics manufacture and repair are exposed to electromagnetic radiation in the very high frequency and ultra-high frequency ranges and also may be exposed to soldering fumes, solvents, and a variety of other chemicals.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Thuroczy G et al. 1994

Thuroczy G, Kubinyi G, Bodo M, Bakos J, Szabo L D
Simultaneous response of brain electrical activity (EEG) and cerebral circulation (REG) to microwave exposure in rats
In: Rev Environ Health, 10. Jg. (1994), S. 135.

ABSTRACT:
The correlations between physiological modalities in microwave field-activated systemic or localized regulatory mechanisms with changes in the central nervous system (CNS) seem not to be identical. These problems are important because of the increased number of radiating appliances, e.g. portable radios and mobile telephones. In two series of experiments on anaesthetized rats (N = 40) (i) before and after 10 min, whole body exposures to 2.45 GHz CW microwaves, and (ii) during 30 min exposures to 4 GHz amplitude modulated (AM, 16 Hz) microwaves, the effects on the CNS were observed simultaneously with those on the cardiovascular system by quantitative polygraphic measurement. In acute experiments on rats, electroencephalograms (EEG), rheoencephalograms (REG) as an index of cerebral blood flow (CBF), brain tissue DC impedance and temperature and ECG were recorded simultaneously. The total power of EEG spectra increased after whole body 30 mW/cm2 2.45 GHz CW exposure for 10 min. No changes occurred at 10 mW/cm2. The CBF increased after 10 mW/cm2 exposure. The power of EEG delta (0.5-4 Hz) waves was increased by thermal level of brain localized 4 GHz CW exposure at 42 mW/g specific absorption rate (SAR) simultaneously with the REG amplitude as an index of cerebral blood flow. Amplitude modulation at 16 Hz and 8.4 mW/g SAR was associated with increased power of EEG beta (14.5-30 Hz) waves but changes in the CBF were not observed. CW radiation at 8.4 mW/g increased the cerebral blood flow, but did not change EEG spectra.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Toler J C et al. 1997

Toler J C, Shelton WW, Frei M R, Merritt J H, Stedham M A

Long-term, low-level exposure of mice prone to mammary tumours to 435 MHz radiofrequency radiation

In: Radiat Res, 148. Jg. (1997), S. 227.

ABSTRACT:
The purpose of this study was to determine if chronic, low-level exposure of mice prone to mammary tumors to 435 MHz radiofrequency (RF) radiation promotes an earlier onset, a faster growth rate or a greater total incidence of mammary tumors than in sham-exposed controls. Two hundred female C3H/HeJ mice were exposed for 21 months (22 h/day, 7 days/week) to a horizontally polarized 435 MHz pulse-wave (1.0 micros pulse width, 1.0 kHz pulse rate) RF radiation environment with an incident power density of 1.0 mW/cm2 (SAR = 0.32 W/kg). An additional 200 mice were sham-exposed. Animals that died spontaneously, became moribund or were euthanized after 21 months of exposure were completely necropsied; tissues were subjected to histopathological examinations. Concerning mammary carcinomas, there were no significant differences between the two groups with respect to latency to tumor onset, tumor growth rate and overall tumor incidence. Histopathological examination revealed no significant differences in numbers of malignant, metastatic or benign neoplasms between groups. Survival probability was estimated by the Kaplan-Meier method; no significant difference between groups was noted (Cox's test). Under the conditions of this long-term study, low-level exposure of mice prone to mammary tumors to 435 MHz RF radiation did not affect the incidence of mammary tumors, tumor growth rate, latency to tumor onset or animal longevity when compared to sham-exposed controls.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Tomenius L 1986

Tomenius L

50-Hz electromagnetic environment and the incidence of childhood tumors in Stockholm County

In: Bioelectromagnetics, 7. Jg. (1986), S. 191.

ABSTRACT:
The magnetic fields from overhead power lines and other electromagnetic sources were determined at the birth and diagnosis dwellings of all tumor cases reported in the county of Stockholm during the years 1958-73 for individuals 0-18 years of age. The study was limited to 716 cases having a permanent address in the county both at time of birth and diagnosis. An equivalent number of controls was matched to the cases according to church district of birth, age, and sex. Outside each dwelling, the occurrence of visible electrical constructions (6-200-kV high-voltage wires, substations, transformers, electric railroads, and subways) within 150 m of the dwelling was noted. Also, the 50-Hz magnetic field was measured outside the main entrance of the dwelling. Visible 200-kv wires were noted at 45 of 2,098 dwellings and were found twice as frequently among cases as among controls (P less than .05). The magnetic field measured at the dwelling varied between 0.0004 to 1.9 microT (mean value 0.069 microT). The magnetic field was higher (0.22 microT) at dwellings with visible 200-kV wires than at those without such wires. Magnetic fields of 0.3 microT or more were measured at 48 dwellings, and were found twice as frequently among cases as among controls (P less than .05). The difference was most pronounced for dwellings of nervous system tumors and was less for leukemias.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Tornqvist S et al. 1986

Tornqvist S, Norell S, Ahlbom A, Knave B

Cancer in the electric power industry

In: Br J Ind Med, 43. Jg. (1986), S. 212.

ABSTRACT:
A cohort study of 3358 power linesmen and 6703 power station operators classified in the 1960 population census in Sweden was undertaken. The cancer incidence between 1961 and 1979 was calculated in relation to all male blue collar workers. The relative risk of cancer (all sites) was 1.1, (1.0-1.2, 90% confidence limit) in the group of power linesmen and 1.0 (0.9-1.0) for power station operators. No consistent excess risk of leukaemia or brain tumour was found in the two occupational groups. In both groups a tendency towards an excess risk of cancer of the urinary organs was found.

SCHLAGWÖRTER:
epidemiology; cohort; none; cancer

Tornqvist S et al. 1991

Tornqvist S, Knave B, Ahlbom A, Persson T

Incidence of leukaemia and brain tumours in some "electrical occupations"

In: Br J Ind Med, 48. Jg. (1991), S. 597.

ABSTRACT:
A 19 year follow up study was conducted to explore the association between occupations expected to be exposed to electromagnetic fields and the occurrence of leukaemia and brain tumours. Incidence of cancer between 1961-79 was calculated and the standardised morbidity ratio (SMR) with a 95% confidence interval (95% CI) was related to that of all Swedish working men. For all the selected "electrical occupations" the SMRs for total leukaemia and brain tumours were near unity. Increased risks were noted for all leukaemia among electrical/electronic engineers and technicians, (SMR 1.3; 95% CI 1.0-1.7) as well as in the sub-groups of telegraph/telephone (2.1; 1.1-3.6) and

machine (2.6; 1.0-5.8) industries. Risk for chronic lymphoid leukaemia was increased in the same occupational category (1.7; 1.1-2.5) and in the sub-group of machine industry (4.8; 1.0-14.0), as well as for all linesmen (2.0; 1.0-3.5) and power linesmen (2.8; 1.1-5.7). Risk for acute myeloid leukaemia was increased among all miners (2.2; 1.0-4.1) and miners working in iron/ore mines (5.7; 2.1-12.4). Increased risk for all brain tumours (2.9; 1.2-5.9) and glioblastomas (3.4; 1.1-8.0) appeared among assemblers and repairmen in radio and TV industry. Raised risk for all brain tumours was seen for all welders (1.3; 1.0-1.7) and welders in iron/steel works (3.2; 1.0-7.4) and risk for glioblastomas was also increased for all welders (1.5; 1.1-2.1). No major changes in relative risk estimates were noted after the exclusion of persons who were over 65 at the time of diagnosis.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Trigano A J et al. 1999

Trigano AJ, Azoulay A, Rochdi M, Campillo A

Electromagnetic interference of external pacemakers by walkie-talkies and digital cellular phones: experimental study

In: Pacing Clin Electrophysiol, 22. Jg. (1999), S. 588.

ABSTRACT:
A number of experimental and clinical studies have documented the risk potential of interference with implanted pacemakers by various types of cellular phones. Radiofrequency susceptibility of external medical equipment has also been reported in experimental studies. The purpose of this experimental study was to evaluate electromagnetic interference of external pacemakers by walkie-talkies and digital cellular telephones. External bipolar pacing was monitored using a digital oscilloscope to record pacemaker pulses and electromagnetic interference separately. Tests with the walkie-talkie, Private Mobile Radio (PMR) (160 MHz, 2.5 W) were conducted during the calling phase. Tests with the cellular phones, global system for mobile communications (GSM) (900 MHz, 2 W) and Digital Cellular System (DCS) (1,800 MHz, 1 W) were conducted in the test mode. Nine widely used external pacemakers from four manufacturers were tested. Various disturbances including pacing inhibition and asynchronous pacing were observed in eight pacemakers by the PMR, in four by the GSM phone, and in two by the DCS phone. The maximum distance that interference persisted ranged from 10-200 cm. This experimental study shows a potential risk of interference of external pacemakers by walkie-talkies and cellular digital phones. Appropriate warnings should be issued against the potentially serious risks of using communication devices in the vicinity of acutely ill patients treated with temporary transvenous cardiac pacemakers.

SCHLAGWÖRTER:
physics; experimentally; hf; others

Tynes T et al. 1992

Tynes T, Andersen A, Langmark F

Incidence of cancer in Norwegian workers potentially exposed to electromagnetic fields

In: Am J Epidemiol, 136. Jg. (1992), S. 81.

ABSTRACT:
The risk of cancer was investigated in a cohort of 37,945 male Norwegian electrical workers for whom information on job description was collected from 1960 census data and linked to the 1970 census data. The standardized incidence ratio was calculated for all cancer sites in the overall cohort by comparison with national incidence rates for economically active men at the 1960 census. The standardized incidence ratios for cancers of the breast, pleura (mesothelioma), larynx, and bladder and for soft tissue sarcoma were elevated, while those for non-Hodgkins and Hodgkins lymphoma were lower. The standardized incidence ratio for leukemia for electrical workers with 10 or more economically active years was 1.41. The standardized incidence ratio for brain tumors in this subgroup of electrical workers was 1.14. These results from a large, national, population-based study at the Cancer Registry of Norway give support to previous findings of a possible association between electrical work and the risk of leukemia.

SCHLAGWÖRTER:
epidemiology; cohort; none; cancer

Tynes T et al. 1994

Tynes T, Jynge H, Vistnes A I

Leukemia and brain tumors in Norwegian railway workers, a nested case-control study

In: Am J Epidemiol, 139. Jg. (1994), S. 645.

ABSTRACT:
In an attempt to assess whether exposure to electromagnetic fields on Norwegian railways induces brain tumors or leukemia, the authors conducted a nested case-control study of railway workers based on incident cases from the Cancer Registry of Norway in a cohort of 13,030 male Norwegian railway workers who had worked on either electric or non-electric railways. The cohort comprised railway line, outdoor station, and electricity workers. The case series comprised 39 men with brain tumors and 52 men with leukemia (follow-up, 1958-1990). Each case was matched on age with four or five controls selected from the same cohort. The exposure of each study subject to electric and magnetic fields was evaluated from cumulative exposure measures based on present measurements and historical data. Limited information on potential confounders such as creosote, solvents, and herbicides was also collected; information on whether the subject had smoked was obtained by interviews with the subjects or work colleagues. The case-control analysis showed that men employed on electric railways, compared with non-electric ones, had an odds ratio for leukemia of 0.70 (adjusted for smoking) and an odds ratio for brain tumor of 0.87. No significant trend was shown for exposure to either magnetic or electric fields. These results do not support an association between exposure to 16 2/3-Hertz electric or magnetic fields and the risk for leukemia or brain tumors.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Tynes T et al. 1994a

Tynes T, Reitan J B, Andersen A

Incidence of cancer among workers in Norwegian hydroelectric power companies

In: Scand J Work Environ Health, 20. Jg. (1994), S. 339.

