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Briefing for the California Public Utilities Commission on Smart Meters and Potential Health Impacts

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CPUC Briefing, C. Sage, September 9, 2010

FCC Compliance is Uncertain

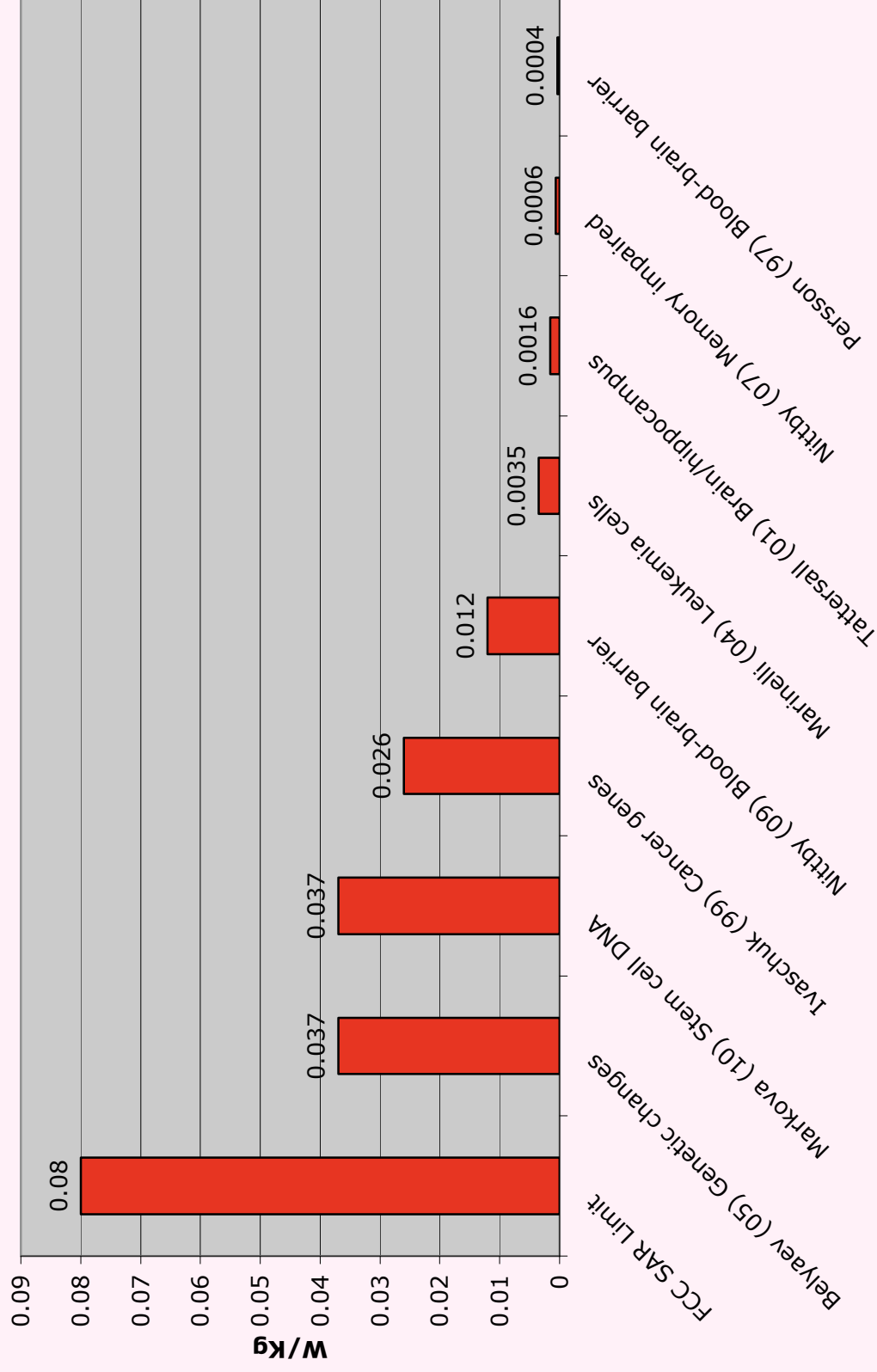
- Meter compliance is not known ‘in the manner installed and operated’.
- Cannot determine compliance of meter in isolation.
- FCC compliance of meters depends on RF emissions, ‘traffic’ and where located in relation to occupied space. We all need full RF emissions information.
- FCC compliance statements do not address these variables, so are not reliable.
- CPUC approvals have ignored these questions that are key to assessing potential RF health risks.

