

Report to the Workplace Safety and Insurance Appeals Tribunal

Breast Cancer and Occupational Exposure to Electromagnetic Fields

Response to Request from Heidi Evelyn, Tribunal Counsel Office,
Workplace Safety and Insurance Appeals Tribunal

Dated: January 7 & 9, 2009.

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February 9, 2009

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Breast Cancer and Occupational Exposure to Electromagnetic Fields, February 9, 2009

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Dated: January 7 & 9, 2009.

Heidi Evelyn sent me two letters (January 7 & 9, 2009) requesting copies of papers that I referenced in my original report to the Workplace Safety and Insurance Appeals Tribunal. I was unable to meet the January 28, 2009 deadline. Attached are the documents requested that I was able to find (Request A).

It is my understanding that there were other requests that Ms Evelyn did not include in the January 7 and 9 2009 letter. The following come to mind but there may have been others.

- Request B. Mr Gilbert asked me if I thought that 2 mG was a safe limit and my response was “no”. He asked me to justify my answer and to cite the references upon which it was based.
- Request C. I was challenged on my statement that 2 to 4 mG is a critical level for childhood leukemia.
- Request D. I was also asked to provide information about the Liburdy Affair.

Request A. Copies of references cited.

The following references appeared in my original report (November 2008) and were requested. Those in “red” (12) were made available during the hearing. Those in “blue” (18) are provided in full as an attachment. Those in “green” (6) have abstracts provided (Appendix A). I was unable to find 4 documents but these are fully referenced and can be obtained directly from the journals cited.

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Request B. Mr Gilbert asked me if I thought that 2 mG was a safe limit and my response was “no”. He asked me to justify my answer and to cite the references upon which it was based.

Is 2 mG a safe magnetic field exposure?

No, I do not think that 2 mG is a safe exposure. We have scientific evidence that lower levels have been associated with cancers. Three types of studies come to mind.

One we discussed during my cross-examination (please refer Table 2, [Feychting et al. 1998](#)). For ER+ breast cancer among women younger than 50, exposed to magnetic fields **at or above 1 mG the OR was 7.4 and the 95% CI was 1.0-1.78.**

The second type of study is with childhood leukemia (see 3 studies in Table 2) where a statistically significant increased risk of childhood cancers was associated with magnetic flux densities below 2 mG. One of these studies was conducted in Toronto by [Green et al. 1999](#) and shows a relationship between childhood leukemia and electromagnetic field exposure. With an average magnetic flux density of **1.4 mG there was a statistically significant increased risk for all childhood leukemias with an odds ratio of 4.5 and a 95% CI 1.3-15.9.** This was for the adjusted odds ratios (Table 4 in Green et al. 1999). With an adjusted OR potential confounders are eliminated. This study is based on children wearing for 48 hours a personal monitoring device, which is known to be one of the most accurate methods of assessing exposure. Reference is provided as attachment (Appendix B).

A third study by [Feychting et al. 2000](#) showed a statistically significant increased risk of children developing leukemia when their fathers were occupationally exposed to magnetic fields between **1.3-2.1 mG (1.6 OR, 1-2.5 95% CL).** Reference is provided as attachment.

I expect there are other studies but these should suffice to show that 2 mG is not necessarily the lowest magnetic flux density associated with cancer risk.

SAFETY FACTOR

Another important fact that needs to be considered when a particular level of exposure is associated with a health risk is that agencies responsible for setting guidelines often include a **safety factor** to ensure that workers and the public are protected.

For example Health Canada established [Safety Code 6, Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz](#). For frequencies between 100 kHz and 10 GHz, the SAR (specific absorption rate) takes precedence over field strength. The SAR (specific absorption rate) is set to avoid a thermal effect.

Safety Code 6: Safety Factor for SAR (page 11).

For exposure limits of RF and microwave exposed workers, a safety factor of approximately 10 was incorporated with reference to the scientific-consensus threshold for adverse health effects. For other persons including the general public, an additional safety factor (2 to 5) was included to arrive at lower limits. The incorporation of these safety factors is to provide for all possible conditions under which the exposure might occur.

If we used the same rationale for low frequency magnetic fields we would have the following limits established for workers and the public based on our initial estimate of the threshold for adverse effects (Table 1).

TABLE 1. Threshold for adverse effect of low frequency magnetic fields and applied safety factors to protect workers and public (Based on RF exposure in Safety Code 6; 10 times for workers, additional 2 to 5 times for public).

Study	Threshold mG	Workers mG	Public mG	Reference
breast cancer <i>in vitro</i> studies	12	1.2	0.24 - 0.60	Liburdy, Blackman, etc.
childhood leukemia (high estimate)	4	0.4	0.08 - 0.20	Ahlbom et al. 2000
childhood leukemia (intermediate)	3	0.3	0.06 – 0.15	Greenland et al. 2000
childhood leukemia (low estimate)	2	0.2	0.04 - 0.10	Wartenberg 2001

NOTE: papers in Table 1 are provided as attachments (Appendix B).

Request C. I was challenged on my statement that 2 to 4 mG is a critical level for childhood leukemia.

Some international agencies agree that there is an association between magnetic field exposure in the home and childhood leukemia and often mention 4 mG as the “threshold” value. Yet clearly scientific studies show an increased risk around 2 mG and some at lower values (Table 2). A statement that 4 mG is the threshold value at which childhood cancer risk increases is clearly a misrepresentation of the data. What we find is that as the exposure increases so does the risk. This “dose/response” relationship is one of the criteria for causation according to the Bradford Hill-Criteria that we discussed at the appeal.

TABLE 2. Childhood cancer and exposure to magnetic fields in the home. The odds ratio (OR) and the 95% confidence intervals (CI) associated with specific magnetic flux densities (MFD) expressed in milli Gauss (mG) are provided as well as the location where the studies were done. Based on Havas 2000 plus more recent references. (References in blue attached.)

MFD (mG)	OR	95% CI	Location	Source
Epidemiological Studies				
1.15 [#]	2.2	1.1-4.3	US	London et al. 1991
1.38	2.9	1.0–7.3	Sweden	Feychting and Ahlbom 1993
1.4	4.5	1.3-15.9	Toronto, Canada	Green et al. 1999*
2–4	2.4	1.1–5.4	Germany	Schuz et al. 2001**
>2.0	1.89	1.1-3.26	Germany	Meinert and Michaelis 1996
>2.0	2.0	1.0-4.1	Sweden	Feychting et al. 1995
≥2.0	6.3	1.5-26	Sweden	Feychting et al. 1997
>2.2	2.8	0.9–8.3	Colorado, USA	Savitz et al. 1988
>2.5	3.0	1.8–5.0	Colorado, USA	Wertheimer and Leeper 1979
2.0–2.8	2.2	1.1-4.3	Sweden	Floederus et al. 1993
≥2.9	3.0	1.6-5.8	Sweden	Floederus et al. 1993
>3.0	1.62	1.1-2.39	Germany	Meinert and Michaelis 1996
>3.0	3.8	1.4–9.3	Sweden	Feychting and Ahlbom 1993
>4.0	4.3	1.3–14.7	Germany	Schuz et al. 2001**
>4.0	5.0	-	Denmark	Olsen 1992
>4.1	3.7	1.8-7.7	Sweden	Floederus et al. 1993
4-5	6.4	1.3-32	USA	Linet et al. 1997***
>5.0	5.1	2.1-12.6	Sweden	Feychting et al. 1995
Meta-Studies				
≥2	1.34	1.07-1.67	14 studies	Wartenberg et al. 2001
≥3	1.83	1.34-2.49	12 studies	Greenland et al. 2000
≥4	2.0	1.27-3.13	9 studies	Ahlbom et al. 2000

[#] mean value; * 48-h personal monitor; ** nighttime exposure (10 pm to 6 am); *** 24-h measurements

Request D. I was also asked to send information about the Liburdy Affair

The science showing that *in vitro* magnetic fields of 12 mG are able to disrupt the oncostatic effect of both tamoxifen and melatonin on human breast cancer cells is highly damaging to Bell Canada in this case. For this reason Mr. Gilbert set out to discredit the science. He attempted to have this information dismissed because of something that has come to be known as the “Liburdy Affair” (Appendix C).

However, Liburdy’s research on melatonin or tamoxifen has never been criticized. His research has been independently replicated, which-I mentioned before-is the gold standard in science. Mr. Gilbert tried to insinuate that perhaps Liburdy contaminated his breast cancer cells and thus “fudged” the data. Liburdy then provided these “contaminated” cells to others who replicated his results.

What were the cultures contaminated with? Yeast, bacteria, viruses? Sterile technique is used to prevent this from happening. Furthermore, these contaminants can be detected under the microscope and would have been detected during routine cell enumeration.

The only thing that would affect the results is if the original breast cancer cells mutated into a form that was different and, Mr. Gilbert would have you believe, more sensitive to magnetic fields than the original culture. If Liburdy was indeed able to deliberately generate a sub-strain of more sensitive breast cancer cells this would be a scientific breakthrough and would be hailed as such.

