



**Royal Society of Canada
Expert Panel: Safety Code 6**

Dr. Rob Tarzwell Presentation Notes

Date: October 30, 2013

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Project Update

RSC SC 6 Notes



Bad Science Watch

Bad Science Watch is an independent Canadian consumer protection organization dedicated to promoting good science in public policy.

The following was prepared by volunteers and represents what we believe to be an honest, fair, and science-based evaluation. We are an independent body that is funded by private donations and we do not represent any corporate interests.

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Preamble

The following notes represent the body and supporting documentation from an oral presentation by Bad Science Watch science adviser Dr. Rob Tarzwell to the Royal Society of Canada's Expert Panel on Safety Code 6. References follow.

Presentation Notes

I would like to argue in favour of maintaining the current standard

My own background:

- Qualified in and practicing nuclear medicine: the use of sealed and unsealed sources of ionizing radiation in the diagnosis and treatment of disease, including pure and applied knowledge of radiobiology, special interest in functional neuroimaging in psychiatric disorders
- Qualified in and practicing psychiatry: special focus during training in the diagnosis and treatment of somatization in the form of medically unexplained symptoms
- Published research in the diagnosis and management of medically unexplained symptoms driven by psychological factors in the ER setting
- Published research in the use of functional neuroimaging with radiotracers in psychiatric disorders

Radiobiology

First, I would like to address the radiobiology:

- Radiobiologically, we have a deep understanding of the physical effects of EM radiation on living tissue
 - Ionizing radiation :
 - >1 eV: removal of orbital electrons, can damage DNA, more likely create free radicals and superoxides which cause free radical cascades leading to intracytoplasmic/intranuclear damage → apoptosis, carcinogenesis, defensive responses (melanin)
 - Non-ionizing radiation:
 - static fields (e.g. MRI)

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- low frequency EM with wavelength larger than the human body, surface interaction
- excitation (e.g. retina, photosynthesis)
- **RF range: 100 kHz to 1 300 GHz, specifically 900 MHz - 1 GHz
- heating of tissue, mainly via induction of current in H₂O dipole, but any molecule with a dipole

Mechanism

There is no known plausible radiobiological mechanism for the induction of the specific symptom cluster of Idiopathic Environmental Sensitivity Induced by EMF (IEI-EMF)

- Key distinction: physical effects (warming) vs somatic symptoms:
 - redness (possibly hyperemia from warming)
 - tingling
 - facial burning (possible from high power exposures)
 - fatigue
 - tiredness
 - decreased concentration
 - dizziness
 - nausea
 - palpitations
 - GI distress
 - Social, occupational, mental impairment

Furthermore, multiple blinded, controlled experiments seeking a link between EM radiation and somatic symptoms have failed to establish one (Baliatsas, 2011).



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Psychology

Now, turning to the psychological realm

- An alternate explanation exists, somatization, which parsimoniously accounts for multiple lines of evidence:
 - Symptoms are provoked by perceived exposure but not by actual exposure which is non-perceived.
 - CBT, a form of psychotherapy, is the only treatment which has shown efficacy in treating IEI-EMF.
 - The symptoms themselves show heavy overlap with symptoms seen in primary care and specialty clinics which are ultimately attributable to somatization.
 - Symptoms can be provoked psychologically, e.g. watching a video on the dangers of WiFi exposure followed by sham exposure.
 - Symptoms are more common in individuals with higher levels of reported anxiety and overlap significantly with symptoms of anxiety: flushing, tingling, dizziness, palpitations, GI distress, functional impairment, and anxiety is *commonly* mistaken for a medical illness or even catastrophe, to the degree where this phenomenon is a common cultural trope (anxious individual has panic attack, believes it's heart attack, goes to hospital)

Neuroimaging

Finally, I address the functional neuroimaging studies which purport to show a putative link between 1 GHz EMR and changes in brain perfusion or metabolism

- First, it is known that EMF, is capable of influencing neuronal metabolism. This is the basis of transcranial magnetic stimulation, done with sufficient power to evoke motor neuron firing.
- PET study in humans (had no effects with 30 min exposure in 9 volunteers at 1.9 GHz)
- Volkow 2011: Minimal increased (33.3 vs 35.7 umol/100g in region near antenna) with increased metabolism correlating with energy absorbed: “unknown significance”
 - Didn't control for simple heat output from battery power consumption
 - Areas affected were distant from areas closest to phone antenna, which themselves were unaffected

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- Investigators were not blinded and statistics relied on knowing which side had activation of the cell phone
- Statistical results were not internally consistent: demonstrating a tight linear correlation but with a claimed effect only just above the 95% CI
- “Figure 2” in Volkow shows a whole brain increase in glucose metabolism from “off” to “on,” not simply a regional increase, and yet they claim only a regional effect. This overall increase is not accounted for in the analysis and is plausibly not irrelevant to the orbital increase
- Mori and Arendash (2011) have demonstrated beneficially increased neuronal activation in mutant and control mice both with cognitive performance and in vivo markers of neuronal activation (c-fos expression in neurons)
- Kwon et al (2011) reported suppression of glucose metabolism from mobile.
- Replication of the Volkow results has not been reported.

Essentially, it is simply not possible to know what to make of this literature, if anything at all, with regard to humans.

Conclusion

To change the safety standard for a psychologically driven phenomenon may paradoxically result in aggravation of that phenomenon at a national scale due to the media attention such a change would almost certainly draw given the circumstances under which it is being scrutinized (Witthoft and Rubin, 2013).

References

Baliatsas, C., Kamp, I.V., Le Bret, E., and Rubin, G.J. (2012). Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): A systematic review of identifying criteria. *BMC Public Health* 12, 643.

Davis, C.C., and Balzano, Q. (2011). Cell Phone Activation and Brain Glucose Metabolism. *JAMA: The Journal of the American Medical Association* 305, 2066–2067.

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Kwon, M.K., Kim, S.K., Koo, J.M., Choi, J.Y., and Kim, D.W. (2012). EHS subjects do not perceive RF EMF emitted from smart phones better than non-EHS subjects. In 2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), pp. 2190–2193.

Kwon, M.S., Vorobyev, V., Kännälä, S., and Laine, M. (2011). GSM mobile phone radiation suppresses brain glucose metabolism. *Journal of Cerebral Blood Flow and Metabolism* 31, 2293.

Mori, T., and Arendash, G.W. (2011). Long-Term Electromagnetic Field Treatment Increases Brain Neuronal Activity: Linkage to Cognitive Benefit and Therapeutic Implications for Alzheimer's Disease. *J Alzheimers Dis* 1, 1–4.

Nieto-Hernandez, R., Rubin, G.J., Cleare, A.J., and Weinman, J.A. (2008). Can evidence change belief? Reported mobile phone sensitivity following individual feedback of an inability to discriminate active from sham signals. *Journal of Psychosomatic Research* 65, 453.

Schröttner, J., Leitgeb, N., and Hillert, L. (2007). Investigation of electric current perception thresholds of different EHS groups. *Bioelectromagnetics* 28, 208–213.

Volkow ND, Tomasi D, Wang G, and et al (2011). Effects of cell phone radiofrequency signal exposure on brain glucose metabolism. *JAMA* 305, 808–813.

Witthöft, M., and Rubin, G.J. (2013). Are media warnings about the adverse health effects of modern life self-fulfilling? An experimental study on idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF). *Journal of Psychosomatic Research* 74, 206–212.