



FORENSIC APPLICATIONS CONSULTING TECHNOLOGIES, INC.

CLUSTER PHOBIA

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Speaking of scientific myths ...

Regarding overhead power-lines, someone recently asked me if “the science is settled” on the issue of nonionizing radiation (NIR) and leukemia and then quoted a “scientific paper.”

One of the biggest problems with scientific papers is that they are often reviewed by non-scientists who don’t know the language of science. The net result is the nonscientist, having read the same article as a scientist, usually interprets the paper in a manner that isn’t even close to the intended message.

The second largest problem with scientific papers is scientific misconduct.

The U.S. National Academy of Sciences in *The Proceedings of the National Academy of Sciences*, is arguably one of those still-reliable sources of objective science. Therefore, when a 2012 paper(1) appeared in *The Proceedings*, titled “*Misconduct Accounts for the Majority of Retracted Scientific Publications*,” it should have been particularly

noteworthy. The authors revealed that the most common reason for retraction of 2,047 peer reviewed articles was fraud/suspected fraud.

These two aspects of “scientific studies” can conspire to produce the fodder of the news media culture – sensationalism. This is primarily because journalists fit into the first category and contribute to the second by either intentionally or unintentionally confusing “*association*,” “*correlation*” and “*causation*” with clock-work regularity.

One of the most remarkable journeys of scientific fraud witnessed in recent years from conception to moribundity is the myth of overhead power lines and cancer (and the spin-off exposures to other non ionizing radiations).

The origination of this myth starts with the remarkable report by Wertheimer and Leeper. (2) I say “remarkable” because it is remarkable that such junk science ever made it to print, and, in spite of the pathological flaws, this “scientific” paper took on a life of its own in the popular media. (I actually have an inside track on one of the authors and as soon as enough people die, I may share some stories).

The original “study” was so badly designed, so poorly executed and poorly founded on actual science that it was immediately discounted as bunk by real scientists who bothered to actually read the original paper.

The paper purported to demonstrate that EMFs from overhead power-lines caused cancer. In fact, as designed, the study didn’t even study the link between cancer and EMFs, rather, as designed, at best, the “study” (which didn’t actually study anything at all) was an inventory of cable diameters in selected residential areas. The study didn’t demonstrate correlation, it didn’t even demonstrate association and it certainly didn’t demonstrate causation. But, with the help of hungry journalists prowling for a good scare, it DID cause a big splash and as a result, there are still people who wrongly believe that EMFs from hair dryers, electric blankets, and overhead lines will give you cancer, in spite of a lack of evidence.

At the heart of the “study” was the concept of “clusters.” Epidemiologically, a recognized difficulty in the investigation of reported clusters is that there usually are no predetermined boundaries (spatial or temporal). Rather, for most investigators, the number of illnesses has defined the boundaries of the cluster. That is, “the tail has wagged the dog” instead of the other way around. It is the apparent cluster observation that usually prompts the study in the first place, and is the impetus for the financial backing (or political agenda) of the study.

Therefore, such a study has, as its foundation, an underlying selectional bias. In truth, it is virtually impossible to determine whether the number of cases is in excess of the number that might be attributable to chance alone without *a priori* defined boundaries (spatial and temporal). In the EMF/childhood disease studies indicating a significant association, a priori conditions were not established.



A common pitfall of the average person's perception of an illness density for a given boundary (occupational or geographical) as “unusually high” is the definition of the sample size. The difference between an apparent elevation in illness density (sudden occurrences of cases) between the sub-group sample (in this case, people living near a sub-station, or children cases in a particular geographical location) and the normal background prevalence cannot be considered where the sub-group is defined exclusively by the cases. And yet, that is exactly what many of the EMF studies have done.

For a very good example of how a cluster study with good intentions can go horribly wrong, and end up showing a causation where in fact the incident rate of leukemia is actually LOWER in the exposed population than in the general population, one may revisit the critical reviews associated with the Sellafield leukemia studies and more level headed follow up studies. (3)(4)(5)(6)

During the next few years following the Wertheimer fiasco, there was a VAST amount of money wasted as researchers scrambled for available dollars and had no qualms with laboring under a false misconception.