The suggestion that Liburdy did not use proper sterile technique, that he deliberately “contaminated” his cultures with something that would dramatically change the results and then gave these contaminated cells to other labs where scientists blindly did the testing without recognizing this contamination is preposterous. It is based on fiction not fact and Mr. Gilbert hasn’t a shred of evidence to back up his insinuations. Mr Gilbert is clutching at straws.

This fictional account is intended to minimize this important research because it supports the fact that women who are being treated for breast cancer and are exposed to a magnetic fields may have their recovery compromised. The fact that 2 of the 3 women who went back to work died of breast cancer, while the one who refused to return is still alive is consistent with the results obtained by all the labs that have tested estrogen-responsive breast cancer cells and their response to both tamoxifen and melatonin in a high magnetic field.

Those who testify at a hearing are sworn to tell the truth. They are expected to support their statements with factual evidence. Lawyers should be held to the same high level of accountability. Had I made the statements that Mr. Gilbert made about Dr. Liburdy I would be committing libel.

Concluding Remarks of Dr. Havas

The original premise upon which this appeal is based is that magnetic fields in the work place contributed to the development of breast cancer among 3 women in a building in Hamilton.

It is based on the following evidence:

1. There was a breast cancer cluster within a short period of time in this building with 5 breast cancers reported when 0.5 were expected. This represents a risk of 10-fold (or 900% increase risk) and is much higher than any of the data presented in this report except the Milham study of 3 breast cancers among men.
2. Three of the five women believed that the workplace contributed to their breast cancer. These 3 women were young, healthy, active with young families and no family history of breast cancer and no lifestyle habits or physiological markers that are associated with breast cancer (smoking, drinking, diet, weight, menses, parity, etc).
3. These 3 women worked in front of computers and were exposed to electromagnetic fields.
4. Scientific studies have reported an association between various types of cancers and occupational magnetic field exposure.

So, it was a valid assertion that since these women were surrounded by computers they were exposed to magnetic fields. Indeed the average exposure was estimated to be 1.86 mG.

So the question was, *“Is there any evidence that an average magnetic field of 1.86 mG could contribute to breast cancer among any or all of these three women?”*

The answer to that question is “yes” based on epidemiological studies of occupational exposure, on *in vivo* studies with rats showing cancer promotion, and based on *in vitro* studies showing that breast cancer “recovery” may be compromised in a high magnetic field environment.

BUT other aspects of exposure in the workplace that may contribute to breast cancer have been completely ignored and it would be negligent of me not to mention them.

In addition to magnetic fields, these women were exposed to:

1. **microsurges** (high frequency transients) generated by the computers (kHz range), which have been associated with cancers ([Milham and Morgan 2008](#));
2. **contact current** flowing through their body from touching the keyboard. This contact current is associated with cancer at levels of 18 micro Amps ([Kavet 2000](#)) and, in conjunction with magnetic fields, generates a greater risk of cancer ([Wertheimer et al. 1995](#)).
3. **brominated flame retardants** are present in computers and are known endocrine disruptors. They are degassed from plastics and elevated concentrations are found in breast milk among women who work on computers. These brominated chemicals have been linked with higher risks of lymphoma and breast cancer ([Siddiqui 2003](#)).

Respectfully Submitted February 9, 2009
Magda Havas

APPENDIX A
Abstracts for Nov 2008 and Feb 2009 Reports

9. Demers et al. 1991.

Am J Epidemiol. 1991 Aug 15;134(4):340-7.

Occupational exposure to electromagnetic fields and breast cancer in men.

Demers PA, Thomas DB, Rosenblatt KA, Jimenez LM, McTiernan A, Stalsberg H, Stemhagen A, Thompson WD, Curnen MG, Satariano W, et al.

Data from a population-based case-control study of breast cancer in men were used to examine the hypothesis that occupational exposure to electromagnetic fields increases the risk of breast cancer. Incident cases (n = 227) diagnosed between 1983 and 1987 were obtained from 10 population-based cancer registries of the Surveillance, Epidemiology, and End Results program of the National Cancer Institute. Controls (n = 300) were selected by random digit dialing and from Medicare eligibility lists. Exposure status, defined as ever having been employed in a job which has been classified as involving potential exposure to electromagnetic fields, was assigned without knowledge of case/control status. An elevated risk was found for any job with exposure (odds ratio (OR) = 1.8, 95 percent confidence interval (CI) 1.0-3.7), and risk was highest among electricians, telephone linemen, and electric power workers (OR = 6.0, 95 percent CI 1.7-21) and radio and communications workers (OR = 2.9, 95 percent CI 0.8-10). Risk did not vary with duration of exposed employment. The risk was highest among subjects who were first employed in jobs with exposure before the age of 30 years and who were initially exposed at least 30 years prior to diagnosis. These results lend support to the theory that electromagnetic fields may be related to breast cancer in men. The hypothesis warrants evaluation in women.

11. Feychting et al. 1997.

Epidemiology 1997 Jul;8(4):384-9.

Occupational and residential magnetic field exposure and leukemia and central nervous system tumors.

Feychting M, Forssén U, Floderus B.

Studies of magnetic field exposure and cancer have focused on either residential or occupational exposure. We conducted a case-control study taking into account both exposure sources. We identified leukemia and central nervous system tumor cases and controls from a population living within 300 m of transmission lines in Sweden. We have previously reported results considering residential exposure alone. Here, we evaluate the effect of occupational exposure and of the combined exposures. We estimated residential exposure through calculations of the magnetic fields generated by power lines. We obtained information about occupation from censuses and linked the occupations to a job-exposure matrix based on magnetic field measurements. For occupational exposure of ≥ 0.2 microT, we estimated the relative risk for leukemia to be 1.7 [95% confidence interval (CI) = 1.1-2.7]. The increased risk was confined to acute myeloid and chronic lymphocytic leukemia. For residential exposure of ≥ 0.2 microT, the relative risk for leukemia was estimated at 1.3 (95% CI = 0.8-2.2), with higher risk estimates for acute and chronic myeloid leukemia. We estimated the relative risk for leukemia among subjects highly exposed both at home and at work to be 3.7 (95% CI = 1.5-9.4). These results provide support for an association between magnetic field exposure and leukemia. Relative risks for nervous system tumors were close to unity.

12. Feychting et al. 1998.

Epidemiology. 9(4):392, July 1998.

Magnetic Fields and Breast Cancer in Swedish Adults Residing near High-Voltage Power Lines.

Feychting, Maria; Forssen, Ulla; Rutqvist, Lars Erik; Ahlbom, Anders

Abstract: We conducted a case-control study to test the hypothesis that residential magnetic field exposures increase the incidence of breast cancer. The study was based on people who had lived within 300 m of 220- or 400-kV power lines in Sweden at any time between 1960 and 1985. We identified 699 cases of breast cancer in women and 9 cases in men. One matched control per female case and eight per male case were selected at random. Estrogen receptor information was available for a subset of female cases. We assessed magnetic field exposure through calculations of the magnetic fields generated by the power lines before diagnosis. For calculated magnetic field levels ≥ 0.2 microtesla (μT) closest in time before diagnosis, we estimated the relative risk to be 1.0 [95% confidence interval (CI) = 0.7-1.5] for women and 2.1 (95% CI = 0.3-14.1) for men. Women younger than 50 years of age at diagnosis had a relative risk of 1.8 (95% CI = 0.7-4.3). For women with estrogen receptor-positive breast cancer, the relative risk was estimated at 1.6 (95% CI = 0.6-4.1), using the exposure cutoff point ≥ 0.1 μT . Among estrogen receptor-positive women younger than 50 years at diagnosis, the relative risk increased to 7.4 (95% CI = 1.0-178.1). (C) Lippincott-Raven Publishers.

13. Floderus et al. 1994.

Cancer Causes Control 5: 189-194.

Incidence of selected cancers in Swedish railway workers, 1961–79

Birgitta Floderus¹, Siv Törnqvist¹ and Carin Stenlund¹

Abstract Among all Swedish men, 20 to 64 years of age and employed in 1960, railway workers were selected and compared with the population at large, concerning the incidence of leukemia, lymphoma, tumors of the brain, breast, and the pituitary gland. The study was a re-analysis of the 1961–79 incidence data previously showing no increase in risk for leukemia and brain tumors for railway workers. In the present study, follow-up was divided into two 10-year periods, and elevated relative risks (RR) were found for the first decade. For the first decade, engine drivers and conductors combined had an RR of chronic lymphocytic leukemia, acute myeloid leukemia, and lymphoma of 1.9 (95 percent confidence interval [CI]=0.9–4.0), 1.4 (CI=0.4–4.3), and 1.0 (CI=0.5–1.9), respectively. For all brain tumors, the RR was 1.2 (CI=0.8–1.9), with a higher risk estimate for those below age 30 (RR=12.2, CI=2.8–52.5). Three cases of breast cancer and nine cases of tumors of the pituitary gland occurred among engine drivers and conductors, corresponding to RRs of 4.9 (CI=1.6–11.8) and 3.2 (CI=1.6–6.2), respectively. Work on trains entails extremely high exposure to low frequency magnetic fields (EMF). The results give some support to the hypothesis of an association between EMF and certain types of cancers. The outcome for the pituitary gland, being a focal point of hormonal regulation, suggests a hormonal link.

