GAZİ UNIVERSITY
FACULTY OF MEDICINE
BIOPHYSICS DEPARTMENT
Ankara, TURKEY

GAZI NON-IONIZING RADIATION PROTECTION CENTER (GNRK)
&
GAZI BIOPHYSICS DEPARTMENT

www.biyofizik.gazi.edu.tr   www.gnrk.gazi.edu.tr
• GAZİ BIOPHYSICS has been carrying out studies on the biological impacts of Non-Ionizing Radiation – NIR EMF since 1989

• Our laboratory includes: physicists, biologists, electrical engineers, all of whom are studying how living systems respond to EMF

• Our research team includes physicists, biologists, electrical engineers, physicians, biochemists, pathologists and veterinarians
• GAZİ BIOPHYSICS is located in Ankara and have been supported by Scientific Research Funds of Gazi University and NATO STO

• GAZİ BIOPHYSICS is Representative of Universities to NATO STO HFM since 2007,

WHO International Advisory Committee member on EMF to WHO since 2001,

Scientific Secretariat Member of ICEMS since 2007
• We do expose animals and cell cultures to RF EMF including mobile phones

• We do clinical research on RF EMF

• We measure all kinds of EMF sources including cellular phones, base stations, transformers, high power lines, TV and radio antennas, Microwave ovens, Diathermy units, Wi-Fi’s. MRI’s, Radars under Gazi Nonionizing Radiation Protection Center (GNRK)
RECENT RF STUDIES OF
GAZİ BIOPHYSICS
&
GNRK
PREGNANCY STUDY

2007-cont.
Totally 126 adult, pregnant, and offspring New Zealand White rabbits used in the study
- 18 adults
- 18 pregnant
- 18 newborns (2 days old)
- 72 offsprings (1-month old)
  - 36 female
  - 36 male

exposed to 1800 MHz GSM modulated RFR (G2) (217 Hz, 20dBm, 14V/m), 15min/day, 7 days.
1800 MHz GSM like signal formed by Signal Generator – (Agilent Technologies 8648C, 9 kHz – 3.2 GHz, Santa Clara, CA, USA) with an integrated pulse modulation unit and Horn antenna.

Horn antenna - Schwarzbeck, Doppelsteg Breitband BBHA 9120 L3F, 0.5 – 2.8 GHz, Schönau, Germany

The generated power is controlled by Spectrum Analyzer - Agilent Technologies N9320A, 9 kHz – 3GHz, Santa Clara, CA, USA

Measurement of the output radiation - NARDA EMR 300 and Type 26.1 probe (300 kHz - 40 Ghz)
Findings:

1800 MHz RF exposure: 15min/day, 7 days

- Increased DNA base modification and free radical formation in brain tissue of non-pregnant adults

- Increased oxidative stress in liver tissue of non-pregnant adults, pregnant women and their newborns (2 day old)

Oxidative stress damages tissues.
• Increased apoptotic cells-PROGRAMMED CELL DEATH-in the brain (neurons, glial cells) and eye (cornea, lens) tissues of adults, pregnancies and newborns

• Increased DNA base modification in liver tissue of female infants (one month old)
RF exposed induced free radicals might lead to oxidative damage in liver, which in turn disrupts normal metabolism and physiology of liver tissue.


Female infants

- Decreased Outer Hair Cell Motility
- Decreased Distortion Product Otoacoustic Emissions amplitudes

Male infants

- Decreased Cochlear Activity,
- Decreased Outer Hair Cell Electromotility
- Decreased Distortion Product Otoacoustic Emissions amplitudes


BLOOD-BRAIN-BARRIER (BBB) STUDY
900 MHz & 1800 MHz CW and GSM-like RFR
(217 Hz, 577 µs pulse duration, 4.54 V/m) 20 min exp.,
(n=45 female young adult Wistar albino rats)

- increased BBB Permeability in females for 900 MHz CW and GSM – like modulated RFR and 1800 MHz CW.
- No effect found for 1800 MHz GSM – like modulated

900 MHz & 1800 MHz, CW and GSM-like RFR (217 Hz, 577 µs pulse duration, 4.54 V/m) for 20 min exp., (n=45 male young adult Wistar albino rats)

increased BBB permeability in all exposed males.

THYROID STUDY
900 MHz GSM Modulated RFR (217 Hz, 1.35 W/kg)  
15min/day, 21 days  
(n=30 male 2 months old Wistar rats)  

induced hypothyroidism and caspase activation  
(indicator of apoptosis)

OXIDATIVE STRESS STUDY
900 MHz GSM Modulated RFR (217 Hz, 1.35 W/kg)
15min/day, 21 days
(n=30 male 2 months old Wistar rats)

oxidative damage in liver, heart, lung and testis tissues

HAIR ROOT CELLS STUDY
Lai and Singh’s study: (2.45 GHz RF, 2 h)
Single and double-stranded DNA breakage in rat brain cells

Gazi Biophysics’s study: 900 MHz GSM Modulated RFR (217 Hz, 577 µs, 0.974 W/kg) for 15 and 30 min, human hair root cells,
Comet Assay Technique

Hair Roots plucked from the head area behind the ear used for the phone calls where maximum SAR measured
6 women, 2 men, 30 - 47 years old
Single-strand DNA breaks found in the hair root cells


30 minutes
BLOOD LYMPHOCYTES STUDY
1800 MHz GSM Modulated RFR (217 Hz, 0.21 W/kg) for 6, 8, 24 and 48 h (human peripheral blood lymphocytes)

- Inhibited cell proliferation
- Increased Sister Chromatid Exchange frequency
  (indicator of DNA damage)

Meric Arda Esmekaya, Ebru Aytekin, Elcin Ozgur, Goknur Guler Ozturk, Mehmet Ali Ergun, Suna Omeroğlu, Nesrin Seyhan (2011). Mutagenic and morphologic impacts of 1.8 GHz Radiofrequency Radiation on human peripheral blood lymphocytes (hPBLs) and possible protective role of pre-treatment with Ginkgo Biloba (EGb 761). Science of the Total Environment, 410(59-64)
ON GOING STUDIES
• Multifrequency EMF exposure
  RF, 2100 MHz ; ELF, 50 Hz on the permeability of BBB in diabetic and non-diabetic rats

• Skin hydroxyproline level in RF exposed (900 MHz) rats

• 1800 MHz GSM-like RFR on the tendency of metabolism-related diseases of intrauterina and extrauterina exposed infant rabbits
Intrauterine and extrauterine exposure to 1800 MHz GSM-like radiofrequency effects on blood chemistry and oxidative stress in infant rabbits

2.1 GHz Wideband Code Division Multiple Access (W-CDMA) modulated RFR exposure for 4 and 24 h, in breast fibroblast cells
Research Team

1. Gazi University, Medical Faculty

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