SOME Reproductive & neurological impacts of mobile phone radiation and toxic chemicals—a BRIEF update & theoretical speculation

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The biological impact of non-ionizing radiation and toxic chemicals varies with

Temperature
Wave characteristics
Cell types & age
Tissue exposed
Intracellular signaling (MAPK transcription, mRNA)
Type of exposure, continuous v. modulated
ROS & Other variables TBD
The impact of any form of radiation depends on signal properties & chemical exposures

- Frequency (pace)
- Amplitude (power)
- Pulse (beats)
- Intensity (power density)
- Polarity
- Information content

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Courtesy of Margaritis et al

The impact of radiation or toxic chemicals depends on the types & parts of cells

- Cell age/function
- Tissue
- Host status
- Cell health
- Intracellular signaling (ERK)
- Membrane
- Mitochondrial activation

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Vulnerability to Toxic Insult

- Depends on the rate of cell proliferation
- Therefore, younger faster growing cells are more vulnerable, i.e., spermatocytes, neuronal stem cells, mouse embryonic (all have thinner Membranes!?)
Controlled Experiments with Human Material--
sperm

Cell Phone Exposed

Not Exposed

Exposed Sperm were Significantly Reduced & damaged
Melatonin Protects Against RF Radiation Damage

- Xu et al
- Brain Research, 2010

Protective Effects of Anti-oxidants is Evidence for chemical synergies

- Anthocyanadin
- Cyanadin
- Ascorbate
- Tocoopherol
- Polyphenol
- Selenium
Possible shared mechanisms of EMF/chemicals

• Altered calcium homeostasis due to low frequency EMW exposure leads to plasma membrane weakening. Negatively charged phospholipid bilayer of the cell membranes binds to divalent cations, such as calcium,
• which fit between phospholipid molecules and prevents them from repelling each other.

Possible shared mechanisms of EMF/chemicals

Calcium helps to stabilize and strengthen cell membranes
Under induced alternating voltage across the cell membrane, submembrane calcium ions are displaced on and off the cell membrane.
Thank You! Collaborators

- Ashok Agarwal, Cleveland Clinic
- Igor Belyaev, National Cancer Institute of Slovakia
- Institute of General Physics, Russian Academy of Science, Moscow, Russia
- Andreas Christ, formerly with IT’ IS, Switzerland
- Alvaro DeSalles, University of Porto Allegre
- Suleyman Kaplan, Ondokuz Mayis Medical Univ.
- Lukas Margaritis and Adamantia Fragopoulou, University of Athens, Greece
- Lloyd Morgan, Susan F. Dixon, Ron Herberman, EHT
- Nesrin Seyhan, Gazi University, Ankara
- Hugh Taylor, Yale University
How to Protect Your Family

- France, Finland, Israel, and the European Environment Agency advise cellphone precautions
  - Use speakerphone
  - Use earpieces
  - Do not keep phone on body/in pocket
  - Avoid use in areas of weak signals
  - Protect abdomens—pregnant, adolescent and men wishing to become fathers
  - Do not text while driving/biking/moving

Campaign for Safer Cell Phones—Berkely 2015 Ordinance under development

- Warning labels for cell phones
- Use an earpiece or speakerphone
- Don’t keep phone on and on the body
- Text message rather than talk
- Ban apps to be played next to babies’ heads
- Promote and generate funding for major independent research programs
Campaign for Safer Cell Phones—Berkely 2015 Ordinance under development

- Where manufacturers provide advice about recommended distance for using mobile phones that information must be made visible at the point of sale