ABSTRACT:
OBJECTIVES--The goal of this study was to examine whether exposure to electric or magnetic fields is related to cancer. METHODS--The study cohort consisted of 5088 men who had worked for at least one year between 1920 and 1991 for any of eight participating companies which produce and distribute hydroelectric power in Norway. The occupational exposure of these workers included extremely low-frequency electromagnetic fields. Incident cancer cases identified from the Cancer Registry of Norway were analyzed on the basis of the standardized incidence ratio with the Norwegian male population as reference. RESULTS--The incidence of cancer was close to unity for the cohort. The standardized incidence ratio for lymphoma was below unity, whereas those for leukemia and brain tumors were similar to those expected. Calculated cumulative exposure to electric or magnetic fields was not associated with the incidence of leukemia or brain tumors, but an excess of malignant melanoma was shown for the highest category of magnetic field exposure. An analysis of combined possible exposure to oils containing polychlorinated biphenyls and exposure to magnetic fields

or possible exposure to electric sparks gave standardized incidence ratios of 265 and 280, respectively, for the higher exposure category. CONCLUSIONS--These results do not support the assumption of a possible association between exposure to electromagnetic fields and leukemia and brain tumors. The possible association between exposure to polychlorinated biphenyls or magnetic fields and risk of malignant melanoma should be further evaluated in future studies.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Tynes T et al. 1996

Tynes T, Hannevik M, Anderson A, Vistnes A I, Haldorsen T

Incidence of breast cancer in Norwegian female radio and telegraph operators

In: Cancer Causes Control, 7. Jg. (1996), S. 197.

ABSTRACT:
Exposure to electromagnetic fields may cause breast cancer in women if it increases susceptibility to sex-hormone-related cancer by diminishing the pineal gland's production of melatonin. We have studied breast cancer incidence in female radio and telegraph operators with potential exposure to light at night, radio frequency (405 kHz-25 MHz), and, to some extent, extremely low frequency fields (50 Hz). We linked the Norwegian Telecom cohort of female radio and telegraph operators working at sea to the Cancer Registry of Norway to study incident cases of breast cancer. The cohort consisted of 2,619 women who were certified to work as radio and telegraph operators between 1920 and 1980. Cancer incidence was analyzed on the basis of the standardized incidence ratio (SIR), with the Norwegian female population as the comparison group. The incidence of all cancers was close to unity (SIR = 1.2). An excess risk was seen for breast cancer (SIR = 1.5). Analysis of a nested case-control study within the cohort showed an association between breast cancer in women aged 50+ years and shift work. In a model with adjustment for age, calendar year, and year of first birth, the rate ratio for breast cancer associated with being a radio and telegraph operator--in comparison with all Norwegian women born 1935 or later--analyzed with Poisson regression, was 1.5 after adjustment for fertility factors. These results support a possible association between work as a radio and telegraph operator and breast cancer. Future epidemiologic studies on breast cancer in women aged 50 and over, should address possible disturbances of chronobiological parameters by environmental factors.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Tynes T et al. 1997

Tynes T, Haldorsen T

Electromagnetic fields and cancer in children residing near Norwegian high-voltage power lines

In: Am J Epidemiol, 145. Jg. (1997), S. 219.

ABSTRACT:
The aim of the nested case-control study reported here was to test the hypothesis that exposure to electromagnetic fields of the type generated by high-voltage power lines increases the incidence of cancer in children aged 0-14 years. The study population comprised children who during at least one of the years 1960, 1970, 1980, 1985, 1987, or 1989 had lived in a census ward crossed by a high-voltage power line. The cases were diagnosed from 1965 to 1989 and were matched to controls by year of birth, sex, and municipality. Exposure to electric and magnetic fields was calculated by means of computer programs in which power line characteristics and distance were taken into account. No association was found between exposure to time-weighted average exposure to magnetic fields and cancer at all sites, brain tumors, lymphoma, or leukemia. Cancer at other sites showed elevated odds ratios in the two highest exposure categories in some, but not all, measures of exposure. This study provides little support for an association between children's exposure to magnetic fields and cancer and no support for an association between leukemia and such exposure, but no firm conclusions can be drawn owing to the small numbers involved.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

U K Childhood Cancer Investigators Study 2000

U K Childhood Cancer Investigators Study

Childhood cancer and residential proximity to power lines

In: Br J Cancer, 83. Jg. (2000), S. 1573.

ABSTRACT:
In the United Kingdom Childhood Cancer Study, a population-based case-control study covering the whole of England, Scotland and Wales, measured power-frequency magnetic fields were not found to be associated with risk for any malignancy. To examine further the risk associated with residential proximity to electricity supply equipment, distances to high-voltage lines, underground cables, substations and distribution circuits were collected for 3380 cases and 3390 controls. Magnetic field exposure from this equipment was calculated using distance, load and other circuit information. There was no evidence that either proximity to electrical installations or the magnetic field levels they produce in the UK is associated with increased risk of childhood leukaemia or any other cancer. Odds ratios of 0.73 (95% CI = 0.42-1.26) for acute lymphoblastic leukaemia, 0.75 (95% CI = 0.45-1.25) for all leukaemias, 1.08 (95% CI = 0.56-2.09) for central nervous system cancers and 0.92 (95% CI = 0.64-1.34) for all malignancies were obtained for residence within 50 m of an overhead line. When individuals with a calculated magnetic field exposure > or = 0.2 microT were compared to those in a reference category of exposure <0.1 microT, odds ratios of 0.51 (95% CI = 0.11-2.33) for acute lymphoblastic leukaemia, 0.41 (95% CI = 0. 09-1.87) for total leukaemia, 0.48 (95% CI =0.06-3.76) for central nervous system cancers and 0.62 (95% CI = 0.24-1.61) for all malignancies were obtained. Copyright 2000 Cancer Research Campaign.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

UK Childhood Cancer Study Investigators 1982

UK Childhood Cancer Study Investigators

The United Kingdom Childhood Cancer Study: objectives, materials and methods. UK Childhood Cancer Study Investigators

In: Br J Cancer, 45. Jg. (1982), S. 1073.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
epidemiology; case-control; none; cancer

UK Childhood Cancer Study Investigators 1999

UK Childhood Cancer Study Investigators

Exposure to power-frequency magnetic fields and the risk of childhood cancer. UK Childhood Cancer Study Investigators

In: Lancet, 354. Jg. (1999), S. 1925.

ABSTRACT:
BACKGROUND: Previous studies have suggested an association between exposure to power-frequency electromagnetic fields (EMF) and the development of childhood malignant disease, especially leukaemia and tumours of the central nervous system. We investigated the relation between all childhood cancer and exposure to power-frequency magnetic fields. METHODS: The UK

Childhood Cancer Study was a population case-control study covering the whole of England, Wales, and Scotland. All children with a confirmed malignant disorder were potentially eligible. For each case, we matched two controls on date of birth and sex, randomly chosen from the list of the Family Health Services Authority in England and Wales or Health Board in Scotland. In the main study, 3838 cases and 7629 controls were interviewed. The EMF part of the study included only one control per case, and household EMF measurements and school measurements where relevant were taken on 2226 matched pairs. These measurements, adjusted for historical line load and appliance fields, were used to estimate average exposure in the year before the date of diagnosis, or an equivalent date for controls. Analyses were by conditional logistic regression, incorporating a census-derived deprivation index used as a measure of socioeconomic status. FINDINGS: For children with mean exposures of more than 0.2 microT compared with children with mean exposures of less than 0-1 microT, the adjusted odds ratios were 0.92 (95% CI 0.47-1.79) for acute lymphoblastic leukaemia, 0.90 (0.49-1.63) for all leukaemia, 0.46 (0.11-1.86) for central-nervous-system tumours, 0.97 (0.46-2.05) for other malignant disease, and 0.87 (0.56-1.35) for all malignant disease combined. Higher exposures (>0.4 microT) were recorded for only 17 (<0.4%) individuals (eight cases, nine controls). INTERPRETATION: This study provides no evidence that exposure to magnetic fields associated with the electricity supply in the UK increases risks for childhood leukaemia, cancers of the central nervous system, or any other childhood cancer.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Urban P et al. 1998

Urban P, Lukas E, Roth Z

Does acute exposure to the electromagnetic field emitted by a mobile phone influence visual evoked potentials? A pilot study

In: Centr Eur J Public Health, 6. Jg. (1998), S. 288.

ABSTRACT:
To search for a potential negative influence on the central nervous system (CNS) of the electromagnetic field emitted by a mobile phone, the authors performed a pilot experimental study of the influence of a single short acute exposure to the GSM mobile phone Motorola 8700, using visual evoked potentials (VEP) examination as an electrophysiological marker of CNS dysfunction. The study group consisted of 20 healthy volunteers. The duration of exposure was 5 minutes. The output power of the device was 1.5 W when the antenna was pulled up. Five parameters of VEP were evaluated by means of multifactorial ANOVA. Confounding effects of age, sex, and of the call in itself were taken into consideration. No statistically significant influence of the above-described exposure to the electromagnetic field emitted by the mobile phone on latencies or amplitudes of VEP was observed.

SCHLAGWÖRTER:
medicine; experimentally; hf; others

Van Leeuwen G M J et al. 1999

Van Leeuwen G M J, Lagendijk J J W, Van Leersum B J A M, Zwamborn A P M, Hornsleth S N, Kotte A N T J

Calculation of brain temperatures due to exposure to a mobile phone

In: Phys Med Biol, 44. Jg. (1999), S. 2367.

ABSTRACT:
In this study we evaluated for a realistic head model the 3D temperature rise induced by a mobile phone. This was done numerically with the consecutive use of an FDTD model to predict the absorbed electromagnetic power distribution, and a thermal model describing bioheat transfer both by conduction and by blood flow. We calculated a maximum rise in brain temperature of 0.11 degrees C for an antenna with an average emitted power of 0.25 W, the maximum value in common mobile phones, and indefinite exposure. Maximum temperature rise is at the skin. The power distributions were characterized by a maximum averaged SAR over an arbitrarily shaped 10 g volume of approximately 1.6 W kg(-1). Although these power distributions are not in compliance with all proposed safety standards, temperature rises are far too small to have lasting effects. We verified our simulations by measuring the skin temperature rise experimentally. Our simulation method can be instrumental in further development of safety standards.

SCHLAGWÖRTER:
physics; experimentally; hf; others

van Wijngaarden E et al. 1999

van Wijngaarden E, Savitz D A, Kleckner R C, Mihlan G, Nylander-French L A, Dufort V, Cai J, Loomis D, Kromhout H

Refinements in magnetic field exposure assignment for a case-cohort study of electrical utility workers

In: Ann Occup Hyg, 43. Jg. (1999), S. 485.

ABSTRACT:
This study examined the effect of refinements in exposure assignment on annual and career exposure to 60 Hz magnetic fields, using all deaths from brain cancer (145) and leukemia (164) and a random sample of 800 workers from a cohort of 138,905 men. Reassessment of 1060 job titles in the measurement database generated 20 subcategories in addition to 28 occupational categories used in the original cohort mortality study. Furthermore, previously misclassified jobs were corrected. The complete work history of each sub-cohort member was re-examined. Original and refined average annual exposures were 0.086 and 0.088 microT, respectively. The average career cumulative exposures were 1.40 and 1.44 microT-years, respectively. Spearman correlation coefficients between the original and refined methods across the companies were 0.81 for annual exposure and 0.93 for career cumulative exposure. 23% of the workers were assigned to another exposure ranking after refinement, but 85% of these moved to an adjacent group, suggesting that the differences in exposure ranking are small. The results of this study indicate that refinements have modest influence on the average annual and career exposures. However, the refinements may only change a very rough exposure assessment into one that is slightly less crude. The proportion of workers assigned to another exposure ranking indicated that nondifferential exposure misclassification in the original cohort mortality study may have occurred. Implications of these changes for the risk estimates of brain cancer and leukemia cases will to be examined.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

van Wijngaarden E et al. 2000

van Wijngaarden E, Savitz D A, Kleckner R C, Cai J, Loomis D

Exposure to electromagnetic fields and suicide among electric utility workers: a nested case-control study

In: Occup Environ Med, 57. Jg. (2000), S. 258.

ABSTRACT:
OBJECTIVES: This nested case-control study examines mortality from suicide in relation to estimated exposure to extremely low frequency electromagnetic fields (EMFs) in a cohort of 138,905 male electric utility workers. METHODS: Case-control sampling included 536 deaths from suicide and 5348 eligible controls. Exposure was classified based on work in the most common jobs with increased exposure to magnetic fields and indices of cumulative exposure to magnetic fields based on a measurement survey. RESULTS: Suicide mortality was

increased relative to work in exposed jobs and with indices of exposure to magnetic fields. Increased odds ratios (ORs) were found for years of employment as an electrician (OR 2.18; 95% confidence interval (95% CI) 1.25 to 3.80) or lineman (OR 1.59; 95% CI 1.18 to 2.14), whereas a decreased OR was found for power plant operators (OR 0.67; 95% CI 0.33 to 1.40). A dose response gradient with exposure to magnetic fields was found for exposure in the previous year, with a mortality OR of 1.70 (95% CI 1.00 to 2.90) in the highest exposure category. Stronger associations, with ORs in the range of 2.12-3.62, were found for men <50 years of age. CONCLUSION: These data provide evidence for an association between occupational electromagnetic fields and suicide that warrants further evaluation. A plausible mechanism related to melatonin and depression provides a direction for additional laboratory research as well as epidemiological evaluation.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

van Wijngaarden E et al. 2000a

van Wijngaarden E, Savitz D A, Kleckner R C, Cai J, Loomis D

Exposure to electromagnetic fields and suicide among electric utility workers: a nested case-control study

In: West J Med, 173. Jg. (2000), S. 94.