What About Multiple Meters?

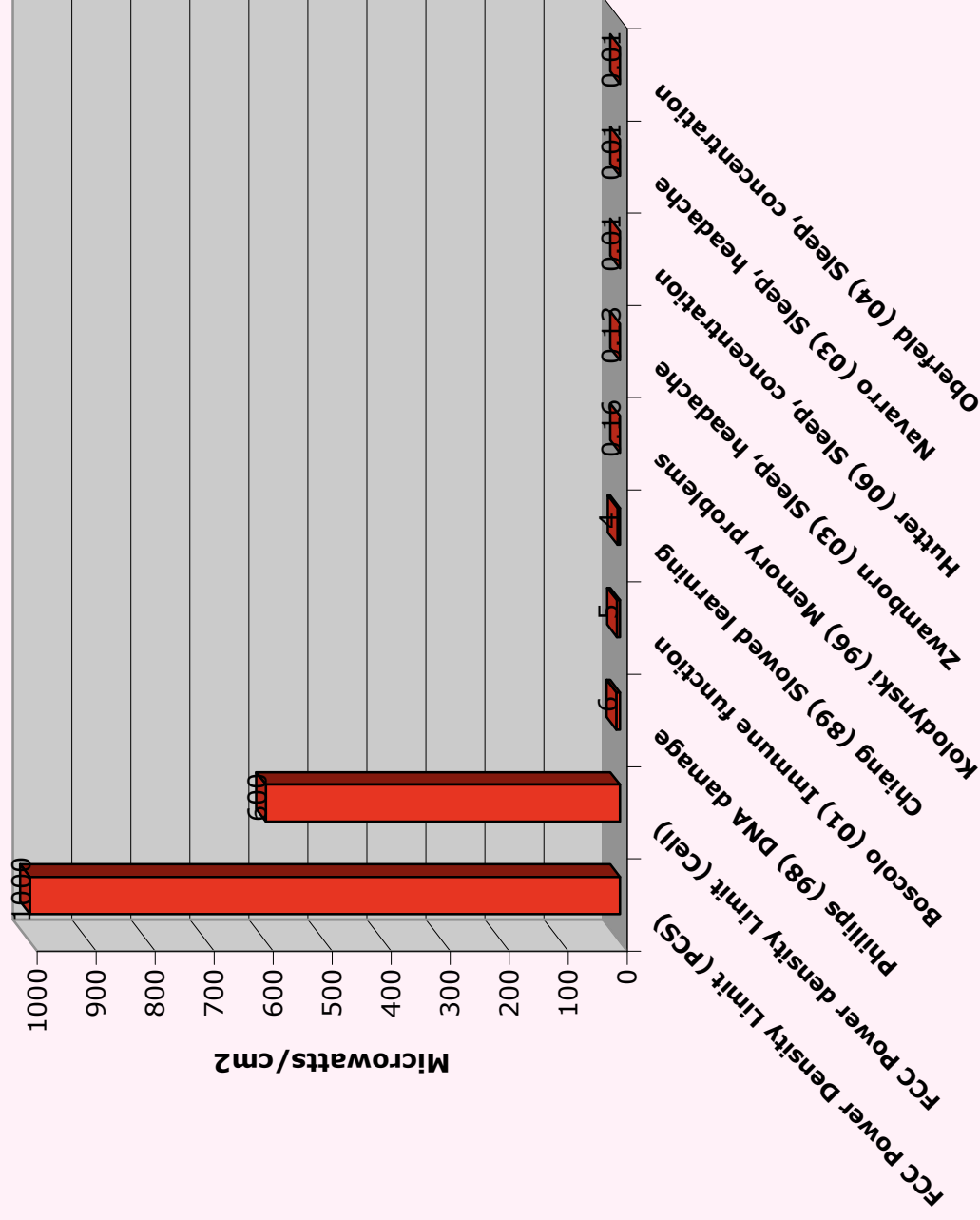


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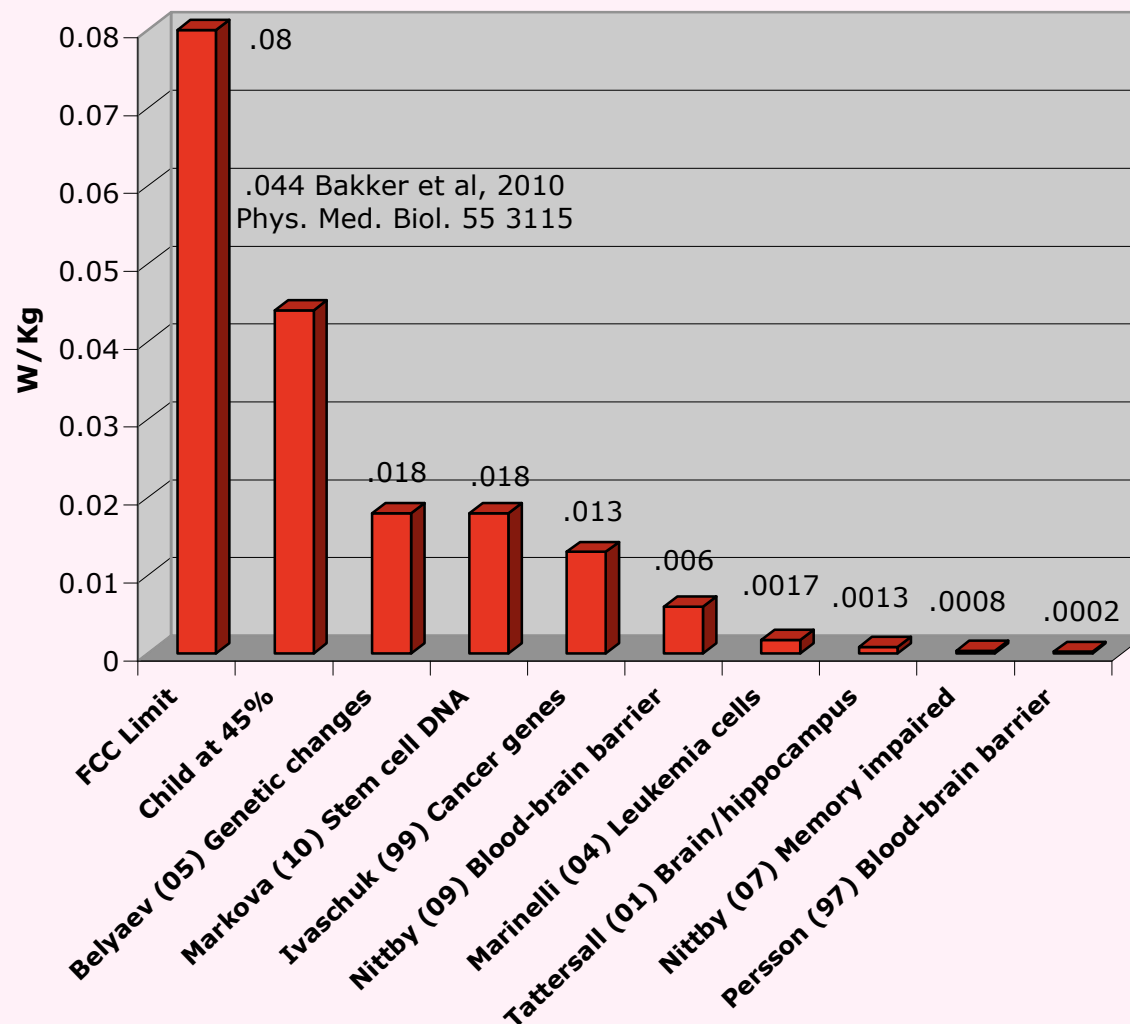
SAR Studies at Cell Phone Frequencies Reporting Bioeffects and Adverse Health Effects Below FCC Safety Limits



Cell Phone Frequency Studies Reporting Bioeffects and Adverse Health Effects Below FCC Safety Limits (Power Density)



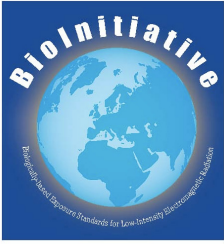
SAR Studies at Cell Phone Frequencies Reporting Bioeffects and Adverse Health Effects (Children absorb 45% more RF)





