UNIVERSITY OF ROSTOCK

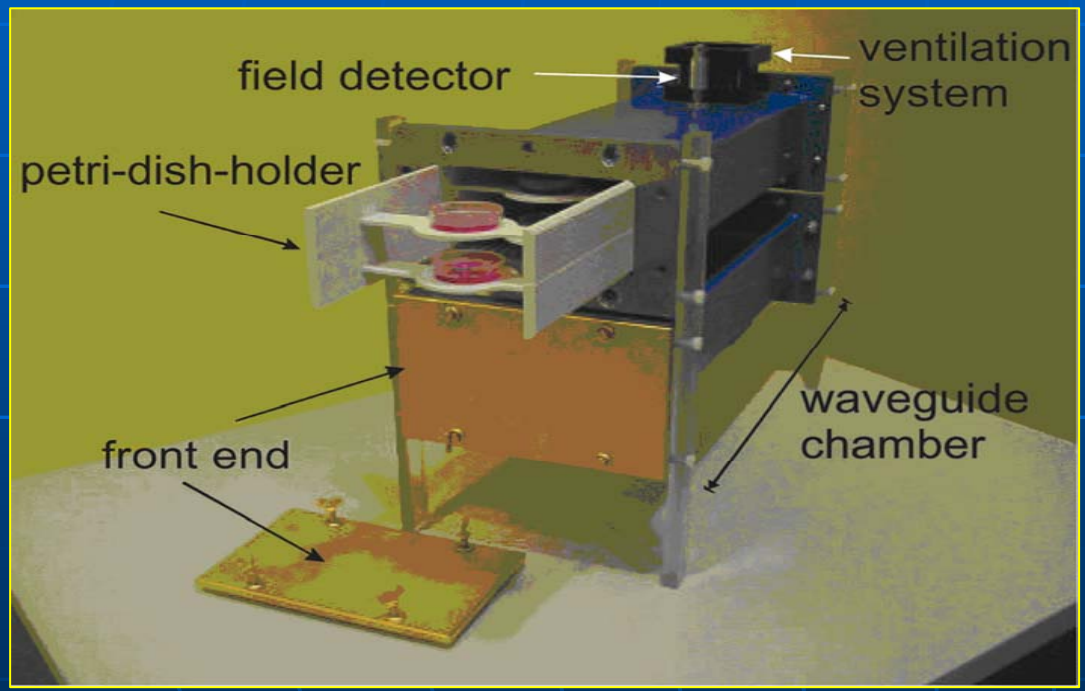
Institute for Cell Biology and Biosystem Technology
Division of Environmental Physiology

Untersuchungen zu Wirkmechanismen an Zellen unter Exposition mit hochfrequenten elektromagnetischen Feldern der Mobilfunktechnologie

Start: September 2003

Myrtill Simkó

ITIS Radio frequency setup



1,8 GHz:

- CW
- GSM 217 Hz
- Hearing (GSM-DTX)
- Speaking (GSM-nonDTX)
- Talk (GSM-Talk)(70 : 30%)

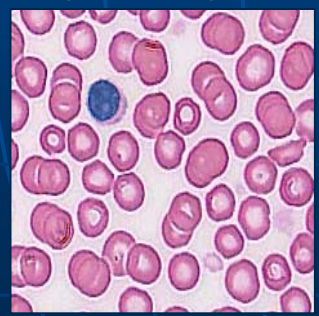
SAR: 0.5; 1.0; 1.5; 2.0 W/kg
Exp. time: 10 min on/off
45 min cont.

Cell systems

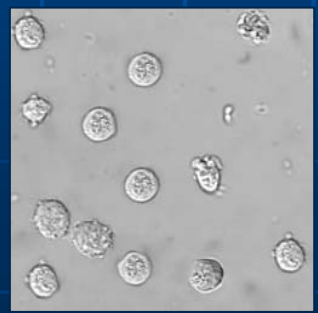
- **Human primary Monocytes and Lymphocytes:** isolated from human umbilical cord blood within 48 h after birth
- **Mono Mac 6 (MM6):** human acute monocytic leukemia cells
- **K562:** human chronic myeloid leukemia