24. Kliukiene et al. 2003.

Eur J Cancer Prev 12(4):301-7 (2003)

Follow-up of radio and telegraph operators with exposure to electromagnetic fields and risk of breast cancer

Kliukiene J., Tynes T. and Andersen A.

It is still unclear whether exposure to electromagnetic fields (EMF) is associated with breast cancer. To further investigate the issue, we followed-up a cohort of Norwegian female radio and telegraph operators in the period 1 January 1961 to 31 May 2002, with 99 breast cancer cases. The standardized incidence ratio (SIR) for breast cancer was 1.30 (95% confidence intervals (CI) 1.05-1.58), compared with the total Norwegian female population. In a subsequent nested case-control study, exposure to radio frequency (405 kHz-25 MHz) and extremely low-frequency (50 Hz) fields due to stay in the radio room during day and night was cumulated by years of employment and workload according to ship type. The exposure was assessed in two age groups (<50, 50+) with regard to risk of breast cancer. The odds ratios in the group with the highest cumulative exposure were 1.78 (95% CI 0.59-5.41) and 2.37 (95% CI 0.88-6.36) in the younger and the older women, respectively. P-value for trend was 0.03 in both age groups. The results of the oestrogen receptor status analysis by exposure to EMF showed an increased risk of oestrogen receptor-positive breast cancer in the younger women, while the older age group had an elevated risk of oestrogen receptor negative breast cancer. Thus, the present study contributes to the hypothesis of an association between occupational exposure to EMF and increased risk of breast cancer.

29. Loomis et al. 1994.

J Natl Cancer I 86(12):921-5 (1994)

Breast-Cancer Mortality among Female Electrical Workers in the United States.

Loomis D. P., Savitz D. A. and Ananth C. V.

Background: Previous epidemiologic studies have suggested that exposure to electric or magnetic fields in occupational and residential environments may cause cancer, Recent experimental findings provide some support for the hypothesis that exposure to extremely low-frequency electromagnetic fields reduces the pineal gland's nocturnal production of the hormone melatonin, thereby increasing susceptibility to sex hormone-related cancers such as breast cancer. **Purpose:** Our purpose was to assess the evidence that cancer of the female breast might be associated with exposure to extremely low-frequency electromagnetic fields. **Methods:** Records of women who had breast cancer as the underlying cause of their death (ICD-9 174) and control subjects (four per case) were selected from computer files of U.S. mortality data for the years 1985-1989. Women 20 years and older at the time of their death were eligible for inclusion if they were residents of and died in one of the 24 states that provided death certification records with occupation and industry codes to the National Center for Health Statistics for at least 1 year during the study interval. Data from death certificates were used to classify the case and control subjects with regard to potential occupational exposure to electric and magnetic fields. Control subjects were a random sample of women who died of any other underlying cause, excluding leukemia and brain cancer. **Results:** The data analysis contrasted 68 women with breast cancer and 199 controls, all with electrical occupations, with 27 814 women with breast cancer and 110 750 controls, all of whom had other occupations. Electrical workers had excess mortality from breast cancer relative to other employed women [odds ratio (OR) = 1.38; 95% confidence interval (CI) = 1.04-1.82]. Adjusted ORs for specific electrical occupations were 1.73 (95% CI = 0.92-3.25) for electrical engineers, 1.28 (95% CI = 0.79-2.07) for electrical technicians, and 2.17 (95% CI = 1.17-4.02) for telephone installers, repairers, and line workers. There was no excess of breast cancer, however, in seven other occupations held more frequently by women and also involving potentially elevated electrical exposures, including telephone operators, data keyers, and computer operators and programmers. **Conclusions:** In light of the limitations inherent in death certification data and the design of this study, any conclusions regarding the hypothesis that exposure to extremely low-frequency electromagnetic fields causes breast cancer among women must be limited. Nevertheless, our findings are broadly consistent with that hypothesis and encourage further investigation with improvements in study design and data quality.

For Present Report: Wertheimer et al. 1995.

Bioelectromagnetics 16(2):86-96.

Childhood cancer in relation to indicators of magnetic fields from ground current sources

Nancy Wertheimer, David A. Savitz, Ed Leeper

Abstract

This study examines childhood cancer risk in relation to certain factors likely to indicate magnetic field exposure from ground currents in the home. Substantial ground currents are most often found in homes having conductive plumbing, in which an uninterrupted metallic path in the water pipes and water main connects the grounding systems of neighboring houses. Information on plumbing conductivity was obtained from water suppliers for the homes of 347 cases and 277 controls identified in an earlier study of magnetic field exposure and childhood cancer in the Denver area. An increased cancer risk was observed for children in homes with conductive plumbing: The matched odds ratio was 1.72 (1.03-2.88) and increased to 3.00 (1.33-6.76) when analysis was limited to cases and controls who were residentially stable from the reference date to the study date. A measurement metric likely to indicate active ground currents (measurements having above-median intensity and a nonvertical orientation of $<55^\circ$ from the horizontal) was identified. In contrast to measured field intensity alone, for which only modest associations with cancer have been reported, this metric shows a high and significant cancer risk [matched O.R. = 4.0 (1.6-10.0)] consistent over a range of intensity and angle cutpoints. Such elevated nonvertical fields were also associated with cancer in an independent data set, which was gathered to study adult nonlymphocytic leukemia in the Seattle area. The associations of cancer with conductive plumbing and with this exposure metric both suggest that cancer risk is increased among persons with elevated magnetic field exposure from residential ground currents. © 1995 Wiley-Liss, Inc.

APPENDIX B

List of References Cited in Current Document that are Attached (abstract only see Appendix A)

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APPENDIX C

The “Liburdy Affair”

[Note: my comments are highlighted in red]

- A. Federal Register Notice (June 17, 1999)
- B. Dr. Liburdy Responds (July 20, 1999)
- C. San Francisco Chronicle Article (July 23, 1999)
- D. New York Times Article (July 24, 1999)
- E. Louis Slesin of Microwave News Responds (July 27, 1999)
- F. James Butler Responds to Globe & Mail Article [New York Times reprint] (July 28, 1999)
- G. Microwave News Commentary (July/August 1999)
- H. Reuters article (August 11, 1999)

A. Federal Register Notice, June 17, 1999

Federal Register: June 17, 1999 (Volume 64, Number 116), Notices, Page 32503-32504
From the Federal Register Online via GPO Access [wais.access.gpo.gov] [DOCID:fr17jn99-88]

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Office of the Secretary
Findings of Scientific Misconduct
AGENCY: Office of the Secretary, HHS.
ACTION: Notice.

SUMMARY: Notice is hereby given that the Office of Research Integrity (ORI) has made a final finding of **scientific misconduct** in the following case:

Robert P. Liburdy, Ph.D., Lawrence Berkeley National Laboratory: Based on an investigation report by the Lawrence Berkeley National Laboratory (LBNL) dated July 7, 1995, and an analysis of the data and information from Dr. Liburdy obtained by ORI during its oversight review, ORI found that Dr. Liburdy, former staff biochemist at LBNL, **engaged in scientific misconduct in biomedical research by intentionally falsifying and fabricating data and claims about the purported cellular effects of electric and magnetic fields (EMF) that were reported in two scientific papers:**

- (1) Liburdy, R.P. "Biological interactions of cellular systems with time-varying magnetic fields. Annals of the New York Academy of Sciences 649:74-95, 1992 ("ANYAS paper"); and
- (2) Liburdy, R.P. "Calcium signaling in lymphocytes and ELF fields." FEBS Letters 301:53-59, 1992 (the "FEBS Letters paper"). The ANYAS and FEBS Letters papers were supported by a National Cancer Institute (NCI), National Institutes of Health (NIH), grant. **[NOTE: Calcium flux research has since been independently replicated and I refer to neither of these papers in my written testimony.]**

The ANYAS and FEBS Letters papers reported data indicating that EMF exert a biological effect by altering the entry of calcium across a cell's surface membrane. EMF, which are ubiquitous forms of radiation that arise from diverse sources such as power lines, home wiring, and household appliances, have been of public concern for potential health effects. Dr. Liburdy's claims were potentially very important when published in 1992 because they purported to link EMF and calcium signaling, a fundamental cell process governing many important cellular functions.