Important Highlights of the BioInitiative Report (2007)

- 14 contributors from five countries (international effort) over 9 months.
- Grew out of Bioelectromagnetics Society annual meetings - need for overview of low-intensity ELF and RF studies and their meaning.
- Three past BEMS presidents, five full BEMS members in the group. Decades of research and policy experience.
- Over 2000 scientific studies reviewed.
- Published on the web August 2007
- Pathophysiology Journal 16:2, 3 Special Issue in 2009



Participants and Topics

- | | |
|--------------------------|---------------------------------|
| • Carl Blackman USA | Modulation Effects |
| • Martin Blank USA | Stress Proteins (hsp) |
| • Michael Kundi Austria | Epidemiology - Public Health |
| • Henry Lai USA | Neurologic Effects |
| • Lennart Hardell Sweden | Brain Tumors |
| • Kjell H. Mild Sweden | Brain Tumors |
| • Zhengping Xu China | Proteomics/Genomics |



Participants and Topics

- Olle Johansson Sweden Immune Function
Hypersensitivity
- Eugene Sobel USA Melatonin - Alzheimers
- Zoreh Davanipour USA ALS - Breast Cancer
- David Carpenter USA Public Health
- David Gee Denmark Precautionary Principle
- Cindy Sage USA Editor-EMF Policy Planning
- Amy Sage USA Research Associate



Key Findings

- Low-intensity (non-thermal) effects are established.
- Existing public safety limits are inadequate to protect public health.
- New, biologically-based public safety limits and preventative measures are warranted now.
- It is not in the public interest to wait.



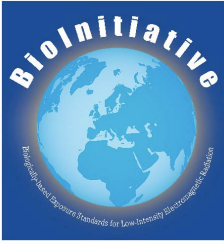
Genotoxicity

- Radiofrequency radiation exposure can induce genetic damage/changes in cells and organisms at non-thermal (low-intensity) exposure levels.
- This can lead to change in cellular functions, cancer, and cell death.
- 2010 Study in EHP reports reduction in DNA repair in human stem cells exposed to 915 MHz cell phone frequency at one meter or 0.037 W/Kg (Belyaev, 2010)



ELF and RFR Can Be Genotoxic at Low-Intensity Exposure Levels

- **There is substantial evidence that RFR may be considered genotoxic (cause DNA damage).** Of 28 total studies on radiofrequency radiation (RFR) and DNA damage, 14 studies reported effects (50%) and 14 reported no significant effect (50%). Of 29 total studies on radiofrequency radiation and micronucleation, 16 studies reported effects (55%) and 13 reported no significant effect (45%). Of 21 total studies on chromosome and genome damage from radiofrequency radiation, 13 studies (62%) reported effects and 8 studies (38%) reported no significant effects.
- **Extremely-low frequency (ELF-EMF) has also been shown to be genotoxic and cause DNA damage.** Of 41 relevant studies of genotoxicity and ELF-EMF exposure, 27 studies (66%) report DNA damage and 14 studies (44%) report no significant effect.



Stress Proteins (hsp)

- **Cells react to an EMR as potentially harmful:**
 - Direct interaction of ELF and RF with DNA has been documented and both activate the synthesis of stress proteins.
 - Biochemical pathway that is activated is the same pathway in both ELF and RF and it is non-thermal.
 - Existing limits do not protect us.



Brain Tumors and Acoustic Neuroma

- Studies on brain tumors and use of mobile phones for ≥ 10 years gave a consistent pattern of an increased risk for acoustic neuroma and brain tumors (gliomas).
- The risk is most pronounced for high-grade glioma. The risk is highest for ipsilateral exposure.
- Existing standards do not protect us.