Monocytes

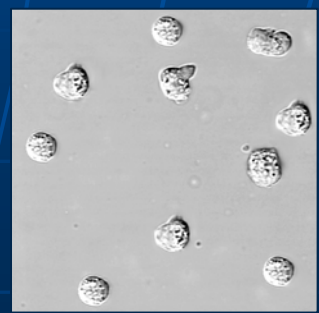
Lymphocytes



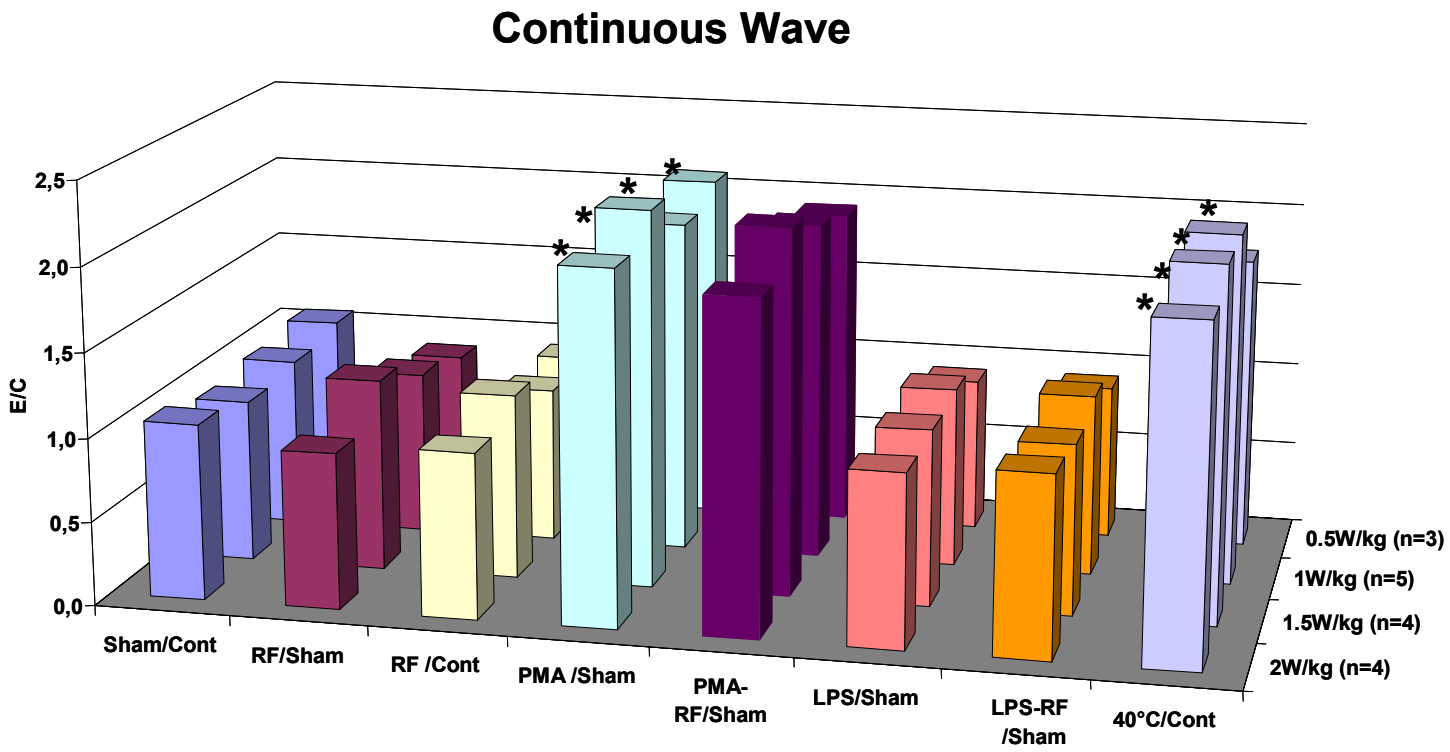
Mono Mac 6 cells



K562 cells