Then, in August of 1998, a report (7) was released by an unimaginative group of objective scientists who clearly could not see the fun (and finances) in all the drama. The Working Group for the leukemia and lymphoma model organized by the NIEHS and the EMF Research and Public Information Dissemination (EMFRAPID) Program through United States Department of Energy and the National Institute of Environmental Health Sciences/National Institutes of Health poured water on the parade:

Two long-term bioassays demonstrated no carcinogenic response, and one showed an equivocal response at one tumor site in animals of one sex of one species. Within the limits of the experimental model of multistage mammary carcinogenesis, the results of the ensemble of experiments do not provide convincing evidence for a promoting effect of EMF on chemically induced mammary cancer. In another commonly investigated model, skin carcinogenesis, exposure to magnetic fields had no effect. EMF did not promote leukemia or lymphoma in mice or rats in several studies.

In several long-term bioassays, no association was found between exposure to magnetic fields and brain cancer; however, the sensitivity of rodent models for assaying brain cancer has not been well established.

Most of the investigations carried out until now have followed the pattern of the traditional testing of chemical agents suspected to be carcinogenic. While additional traditional studies are fully justified and may produce useful results, it is conceivable that investigations of the role of the factors involved in the multistep, multifactorial carcinogenesis process (perhaps including EMF) may require different approaches than those used until now.

The overall conclusion of the Working Group is that most of the studies suggest a lack of carcinogenicity, and the few with borderline positive results are inadequate to conclude that exposure to magnetic fields at the magnitude and field configurations at which they were investigated increases the incidence of cancer in rodents.

There is inadequate evidence in experimental animals for carcinogenicity from exposure to extremely low frequency electromagnetic fields.



This conclusion was supported by 19 of the 29 members of this particular Working Group within the international consortium gathered to investigate the issue; there were 8 members who voted for a 'lack' of evidence of carcinogenicity, there was 1 abstention and 1 absent.

Finally, specific to EMF induced leukemia in children, that particular NIEHS working group concluded:

The majority (20 out of 26) of the Working Group members who voted concluded there is limited evidence that residential exposure to ELF magnetic fields is carcinogenic to children on the basis of the results of studies of childhood leukemia; the remaining 6 voting members concluded that there was inadequate evidence. Three lines of evidence supported the overall finding: the association between exposure to calculated magnetic fields and risk for childhood leukemia, the association between exposure to measured 24-h magnetic fields and risk for childhood leukemia, and continued concern about the association between wire codes and risk for childhood leukemia. There was inadequate evidence from spot measurements of magnetic fields in homes to support this finding.

Now, does this mean that the “science is done”? Of course not – As the dynamic human continues to evolve (physiologically as well as environmentally), the NIR exposure scenarios also change. However, neither does this mean that researchers and government bodies are justified in constantly stirring the pot with “uncertainty” just to keep them employed until retirement. (As seen with some environmental issues such as radon, and Global Warming).

As a result of the silliness produced, we see products such as that featured in the photograph at the top, which is a personal Faraday cage sold by “LessEMF dot com.” For a mere \$79.95, you too can own one of these personal protective devices and simultaneously publicly advertise your ability to understand science. (Photo credit and possible copyright, “LessEMF dot com” Used here without permission in good faith under the fair use doctrine.)

References:

- 1) Fang FC, Steen RG, Casadevall A, 2012
- 2) Wertheimer N, Leeper E. *Electrical wiring configurations and childhood cancer*. Am J Epidemiol. 1979 Mar;109(3):273-84.
- 3) Babbitt, J.T., Kharazi, A.I., Taylor, J.M.G., et al, *Leukemia/lymphoma in mice exposed to 60 Hz magnetic fields: Results of the chronic exposure study*. EPRI: Los Angeles, 1998
- 4) Shen, Y.H., Shao, B.J., Chiang, H., Fu, et al, *The effects of 50 Hz magnetic field exposure on dimethylbenz(alpha)anthracene induced thymic lymphoma/leukemia in mice* Bioelectromagnetics, 18, 360-364, 1997
- 5) McCormick, D.L., Ryan, B.M., et al, *Magnetic field exposure and risk of lymphoma in PIM transgenic and TSG-p53 (p53 knockout) mice*. Carcinogenesis 1998



6) Harris, A.W., Basten, A., Gebski, V., et al, *A test of lymphoma induction by long-term exposure of Em- Pim1 transgenic mice to 50 Hz magnetic fields*. Radiation Research, 149, 300-307, 1998

7) Assessment of Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields: Working Group Report, (Organized by the NIEHS with support of the EMF Research and Public Information Dissemination (EMFRAPID) Program through the United States Department of Energy and the National Institute of Environmental Health Sciences/National Institutes of Health, Portier CJ and Wolfe MS Eds. NIH Publication No. 98-3981