[Page 32504]

Dr. Liburdy has entered into Voluntary Exclusion Agreement with ORI. As part of this Agreement, Dr. Liburdy neither admits nor denies ORI's finding of scientific misconduct. The settlement is not an admission of liability on the part of the respondent. As part of the Voluntary Exclusion Agreement, Dr. Liburdy has voluntarily agreed:

- (1) To exclude himself from any contracting or subcontracting with any agency of the United States Government and from eligibility for, or involvement in, nonprocurement transactions (e.g., grants and cooperative agreements) of the United States Government as defined in 45 C.F. R. Part 76 (Debarment Regulations) for the three (3) year period beginning May 28, 1999;
- (2) To exclude himself from serving in any advisory capacity to the Public Health Service (PHS), including but not limited to service on any PHS advisory committee, board, and/or peer review committee, or as a consultant for the three (3) year period beginning May 28, 1999; and
- (3) To submit letters to the journals ANYAS and FEBS Letters, requesting retraction of Figure 12 of the ANYAS paper and of Figures 6 and 7 of the FEBS Letters paper within 30 days of the date of the agreement.

FOR FURTHER INFORMATION CONTACT:

Chris B. Pascal, Acting Director, Office of Research Integrity.
5515 Security Lane, Suite 700, Rockville, MD 20852, (301) 443-5330.

B. Dr. Liburdy Responds (July 20, 1999)

By Robert P. Liburdy Ph.D.

Tuesday, July 20, 1999

Here are presented two statements I have prepared which address allegations against me of scientific misconduct. A charge of misconduct is a serious allegation and all facts relevant to the issues should be considered carefully.

Thus, I feel it is important to present the following statements, below, which contain facts which were not mentioned in the Federal Register notice posted by the government. One statement was read by me at the 1999 Bioelectromagnetics Society meeting, and the second is a recently published letter-to-the-editor of Science in response to a news article. Further information will be available at the website www.liburdy.com.

The key facts, presented in the statements below, are:

- 1) The allegations involve a disagreement over how calcium (fura) data were graphed in three figures in two papers from 1992. My raw data for these figures remain valid, and they support my findings, as published.
- 2) In these two 1992 papers I also present calcium-45 data which cross-validate the fura data. Thus, the findings of the papers are supported by data obtained using two different, complementary techniques.
- 3) **No papers of mine are being retracted. Not a single word of my scientific conclusions are invalid, and they remain as published.**
- 4) **Independent scientists have reviewed the graphing issues and each has concluded that no misconduct occurred, and that my data supports my findings.**
- 5) **I do not admit any scientific wrongdoing. However, I could not afford to challenge the federal Office of Research Integrity (ORI) in a protracted legal battle, and I entered into a settlement in which I admit no liability.**

B-1. [The Bioelectromagnetics Society 1999 Annual Meeting, Hyatt Regency Hotel, Long Beach, CA. Read at the annual business meeting on June 23, 1999.](#)

At our annual meeting this week I learned that a charge of scientific misconduct was announced against me in the Federal Register. I saw this text yesterday and I have already spoken to some colleagues but not all of those I wanted to contact, and I thank them for their time. I would like to provide some comments here to the rest of my colleagues and professional friends.

I wish to state several facts not mentioned in the announcement. **First, at my request other scientists have independently reviewed the facts and do not agree with this charge.** The allegations stem from a disgruntled employee who claimed my research was not reproducible.

LBL used this as an opportunity to extensively review my research and to forward a complaint to the Office of Research Integrity (ORI). **The ORI charges center on graphic techniques I used in presenting fura data depicting calcium changes in one figure in a 1992 review paper, and two figures in a 1992 research paper.** For example, in one graph I used a computer to process fura data for graphical presentation including a baseline adjustment and normalization to graphically overlay and compare exposed vs. control traces. Techniques like these are used in the literature, however, I did not mention this computer processing in the methods section. Such "processed" data was then characterized by ORI as being intentionally "fabricated" data in the charge.

I emphasize that the fura data in my studies are valid. Moreover, this data was complemented by calcium-45 data presented in the same papers. This data support my conclusions and the scientific findings in my papers, and they stand as published. This fact was not mentioned in the government notice. **It is important to emphasize that I am not retracting any papers nor any scientific conclusions from these studies because they remain valid.** I am retracting three fura figures, which are supported by calcium-45 data in the same papers, and I intend on submitting for publication a description of the graphical methods with new corrected figures to complete the record. **I emphasize that several independent scientists have reviewed these facts at my request and they do not agree with a charge of scientific misconduct.** However, I cannot financially afford to continue to legally challenge these charges over the next several years. As a result I have agreed to a voluntary exclusion with ORI, and this is not an admission of liability on my part, as stated in the government announcement.

I trust that my colleagues in the Society will consider the above issues in a fair and unbiased manner.

Finally, and importantly, I should state for clarity that **the breast cancer research I have conducted over the past six years is not part of these charges and has never been challenged. My published studies stand and these findings have been independently replicated by four other laboratories.** For example, at this meeting Dr. Kabuto and Dr. Ishido and their colleagues from Japan report in poster P40 that they successfully replicated our melatonin findings at 12 mG. This constitutes the fourth independent laboratory replication of this finding.

In closing I would like to thank you very much for the opportunity to make these comments to you today.

Robert P. Liburdy, Ph.D.

[B-2. Letter to the Editor of Science Published in the July 16, 1999 issue Calcium and EMFs: Graphing the Data](#)

The article "EMF Researcher made up data, ORI says" (News of the Week, 2 July, p. 23) by Dan Vergano deals with research I did on the effect of electromagnetic fields (EMFs) on calcium in lymphocytes that was published in 1992. An allegation of scientific misconduct is a serious charge, and a balanced and neutral review of the facts is essential for truthful conclusions to be

drawn about the science. I was attending the annual Bioelectromagnetics Society meeting in June when Vergano sent me a fax (and thus I missed the opportunity to be interviewed by him), but I would like to now provide several facts. **The raw data for my two calcium studies (1) are valid. Thus, these two papers are not being retracted, and my scientific conclusions stand as published.** I admit no scientific wrongdoing. I could not afford a protracted legal battle with the federal Office of Research Integrity (ORI), and a settlement was reached in which I admit no liability. The crux of the charges by ORI center on the way fura data (obtained using the fura fluorescent probe) were graphed. For example, to overlay calcium traces for visual comparison, a baseline adjustment was done, and traces were normalized and synchronized for reagent addition. My error was in not describing these procedures in the methods section. Lawrence Berkeley National Laboratory (LBNL) and ORI then characterized this "processed" data as "fabricated" data, which technically meets the definition of misconduct, but these techniques are used in the literature: for example, baseline adjustment and normalization of calcium traces have been graphically depicted in (2). In my 1992 papers calcium-45 isotope data were also presented to cross-validate the fura data; these calcium-45 data fully support my scientific conclusions, as published.

Neutral, scientific experts reviewed the graphical issues independently at my request: Carl Blackman (Environmental Protection Agency); Richard Nuccitelli (University of California, Davis); James W. Putney, Jr. (National Institutes of Health). Each one constructively criticized me for not reporting these details, but each concluded there was no intent to deceive, that data supports the conclusions, and this was not misconduct. Since 1992 additional experimental studies have provided support for alterations in calcium in cells exposed to EMFs (3). Replication of findings is critical to the scientific process and, since 1993, in our laboratory, environmental level magnetic fields have been shown to block tamoxifen and melatonin action in human breast cancer cells (4). Four independent replications of these findings have been reported at scientific meetings in 1998 and 1999 (5).

Robert P. Liburdy, Ph.D.
1820 Mountain View Drive
Tiburon, CA 94920, USA
E-mail: Rpliburdy@aol.com
References

1. R.P. Liburdy, Ann. N.Y. Acad. Sci. 649, 74 (1992); R.P. Liburdy, FEBS Lett. 301, 53 (1992).
2. D.O. Ruehlmann et al., FASEB J. 12, 613 (1998).
3. These studies are reviewed, in part, at www.niehs.nih.gov/emfrapid.
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National Laboratory, Richland, WA; poster P-12, *ibid.*; M. Ishido, Y. Kurokawa, H. Nitta, M. Kabuto, National Institute for Environmental Studies, Tsukuba, Japan, poster P-40, The Bioelectromagnetics Society meeting, Long Beach, CA June 20-24, 1999. Battelle, Pacific Northwest National Laboratory is a National Replication Laboratory in the National Institutes of Environmental Health Sciences/Department of Energy RAPID program.

6. Further information on the topic of this letter can be found on the discussion page of The Bioelectromagnetics Society website, www.bioelectromagnetics.org.

C. San Francisco Chronicle Article (July 23, 1999)

U.S. Says Fake Data Tied Cancer: Power Lines: Berkeley researcher denies wrongdoing
Tanya Schevitz, Staff Writer San Francisco Chronicle
July 23, 1999

A Lawrence Berkeley National Laboratory researcher fabricated data in 1992 studies that were considered tantalizing evidence that electric and magnetic radiation could cause cancer, a federal watchdog agency has found.

The dangers of exposure to electromagnetic fields generated by power lines, home wiring and household appliances have been hotly debated. A recent congressional report found that evidence of a link is weak.

But the studies by Robert P. Liburdy, reported in scientific journals, were significant at the time because they purported to show the first plausible biological mechanism linking electromagnetic fields exposure to cancer and other diseases including childhood leukemia.