1800 MHz - Free radical production (human Mono Mac 6 cells)



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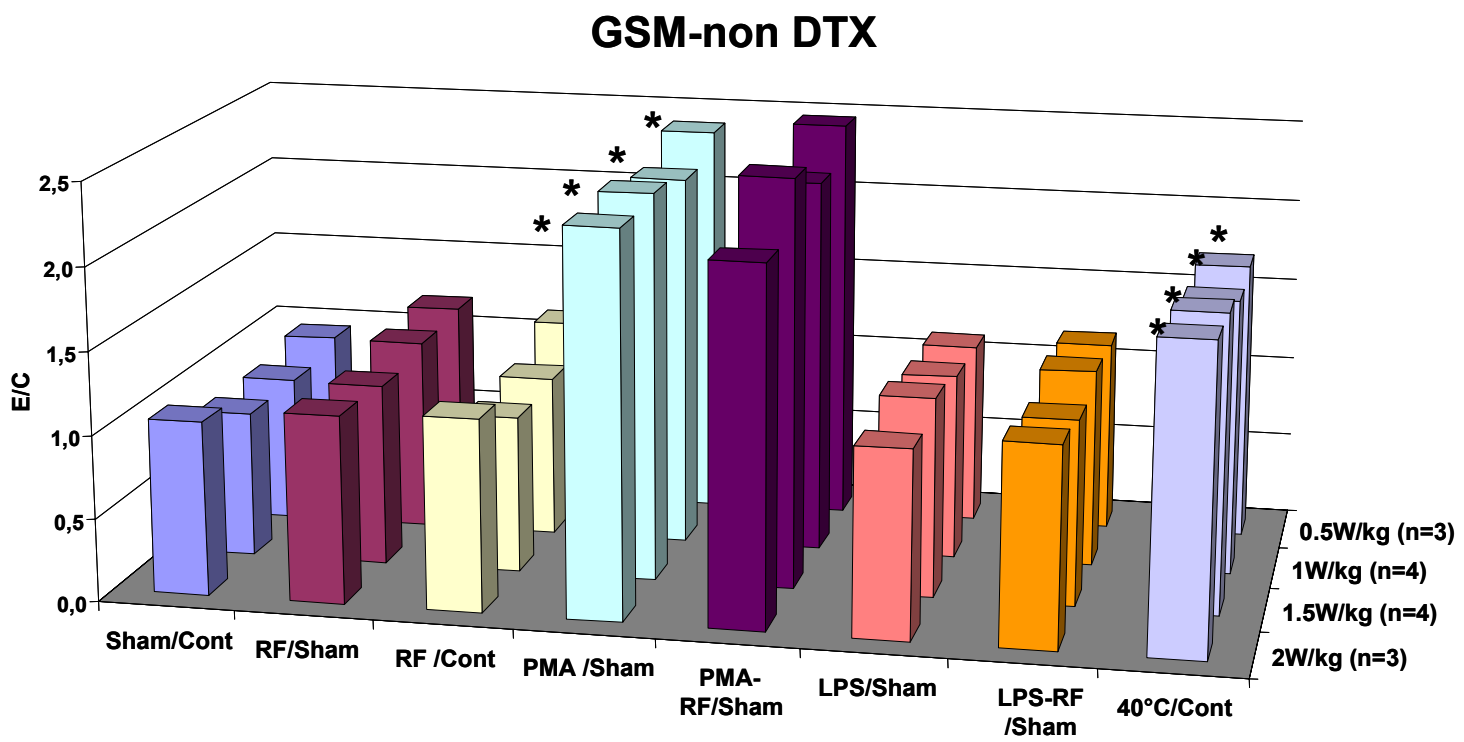