ABSTRACT:
OBJECTIVE: To examine mortality from suicide in relation to estimated exposure to extremely low-frequency electromagnetic fields in a cohort of 138,905 male electric utility workers. METHODS: Case-control sampling, which included 536 deaths from suicide and 5, 348 eligible controls. Exposure was classified based on work in the most common jobs with increased exposure to magnetic fields and indices of cumulative exposure to magnetic fields based on a measurement survey. RESULTS: Suicide mortality was increased relative to work in exposed jobs and with indices of exposure to magnetic fields. Increased odds ratios (ORs) were found for years of employment as an electrician (OR, 2.18; 95% confidence interval [CI], 1.25-3.80) or line worker (OR, 1.59; 95% CI, 1.18-2.14), whereas a decreased OR was found for power plant operators (OR, 0.67; 95% CI, 0.33-1.40). A dose-response gradient with exposure to magnetic fields was found for exposure in the previous year, with a mortality OR of 1.70 (95% CI, 1.00-2.90) in the highest exposure category. Stronger associations, with ORs in the range of 2.12 to 3.62, were found for men younger than 50 years. CONCLUSIONS: These data provide evidence for an association between occupational electromagnetic fields and suicide that warrants further evaluation. A plausible mechanism related to melatonin and depression provides a direction for additional laboratory research and epidemiologic evaluation.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Van Wijngaarden E et al. 2001

Van Wijngaarden E, Nylander-French LA, Millikan RC, Savitz DA, Loomis D

Population-based case-control study of occupational exposure to electromagnetic fields and breast cancer

In: Ann Epidemiol, 11. Jg. (2001), S. 297.

ABSTRACT:
PURPOSE: This population-based case-control study examined occupational exposure to electromagnetic fields in relation to female breast cancer incidence among 843 breast cancer cases and 773 controls. METHODS: Exposure was classified based on work in the two longest-held jobs, and indices of cumulative exposure to magnetic fields based on a measurement survey. RESULTS: Female breast cancer was not associated with employment as an office or industrial worker. For the total study population, cumulative exposure over the entire career, and in the past 0-10 and 10-20 years generally showed odds ratios (ORs) close to the null. Moderately elevated risks were found for intermediate but not high levels of cumulative exposure accumulated 20 or more years ago (OR = 1.5; 95% CI = 1.1-2.0). Associations were stronger for premenopausal women (OR = 1.7; 95% CI = 1.1-2.7) in the past 10-20 years, and those with estrogen-receptor positive (ER+) breast tumors (OR = 2.06; 95% CI = 1.1-4.0). No consistent dose-response patterns were observed. CONCLUSIONS: These findings give little support to the hypothesis that electromagnetic fields cause cancer of the female breast.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

van Wijngaarden E et al. 2001a

van Wijngaarden E, Savitz D A

Occupational sunlight exposure and mortality from non-Hodgkin lymphoma among electric utility workers

In: J Occup Environ Med, 43. Jg. (2001), S. 548.

ABSTRACT:
This case-control study examined occupational sunlight exposure and death from non-Hodgkin lymphoma (NHL) and NHL subtypes among 188 cases and 1880 controls selected from a cohort of 138,905 male electric utility workers. Exposure was classified according to work history linked to indices of cumulative sunlight exposure. Odds ratios and 95% confidence intervals were derived from conditional logistic regression models and were conditioned on the matching factors birth year and ethnicity. Mortality from NHL and intermediate/high-grade lymphomas was not related to cumulative sunlight exposure, with odds ratios around the null. For low-grade lymphomas, a dose-response gradient was observed for exposure in the past 12 to 21 years, but this result seemed to be sensitive to cut points for categorization of cumulative exposure. These data do not provide evidence for an association between occupational sunlight exposure and mortality from NHL or NHL subtypes.

SCHLAGWÖRTER:
epidemiology; case-control; hf; cancer

Van Zandt L L 1986

Van Zandt L L

Resonant microwave absorption by dissolved DNA

In: Phys Rev Letts, 57. Jg. (1986), S. 2085.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Varma MM et al. 1976

Varma M M, Traboulay E A

Comparison of native and microwave irradiated DNA

In: Experiention, 33. Jg. (1976), S. 1649.

ABSTRACT:
Chemical changes induced in the testicular DNA of irradiated Swiss male mice are described. Parameters quantified were hyperchromocity and melting temperature. The data supports the possibility that microwave causes strand separation.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Vasquez M V et al. 1999

Vasquez M V, Clancy C J, Blackwell D B, Donner M D, Tice R T, Hook G H, McRee D M

Genotoxicity of radio frequency radiation fields generated from analog, TDMA, CDMA and PCNA in human blood cells evaluated using single gel (SCG) electrophoresis and the cytochalasin B micronucleus assay

In: Environ Mol Mutagen, 33. Jg. (1999), H. Suppl 30, S. 66.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Vena J E et al. 1991

Vena J E, Graham S, Hellmann R, Swanson M, Brasure J

Use of electric blankets and risk of postmenopausal breast cancer

In: Am J Epidemiol, 134. Jg. (1991), S. 180.

ABSTRACT:
hronic exposure to 60-Hz electromagnetic fields has been hypothesized to increase breast cancer risk by suppressing the normal nocturnal rise in pineal melatonin. From 1987 to 1989 in western New York the authors investigated the use of electric blankets as a risk factor for breast cancer in a case-control study of postmenopausal women aged 41-85 years. A study population of 382 cases and 439 randomly selected community controls was queried regarding use in the previous 10 years, the frequency of use by season, and the mode of use. After adjusting for age and education, the odds ratio (OR) for use of an electric blanket in the past 10 years (33% of cases, 35% of controls) was 0.89 (95% confidence interval (95% CI) 0.66-1.19), and the risk did not differ in a dose-response fashion by the number of years used. The risk associated with daily use relative to nonuse was 0.97 (95% CI 0.70-1.35). Use sometimes to warm the bed and sometimes throughout the night was not associated with risk (OR = 0.64, 95% CI 0.40-1.05). The risk of breast cancer among those who used the blanket continuously throughout the night was 1.31 (95% CI 0.88-1.95). Those who reported daily use in season, continuously throughout the night for the past 10 years did not have significantly elevated risk (OR = 1.25, 95% CI 0.73-2.16). Adjustment for the Quetelet index and reproductive risk factors did not alter the results. These findings do not support the hypothesis that electric blanket use is associated with an increased risk for breast cancer. The slightly elevated estimate of risk for the most frequent electric blanket users and the potential public health significance of electromagnetic field exposure suggest that further inquiries be undertaken.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Vena J E et al. 1994

Vena J E, Freudenheim J L, Marshall J R, Laughlin R, Swanson M, Graham S

Risk of premenopausal breast cancer and use of electric blankets

In: Am J Epidemiol, 140. Jg. (1994), S. 974.

ABSTRACT:
Electric blanket use, estimated to significantly increase background exposure to 60-Hz electromagnetic fields, has been hypothesized to increase breast cancer risk. From 1986 to 1991 in western New York State, the authors investigated the use of electric blankets as a risk factor for breast cancer in a case-control study of premenopausal women. A total of 290 premenopausal breast cancer cases and 289 age-matched randomly selected community controls were queried in regard to their use of electric blankets in the previous 10 years, including frequency of use in season and mode of use. After adjusting for age, education, and other risk factors, the odds ratio for use of an electric blanket at any time in the previous 10 years (40% of cases and 37% of controls) was 1.18 (95% confidence interval (CI) 0.83-1.68). Estimates of risk did not differ in a dose-response fashion for number of years of electric blanket use. The risk associated with daily use in season relative to nonuse was 1.27 (95% CI 0.86-1.88). The risk of breast cancer among those who reported use of the blanket through the night was 1.43 (95% CI 0.94-2.17). However, the risk for those who reported daily use in season, continuously throughout the night for the previous 10 years was 1.10 (95% CI 0.59-2.05). These findings do not support the hypothesis that electric blanket use is associated with an increased risk for breast cancer. Studies with improved measures of more highly exposed individuals with quantification of total electromagnetic field exposure might clarify the uncertainties regarding risk of breast cancer associated with such exposure.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Verkasalo P K 1996

Verkasalo P K

Magnetic fields and leukemia-risk for adults living close to power lines

In: Scand J Work Environ Health, 22. Jg. (1996), H. Suppl 2, S. 1.

ABSTRACT:
The objective of this study was to investigate the risk of leukemia from magnetic field exposure among Finnish adults living close to high-voltage power lines. The cohort study included 383700 Finnish people having lived in 1970-1989 within 500 m of overhead power lines of 110-400 kV in a magnetic field calculated to be > or = 0.01 microT. The nested case-cohort study was conducted to investigate dose-response and time-related factors in further detail. Data collection was based on several subsequent record linkages of nationwide registers. The subjects were followed for cancer in 1974-1990, providing over 2.5 million person-years. The outcome measures included standardized incidence ratios, incidence rate ratios, and odds ratios for several exposure indices. The total number of leukemia cases was 203. Magnetic fields were not associated with the overall occurrence of leukemia among adults. The risk estimates were adjusted for age, gender, and municipality; the other covariates had no effect on the risk estimates. However, an almost fivefold increase with statistical significance was observed for the risk of chronic lymphatic leukemia in relation to earlier, or long-lasting, exposure to magnetic fields of > or = 0.1 microT. This finding was based on very small numbers. No risk increases were observed for other types of leukemia. While the possibility of an increase in risk at higher magnetic field levels, or in relation to earlier exposures, cannot be excluded on the basis of this study, the results suggest that typical magnetic fields of high-voltage power lines are not an important cause of leukemia in adults.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Verkasalo P K et al. 1993

Verkasalo P K, Pukkala E, Hongisto M Y, Valjus J E, Jarvinen P J, Heikkila K V, Koskenvuo M

Risk of cancer in Finnish children living close to power lines

In: BMJ, 307. Jg. (1993), S. 895.

ABSTRACT:
OBJECTIVE--To investigate the risk of cancer in children living close to overhead power lines with magnetic fields of > or = 0.01 microteslas (microT). DESIGN--Cohort study. SETTING--The whole of Finland. SUBJECTS--68,300 boys and 66,500 girls aged 0-19 years living during 1970-

89 within 500 m of overhead power lines of 110-400 kV in magnetic fields calculated to be > or = 0.01 microT. Subjects were identified by record linkages of nationwide registers. MAIN OUTCOME MEASURES--Numbers of observed cases in follow up for cancer and standardised incidence ratios for all cancers and particularly for nervous system tumours, leukaemia, and lymphoma. RESULTS--In the whole cohort 140 cases of cancer were observed (145 expected; standardised incidence ratio 0.97, 95% confidence interval 0.81 to 1.1). No statistically significant increases in all cancers and in leukaemia and lymphoma were found in children at any exposure level. A statistically significant excess of nervous system tumours was found in boys (but not in girls) who were exposed to magnetic fields of > or = 0.20 microT or cumulative exposure of > or = 0.40 microT years. CONCLUSIONS--Residentia magnetic fields of transmission power lines do not constitute a major public health problem regarding childhood cancer. The small numbers do not allow further conclusions about the risk of cancer in stronger magnetic fields.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Verkasalo P K et al. 1996

Verkasalo P K, Pukkala E, Kaprio J, Heikkila K V, Koskenvuo M

Magnetic fields of high voltage power lines and risk of cancer in Finnish adults: nationwide cohort study

In: BMJ, 313. Jg. (1996), S. 1047.