In a recently released report, the federal Office of Research Integrity said Liburdy committed "scientific misconduct" by "intentionally falsifying and fabricating" his data to support assertions of cellular effects from electric and magnetic fields.

Liburdy, 51, resigned his 15-year position in March after the lab yanked his funding and agreed in May with the federal Office of Research Integrity to retract three data graphs he used to back up his conclusions in two 1992 journal articles.

The Tiburon resident, who received \$3.3 million in federal grants for the research, also agreed to a three-year ban on receiving federal funds.

Liburdy denies any wrongdoing and said he agreed to the sanctions imposed by the Office of Research Integrity only because he could not afford a lengthy legal battle. He insists that the overall conclusions of the articles remain valid and will not be withdrawn.

Liburdy's studies purported to link electric and magnetic radiation and calcium signaling, a process governing many important cellular functions, including turning genes on and off and cell division.

He published the results in two 1992 journal reports, the Annals of the New York Academy of Sciences and FEBS Letters -- a publication of the Federation of European Biochemical Societies. He also presented it at several medical conferences.

He also used the papers to advance a research proposal and to get federal funding.

Liburdy's findings prompted many more studies. Since 1992, at least 20 scientific papers have discussed the connection to calcium signaling but have failed to find a conclusive link, said Chris Portier, an associate director of the National Institute of Environmental Health Sciences.

Cases of scientific misconduct are rare. Lawrence Berkeley Lab officials said there have been only two or three charges of wrongdoing by its researchers in the past 10 years, but they were not proved.

The Office of Research Integrity, charged with protecting federal health research funds, reviews only 12 to 15 cases of scientific fraud a year, said Chris Pascal, the agency's director. But he said many cases probably go unreported because people are afraid of repercussions.

Arthur Caplan, director of the Center for Bioethics at the University of Pennsylvania Health System, said that when fraud does take place, it is usually because of pressures on researchers to capture grants, publish papers and get tenure.

Most scientists realize that such allegations can be the death knell for a research career, and it is rare that a scientist gets caught in outright fraud, Caplan said. "It is a field that depends on trust," he said.

Scientists caught engaging in misconduct have been barred from federal funds for up to 10 years and sometimes face civil suits if their sponsoring institutions are forced to pay back grant funds. That is not the case with the Liburdy investigation.

Lawrence Berkeley Lab undertook its investigation of Liburdy after an unidentified whistleblower challenged his results in 1994. In July 1995, the lab concluded that Liburdy had deliberately falsified data.

The lab alerted the Office of Research Integrity, an arm of the U.S. Department of Health and Human Services. The federal agency's own review, which lasted two years, showed that the deception went deeper, said Chris Pascal, the office's director.

Using Liburdy's raw data, the agency found that in one graph he had used only 7.1 percent of the data points from his experiment and discarded the rest that did not agree with his hypothesis that the electric and magnetic fields affected living cells.

"In contrast to the data shown in the figure, the full set of primary data does not show that exposure to low strength electromagnetic fields results in an inhibition or in a lower level of calcium ions in the cells," the Office of Research Integrity's analysis says.

The report also said he magnified the response in his data and fabricated data to cover up his original deception. "The evidence demonstrates Liburdy knew his data manipulations were significant to the conclusions of the paper," the analysis says.

Liburdy, who disputed the allegations of wrongdoing in a letter to the journal *Science*, said this week that he graphed the data by accepted methods and that all he would do in recanting his figures would be to clarify his technical procedures that were not detailed in the reports.

"The scientific findings are not wrong. They criticized me for how I graphed the data," Liburdy said. "It is a matter of scientific opinion. They are not talking about the data being invalid. They are talking about the interpretation of the data."

Three independent scientists who evaluated the facts at Liburdy's request criticized him for not explaining his graphing procedures but determined that he did not engage in scientific misconduct. The scientific conclusions are valid, they said.

One of the scientists, Richard Nuccitelli, a professor of molecular and cellular biology at the University of California at Davis, this week called the controversy "crazy."

"In a sense, it really is splitting hairs," he said. "If you take the definition very strictly, he was guilty of presenting misleading data. But if you look at the overall result -- is this a valid conclusion or not -- it is."

But he and the other two scientists did not see the entire collection of data, said Stephen Godek, an attorney with the Office of Research Integrity.

The agency's report states that Liburdy's actions "were significant misrepresentations that were intentional and not due to honest error or judgments about the interpretation of the data."

As part of the negotiations with Liburdy, federal investigators agreed not to force Liburdy to retract the articles in their entirety because "any scientist who would read those papers would know that without the falsified figures, the conclusions are meaningless," Godek said.

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D. New York Times Article (July 24, 1999)

Data Tying Cancer to Electric Power Found to be False

By William Broad

The New York Times, July 24, 1999

A Federal investigation has concluded that a scientist at the Lawrence Berkeley Laboratory in Berkeley, Calif., faked what had been considered crucial evidence of a tie between electric power lines and cancer. The disclosure appears to strengthen the case that electric power is safe.

[Note this last statement is faulty reasoning.]

Robert P. Liburdy, a cell biologist at the laboratory, an arm of the Energy Department, was found to have published two papers with misleading data on the biological effect of electromagnetic fields on human cells.

Investigators with the Office of Research Integrity of the Department of Health and Human Services said Dr. Liburdy eliminated data that did not support his conclusions. After the investigation, he resigned quietly from the laboratory in March and has agreed to withdraw his research findings, Federal officials said yesterday.

The officials say his misrepresentations helped him win \$3.3 million in grants from the National Institutes of Health, the Department of Energy and the Department of Defense to investigate a link between electric power and cancer. The findings against Dr. Liburdy were published last month in the Federal Register but have not been widely reported outside scientific publications.

Debate has raged for two decades over whether power lines cause cancer even though top scientific groups such as the National Academy of Sciences have repeatedly found no evidence of danger. **[False statement]** And the fears of some such link have generated conflicts between homeowners, especially those with children, and power companies with high-tension lines running through neighborhoods.

Critics of the power industry and the scientific status quo say enough tantalizing clues keep emerging to warrant further investigations of possible links between electromagnetic radiation and killer diseases.

"If he hadn't gotten these results, nobody would have paid any attention," a Federal investigator in the case, who spoke on the condition of anonymity, said yesterday.

Dr. Liburdy's papers reported data indicating that electromagnetic fields, also known as EMF, alter the entry of calcium across a cell's surface membrane. The fields are ubiquitous forms of radiation that arise from all power lines, home wiring and computers.

Federal officials say Dr. Liburdy's claims were potentially very important when published in 1992 because they purported to link electromagnetic fields to calcium signaling, which is a fundamental process governing many important cellular functions. **[This has since been repeated.]**

"When he originally published these papers, there was quite a bit of interest in it," Glenn R. Woods, the laboratory's counsel, said yesterday. "Now both the lab, and the Office of Research Integrity, have found that data on which he based his conclusions were fabricated."

As part of his settlement, Dr. Liburdy has agreed to make no applications for Federal grants for three years and not contest the findings in administrative proceedings.

Dr. Liburdy can, however, disagree publicly with the misconduct findings, and he is doing so vigorously, professing his innocence.

The ethics investigation of Dr. Liburdy began after a whistle blower challenged his intriguing results. In July 1995, the Lawrence Berkeley Lab found he had indeed falsified data, and it alerted the Office of Research Integrity.

In announcing its findings last month in the Federal Register, the integrity office said Dr. Liburdy had "engaged in scientific misconduct in biomedical research by falsifying and fabricating data and claims about the purported cellular effects of electric and magnetic fields."

Recently, in letters sent over the Internet to colleagues and interested parties, Dr. Liburdy has denied that his research is wrong and said he agreed to the settlement only because he was unable to spend \$1 million to mount a legal defense.

"The raw data for these figures is not challenged, and is valid," Dr. Liburdy wrote in one letter. "How I graphed them is a matter of disagreement among scientists. Independent scientists have reviewed this for me and concluded that misconduct is not warranted."

He also emphasized that "none of my scientific conclusions in the two papers are being retracted," only the disputed published data.

Yesterday, requests for further comments left at Dr. Liburdy's residence in Tiburon, just north of San Francisco, went unanswered.

Federal experts vigorously disagree with Dr. Liburdy's defense.

"This is not a matter of interpretation or graphing," the investigator said. "This is fabrication and falsification. He can express his opinion, but not to an appeal board."

In misconduct cases, especially ones involving large sums of money, the Federal Government can bring civil or criminal charges, and the defendant can be fined and sentenced to jail. In this case, officials say, they concluded that an administrative remedy was sufficient.

The terms of the settlement are detailed in the June 17 Federal Register. The notice says Dr. Liburdy "neither admits or denies" the finding of scientific misconduct.

Federal officials say Dr. Liburdy did not spend all of the \$3.3 million in grant money, and that the remainder is controlled by the Lawrence Berkeley Laboratory.

"It's being used for other science" and none of it has been returned to the Federal Government, Mr. Woods, the laboratory's counsel, said.