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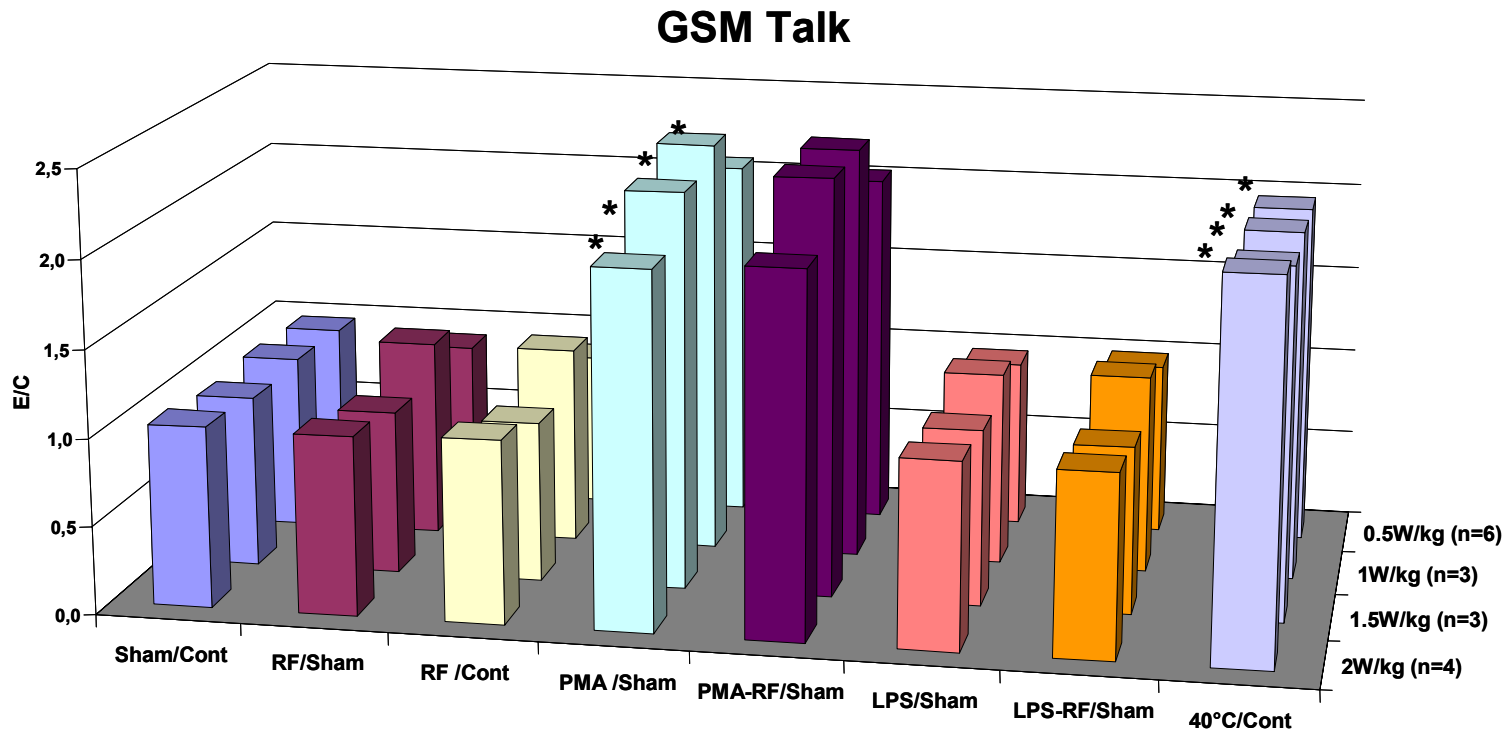