ABSTRACT:
OBJECTIVE: To investigate the risk of cancer in association with magnetic fields in Finnish adults living close to high voltage power lines. DESIGN: Nationwide cohort study. SUBJECTS: 383,700 people who lived during 1970-89 within 500 metres of overhead power lines of 110-400 kV in a magnetic field calculated to be > or = 0.01 microT. Study subjects were identified by record linkages of nationwide registers. MAIN OUTCOME MEASURES: Numbers of observed and expected cases of cancer, standardised incidence ratios, and incidence rate ratios adjusted for sex, age, calendar year, and social class--for example, by continuous cumulative exposure per 1 microT year with 95% confidence intervals from multiplicative models for all cancers combined and 21 selected types. RESULTS: Altogether 8415 cases of cancer were observed (standardised incidence ratio 0.98; 95% confidence interval 0.96 to 1.00) in adults. All incidence rate ratios for both sexes combined were non-significant and between 0.91 and 1.11. Significant excesses were observed in multiple myeloma in men (incidence rate ratio 1.22) and in colon cancer in women (1.16). CONCLUSIONS: Typical residential magnetic fields generated by high voltage power lines do not seem to be related to the risk of overall cancer in adults. The previously suggested associations between extremely low frequency magnetic fields and tumours of the nervous system, lymphoma, and leukaemia in adults and breast cancer in women were not confirmed.

SCHLAGWÖRTER:
epidemiology; cohort; elf; cancer

Verkasalo P K et al. 1997

Verkasalo P K, Kaprio J, Varjonen J, Romanov K, Heikkila K, Koskenvuo M

Magnetic fields of transmission lines and depression

In: Am J Epidemiol, 146. Jg. (1997), S. 1037.

ABSTRACT:
Electromagnetic fields have been suggested to contribute to the risk of depression by causing pineal dysfunction. Some epidemiologic studies have supported this possibility but have generally reported crude methods of exposure assessment and nonsystematic evaluation of depression. Using two available nationwide data sets, the authors identified from the Finnish Twin Cohort Study 12,063 persons who had answered the 21-item Beck Depression Inventory of self-rated depressive symptoms in 1990. The personal 20-year histories of exposure (i.e., distance and calculated annual average magnetic fields) before 1990 to overhead 110- to 400-kv power lines were obtained from the Finnish Transmission Line Cohort Study. The adjusted mean Beck Depression Inventory scores did not differ by exposure, providing some assurance that proximity to high-voltage transmission lines is not associated with changes within the common range of depressive symptoms. However, the risk of severe depression was increased 4.7-fold (95% confidence interval 1.70-13.3) among subjects living within 100 m of a high-voltage power line. This finding was based on small numbers. The authors recommend that attempts be made to strive for a better understanding of the exposure characteristics in relation to the onset and course of depression.

SCHLAGWÖRTER:
epidemiology; cohort; elf; others

Verreault R et al. 1990

Verreault R, Weiss N S, Hollenbach K A, Strader C H, Daling J R

Use of electric blankets and risk of testicular cancer

In: Am J Epidemiol, 131. Jg. (1990), S. 759.

ABSTRACT:
Electric blankets are an important domestic source of electromagnetic fields (EMF) because of the relatively high intensity of emission, prolonged exposure, and intimate contact with the source. In a case-control study of testicular cancer in western Washington during 1981 to 1984, the relation between EMF exposure from electric blankets and the occurrence of testicular cancer was examined. The respective proportions of cases and controls who reported the use of an electric blanket were almost identical (age-adjusted rate ratio (RR) = 1.0, 95% confidence interval (CI) 0.7-1.4). Distributions of the duration of use were also very similar in cases and controls. Compared with controls, the frequency of use of an electric blanket was slightly lower in men with seminoma (RR = 0.7, 95% CI 0.5-1.2) and slightly higher among men with nonseminoma germ cell tumors (RR = 1.4, 95% CI 0.9-2.3). Overall, the results of this study suggest that increased exposure to EMF from electric blankets contributes little, if at all, to the risk of testicular cancer in adult white men.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Verschaeve L 1995

Verschaeve L

Can non-ionizing radiation induce cancer?

In: Cancer J, 8. Jg. (1995), S. 237.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
other field; other type; hf; cancer

Verschaeve L et al. 1998

Verschaeve L, Maes A

Genetic, carcinogenic and teratogenic effects of radiofrequency fields

In: Mutat Res, 410. Jg. (1998), S. 141.

ABSTRACT:
This paper reviews the literature data on the genetic toxicology of radiofrequency (RF) radiation. Whereas in the past most studies were devoted to microwave ovens and radar equipment, it is now mobile telecommunication that attracts most attention. Therefore we focus on mobile telephone frequencies where possible. According to a great majority of the papers, radiofrequency fields, and

mobile telephone frequencies in particular, are not genotoxic: they do not induce genetic effects in vitro and in vivo, at least under non-thermal exposure conditions, and do not seem to be teratogenic or to induce cancer. Yet, some investigations gave rather alarming results that should be confirmed and completed by further experiments. Among them the investigation of synergistic effects and of possible mechanisms of action should be emphasised.

SCHLAGWÖRTER:
epidemiology; Review; hf; others

Vijayalaxmi et al. 1997

Vijayalaxmi, Frei M R, Dusch S J, Guel V, Meltz M L, Jauchem J R

Frequency of micronuclei in the peripheral blood and bone marrow of cancer-prone mice chronically exposured to 2450-MHz radiofrequency radiation

In: Radiat Res, 147. Jg. (1997), S. 495.

ABSTRACT:
C3H/HeJ mice, which are prone to mammary tumors, were exposed for 20 h/day, 7 days/week, over 18 months to continuous-wave 2450 MHz radiofrequency (RF) radiation in circularly polarized wave guides at a whole-body average specific absorption rate of 1.0 W/kg. Sham-exposed mice were used as controls. The positive controls were the sentinel mice treated with mitomycin C during the last 24 h before necropsy. At the end of the 18 months, all mice were necropsied. Peripheral blood and bone marrow smears were examined for the extent of genotoxicity as indicated by the presence of micronuclei in polychromatic erythrocytes (PCEs). The results indicate that the incidence of micronuclei/1,000 PCEs was not significantly different between groups exposed to RF radiation (62 mice) and sham-exposed groups (58 mice), and the mean frequencies were 4.5 +/- 1.23 and 4.0 +/- 1.12 in peripheral blood and 6.1 +/- 1.78 and 5.7 +/- 1.60 in bone marrow, respectively. In contrast, the positive controls (7 mice) showed a significantly elevated incidence of micronuclei/1,000 PCEs in peripheral blood and bone marrow, and the mean frequencies were 50.9 +/- 6.18 and 55.2 +/- 4.65, respectively. When the animals with mammary tumors were considered separately, there were no significant differences in the incidence of micronuclei/1,000 PCEs between the group exposed to RF radiation (12 mice) and the sham-exposed group (8 mice), and the mean frequencies were 4.6 +/- 1.03 and 4.1 +/- 0.89 in peripheral blood and 6.1 +/- 1.76 and 5.5 +/- 1.51 in bone marrow, respectively. Thus there was no evidence for genotoxicity in mice prone to mammary tumors that were exposed chronically to 2450 MHz RF radiation compared with sham-exposed controls.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Vijayalaxmi et al. 1997a

Vijayalaxmi, Mohan N, Meltz M L, Wittler M A

Proliferation and cytogenetic studies in human blood lymphocytes exposed in vitro to 2450-MHz radiofrequency radiation

In: Int J Radiat Biol, 72. Jg. (1997), S. 751.

ABSTRACT:
Aliquots of human peripheral blood collected from two healthy human volunteers were exposed in vitro to continuous wave 2450 MHz radiofrequency radiation (RFR), either continuously for a period of 90 min or intermittently for a total exposure period of 90 min (30 min on and 30 min off, repeated three times). Blood aliquots which were sham-exposed or exposed in vitro to 150 cGy gamma radiation served as controls. The continuous wave 2450 MHz RFR was generated with a net forward power of 34.5 W and transmitted from a standard gain rectangular antenna horn in a vertically downward direction. The mean power density at the position of the cells was 5.0 mW/cm2. The mean specific absorption rate calculated by Finite Difference Time Domain analysis was 12.46 W/kg. Immediately after exposure, lymphocytes were cultured for 48 and 72 h to determine the incidence of chromosomal aberrations and micronuclei, respectively. Proliferation indices were also recorded. There were no significant differences between RFR-exposed and sham-exposed lymphocytes with respect to; (a) mitotic indices; (b) incidence of cells showing chromosome damage; (c) exchange aberrations; (d) acentric fragments; (e) binucleate lymphocytes, and (f) micronuclei, for either the continuous or intermittent RFR exposures. In contrast, the response of positive control cells exposed to 150 cGy gamma radiation was significantly different from RFR-exposed and sham-exposed lymphocytes. Thus, there is no evidence for an effect on mitogen-stimulated proliferation kinetics or for excess genotoxicity within 72 h in human blood lymphocytes exposed in vitro to 2450 MHz RFR.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Vijayalaxmi et al. 1998

Vijayalaxmi, Frei M R, Dusch S J, Guel V, Meltz M, Jauchem, J R

Correction of an error in calculation in the article ``Frequency of micronuclei in the peripheral blood and bone marrow of cancer prone mice chronically exposed to 2450 MHz radiofrequency radiation (Radiat Res, 147, 495, 1997

In: Radiat Res, 149. Jg. (1998), S. 308.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Vijayalaxmi et al. 1999

Vijayalaxmi, Seaman R L, Belt M L, Doyle J M, Mathur S P, Prihodas T J

Frequency of micronuclei in the blood and bone marrow cells of mice exposed to ultra-wideband electromagnetic radiation

In: Int J Radiat Biol, 75. Jg. (1999), S. 115.

ABSTRACT:
PURPOSE: To investigate the extent of genetic damage in the peripheral blood and bone marrow cells of mice exposed to ultra-wideband electromagnetic radiation (UWBR). MATERIALS AND METHODS: CF-1 male mice were exposed to UWBR for 15 min at an estimated whole-body average specific absorption rate of 37 mW x kg(-1). Groups of untreated control and positive control mice injected with mitomycin C were also included in the study. After various treatments, half of the mice were killed at 18 h, and the other half at 24 h. Peripheral blood and bone marrow smears were examined to determine the extent of genotoxicity, as assessed by the presence of micronuclei (MN) in polychromatic erythrocytes (PCE). RESULTS: The percentages of PCE and the incidence of MN per 2000 PCE in both tissues in mice killed at 18 h were similar to the frequencies observed in mice terminated at 24 h. There were no significant differences in the percentage of PCE between control and the mice with or without UWBR exposure; the group mean values (+/- standard deviation) were in the range of 3.1+/-0.14 to 3.2+/-0.23 in peripheral blood, and 49.0+/-3.56 to 52.3+/-4.02 in bone marrow. The mean incidence of MN per 2000 PCE in control and in mice with or without UWBR exposure ranged from 7.7+/-2.00 to 9.7+/-2.54 in peripheral blood and 7.4+/-2.32 to 10.0+/-3.27 in bone marrow. Pairwise comparison of the data did not reveal statistically significant differences between the control and mice with or without UWBR exposure groups (excluding positive controls). CONCLUSION: Under the experimental conditions tested, there was no evidence for excess

genotoxicity in peripheral blood or bone marrow cells of mice exposed to UWBR.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Villeneuve P J et al. 2000

Villeneuve P J, Agnew D A, Miller A B, Corey P N
Non-Hodgkin's lymphoma among electric utility workers in Ontario: the evaluation of alternate indices of exposure to 60 Hz electric and magnetic fields
In: Occup Environ Med, 57. Jg. (2000), S. 249.

ABSTRACT:
OBJECTIVES: To examine associations between non-Hodgkin's lymphoma (NHL) and exposures to 60 Hz magnetic and electric fields in electric utility workers with a series of indices that capture a variety of aspects of field strength. METHODS: The study population consisted of 51 cases of NHL and 203 individually matched controls identified from within a cohort of male electric utility workers in Ontario. Odds ratios were calculated for several exposure indices with conditional logistic regression models. Aspects of exposure to electric and magnetic fields that were modelled included: the percentage of time spent above selected threshold field intensities, mean transitions in field strength, SD, and the arithmetic and geometric mean field intensities. RESULTS: For the most part, there was a lack of an association between exposure indices of magnetic fields and the incidence of NHL. Subjects in the upper tertile of percentage of time spent above electric field intensities of 10 and 40 V/m had odds ratios of 3.05 (95% confidence interval (95% CI) 1. 07 to 8.80) and 3.57 (1.30 to 9.80), respectively, when compared with those in the lowest tertile. Moreover, the percentages of time spent above these electric field thresholds were significant predictors of case status over and above the association explained by duration of employment and the arithmetic or geometric mean exposure. CONCLUSIONS: These data suggest that exposures above electric field threshold intensities of 10 and 40 V/m are important predictors of NHL. Consequently, the findings support the hypothesis that electric fields may play a promoting part in the aetiology of this cancer. Further occupational studies that include assessment of exposure to electric fields and measures of field strength above similar threshold cut off points are needed to confirm these findings.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Villeneuve P J et al. 2000a

Villeneuve P J, Agnew D A, Miller A B, Corey P N, Purdham J T
Leukemia in electric utility workers: the evaluation of alternative indices of exposure to 60 Hz electric and magnetic fields
In: Am J Ind Med, 37. Jg. (2000), S. 607.