Dr. Liburdy's two disputed papers both appeared in 1992, and in both cases he was the lone author.

The paper, "Biological interactions of cellular systems with time-varying magnetic fields," appeared in the Annals of the New York Academy of Sciences. "Calcium signaling in

lymphocytes in ELF fields" appeared in FEBS Letters, published by the Federation of European Biochemical Societies.

In the years since Dr. Liburdy's research appeared, more than 20 studies have found no hard evidence that electric power causes cancer, a National Institutes of Health panel concluded recently.

Robert L. Park, a professor of physics at the University of Maryland who has long questioned the power-cancer link, said Dr. Liburdy's deception was probably typical for the field, which has sometimes been belittled as crusaders out to vilify industry.

"It's often not deliberate fraud either," Dr. Park said of slanted data. "People are awfully good at fooling themselves. They're so sure they know the answer that they don't want to confuse people with ugly-looking data."

In the power line debate, he added, the proponents of danger "were desperately looking for a physical effect, and the nearest they could come by was the calcium signal."

The growing consensus among researchers seems to be that electric power is safe. **[If this is indeed the case why are power frequency magnetic fields classified as a possible carcinogen?]**

Two years ago, a large, meticulously designed study found no evidence that electric power lines cause leukemia in children. The study was a collaboration between scientists at the National Cancer Institute and childhood leukemia specialists from the nation's leading medical centers. It involved 636 children with acute lymphoblastic leukemia, the most common childhood cancer, and 620 healthy children who were matched to the cancer patients by race, age and residential neighborhood.

Scientists tracked the children's exposure to the magnetic fields that power lines produce, but found no link between exposure and risk.

Dr. Park said the new findings of power-cancer misrepresentation would aid the emerging consensus on safety. "But I'm not sure how strongly," he added, as other scientists are still investigating and advancing the idea of a cancer linkage.

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E. Louis Slesin of Microwave News Responds (July 27, 1999)

Dear Colleagues:

The feeding frenzy over the misconduct charges against Dr. Robert Liburdy has gotten out of hand. The enemies of prudent policies towards EMF safety and the continuation of EMF health research are using the Liburdy affair to further their own agendas.

All the usual suspects have had their say: Junk journalists, rabid physicists and industry apologists.

But first, a few words about Liburdy. The case made by the Office of Research Integrity (ORI) against him is complex and not easy to summarize, but two things are clear:

- (1) **Liburdy has not withdrawn any of his scientific conclusions. He has retracted three graphs.**
- (2) **The Liburdy work that ORI has challenged is but a small part of the many lab studies on EMFs and calcium and, more importantly, only a footnote to the ongoing EMF-cancer debate.**

Anyone who has followed this debate over the last 20 years knows that it turns on epidemiological studies showing that children and workers exposed to power line EMFs have higher than expected rates of leukemia. In fact, one of the reasons some scientists have trouble accepting that EMFs promote cancer is the lack of clear supporting data from laboratory experiments.

Science magazine ran a short item on the Liburdy affair in its July 2 issue and the matter receded into the background until Friday, July 23, when the San Francisco Chronicle put it on its front page. The Chronicle tried to make the connection between Liburdy's calcium work and cancer by noting that Liburdy's 1992 studies "were considered tantalizing evidence that electric and magnetic radiation could cause cancer." In the 28 paragraphs that followed, there was not a single word to back up this claim.

The next day, the New York Times took the story to a new low with a front page, above-the-fold, story headlined: DATA TYING CANCER TO ELECTRIC POWER FOUND TO BE FALSE. Reporter William Broad led with: "A federal investigation has concluded that a scientist at the Lawrence Berkeley Laboratory in Berkeley, Calif. faked what had been considered crucial evidence of a tie between electric power lines and cancer. The disclosure appears to strengthen the case that electric power is safe."

A few paragraphs later and still on page 1, Broad offers the following quote from an unnamed federal investigator (presumably from ORI): "If he hadn't gotten these results, nobody would have paid any attention."

In the 33-paragraph story, **Broad fails to offer a single word from a cancer researcher or a biologist or a biophysicist to back this claim -- or even to show that Liburdy's work is related to cancer. Instead, Broad offers some quotes from Dr. Robert Park, a lobbyist for the American Physical Society, who has turned his anti-EMF opinions into a crusade. Park did not miss this opportunity to strike a blow against EMF research. According to Broad, Park believes that, "Liburdy's deception was probably typical for the field."**

Broad's story appeared in newspapers across the country that Saturday (July 24), including the front page of the Denver Post and the Providence Journal.

Broad failed to tell the readers of *the Times* that a few weeks ago, in mid-June, the National Institute of Environmental Health Sciences (NIEHS) issued a report to the U.S. Congress which concluded that although there is only "weak" evidence for an EMF-cancer risk, there is a "consistent pattern of a small increased risk with increasing exposure." As a result, Dr. Kenneth Olden, the director of the NIEHS, advised the adoption of a policy of prudent avoidance, that is to use of low-cost methods to reduce exposure to EMFs.

In fact, *the Times* has never covered the NIEHS report. Nor has *the Times* ever said a word about the conclusions of a working group assembled by the NIEHS in June 1998, which found that the epidemiological evidence was strong enough to classify EMFs as "possible human carcinogens."

Broad, who worked for *Science* magazine before he moved to *the Times* many years ago, ignored the statement from Dr. Christopher Portier, the principal author of the NIEHS report, who told *Science* for its story on Liburdy that the Liburdy calcium studies had had "no impact whatsoever" on the NIEHS report's conclusions.

Today, July 27, the voice of industry has joined the chorus: They want Liburdy's head for an appetizer and the end of prudent avoidance for dessert. Writing in the *Wall Street Journal*, Elizabeth Whelan of the American Council on Science and Health, an industry front group, seeks to close the book on the EMF health debate: We "now know" she writes, that it was all a "phony health risk." Whose medical opinion does Whelan cite? Robert Park's, of course.

Why do journalists like Broad and physicists like Park rail against any concerns over EMFs? (Some years ago, Broad compared concern over EMFs to claims on the "earthly presence of space aliens.") Hard to say, but the net effect is anti-science. Strange qualities for a science journalist and a lobbyist for science.

As we say in New York: Enough Already!

The only way to settle the EMF health debate is with good science -- not with junk journalism, industry propaganda and ideological agendas.

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F. James Butler Responds to Globe & Mail Article [New York Times reprint] July, 28, 1999

The Globe & Mail editors form the headline, “ Faked findings mean power-line electrical fields appear to be safe after all “ and attached it to an article by William Broad of the New York Times. It’s the long running saga of electromagnetic fields, EMFs.

Stop and listen, you can hear the media exhale. The sigh of relief. Relief from legal exposure that drives this rabid vigor in media corporations who believe they feel the legal noose loosen. Electromagnetic fields are everywhere electric current flows. In the news room people have been sitting in front of high emission monitors for 30 years.

The story - or I should say the 40,000 plus stories - over the past 20 years is about whether this ubiquitous radiation from everyday appliances and our electric power grid is affecting our health. It’s no small public health concern.

The story of alleged fraud in research of these electromagnetic fields by Dr. Robert P. Liburdy of Lawrence Berkeley Labs caused a giddy feeding frenzy in the media. By the media. The Associated Press writer was so excited they got his name wrong.

It is 20 years, and the media has managed to avoid getting to the bottom of the story of electromagnetic fields. The question is basic, Is electricity killing us?. Trouble is, the media has never had a vested self-interest of this size in any story in history. And Watergates Woodward-Berstein model long subsumed by profitable self-service.

With few words, the Globe may have strayed farthest from the truth on a per line basis than any other media spinners and twisters. You offer no original input.

The New York Times story was about one single scientist and the three graphs he removed from his data. It is yet an open question as to whether it was fraudulent because it would take this scientist an airing in a court of law for which he has no resources. Dr. Liburdy had three research inquiries affected by this controversy.

Lets get to the science but make it simple and shed some light on the matter. The science is Greek to your readers as much as it is to your editors, evidenced by your second-rate headline. So instead, here is a simpler approach accessible to all.

I will ignore the facts of the case and the legions of defenders. Lets say Dr. Liburdy is guilty for the sake of argument. What does this mean in this critical health debate?

For starters, he’s one guy. In June, the National Institute for Environmental Health (NIEHS) just completed a five year investigation of electromagnetic fields. They classified EMF as a Class 2B carcinogen or “possible carcinogen”. This category includes Carbon Tetrachloride, Chlordane, DDT, Diesel fuel among other substances.

This New York Times writer omitted this fact. The most anxiously awaited document on the subject of EMF in 7 years and he failed to mention it? The New York Times didn't even cover it! Amazing. And bizarre. This surely has no connection with the lawsuit the New York Times lost on EMF exposure from computers and cataracts.

There are 50,000 scientific papers on the biological effects of electromagnetic fields. What does this suggest to even the layman? One single agent implicated in many dozens of diseases. Dozens of scientific specialties are involved who can't even speak with each other let alone converge in the very narrow confines of scientific method. And Dr. Liburdy was looking as something called "calcium e-flux" as the possible "mechanism of action". We can't find hazard unless we have this "mechanism of action", it is as the name suggests, a plausible way for an effect to happen.