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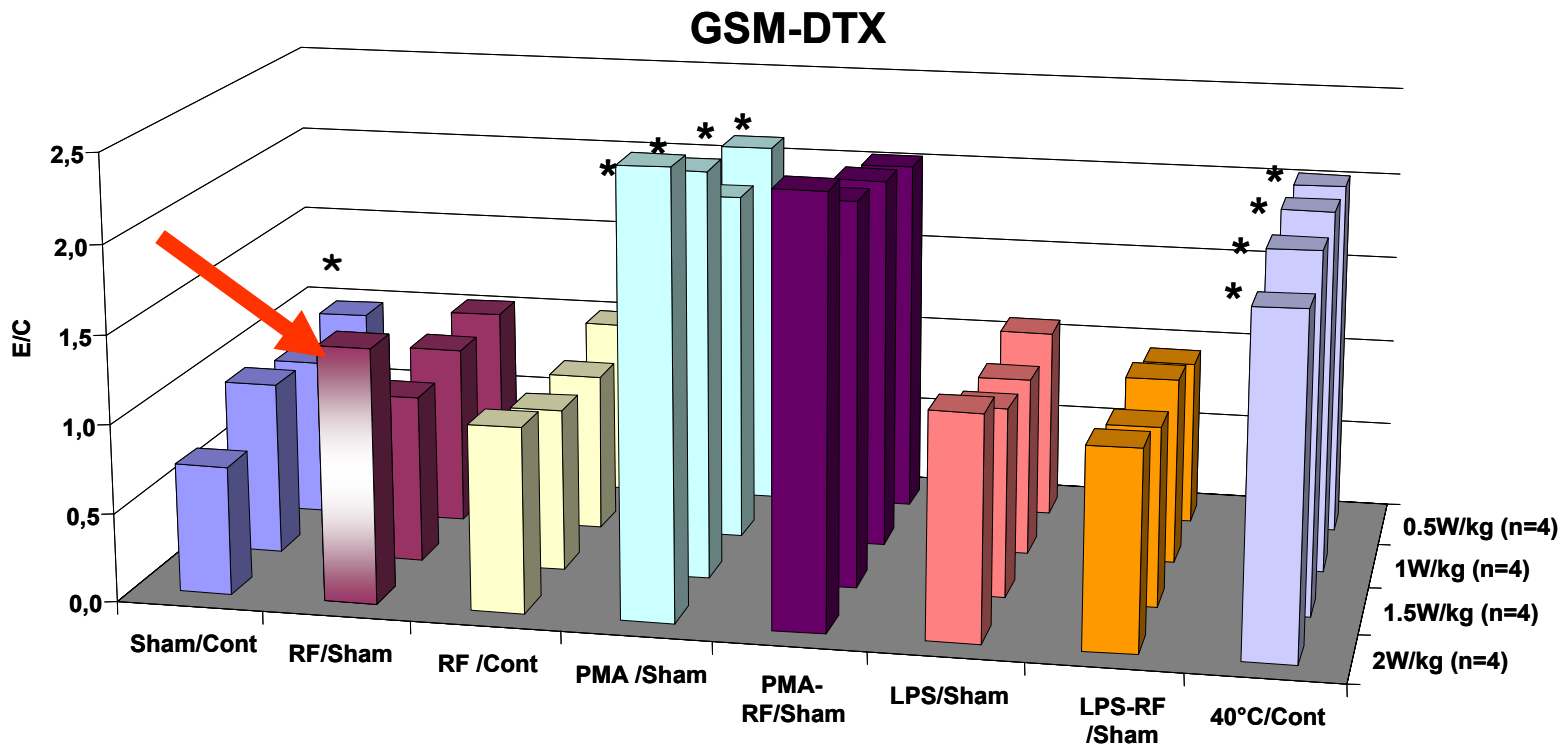
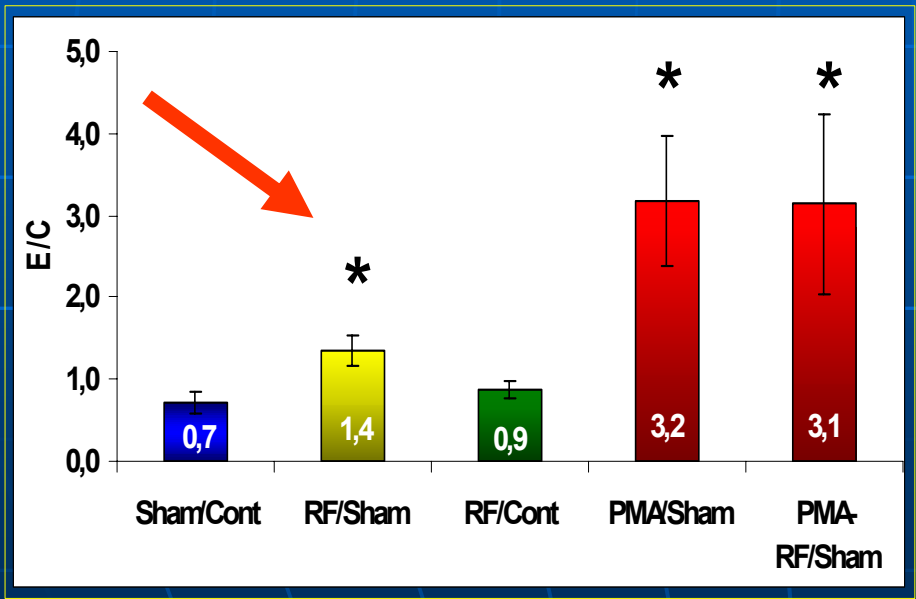