ABSTRACT:
BACKGROUND: Epidemiological studies have inconsistently demonstrated a positive relationship between magnetic and/or electric fields and leukemia. Although exposure to both 60 Hz electric and magnetic fields can be characterized in many ways, to date, risk assessment has been performed by using only a limited number of exposure indices. METHODS: The associations between adult leukemia and indices of electric and magnetic fields were explored within a nested case-control study of 31,453 Ontario electric utility workers. RESULTS: The percentage of time spent above electric field thresholds of 20 and 39 V/m was predictive of leukemia risk after adjusting for duration of employment and the arithmetic mean exposure to both electric and magnetic fields (P<0.05). Duration of employment was strongly associated with an increased risk of leukemia. Those who had worked for at least 20 years, and were in the highest tertiles of percentage of time spent above 10 and 20 V/m had odds ratios of 10.17 (95% CI = 1.58-65.30) and 8.23 (95% CI = 1. 24-54.43), respectively, when compared to those in the lowest tertile. Nonsignificant elevations in risk were observed between indices of magnetic fields and leukemia. CONCLUSIONS: Our results support the hypothesis that electric fields act as a promoting agent in the etiology of adult leukemia. Exposure assessment based on alternate indices of electric and magnetic fields should be incorporated into future occupational studies of cancer.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Villeneuve P J et al. 2002

Villeneuve P J, Agnew D A, Johnson K C, Mao Y
Brain cancer and occupational exposure to magnetic fields among men: results from a Canadian population-based case-control study
In: Int J Epidemiol, 31. Jg. (2002), S. 210.

ABSTRACT:
BACKGROUND: The relationship between occupational exposure to magnetic fields and brain cancer in men was investigated using population-based case-control data collected in eight Canadian provinces. Emphasis was placed on examining the variations in risk across different histological types. METHODS: A list of occupations was compiled for 543 cases and 543 controls that were individually matched by age. Occupations were categorized according to their average magnetic field exposure through blinded expert review (<0.3, 0.3-<0.6, and > or = 0.6 microT). In total, 133 cases (14%) and 123 controls (12%) were estimated to have at least one occupation whereby magnetic field exposures exceeded 0.3 microT. Odds ratios (OR) were generated using conditional logistic regression, and were adjusted for suspected occupational risk factors for brain cancer. RESULTS: A non-significantly increased risk of brain cancer was observed among men who had ever held a job with an average magnetic field exposure >0.6 microT relative to those with exposures <0.3 microT (OR = 1.33, 95% CI : 0.75-2.36). A more pronounced risk was observed among men diagnosed with glioblastoma multiforme (OR = 5.36, 95% CI : 1.16-24.78). Moreover, a cumulative time weighted index score of magnetic field exposure was significantly related to glioblastoma multiforme (P = 0.02). In contrast, magnetic field exposures were not associated with astrocytoma or other brain cancers. CONCLUSIONS: Our findings support the hypothesis that occupational magnetic field exposure increases the risk of glioblastoma multiforme.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Violanti J M 1997

Violanti J M
Cellular phones and traffic accidents
In: Public Health, 111. Jg. (1997), S. 423.

ABSTRACT:
Cellular phone use in motor vehicles is becoming an increasing world-wide phenomenon. Using data obtained from traffic accidents reported between 1992 and 1995 in the state of Oklahoma, USA, this study examined statistical rate-ratios of accident characteristics between drivers with or without cellular phones. Rates were calculated between cellular phone involvement and reported accident causes, types of collision, driver actions immediately prior to the accident, location of the accident, the extent of fatalities, and age and gender of drivers. Results indicated a significant increased rate among drivers with cellular phones for inattention, unsafe speed, driving on wrong side of road, striking a fixed object, overturning their vehicle, swerving prior to the accident, and running off the roadway. People with phones stood an

increased risk of being killed in an accident over persons without phones. Males with phones had a significantly higher rate than females for many of accident characteristics mentioned above. Rate-ratios of some accident characteristics and fatalities increased as age increased, with the exception of drivers under age 20 yrs, who had the highest fatality rate. Limitations of the study and possible prevention alternatives are discussed.

SCHLAGWÖRTER:
epidemiology; other type; none; others

Violanti J M et al. 1996

Violanti J M, Marshall J R

Cellular phones and traffic accidents: an epidemiological approach

In: Accid Anal Prev, 29. Jg. (1996), S. 265.

ABSTRACT:
Using epidemiological case-control design and logistic regression techniques, this study examined the association of cellular phone use in motor vehicles and traffic accident risk. The amount of time per month spent talking on a cellular phone and 18 other driver inattention factors were examined. Data were obtained from: (1) a case group of 100 randomly selected drivers involved in accidents within the past 2 years, and (2) a control group of 100 randomly selected licensed drivers not involved in accidents within the past 10 years. Groups were matched on geographic residence. Approximately 13% (N = 7) of the accident and 9% (N = 7) of the non-accident group reported use of cellular phones while driving. Data was obtained from Department of Motor Vehicles accident reports and survey information from study subjects. We hypothesized that increased use of cellular phones while driving was associated with increased odds of a traffic accident. Results indicated that talking more than 50 minutes per month on cellular phones in a vehicle was associated with a 5.59-fold increased risk in a traffic accident. The combined use of cellular phones and motor and cognitive activities while driving were also associated with increased traffic accident risk. Readers should be cautioned that this study: (1) consists of a small sample, (2) reveals statistical associations and not causal relationships, and (3) does not conclude that talking on cellular phones while driving is inherently dangerous.

SCHLAGWÖRTER:
epidemiology; case-control; none; others

Violanti, J M 1998

Violanti, J M

Cellular phones and fatal traffic collisions

In: Accid Anal Prev, 30. Jg. (1998), S. 519.

ABSTRACT:
A case-control study was conducted to determine statistical associations between traffic fatalities and the use or presence of a cellular phone, given involvement in a collision. The hypothesis of this study does not imply that cellular phones directly affect fatalities, but that phones increase the risk of certain accident characteristics in fatal collisions more than those same characteristics in non-fatal collisions. Analysis employed data from 223,137 traffic accidents occurring between 1992 and 1995. Information on collision characteristics and cellular phone involvement for each fatality was compared with the same information for each non-fatality (controls). Statistically adjusting for other collision variables (age, gender, alcohol use, speed, inattention and driving left of center), an approximate nine-fold increased risk was found for a fatality given the use of a cellular phone. An approximate two-fold increased risk for a fatality was found given the presence of a cellular phone in the vehicle. Combined effects of reported phone use, driving to the left of center and inattention increased the risk of a fatal collision more than phone use did by itself. This analysis implies a statistical, but not necessarily a causal, relationship. A multitude of factors are involved in any traffic collision, and the exact cause of an accident and its severity level is difficult to disentangle.

SCHLAGWÖRTER:
epidemiology; case-control; none; others

Vollrath L et al. 1997

Vollrath L, Spessert R, Kratzsch T, Keiner M, Hollmann H

No short-term effects of high frequency electromagnetic fields on the mammalian pineal gland.

In: Bioelectromagnetics, 18. Jg. (1997), S. 376.

ABSTRACT:
There is ample experimental evidence that changes of earth-strength static magnetic fields, pulsed magnetic fields, or alternating electric fields (60 Hz) depress the nocturnally enhanced melatonin synthesis of the pineal gland of certain mammals. No data on the effects of high-frequency electromagnetic fields on melatonin synthesis is available. In the present study, exposure to 900 MHz electromagnetic fields [0.1 to 0.6 mW/cm2, approximately 0.06 to 0.36 W/kg specific absorption rate (SAR) in rats and 0.04 W/kg in Djungarian hamsters; both continuous and/or pulsed at 217 Hz, for 15 min to 6 h] at day or night had no notable short-term effect on pineal melatonin synthesis in male and female Sprague-Dawley rats and Djungarian hamsters. Pineal synaptic ribbon profile numbers (studied in rats only) were likewise not affected. The 900 MHz electromagnetic fields, unpulsed or pulsed at 217 Hz, as applied in the present study, have no short-term effect on the mammalian pineal gland.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Vorobyov V V et al. 1997

Vorobyov V V, Galchenko A A, Kukushkin N L, Akoev I G

Effects of weak microwave fields amplitude modulated at ELF on EEG of symmetric brain areas in rats

In: Bioelectromagnetics, 18. Jg. (1997), S. 293.

ABSTRACT:
Averaged electroencephalogram (EEG) frequency spectra were studied in eight unanesthetized and unmyorelaxed adult male rats with chronically implanted carbon electrodes in symmetrical somesthetic areas when a weak (0.1-0.2 mW/cm) microwave (MW, 945 MHz) field, amplitude-modulated at extremely low frequency (ELF) (4 Hz), was applied. Intermittent (1 min "On," 1 min "Off") field exposure (10-min duration) was used. Hemispheric asymmetry in frequency spectra (averaged data for 10 or 1 min) of an ongoing EEG was characterized by a power decrease in the 1.5-3 Hz range on the left hemisphere and by a power decrease in the 10-14 and 20-30 Hz ranges on the right hemisphere. No differences between control and exposure experiments were shown under these routines of data averaging. Significant elevations of EEG asymmetry in 10-14 Hz range were observed during the first 20 s after four from five onsets of the MW field, when averaged spectra were obtained for every 10 s. Under neither control nor pre- and postexposure conditions was this effect observed. These results are discussed with respect to interaction of MW fields with the EEG generators.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wachtel H et al. 1975

Wachtel H, Seaman R, Joines W

Effects of low-intensity microwaves on isolated neurons

In: Ann NY Acad Sci, 247. Jg. (1975), S. 46.

ABSTRACT:
The experimental approach consists of placing a ganglion of the marine gastropod aplysia within a microwave stripline and employing intracellular glass microelectrodes to record the electric activity of individual neurons before,

during and after the ganglion is irradiated. In addition to monitoring the incident and reflected microwave power levels, ganglionic temperature is carefully recorded. Definite effects have been noted on the firing patterns of Aplysia neurons at absorbed microwave power levels that are below what human brain cells would be exposed to at the accepted American 'safety' level (10 mW/cc). In large part, these effects are attributable to slight ganglionic warming, but in some cases, the authors have also found effects that are not accompanied by, or not reproduced by, ganglionic warming.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wagner P et al. 1998

Wagner P, Roschke J, Mann K, Hiller W, Frank C

Human sleep under the influence of pulsed radiofrequency electromagnetic fields: a polysomnographic study using standardized conditions

In: Bioelectromagnetics, 19. Jg. (1998), S. 199.

ABSTRACT:
To investigate the influence of radiofrequency electromagnetic fields (EMFs) of cellular phone GSM signals on human sleep electroencephalographic (EEG) pattern, all-night polysomnographies of 24 healthy male subjects were recorded, both with and without exposure to a circular polarized EMF (900 MHz, pulsed with a frequency of 217 Hz, pulse width 577 micros, power flux density 0.2 W/m2. Suppression of rapid eye movement (REM) sleep as well as a sleep-inducing effect under field exposure did not reach statistical significance, so that previous results indicating alterations of these sleep parameters could not be replicated. Spectral power analysis also did not reveal any alterations of the EEG rhythms during EMF exposure. The failure to confirm our previous results might be due to dose-dependent effects of the EMF on the human sleep profile.

SCHLAGWÖRTER:
medicine; experimentally; hf; others

Wainwright P R 2000

Wainwright P R

Thermal effects of radiation from cellular telephone

In: Phys Med Biol, 45. Jg. (2000), S. 2363.