The power companies have held the EMF issue at bay by funding mainly leukemia, designing the studies and having their shells scream "no mechanism of action" We didn't have a "mechanism of action" for how smoking causes lung cancer until 1996! You will notice that is when the tobacco companies started negotiating.

We had no "mechanism of action" for aspirin til 1997 but that didn't stop us from enjoying its benefits. Today, we still don't have a real MOA for how water molecules are heated in a microwave but still use them in over 90% of homes in N. America.

With EMF, there are a half a dozen active areas of investigation into mechanism. We may ultimately identify a half a dozen and a dozen more may go undetected. No prior agent has had this scope. But then, humans are composed of electromagnetic waves.

Back to Dr. Liburdy, the one man tempest in a teapot. The National Institute of Environmental Health Science in had just looked at Liburdy's stuff prior to its report. As Microwave News reports, principal author, Dr. Chris Portier, told Science Liburdy's calcium studies had "no impact whatsoever" on their conclusions.

Yet the New York Times article would have us all believe this was the only EMF science, the lynch pin of discovery. Baloney. The NIEHS looked at 300 studies and were criticized for looking at too few - curiously missing many with positive findings. Examples include Dr. Michael Persinger at Laurentian University and his staggering findings suggesting mental disorders. Also, Dr. Gilles Theriault at McGill with Dr. Ben Armstrong and their landmark lung cancer findings. But they are foreigners, eh?

In the United States there was also the National Academy of Sciences (NAS) report on the carcinogenicity of electromagnetic fields. The New York Times author refers to the NAS report as evidence of no health effects findings. They precisely said things like "there is no consistent and conclusive evidence" of a "causal" relationship. In scientific terms you can drive a Mac truck through this weasely wordsmithing.

In the NAS overview of the scientific material the most cited author was a Dr. Kjell Hansson Mild. That's right, a Swedish guy. Americas NAS investigation did extend beyond their borders. Good thing since much of the science is in Sweden and Russia.

The bad news is this same Dr. Mild, author of 100 papers on EMF over 20 years, was unhappy with the NAS report. He wrote the Chairman asking, "how it can be that the report has turned out to be so biased in the selection of papers included?" Wondering why his "work has been grossly misquoted" and on and on. No response.

The questions the media should ask are:

- 1) What happened to the Environmental Protection Agency [EPA] Report on Electromagnetic fields in 1990? The conclusions of "probable carcinogen" were enough to get that information buried.
- 2) What about the bold investigation by Mr. Clinton, "I have asked Carol Browning, head of the EPA to look into this...". That report was completed in 1996. Its chief author called it "the most serious indictment of EMF as a cancer promoter so far".
- 3) What of the prestigious National Radiation Protection Board report on EMF? The only blue ribbon board of EMF scientists assembled to answer the question. They advise reducing electromagnetic fields in all new schools, hospital and commercial building to 2 mG. So you know, that's way low, in line with the large Swedish leukemia studies of 1992. They also advise reducing EMF in all existing buildings - residential and commercial to 2mG within 10 years. But what would they know next to political appointees? The report has been stalled for years "in committee".
- 4) Why did Hazel O'Leary, the head of the Department of Energy, kill a 20 year research project into the biological effects of electromagnetic fields just five days before leaving office... to work for the utilities? What does this suggest?
- 5) In the Telecom Act of 1996 was stated [a little jargon here] in Sec.704, 7.) B (iv) "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commissions regulations concerning such emissions".

What the hell does this mean? If any city council in America stops a cell tower antenna from going up for health reasons then it is against U.S. law. As such, the cell phone companies can sue the little city council. And they are, by the hundreds!

The most obnoxious breach of human rights ever visited upon a free nation. In America, you are not allowed to ask – "Is this thing killing me and my family?".

What does this tell your inquiring minds? OK, let us add a key detail. While this legislation was being written by the telecom industry there was \$26 billion flowing into Washington from the auction of the airwaves. Electromagnetic waves.

In any event you're the media and by definition a main part of the problem. There is a story to tell and you refuse to tell it. NBC is owned by General Electric, CBS by Westinghouse and Disney has huge EMF legal exposure. You have thus willfully obstructed the inquiry due to your legal liability and unwillingness to be impartial.

This EMF network of obfuscation includes 9 U.S. government agencies. Add the active antagonism of the computer and telecom industries plus the utilities etc. No time to share the full coercive story. Its one you have missed. Over and over.

The money is the thing. Electromagnetic fields critically impact 8 of the top 10 industries in North America. Not just power companies, computers and telecom groups but real estate, insurance, media - no one is immune. The financial fallout will dwarf the largest of tobacco settlements. To bury the power lines in America would cost \$1.2 trillion and we haven't even tallied "the court costs" yet. These could never be settled. A new amendment to the U.S. constitution will be required.

In case I'm not clear, this is not just leukemia and brain tumours here. Leukemia has been the subject of study because it is very rare and utilities provided 82% of the funding. If you have any inkling of "science for sale" in America you know you can get any result you choose. Ask Dr. Henry Lai and Dr. Ross Adey, two of the world's best EMF researchers. They will recount the ethical entanglements of dealing with the "objective" Wireless Technology Research group and Motorola respectively.

The larger concern is with breast cancer, lung cancer, Alzheimers, immune system, neurological and mental disorders. I am concerned EMF is a common denominator of disease. It is there in the scientific literature for any with a modicum of common sense and the patience to pour through it. Evidently, not current traits of reporters.

The Russians level of safety for electromagnetic field exposure at power line frequencies and microwave frequencies is 1,000X lower than ours. What can you deduce from that? Russia is many years advanced in the science of EMF weaponry, mind control and therapeutic applications i.e. curing diseases like cancer with EMF.

Why do I exclude Canada, or not reserve any prospect we might act independently? We have had the chance. Dr. Theriault at McGill found an incidence of 667% the lung cancer in power line workers at Quebec Hydro. Quebec Hydro responded by canceling the contact with McGill, firing Dr. Gilles Theriault and legally barring him from sharing his data with the scientific medical community. That's EMF in Canada.

The Hospital for Sick Kids in June just found another link between leukemia and magnetic field exposure in children. This time up to 4.5X the risk, higher than the 2-2.5X of previous studies. "As the methods of assessing exposure were refined, we found that the association

between magnetic fields and the risk of developing childhood leukemia became stronger, particularly in children diagnosed at a younger age,” said lead author Dr. Lois Green, epidemiologist in the department of public health sciences at U of T and at Ontario Power Generation. The Globe didn’t consider this?

No, the Globe & Mail throws a “Case Closed!” banner atop the imported news item. No Canadian perspective. No Canadian response. No impartial query as to whether the New York Times article was, in large part, bullshit. No recalling Canadian research inputs. Assuming Americas opinion [through its paper of record] is final.

So what of the New York Times article and the Globe & Mail's interpretative banner. The writer has a point of view uncommon at the New York Times. Usually facts supersede most personal agendas. But not with the health hazard of EMF.

The writer employees industry hack Robert Park to fling mud. Park says “deception was probably typical for the field”. This groundless swipe is at thousands of dedicated people in 24 countries, many who have 20 or more years at this research.

Rather than excessive bias, this is a juicy quote to writer Broad. Park is no research scientist but a political influencer. He is a physicist defending the honour of the American Physical Society who are up to their ass in ass-covering rhetoric with respect to electromagnetic fields. Try figuratively pulling down the trousers of one of these dinosaurs in public you get a feeling for the acute embarrassment they seek to avoid. There will be an accounting and the American Physical Society tops the list.

In future, people will want to know why all health professionals, public officials and scientists they have trusted missed this. It will be profoundly embarrassing. This is what engenders such visceral denials irrespective of the facts as well as the reality that most of us are inadvertently part of the problem.

The New York Times title, “Data Tying Cancer to Electric Power Found to be False” was misleading enough. The implication here is that this unprecedented mass of scientific data going back before WWII turns on one guys science. Ludicrous.

But still the NYT's writer builds this “case “with his industry lobbyist and an unnamed government source saying “If he hadn’t gotten these results nobody would have paid any attention”. The source means attention to Liburdy’s stuff, the writer tries to couch it, with his physicist lackey, to mean the entire research of EMF. More ludicrous. And unethical with the worst of intentions.

With every incident the vested interests media machine goes into action. Other incidents are typically a finding of “no hazard” or “inconclusive”. These groups have been at the lobby and influence game for 100 years many of them. They were the founders of our countries in many ways. But they couldn’t pull the EMF wool over our eyes without being aided and abetted by the media. These same guys are bringing us the future too. Motorola sees even the smallest amongst us with global satellite cell phones in their little pockets. The fact many people believe they are

servicing up brain tumors with the efficiency of McDonalds is of little concern to these financial juggernauts of planetary communications.