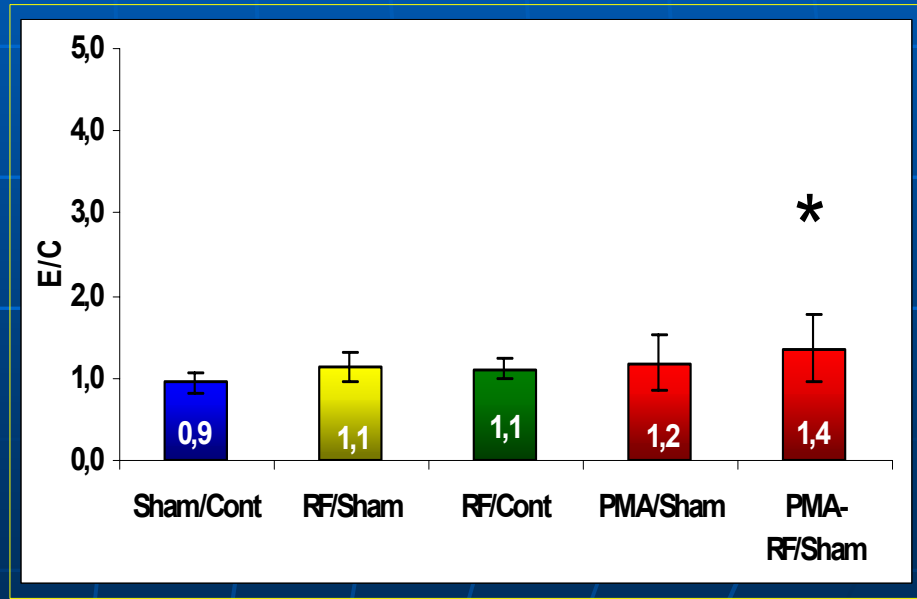
ROS production (DHR-assay)

GSM-DTX, 2 W/kg, for 45 min

Mono Mac 6 cells



K 562 cells



n ≥ 3, p< 0.05

Simkó's Lab

Sham-effect??

GSM-DTX

- active during hearing
- pulsed 1800 MHz DTX signal (2, 8 and 217 Hz modulation)
- pulse maximum is variable, depending of average SAR

Cell type dependent decreased ROS production in sham:

- Mono Mac 6 cells
- monocytes
- not K562 cells

SAR dependency: 0.5, 1.0, 1.5, 2.5 W/kg

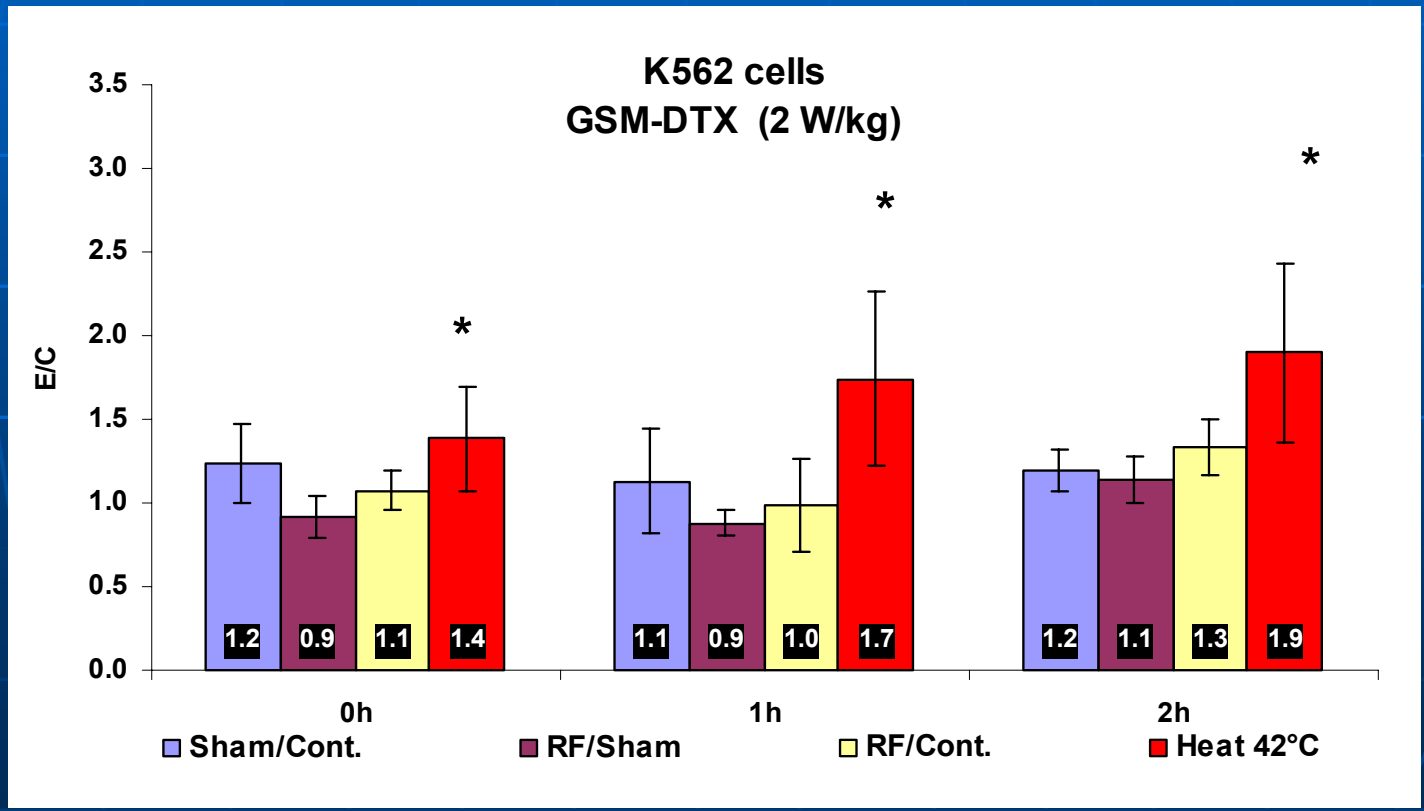
Frequency modulation of 1800 MHz:

- 2, 8, 50 or 217 Hz moduliation
- fixed pulse maximum (500 W/kg) and constant average SAR

Hsp70 expression – DTX signal

average SAR: 2 W/kg (max. pulse: 140 W/kg)

Exposure time: 60 min



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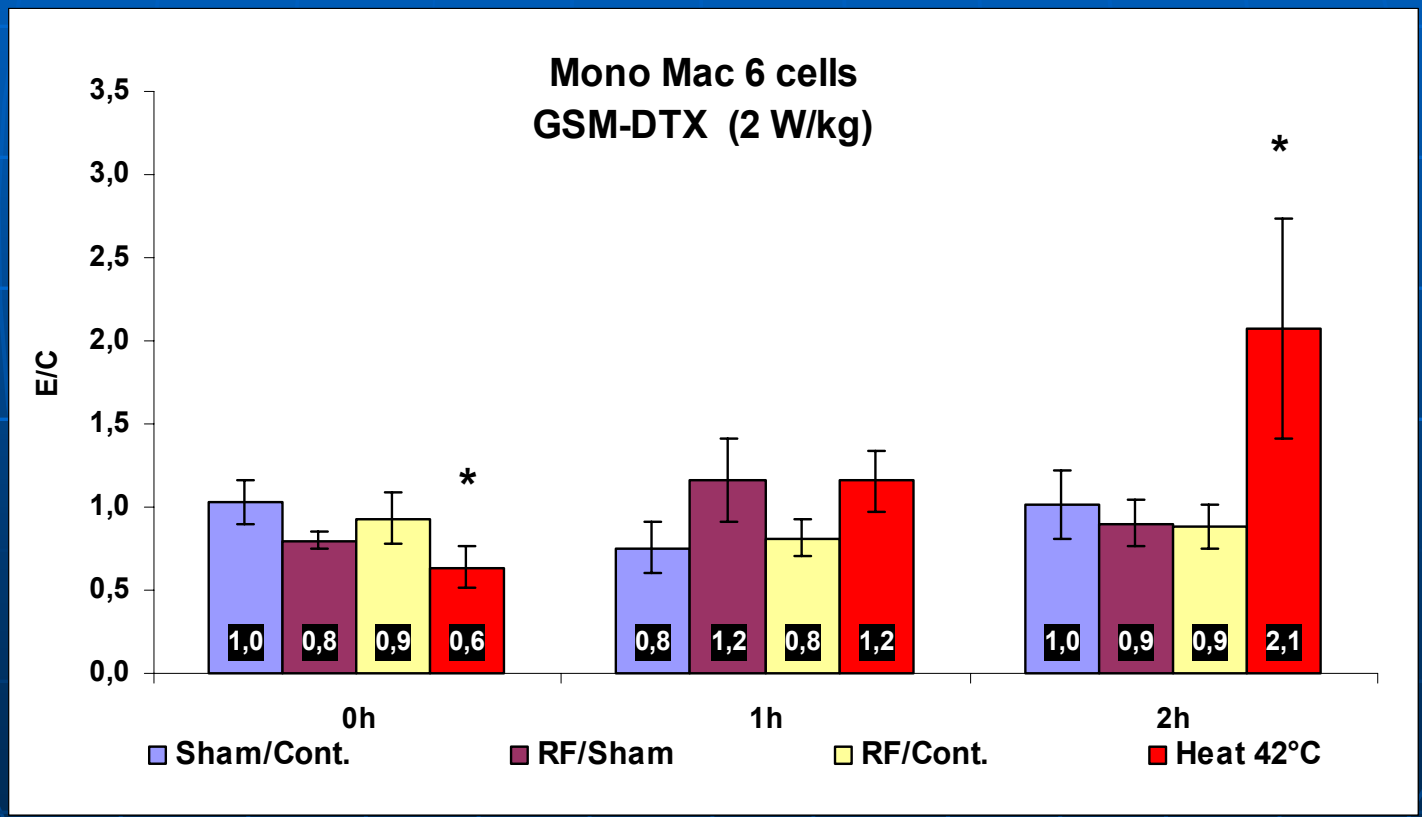
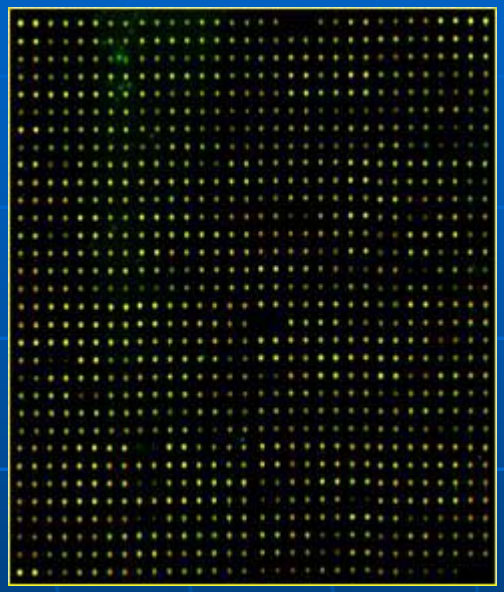
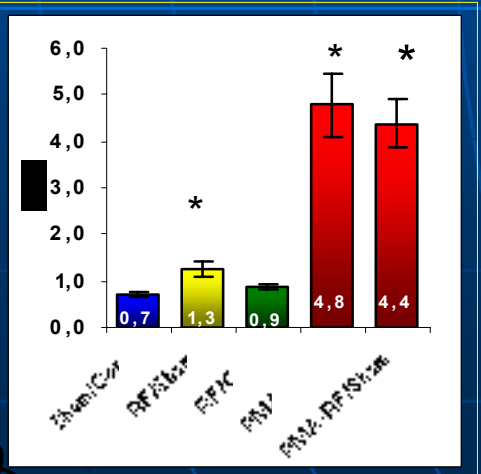