ABSTRACT:
A finite element thermal model of the head has been developed to calculate temperature rises generated in the brain by radiation from cellular telephones and similar electromagnetic devices. A 1 mm resolution MRI dataset was segmented semiautomatically, assigning each volume element to one of ten tissue types. A finite element mesh was then generated using a fully automatic tetrahedral mesh generator developed at NRPB. There are two sources of heat in the model: firstly the natural metabolic heat production; and secondly the power absorbed from the electromagnetic field. The SAR was derived from a finite difference time domain model of the head, coupled to a model 'mobile phone', namely a quarter-wavelength antenna mounted on a metal box. The steady-state temperature distribution was calculated using the standard Pennes 'bioheat equation'. In the normal cerebral cortex the high blood perfusion rate serves to provide an efficient cooling mechanism. In the case of equipment generally available to the public, the maximum temperature rise found in the brain was about 0.1 degrees C. These results will help in the further development of criteria for exposure guidelines, and the technique developed may be used to assess temperature rises associated with SARs for different types of RF exposure.

SCHLAGWÖRTER:
physics; experimentally; hf; others

Walters T J et al. 1995

Walters T J, Mason P A, Sherry C J, Stevens C, Merritt J H

No detectable bioeffects following acute exposure to high peak power ultra-wide band electromagnetic radiation in rats

In: Aviat Space Environ Med, 66. Jg. (1995), S. 562.

ABSTRACT:
A wide range assessment of the possible bioeffects of an acute exposure to high peak power ultra-wide band (UWB) electromagnetic radiation was performed in rats. The UWB-exposure consisted of 2 min of pulsed (frequency: 60 Hz, pulse width: 5-10 ns) UWB (bandwidth: 0.25-2.50 GHz) electromagnetic radiation. Rats were examined using one of the following: 1) a functional observational battery (FOB); 2) a swimming performance test; 3) a complete panel of blood chemistries; or 4) determination of the expression of the c-fos protein in immunohistologically-stained sections of the brain. No significant differences were found between UWB- or sham-exposed rats on any of the measured parameters.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wang B et al. 1999

Wang B, Lai H

Acute exposure to pulsed 2450-MHz microwaves affects water-maze performance of rats

In: Bioelectromagnetics, 21. Jg. (1999), S. 52.

ABSTRACT:
Rats were trained in six sessions to locate a submerged platform in a circular water maze. They were exposed to pulsed 2450-MHz microwaves (pulse width 2 micros, 500 128;pulses/s, average power density 2 mW/cm(2), average whole body specific absorption rate 1.2 W/kg) for 1 h in a circular waveguide system immediately before each training session. One hour after the last training session, they were tested in a probe trial during which the platform was removed and the time spent in the quadrant of the maze in which the platform had been located during the 1-min trial was scored. Three groups of animals, microwave-exposed, sham-exposed, and cage control, were studied. Microwave-exposed rats were slower than sham-exposed and cage control rats in learning to locate the platform. However, there was no significant difference in swim speed among the three groups of animals, indicating that the difference in learning was not due to a change in motor functions or motivation. During the probe trial, microwave-exposed animals spent significantly less time in the quadrant that had contained the platform, and their swim patterns were different from those of the sham-exposed and cage control animals. The latter observation indicates that microwave-exposed rats used a different strategy in learning the location of the platform. These results show that acute exposure to pulsed microwaves caused a deficit in spatial "reference" memory in the rat.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wang Z et al. 1991

Wang Z, Van Dorp R, Weidema A F, Ypey D L
Wang Z, Van Dorp R, Weidema A F, Ypey D L

No evidence for effects of mild microwave irradiation on electrophysiological and morphological properties of cultured embryonic rat dorsal root ganglion cells

In: Eur J Morphol, 29. Jg. (1991), S. 198.

ABSTRACT:
Effects of mild microwave treatment (1 hr, 37 degrees C) on the in vitro development of rat mechanically dissociated dorsal root ganglion (DRG) neurons were investigated to establish whether microwave irradiation effects exist on nervous tissue other than heat induced tissue fixation.

Phase contrast microscopy and immunocytochemical neurofilament stainings did not reveal significant differences between irradiated (2 hr after isolation) and control cultures, maintained up till 21 days. The electrophysiological properties of microwave exposed and non-exposed DRG neurons were compared using the whole-cell patch-clamp technique. Control neurons, in culture for 0-12 days, were excitable. In cultured cells (1-12 days), microwaved 2 hr after isolation, the action potentials were similar to or slightly different from those of the control cells. No acute microwave effects were found on neurons irradiated after 1 day of culture. These results suggest that mild microwave irradiation has neither significant acute nor strong long-term effects on DRG culture development and DRG neuron membrane properties, consistent with the notion that microwave effects essentially are temperature effects.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wartenberg D 1998

Wartenberg D

Residential magnetic fields and childhood leukemia: a meta-analysis

In: Am J Public Health, 88. Jg. (1998), S. 1787.

ABSTRACT:
OBJECTIVES: This article uses meta-analysis methodology to examine the statistical consistency and importance of random variation among results of epidemiologic studies of residential magnetic field exposure and childhood leukemia. METHODS: A variety of meta-analytic statistical methods were applied to all available studies combined and on sub-groups of studies chosen by exposure characteristics. Sample sizes and fail-safe n's were calculated to determine the robustness of results and the potential role of publication bias. RESULTS: Most studies show elevated but not statistically significant odds ratios. Results for exposures assessed by wire codes, distance, and/or historically reconstructed fields are relatively consistent, homogeneous, and positive, while those for direct magnetic field measurements are consistent, homogeneous, and marginally protective. Several unpublished studies, or a single unpublished study with several hundred subjects, would be needed to nullify the observed data. CONCLUSIONS: The observed results identify a consistent risk that cannot be explained by random variation. The data supporting magnetic fields as the principal risk factor are suggestive but inconsistent. Additional studies using innovative designs that focus on highly exposed children offer the most hope of untangling this issue.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Wartenberg D et al. 1993

Wartenberg D, Savitz D A

Evaluating exposure cutpoint bias in epidemiologic studies of electric and magnetic fields

In: Bioelectromagnetics, 14. Jg. (1993), S. 237.

ABSTRACT:
Epidemiologists who study the association between exposure to electric or magnetic fields and adverse health outcomes often classify their subjects as "exposed" and "unexposed," and they report results based on an odds ratio. The exposure classification rule--or dichotomy rule--is typically based on a priori assumptions or arbitrary considerations. We show that results may vary substantially with selection of different cutpoints by which to dichotomize exposure. Further, interpretation and comparison of studies is dependent on the choice of cutpoint. We suggest the use of probability plots as a more informative method of data representation. To demonstrate the utility of probability plots, we re-analyze data reported by Savitz et al. [1988, Am J Epidemiol 128:21-38]. Using a higher exposure cutpoint than that of the original analysis, we obtained larger odds ratios, two of which achieved statistical significance. More important, probability plots of these data showed 1) consistency of results with measures of magnetic fields in both low- and high-power-use situations, and 2) discordance with results based on measures of electric fields. Given these observations, we recommend further study, especially that focused on the most highly exposed individuals.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Washburn E P et al. 1994

Washburn E P, Orza M J, Berlin J A, Nicholson W J, Todd A C, Frumkin H, Chalmers T C

Residential proximity to electricity transmission and distribution equipment and risk of childhood leukemia, childhood lymphoma, and childhood nervous system tumors: systematic review, evaluation, and meta-analysis

In: Cancer Causes Control, 5. Jg. (1994), S. 299.

ABSTRACT:
In 1979, Wertheimer and Leeper reported an increased risk of cancer mortality among children living near 'electrical wiring configurations' suggestive of high current flow. Since then, numerous, often inconclusively small, investigations with conflicting results have studied the possible association between exposure to electric and magnetic fields (EMF) and health effects. The high prevalence of exposure to EMF has drawn attention to the issue of carcinogenesis. We report here the results of a meta-analysis of 13 epidemiologic studies of residential proximity to electricity transmission and distribution equipment and risk of childhood leukemia, lymphoma, and nervous system tumors. The combined relative risks for leukemia, lymphoma, and nervous system tumors are 1.49 (95 percent confidence interval [CI] = 1.11-2.00); 1.58 (CI = 0.91-2.76); and 1.89 (CI = 1.34-2.67) respectively. The reports of the primary studies were evaluated for epidemiologic quality and adequacy of exposure assessment. We found no statistically significant relation between combined relative risk estimates and 15 indicators of epidemiologic quality. Assessment of EMF exposure in the primary studies was found to be imperfect and imprecise. Additional high quality epidemiologic research, incorporating comprehensive assessments of EMF exposure collected concurrently with surrogate measures of exposure, is needed to confirm these results.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Wertheimer N et al. 1979

Wertheimer N, Leeper E

Electrical wiring configurations and childhood cancer

In: Am J Epidemiol, 109. Jg. (1979), S. 273.

ABSTRACT:
An excess of electrical wiring configurations suggestive of high current-flow was noted in Colorado in 1976--1977 near the homes of children who developed cancer, as compared to the homes of control children. The finding was strongest for children who had spent their entire lives at the same address, and it appeared to be dose-related. It did not seem to be an artifact of neighborhood, street congestion, social class, or family structure. The reason for the correlation is uncertain; possible effects of current in the water pipes or of AC magnetic fields are suggested.

SCHLAGWÖRTER:
epidemiology; other type; elf; cancer

Wertheimer N et al. 1982

Wertheimer N, Leeper E

Adult cancer related to electrical wires near the home

In: Int J Epidemiol, 11. Jg. (1982), S. 345.

ABSTRACT:
Like childhood cancer, adult cancer was found to be associated with high-current electrical wiring configurations (HCCs) near the patient's residence. Such wiring can expose occupants of the residence to alternating magnetic fields (AMFs) at a level which, though very low, may produce physiological effects. Several patterns in the data suggest that HCCs and cancer may be causally linked: (1) a dose-relationship was found. (2) The association did not appear to be an artefact of age, urbanicity, neighbourhood, or socioeconomic level. (3) The association was most clearly demonstrable where cancer caused by urban/industrial factors was least apt to obscure the effect. (4) A distinct pattern of latency between first exposure to the HCC and cancer diagnosis was seen, which is consistent with a hypothesis of cancer promotion produced by AMF exposure.

SCHLAGWÖRTER:
epidemiology; ecological; elf; cancer

Wertheimer N et al. 1986

Wertheimer N, Leeper E
Possible effects of electric blankets and heated waterbeds on fetal development
In: Bioelectromagnetics, 7. Jg. (1986), S. 13.

ABSTRACT:
Seasonal patterns were seen in fetal growth and in abortion rate for families using electrically heated beds. These patterns could be attributed to the seasonal use of heated beds. The fact that such seasonal patterns were seen only in users, and not in nonusers, of electrically heated beds suggests that electrical bed heating may have a direct effect on fetal development. The effect could be due to excessive heat or to electromagnetic field exposure.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Wertheimer N et al. 1989

Wertheimer N, Leeper E
Fetal loss associated with two seasonal sources of electromagnetic field exposure
In: Am J Epidemiol, 129. Jg. (1989), S. 220.

ABSTRACT:
We have studied two sources of electromagnetic fields where exposure is highly seasonal (ceiling cable electric heat and electrically heated beds). Because many potential confounders could not be addressed, we can make no valid statement about overall differences in abortion rates between those exposed and those not exposed to these seasonal sources. However, by analyzing seasonal trends, we have minimized the problem of unaddressed confounders because we did not look at a difference between the user and nonuser groups, but rather at a difference within the user group during months of higher exposure compared with months of lower exposure. Thus, each user group provides its own control. The function of the nonuser control group is simply to assure that any seasonal trend found in the user group is not just a general seasonal variation in reported fetal loss that can be found equally well in the nonuser population. Using this technique, we found that each user group reported fetal loss disproportionately often during the season when electromagnetic field exposure was increasing.

SCHLAGWÖRTER:
epidemiology; case-control; elf; others

Wertheimer N et al. 1995

Wertheimer N, Savitz D A, Leeper E
Childhood cancer in relation to indicators of magnetic fields from ground current sources
In: Bioelectromagnetics, 16. Jg. (1995), S. 86.