There is a physicist you might ask, Dr. Robert Kane who holds some 40 patents from his time at Motorola and did their cell phone testing. He would be delighted to share with you the hazards of EMF from cell phones were he not so ill with a brain tumor. I was unable to confirm if he is alive at this writing.

Striking similarities exist between tobacco and electromagnetic fields. The Surgeon General's Report in January 1964 finally denounced the hazards of cigarette smoking. The next August, Dr. Clarence Cook Little announced results of a study by the Council for Tobacco Research after evaluating 350 separate reports.

The tobacco folks declared there was "little to support" the charge cigarette smoking caused cancer. The American Medical Association - representing the doctors of America - refused to join the fray, actually defending tobacco interests. They had \$ 10 million from the tobacco industry for research into the possible hazards of smoking.

In 1945 the first studies linking smoking and lung cancer appeared - the relative increased risk was 2 X. This is exactly the same as the early epidemiological studies of populations with electromagnetic fields. Today, we know smoking increases the risk of lung cancer by 10X and up to 50 X based on the length of time smoked.

The large Ontario Hydro/Quebec Hydro occupational study had statistical spikes. It showed a middle exposed group with acute myeloid leukemia having an increased risk of 37.76 X. That is a big number. Is it an anomaly or a harbinger of future results?

Dr. Anthony Miller of University of Toronto released a follow-up study, another watershed event in this longstanding global debate were it not Canadian in origin. Dr. Miller teased out the electric field exposure as distinct from the magnetic field exposure. The EMF studies have historically focused on magnetic not electric fields.

The Swedes have been saying for years that it's the electric component that's the hazard. Along with the very persistent Dr. Roger Coghill in the United Kingdom.

Dr. Miller found a 12X increased incidence of leukemia. This is a robust finding and if replicated easily conforms to the definition of broad public health risk. Whoops, too late - all the funds are expired on the wrong exposure parameters. Dr. Green of Sick Kids alludes to it in her statement, "As the methods of assessing exposure were refined..". After 20 years we have just now arrived at identifying the bad stuff and how to measure it. To close the book now is to close the book on page one.

Which brings us to the Globe & Mail's spurious headline. Not content to merely carry the information your editors further spun it. "Faked findings mean power-line electrical fields appear to be safe after all " was what you chose to say.

The New York Times article did not conclude “ power-line electrical fields appear to be safe after all”. How could this witless pair, writer Broad and physicist Park, possibly divine such long-sought intelligence. They implied, suggested, alluded to, presumed, insinuated and inferred. But nothing here respects scientific inquiry.

For the record, 95% of the studies are magnetic not electric fields. The Globe & Mail unintentionally hit on one of the big EMF issues. All the studies in the past have merely been experiments to get the structure of investigation right.

To call your thoughtless editorial foray unethical may be too strong simply because I warrant it stems from deep-rooted and genuine ignorance. But there are clear ethical ramifications. People are busy. They want to hear that electricity isn't killing them. They don't want to read the article because the whole thing gives them a headache. Or maybe it's their electromagnetic field exposure?

On the EMF hazard, Canadians now have the official seal of approval of the Globe & Mail most reliably bearing the irreproachable word of the New York Times. All the News That's Fit to Print! And don't you forget it, damn it! Well, not all the news.

Thousands of scientists in 27 countries for 50 years have nearly found the questions. The Globe & Mail gives you the answer in a mere 7 seconds. A wondrous achievement.

Who is on the wrong side of history? And what part will you have played as a corporation, a parent, a business executive or a human being? Like electricity itself all the “EMF industries “ take the least line of resistance. People need to resist.

Who's responsible for our health, our kids health? Today, given our irretrievably corroded mass communications conduits – it's you and I.

James Butler (jbutler@netcom.ca) is CEO of HomeSafe, Inc. During the past seven years he has been an environmental activist in the advocacy of electromagnetic field (EMF) hazard awareness in California.

H. Microwave News Commentary (July/August 1999)

Something Is Terribly Wrong

From Microwave News

In June 1999, these three events happen in just three days:

- The NIEHS issues its report to Congress, which concludes that the evidence that EMFs pose a cancer risk cannot be dismissed. Though this evidence is weak, the NIEHS says, it is reason enough for prudent avoidance (see p.1).
- EMFs are linked to as much as a sixfold increase in the risk of leukemia among young children, in a new study released by the University of Toronto (see p.12).
- Dr. Robert Liburdy agrees to withdraw three graphs in seven-year-old papers on EMF effects on cellular calcium (see p.1).

Which of these stories makes page-one headlines across the country? The Liburdy affair. And what is the lesson that the New York Times draws from the Liburdy business? That "electric power is safe."

Liburdy's calcium experiments were not cancer studies and had only the most speculative relationship to cancer biology. When they were published in 1992, anyone who had said, "This shows that EMFs cause cancer" would have been laughed out of the room. It would have been a ridiculous thing to say, and no one ever did.

Yet now these three Liburdy graphs seem to become more powerful each time they are mentioned in the media. The Associated Press (July 23) claimed that Liburdy's calcium work "was thought to be the first plausible biological explanation" of an EMF-cancer connection. Not one cancer researcher, biologist or biophysicist was quoted in support of this assertion, perhaps because it is not true.

The AP conceded that concerns about EMFs "had been raised well before Liburdy's study," but the New York Times (July 24) wasted no space on such qualifications. In the Times' hands, Liburdy's graphs became "crucial evidence of a tie between electric power lines and cancer"- which had been "faked." Soon the Cleveland Plain Dealer (July 30) was writing that Liburdy "managed to scare the bejabbers out of a lot of people by spinning a yarn about electrical transmission lines causing cancer," and applauded government fraud-busters for exposing this "hoax."

The power of the Liburdy graphs continued to grow. It was in fact "Liburdy's deception" which "sparked a campaign of 'prudent avoidance'," according to Dr. Elizabeth Whelan of the pro-industry American Council on Science and Health, writing in the Wall Street Journal (July 27). "We now know" that the EMF issue "is a phony health risk," added Whelan. Ken Hall of the Edison Electric Institute seems to agree: "As long as you don't touch the wire, it's okay," Hall told the Los Angeles Times (July 29), in a story about commercial development directly beneath

high-voltage power lines. The paper estimated that EMFs in the proposed development would average about 60 mG.

What's ironic is that of the three June events, only two have much to do with EMFs and cancer: the NIEHS report and the Canadian study. Yet those were precisely the two that the media ignored.

There is a serious double standard at work here. The stories on the Liburdy affair are full of false statement which are repeated so often, without rebuttal, that they are already accepted as fact. Where are the moderating voices of public health, of epidemiologists, of consumer advocates?

We don't believe in conspiracies. But at times the influence of corporate power in both science and the media is so overwhelming that it starts to resemble one. Industries worth hundreds of billions of dollars defend their interests, and they do so in many ways.

Recently, a leading epidemiologist at a world-famous medical institution wrote to us on the Liburdy media blitz. He said, "One reason I left this field was that I saw it was virtually impossible to get decent science funded or done without interference in the face of such massive commercial interest." But we can't tell you who he is. His next sentence was, "Don't quote me."

Microwave News

H. Reuters article (August 11, 1999), California lab asked to repay grants over faked data, August 11, 1999

SAN FRANCISCO (Reuters) - The National Cancer Institute wants grant money back from a California laboratory where a researcher allegedly faked data suggesting a link between electromagnetic radiation and cancer, the San Francisco Chronicle reported on Wednesday.

A letter sent this month by the National Cancer Institute to officials at Lawrence Berkeley National Laboratory in Berkeley, California, said the agency seeks the return of \$804,321 in grant money that supported research by Robert Liburdy between Jan. 1, 1991 and March 31, 1994.

But the lab opposed repayment, saying it would amount to a penalty for investigating and reporting the case.

"The institution was brave enough to question the validity of some findings," lab spokesman Ron Kolb told the Chronicle. "We took a stand, and we believe this is a chilling message to other institutions who are expected to police themselves."

Laboratory officials could not immediately be reached for comment.

Liburdy claimed that his studies had located the first plausible biological mechanism linking electromagnetic fields generated by power lines, home wiring and household appliances to cancer and other diseases, including leukemia.

But an investigation by the U.S. Department of Health and Human Service's Office of Research Integrity concluded that Liburdy committed "scientific misconduct" by intentionally falsifying and fabricating data to support his assertions that electromagnetic fields could cause effects in human cells.

Liburdy, 51, resigned his 15-year position in March after the lab withdrew his funding and in May agreed with the Office of Research Integrity to retract three data graphs he had used to back up his conclusions in two 1992 scientific articles.

Liburdy, who also agreed to a three-year ban on receiving any federal funding, has denied any wrongdoing in the case and said he agreed to the conditions imposed by the Office of Research Integrity because he could not afford a lengthy legal battle to clear his name, the Chronicle reported.

The possibility of links between electromagnetic fields and cancer has long been hotly debated, but remains unproven.

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You may be interested to know that Dr. Liburdy left science and is now a practicing lawyer in California.

ATTACHMENTS

Requested References