DTX signal – Protein profiling





Human monocytes

Protein arrays:

- RF: 45 min, 2 W/Kg, GSM DTX Exposition
- Sh: Sham
- Ic: Incubator control

Antibodies (Ab):

- 512 Ab dubble spotted (1024 spotts/array)
- Per array **Cy5** / **Cy3**
- RF-**Cy3** / Sh-**Cy5** and RF-**Cy5** / Sh-**Cy3**

Evaluation:

- 3 values of 4 must show the same direction of regulation

Summary

- 1800 MHz at any time and using different signal modulations do not induce free radical production or Hsp70 expression if data compared to controls
- GSM-DTX signal at 2 W/kg induces a significant increase of free radicals if data compared to sham
- Protein profiling showed 4-6 candidates for real-time PCR which is in progress

Publications

- Lantow M, Schuderer J, Hartwig C and Simkó M: Free radical release and Hsp70 expression in two human immune relevant cell lines after exposure to 1800 MHz radiofrequency radiation (accepted Rad. Res. 2005)

- Simkó M, Hartwig C, Lantow M, Lupke M, Mattsson MO, and Rollwitz J: Hsp70 expression and free radical release after exposure to non-thermal radio-frequency electromagnetic fields and ultrafine particles in human Mono Mac 6 cells (accepted Toxic. Lett. 2005)

- Lantow M, Hartwig C, Maercker C and Simkó M: Free radical Production, Hsp70 exression and protein profiling after 1800 mhz RF exposure in different immune relevant cells. 27 Annual Meeting of The BEMS, 2005, Dublin, Ireland Abstract Book (2005).

- Lantow M and Simkó M: 1800 MHz RF-EMF do not induce free radical production in different immune relevant cells. 26 Annual Meeting of The BEMS, 2004, Washington DC, USA, Abstract Book, (2004).