ABSTRACT:
This study examines childhood cancer risk in relation to certain factors likely to indicate magnetic field exposure from ground currents in the home. Substantial ground currents are most often found in homes having conductive plumbing, in which an uninterrupted metallic path in the water pipes and water main connects the grounding systems of neighboring houses. Information on plumbing conductivity was obtained from water suppliers for the homes of 347 cases and 277 controls identified in an earlier study of magnetic field exposure and childhood cancer in the Denver area. An increased cancer risk was observed for children in homes with conductive plumbing: The matched odds ratio was 1.72 (1.03-2.88) and increased to 3.00 (1.33-6.76) when analysis was limited to cases and controls who were residentially stable from the reference date to the study date. A measurement metric likely to indicate active ground currents (measurements having above-median intensity and a nonvertical orientation of < 55 degrees from the horizontal) was identified. In contrast to measured field intensity alone, for which only modest associations with cancer have been reported, this metric shows a high and significant cancer risk [matched O.R. = 4.0 (1.6-10.0)] consistent over a range of intensity and angle cutpoints. Such elevated nonvertical fields were also associated with cancer in an independent data set, which was gathered to study adult nonlymphocytic leukemia in the Seattle area. The associations of cancer with conductive plumbing and with this exposure metric both suggest that cancer risk is increased among persons with elevated magnetic field exposure from residential ground currents.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Wiklund K et al. 1981

Wiklund K, Einhorn J, Eklund G
An application of the Swedish Cancer-Environment Registry. Leukaemia among telephone operators at the telecommunications administration in Sweden
In: Int J Epidemiol, 10. Jg. (1981), S. 373.

ABSTRACT:
The detection of 4 cases of leukaemia among telephone operators at the Telecommunications Administration in Gothenburg within a period of 6 years (1969-74) evoked disquiet among the employees. Following an inquiry to the National Board of Health and Welfare a retrospective study was undertaken with a view to examining whether this incidence was consistent with the risk for the country as a whole. The study was based on the newly established Cancer-Environment Registry for the period 1961-73 covering the entire country. This was the first occasion on which the Registry had been applied in an investigation of cancer risk for a specific occupational group. The analysis disclosed no higher risk of leukaemia among telephone operators in the Telecommunications Administration in Sweden than among the population as a whole.

SCHLAGWÖRTER:
epidemiology; cohort; hf; cancer

Wilkins J R 3rd et al 1991

Wilkins JR 3rd, McLaughlin JA, Sinks TH, Kosnik EJ
Parental occupation and intracranial neoplasms of childhood: anecdotal evidence from a unique occupational cancer cluster
In: Am J Ind Med, 19. Jg. (1991), S. 643.

ABSTRACT:
Near the end of the data-collection phase of a case-control interview study of environmental factors and childhood brain tumors, an unusual space-time cluster was revealed. Not only had six genetically unrelated children been diagnosed with a primary intracranial tumor in a recent 2.4 year period in a rural county in Ohio, but each child had one parent employed by the same company (two mothers

four fathers). This represents an observed/expected ratio greater than 70 (p much less than 0.001). All tumors were microscopically confirmed, and all case parents worked at the facility in question for at least 1 year prior to conception, during the index pregnancy, and for at least 6 months after birth. The place of parental employment was an electronics firm (Standard Industrial Classification [SIC] group number 367, electronic components and accessories), where more than 100 chemical compounds are used by the company in a manufacturing process. Results of the cluster investigation are described, including a description of the case series. This cancer cluster is unique in that the index case series is composed of the offspring of workers, not the workers themselves.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Wilkins JR 3rd et al. 1990

Wilkins JR 3rd, Hundley V D
Paternal occupational exposure to electromagnetic fields and neuroblastoma in offspring
In: Am J Epidemiol, 131. Jg. (1990), S. 995.

ABSTRACT:
Investigators in Texas have reported an association between paternal employment in jobs linked with exposure to electromagnetic fields and risk of neuroblastoma in offspring. In an attempt to replicate this finding, the authors conducted a case-control study in Ohio. A total of 101 incident cases of neuroblastoma were identified through the Columbus (Ohio) Children's Hospital Tumor Registry. All cases were born sometime during the period 1942-1967. From a statewide roster of birth certificates, four controls were selected for each case, with individual matching on the case's year of birth, race, and sex, and the mother's county of residence at the time of the (index) child's birth. Multiple definitions were employed to infer the potential for paternal occupational exposure to electromagnetic fields from the industry/occupation statements on the birth certificates. Case-control comparisons revealed adjusted odds ratios ranging in magnitude from 0.5 to 1.9. For two of the exposure definitions employed--both of which are similar to one used by the Texas investigators--the corresponding odds ratios were modestly elevated (odds ratios = 1.6 and 1.9). Notably, the magnitude of these odds ratios is not inconsistent with the Texas findings, where the exposure definition referred to yielded an odds ratio of 2.1. Because the point estimates in this study are imprecise, and because the biologic plausibility of the association is uncertain, the results reported here must be interpreted cautiously. However, the apparent consistency between two independent studies suggests that future evaluation of the association is warranted.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; others

Wilkins JR 3rd et al. 1996

Wilkins JR 3rd, Wellage L C
Brain tumor risk in offspring of men occupationally exposed to electric and magnetic fields
In: Scand J Work Environ Health, 22. Jg. (1996), S. 339.

ABSTRACT:
OBJECTIVES: The purpose of the study was to address the possible associations between the occupational exposure of men to electromagnetic fields (EMF) and the risk of childhood brain tumors in offspring by reanalyzing case-referent interview data from a study of environmental factors and childhood brain tumors conducted by one of the authors and first reported in 1990. METHODS: Analyses of the case-referent data were limited to the 94 cases and 166 individually-matched referents for whom data on the biological fathers were available. Paternal exposure to occupational EMF was inferred from a list of job titles compiled for that purpose. Mantel-Haenszel odds ratios (OR) for individually matched cases and referents were estimated for different definitions of exposure. RESULTS: The findings suggested at best very small increases in risk for jobs associated with the occupational EMF exposure of fathers during the one-year period prior to conception, the OR values ranging from 1.12 to 1.31. Notably elevated OR values were, however, found in association with any paternal welding in the one-year preconception period (OR 3.8, 95% confidence interval 0.95-15.55). CONCLUSIONS: The results of reanalysis indicate that preconceptional paternal occupational exposure to EMF is at best only weakly associated with a risk of childhood brain tumors. However, the findings for paternal welding are somewhat intriguing since relatively strong EMF have been measured in association with welding. Further study of welding as a potential risk factor is required since welders may be exposed to a wide range of toxic agents in addition to EMF.

SCHLAGWÖRTER:
epidemiology; other type; elf/hf; cancer

Williams G M et al. 1996

Williams G M, Whysner J
Epigenetic carcinogens: evaluation and risk assessment
In: Experi Toxicol Pathol, 48. Jg. (1996), S. 189.

ABSTRACT:
Regulatory policies in the U.S. have been developed based upon a single model of cancer causation, which assumes chemical-induced genetic alterations. Such a model predicts some degree of cancer risk even at extremely low exposure levels. Many chemicals that produce tumors in experimental animals have been shown to act by epigenetic mechanisms that do not involve an attack by the chemical on DNA leading to subsequent genetic alteration. Such indirect mechanisms require prolonged exposures to high levels of chemicals for the production of tumors. For chemicals that are carcinogenic in this manner, the cancer mechanism would not be operative at exposures below a threshold at which the relevant cellular effect does not occur. Also, in contrast to DNA-reactive mechanisms, epigenetic effects may be unique to the rodent species used for testing. Certain chemical tumorigens have been well studied and provide examples for the use of mechanistic information in risk assessment. Butylated hydroxyanisole and saccharin are nongenotoxic food additives for which no risk to humans is predicted based upon low exposure levels and the likelihood that humans are either insensitive or much less sensitive to the tumorigenic effects found in rodent test species. For another non-genotoxic food additive d-limonene, the mechanism that underlies kidney tumor development in male rats is not expected to be operative in humans at all. The pharmaceutical phenobarbital represents a large group of non-genotoxic liver microsome enzyme inducers, which produce liver cancer in mice at levels that are near to therapeutic doses in humans. Epidemiology studies have not shown phenobarbital-related tumors in humans, indicating that humans may be less sensitive to the effects of phenobarbital. The mechanistic considerations involved in the risk assessment of these agents demonstrate that humans are not at risk from current exposure levels of many epigenetic carcinogens.

SCHLAGWÖRTER:
epidemiology; Review; elf; others

Williams W M et al. 1984

Williams W M, Del Cerro M, Michaelson S M
Williams W M, Del Cerro M, Michaelson S M
Effect of 2450 MHz microwave energy on the blood-brain barrier to hydrophilic molecules. B. Effect on the permeability to HRP
In: Brain Res, 319. Jg. (1984), S. 171.

ABSTRACT:
Alteration of blood-brain barrier (BBB) permeability by

2450 MHz CW microwaves was assessed semi-quantitatively after intravenous injection of horseradish peroxidase (HRP) and exposure of conscious, unrestrained rats to incident power densities of 0, 20 or 65 mW/cm2 for 30, 90 or 180 min. Additional rats were exposed to ambient heat (42 +/- 2 degrees C) for 30 or 90 min. None of the brain regions studied, with the exception of the normally leaky pineal gland, showed extracellular HRP leakage attributable to microwave or thermally-induced breakdown of the blood-brain barrier. The mean ratio of HRP-labeled microvessel endothelium/total number of microvessels counted was determined for each brain region. Mean values for the cortex, hypothalamus, cerebellum and medulla of microwave-exposed and heated rats were consistently below those of corresponding sham levels. This decrease appeared to correlate inversely with power density and duration of exposure. Statistically significant deviation (P less than 0.05) from sham mean values occurred in the cortex, hypothalamus, cerebellum and medulla of animals made hyperthermic with ambient heat or exposure to microwaves at 65 mW/cm2 (specific absorption rate approximately equal to 13.0 W/kg) for 30 or 90 min. Additionally, electron microscopic evaluation of ultrathin sections taken from each of the 4 brain regions revealed no significant extravasation of HRP indicative of microwave or ambient heat-induced disruption of the blood-brain barrier.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wingren G et al. 1995

Wingren G, Hallquist A, Degerman A, Hardell L

Occupation and female papillary cancer of the thyroid

In: J Occup Environ Med, 37. Jg. (1995), S. 294.

ABSTRACT:
This article presents the joint results of two Swedish case-control studies regarding occupational exposure and female papillary thyroid cancer. Questionnaires inquiring about lifetime occupations and specific occupational exposures were mailed to cases and controls, aged 20 to 70 years. Some 185 female papillary or mixed cancer cases and 426 female controls were included in the analysis. Increased risks were seen for women who had worked as a dentist/dental assistant, teacher, shoemaker, or warehouse worker. In addition, occupational contacts with undefined chemicals, x-rays, or video display terminals were indicated as risk factors.

SCHLAGWÖRTER:
epidemiology; case-control; elf/hf; cancer

Wolff S et al. 1985

Wolff S, James T L, Young G B, Margulis A R, Bodycote J, Afzal V

Magnetic resonance imaging: absence of in vitro cytogenetic damage

In: Radiology, 155. Jg. (1985), S. 163.

ABSTRACT:
Human lymphocytes and Chinese hamster ovary (CHO) cells in culture were exposed for 12 1/2 hours to a magnetic resonance imaging apparatus with a 2.35-Tesla magnet and 100-MHz radio frequency emission. The cells were examined for cytogenetic damage manifested either as chromosome aberrations or sister chromatid exchanges (SCEs), which constitute very sensitive measures of genetic and cellular damage. In either unstimulated or stimulated human lymphocytes, as well as in exponentially growing CHO cells, no increase in either chromosome aberrations or SCEs was found as a result of exposure to these MR conditions. The data indicate that long-term exposure to MR imaging conditions far exceeding those to be found in the clinical situation does not cause cytogenetic damage.

SCHLAGWÖRTER:
bioassay; experimentally; elf/hf; biological effects

Wood S J et al. 2001

Wood S J, Scott I R, Netell J J, Tattersall J E H

Effects of low intensity radiofrequency electromagnetic fields on electrical activity in rat hippocampal slices

In: Brain Res, 904. Jg. (2001), S. 43.