Childhood Leukemia

- There is little doubt that exposure to ELF causes childhood leukemia.
- Children who have leukemia and are in recovery have 3 to 4.5 times poorer survival rates if their ELF exposure where they are recovering is between 1mG and 2 mG (Svensen et al, 2007); over 3 mG in another study (Foliart, 2006).
- Gene identified that impairs DNA repair capacity. A 4-fold increased risk for leukemia in children exposed to ELF near power lines. Yang, You, Jin, Xingming, Yan, Chonghuai, Tian, Ying, Tang, Jingyan and Shen, Xiaoming(2008) Case only study of interactions between DNA repair genes (hMLH1, APEX1, MGMT, XRCC1 and XPD) and low-frequency electromagnetic fields in childhood acute leukemia. Leukemia and Lymphoma ,49:12,2344 — 2350



Melatonin and Alzheimer's

- There is strong epidemiologic evidence that long-term exposure to ELF MF is a risk factor for AD.
- There is considerable in-vitro and animal evidence that melatonin protects against AD.
- Human studies indicate that MF exposure can decrease melatonin production.
- New exposure limits are warranted, and preventative action is needed now.

New report by Huss et al., 2009 Am J. Epidemiology reports doubling of AD risk for Swiss population living within 50 m of 220-360 kV line for 15 or more years.

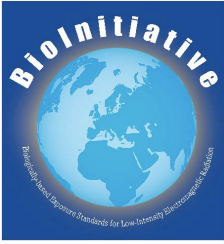


Neurological Effects

- Effects on neurophysiological and cognitive functions are quite well established.
- Pulsed high-frequency electromagnetic fields can affect normal brain functioning.
- CNS effects can occur at very low intensities (cell phone, base station, WI-FI levels).

Neurological Effects

- There is some evidence for effects on sleep, performance, judgment, reaction time, immune function, and behavior.
- There is good evidence for effects on learning and memory; synchronization of brainwave activity and cognition (electrical activity \wedge s at 0.1 W/kg).
- There is substantial evidence that RF is a stressor: chronic stress could have serious effects on general health and wellbeing.
- There is some evidence that low-level RF activates endogenous opioids (addictive center) in the brain.



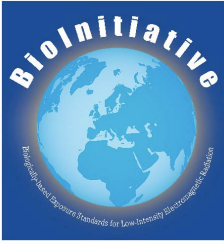
Immune Function

- Both human and animal studies report large immunological changes with exposure to environmental levels of electromagnetic radiation (EMR). Some of these exposure levels are equivalent to those of e.g. wireless technologies in daily life.
- Measurable physiological changes that are bedrock indicators of allergic response and inflammatory conditions are stimulated by EMR exposures (mast cells increase, for example).



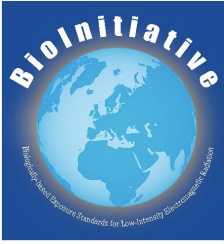
Immune Function Changes

- Over-reaction of immune system = inflammatory response
- Profound increases in mast cells in the upper skin
- Increased degranulation of mast cells and larger size of mast cells in electrohypersensitive individuals
- Presence of biological markers for inflammation that are sensitive to EMF exposure at non-thermal levels
- Changes in lymphocyte viability
- Decreased count of NK cells and T lymphocytes
- Negative effects on pregnancy (uteroplacental circulatory disturbances and placental dysfunction with possible risks to pregnancy).



Immune Function - Electrosensitivity

Electrical hypersensitivity is reported by individuals in the United States, Sweden, Switzerland, Germany, Denmark and many other countries of the world. Estimates range from 3% to perhaps 10% of populations, and appears to be a growing condition of ill-health leading to lost work and productivity.



Therapeutic Uses of PEMF

- Pulsed RF and PEMF are widely used in therapeutic medical applications (bone and wound healing).
- FDA approval for such devices is proof of effect.
- PEMFs have been shown to be effective in treating conditions of disease at energy levels far below current public exposure standards.
- Smart meters emit pulsed RF = indiscriminate and involuntary medical treatment of entire populations 24/7?



Conclusions

- ICNIRP and FCC limits are inadequate to deal with new wireless technologies and 60-Hz power frequency ELF.
- Exposures to ELF and RF - with chronic exposure, can reasonably be presumed to result in adverse impacts to health and well-being.
- Environmental levels of exposures are placing the public at risk. Children are particularly at risk.
- The standard of evidence for judging the science should be precautionary and preventative, given the evidence we have; requiring conclusive evidence is indefensible.
- There is inadequate warning to the public and there is no “informed consent”.
- No positive assertion of safety can be made.
- It is not in the public interest to wait.