ABSTRACT:
Slices of rat hippocampus were exposed to 700 MHz continuous wave radiofrequency (RF) fields (25.2-71.0 V m(-1), 5-15 min exposure) in a stripline waveguide. At low field intensities, the predominant effect on the electrically evoked field potential in CA1 was a potentiation of the amplitude of the population spike by up to 20%, but higher intensity fields could produce either increases or decreases of up to 120 and 80%, respectively, in the amplitude of the population spike. To eliminate the possibility of RF-induced artefacts due to the metal stimulating electrode, the effect of RF exposure on spontaneous epileptiform activity induced in CA3 by 4-aminopyridine (50-100 microM) was investigated. Exposure to RF fields (50.0 V m(-1)) reduced or abolished epileptiform bursting in 36% of slices tested. The maximum field intensity used in these experiments, 71.0 V m(-1), was calculated to produce a specific absorption rate (SAR) of between 0.0016 and 0.0044 W kg(-1) in the slices. Measurements with a Luxtron fibreoptic probe confirmed that there was no detectable temperature change (+/- 0.1 degrees C) during a 15 min exposure to this field intensity. Furthermore, imposed temperature changes of up to 1 degrees C failed to mimic the effects of RF exposure. These results suggest that low-intensity RF fields can modulate the excitability of hippocampal tissue in vitro in the absence of gross thermal effects. The changes in excitability may be consistent with reported behavioural effects of RF fields.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Wrensch M et al. 1999

Wrensch M, Yost M, Miike R, Lee G, Touchstone J

Adult glioma in relation to residential power frequency electromagnetic field exposures in the San Francisco Bay area

In: Epidemiology, 10. Jg. (1999), S. 523.

ABSTRACT:
In a population-based study, we examined residential power frequency electromagnetic field exposures for 492 adults newly diagnosed with histologically confirmed glioma between August 1, 1991 and April 30, 1994, in the San Francisco Bay area and 462 controls, obtained through random-digit dialing frequency, matched to cases for age, gender, and race. Residential exposure assessment consisted of spot measures with EMDEX (Enertech Consultants, Campbell, CA) meters and wire codes based on characterization and location of nearby power lines. We considered the index residence at the time of the case's diagnosis or the control's interview and all other California residences of each subject for 7 years before study entry. We obtained wire codes for eligible residences of 76% and for index residences of 99% of subjects. Using the Kaune-Savitz wire code classification, the relative risk for longest held residences coded as "high" compared with "low" was 0.9 [95% confidence interval (CI) = 0.7-1.3], while relative risk and 95% CIs for front door spot measures of 1.01-2 milligauss, 2.01-3 milligauss, and higher than 3 milligauss compared with < or =1 milligauss were 1.0 (0.7-1.4), 0.6 (0.3-1.1), and 1.7 (0.8-3.6). Adjustment for age, gender, race, and whether the subject owned the residence did not meaningfully alter these findings, nor did comparisons using index or highest coded residence. Because of potential exposure misclassification and the unknown pertinent exposure period, these data cannot provide strong support against, but clearly do not support an association between adult

glioma and residential power frequency electromagnetic field exposures.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Wu R Y et al. 1994

Wu R Y, Chiang H, Shao B J, Li N G, Fu Y D
Effects of 2.45 GHz microwave radiation and phorbol ester 12-O-tetradecanoylphorbol-13-acetate on dimethylhydrazine-induced colon cancer in mice
In: Bioelectromagnetics, 15. Jg. (1994), S. 531.

ABSTRACT:
The purpose of this study was to investigate the effects of 2.45 GHz microwave (MW) radiation on dimethylhydrazine (DMH)-induced colon cancer in mice. The subjects were 115 Balb/c mice 4 weeks of age. The animals were divided into group A (control), group B (DMH), group C (DMH+MW), and group D [DMH + 12-O-tetradecanoylphorbol-13- acetate (TPA)]. Radiation (10 mW/cm2) was delivered dorsally with the E field parallel to the mouse's long body axis in an anechoic chamber. Radiations were administered 3 hr daily, 6 days per week, over a period of 5 months. The average SAR was estimated to be 10-12 W/kg. During the course of radiation treatments, DMH was injected once per week. The tumor promoter TPA was administered once per week for 10 weeks, from the third week on, after the initial treatment. The incidence of tumors did not significantly differ between the three test groups (groups B, C, and D; P > 0.25). However, the number of tumors, the size of the tumors, and the incidence of protuberant and infiltrative types in tumor-bearing animals were higher in group D compared to groups B and C (P < 0.05). No difference was found between groups B and C (P > 0.25). The study indicates that 2.45 GHz microwave radiation at 10 mW/cm2 power density did not promote DMH-induced colon cancers in young mice. The study also showed that

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Yang H K et al. 1983

Yang H K, Cain C A, Lockwood J, Tompkins W A F
Effects of microwave exposure on the hamster immune system. I. Natural killer cell activity
In: Bioelectromagnetics, 4. Jg. (1983), S. 123.

ABSTRACT:
Hamsters were exposed to repeated or single doses of microwave energy and monitored for changes in core body temperature, circulating leukocyte profiles, serum corticosteroid levels, and natural killer (NK) cell activity in various tissues. NK cytotoxicity was measured in a 51Cr-release assay employing baby hamster kidney (BHK) targets or BHK infected with herpes simplex virus. Repeated exposure of hamsters at 15 mW/cm2 for 60 min/day had no significant effect on natural levels of spleen-cell NK activity against BHK targets. Similarly, repeated exposure at 15 mW/cm2 over a 5-day period had no demonstrable effect on the induction of spleen NK activity by vaccinia virus immunization, that is, comparable levels of NK were induced in untreated and microwave-treated animals. In contrast, treatment of hamsters with a single 60-min microwave exposure at 25 mW/cm2 caused a significant suppression in induced spleen NK activity. A similar but less marked decrease in spleen NK activity was observed in sham-exposed animals. Moreover, the sham effects on NK activity were not predictable and appeared to represent large individual animal variations in the response to stress factors. Depressed spleen NK activity was evident as early as 4 h postmicrowave treatment and returned to normal levels by 8 h. Hamsters exposed at 25 mW/cm2 showed an elevated temperature of 3.0-3.5 degrees C that returned to normal within 60 min after termination of microwave exposure. These animals also showed a marked lymphopenia and neutrophilia by 1 h posttreatment that returned to normal by 8-10 h. Serum glucocorticosteroids were elevated between 1 aNd 8 h after microwave treatment. Sham-exposed animals did not demonstrate significant changes in core body temperature, peripheral blood leukocyte (PBL) profile, or glucocorticosteroid levels as compared to minimum-handling controls.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Yao K T S 1976

Yao K T S
Cytogenic consequences of microwave incubation of mammalian cells in culture
In: Genetics, 83. Jg. (1976), S. 84.

ABSTRACT:
no abstract available

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Yao K T S 1982

Yao K T S
Cytogenic consequences of microwave incubation of mammalian cells intubated in vitro
In: J Hered, 73. Jg. (1982), S. 133.

ABSTRACT:
A 2450 MHz microwave oven was converted into a microwave incubator. Rat kangaroo RH5 and RH16 cells were incubated in the incubator and were subcultured every 5 to 7 days. The temperature of the cell cultures in the incubator was maintained at 37 degrees C. The cells were incubated with direct microwave irradiation continuously for 50 passages and then returned to a conventional incubator and allowed to grow for another 30 passages. Cell growth rate was significantly reduced after 7 or 15 subculture passages under irradiation. Chromosome aberrations emerged after the cells had been microwave-incubated for about 20 passages. The long-term irradiation caused 0.84 chromosome breaks per cell in RH5 cell cultures and 0.10 breaks per cell in RH16 cell cultures. After the cell cultures had been returned to the conventional incubator and maintained for 30 passages, the number of chromosomes breaks was greatly reduced in both cell cultures. The number of polyploid cells was increased to 35 percent and 31 percent during the irradiation, and was significantly reduced in the conventional incubator. Many RH5 cells lost one chromosome and became 10-chromosome cells. The number of 10-chromosome cells increased during irradiation and continued to increase after being returned to the conventional incubator.

SCHLAGWÖRTER:
bioassay; experimentally; hf; biological effects

Zaffanella L E et al. 1998

Zaffanella L E, Savitz D A, Greenland S, Ebi K L
The residential case-specular method to study wire codes, magnetic fields, and disease
In: Epidemiology, 9. Jg. (1998), S. 16.

ABSTRACT:
We propose a residential case-specular method for the study of wire codes and childhood cancer. The method compares the wire codes of case residences with the wire codes of identical residences (specular residences) located in a virtual situation in which the position of the residence or the position of the power line is switched around the center of the street. It is designed to discriminate between the magnetic field hypothesis, which postulates that childhood cancer is affected by magnetic fields and that wire codes are a proxy for magnetic fields, vs the neighborhood hypothesis, which postulates that childhood cancer is affected by some characteristics of the

neighborhood other than magnetic fields and wire codes are a proxy for those characteristics. The method is based on several assumptions that we tested with 400 randomly selected residences. Under certain conditions, the method also may allow effect estimation without requiring the selection of controls and the potential biases that result from control selection. The method is applicable to both past and future studies.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Zhang J et al. 1997

Zhang J, Nair I, Sahl J

Effects function analysis of ELF magnetic field exposure in the electric utility work environment

In: Bioelectromagnetics, 18. Jg. (1997), S. 365.

ABSTRACT:
The incomplete understanding of the relation between power-frequency fields and biological responses raises problems in defining an appropriate metric for exposure assessment and epidemiological studies. Based on evidence from biological experiments, one can define alternative metrics or effects functions that embody the relationship between field exposure patterns and hypothetical health effects. In this paper, we explore the application of the "effects function" approach to occupational exposure data. Our analysis provides examples of exposure assessments based on a range of plausible effects functions. An EMDEX time series data set of ELF frequency (40-800 Hz) magnetic field exposure measurements for electric utility workers was analyzed with several statistical measures and effects functions: average field strength, combination of threshold and exposure duration, and field strength changes. Results were compared for eight job categories: electrician, substation operator, machinist, welder, plant operator, lineman/splicer, meter reader, and clerical. Average field strength yields a different ranking for these job categories than the ranks obtained using other biologically plausible effects functions. Whereas the group of electricians has the highest exposure by average field strength, the group of substation operators has the highest ranking for most of the other effects functions. Plant operators rank highest in the total number of field strength changes greater than 1 microT per hour. The clerical group remains at the lowest end for all of these effects functions. Our analysis suggests that, although average field strength could be used as a surrogate of field exposure for simply classifying exposure into "low" and "high," this summary measure may be misleading in the relative ranking of job categories in which workers are in "high" fields. These results indicate the relevance of metrics other than average field strength in occupational exposure assessment and in the design and analysis of epidemiological studies.

SCHLAGWÖRTER:
epidemiology; other type; elf; others

Zheng T et al. 2000

Zheng T, Holford T R, Mayne S T, Owens P H, Zhang B, Boyle P, Carter D, Ward B, Zhang Y, Zahm S H

Exposure to electromagnetic fields from use of electric blankets and other in-home electrical appliances and breast cancer risk

In: Am J Epidemiol, 151. Jg. (2000), S. 1103.

ABSTRACT:
Exposure to electromagnetic fields (EMFs) from use of electric blankets and other in-home electrical appliances has been hypothesized to increase breast cancer risk. To test the hypothesis, the authors analyzed data from a case-control study of female breast cancer conducted in Connecticut in 1994-1997. A total of 608 incident breast cancer patients and 609 age frequency-matched controls, 31-85 years old, were interviewed by trained study interviewers using a standardized, structured questionnaire to obtain information on lifetime use of various in-home electrical appliances. A total of 40% of the cases and 43% of the controls reported regular use of electric blankets in their lifetime, which gave an adjusted odds ratio of 0.9 (95% confidence interval (CI): 0.7, 1.1). For those who reported using electric blankets continuously throughout the night, the adjusted odds ratio was 0.9 (95% CI: 0.7, 1.2) when compared with never users. The risk did not vary according to age at first use, duration of use, or menopausal and estrogen receptor status. The authors also did not find an association between use of other major in-home electrical appliances and breast cancer risk. In conclusion, exposure to EMFs from in-home electrical appliance use was not found to increase breast cancer risk in this study.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer

Zhu K et al. 1999

Zhu K, Weiss N S, Stanford J L, Daling J R, Stergachis A, McKnight B, Brawer M K, Levine R S

Prostate cancer in relation to the use of electric blanket or heated water bed

In: Epidemiology, 10. Jg. (1999), S. 83.

ABSTRACT:
Using data from a case-control study conducted in Group Health Cooperative (GHC) of Puget Sound, we examined the relation between the use of electric blankets or heated water beds and the risk of prostate cancer. Cases were 175 prostate cancer patients ages 40-69 years. Controls were 258 male GHC members frequency matched to cases. The odds ratio (OR) for prostate cancer associated with the use of an electric blanket or heated water bed was 1.4 (95% confidence interval (CI) 0.9-2.2). The risk, however, did not tend to be higher with increasing months per year or years of use. This study did not provide clear evidence on the hypothesized association.

SCHLAGWÖRTER:
epidemiology; case-control; elf; cancer