

Bio-Initiative Claims Compared To Findings of Independent EMF Reviews

The Bio-Initiative Report was prepared by a self-selected group of EMF researchers and activists, and includes many claims about EMF research that differ substantially from the findings of national and international public health organizations that have examined the EMF research in detail. These organizations include the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), and public health authorities in the U.S., Canada, U.K., Ireland, Sweden and Australia, among others. (Detailed bibliographic citations are provided at end of this document.)

OVERALL POSITION ABOUT EMF & HEALTH	
<i>Bio-Initiative Claim</i>	<i>“Several decades of international scientific research confirm that EMFs are biologically active in animals and in humans, which could have major public health consequences.”¹</i>
WHO 2008	“Despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health.” ²
WHO 2008	“Based on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields.” ³
Ireland 2007	“The [authoritative expert] reviews all agreed that there were no established adverse health consequences arising from exposure to ELF at levels below the limits set out in the ICNIRP 1998 guidelines.” ⁴
Australia 2006	“[B]ased on the total database of scientific research, there is insufficient evidence to conclude that exposure to the normally encountered environmental levels cause adverse health effects in humans.” ⁵
Canada 2005	“[T]he available scientific evidence to date does not support the assumption that adverse health effects from exposure to [power-frequency] fields at levels normally encountered in our homes, schools and offices pose a risk to human health.” ⁶
U.S. 1999	“The NIEHS believes that the probability that ELF-EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm.” ⁷
U.S. 1999	“The results of the EMF-RAPID program do not support the contention that the use of electricity poses a major unrecognized public-health danger.” ⁸

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EMF & CHILDHOOD LEUKEMIA	
<i>Bio-Initiative Claim</i>	<i>“There is little doubt that exposure to ELF causes childhood leukemia.”⁹</i>
WHO 2008	“[S]cientists have not generally concluded that [there is] a cause-effect relation between exposure to the fields and disease (as opposed to artifacts in the study or effects unrelated to field exposure). In part, this conclusion has been reached because animal and laboratory studies fail to demonstrate any reproducible effects that are consistent with the hypothesis that fields cause or promote cancer.” ¹⁰
WHO 2007	“[O]n balance, the evidence related to childhood leukaemia is not strong enough to be considered causal.” ¹¹
Ireland 2007	“[O]verall the evidence is considered weak, suggesting it is unlikely that ELF magnetic fields cause leukaemia in children.” ¹²
U.K. 2007	“In the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or isolated cells, the epidemiological evidence is currently not strong enough to justify the firm conclusion that such fields cause leukaemia in children.” ¹³
Canada 2005	“The evidence associating cancer in children with exposure to power-frequency EMF's is considered inconclusive for higher field exposures and not established for lower field exposures.” ¹⁴
U.K. 2004	“[T]he evidence is not strong enough to justify a firm conclusion that such fields [EMF] cause leukaemia in children.” ¹⁵
Netherlands 2004	“[T]here is no evidence to support the existence of a causal relationship here. Nor has research yet uncovered any evidence that a causal relationship might exist.” ¹⁶
U.S. 2002	The association reported between magnetic fields and childhood leukemia is “weak, and it is not clear whether it represents a cause-and-effect relationship.” ¹⁷
IARC 2002	“There is <i>limited evidence</i> in humans for the carcinogenicity of extremely low-frequency magnetic fields in relation to childhood leukemia.” “It cannot be excluded that a combination of selection bias, some degree of confounding and chance could explain the results.” ¹⁸

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CHILDHOOD CANCERS OTHER THAN LEUKEMIA	
<i>Bio-Initiative Claim</i>	<i>“There is some evidence that other childhood cancers may be related to ELF exposure but not enough studies have been done.”¹⁹</i>
WHO 2007	“With regard to other childhood cancers, no consistent relationship has been reported in studies of childhood brain tumours or cancers at other sites and residential ELF electric and magnetic fields.” ²⁰
WHO 2007	“In general, the animal studies, which included a number of life-time studies and studies of animals predisposed to develop cancer, and in vitro studies of cellular processes implicated in carcinogenesis, did not support the hypothesis that ELF EMFs were carcinogenic.” ²¹
IARC 2002	“No consistent relationship has been seen in studies of childhood brain tumours or cancers at other sites and residential ELF electric and magnetic fields.” ²²
ADULT BREAST CANCER	
<i>Bio-Initiative Claim</i>	<i>“There is sufficient evidence ... to conclude that high MF exposure may be a risk factor for breast cancer.”²³</i>
WHO 2007	“[T]he evidence for an association between ELF exposure and the risk of breast cancer ... does not support an association of this kind.” ²⁴
E.C. 2007	“[F]or breast cancer ... recent research has indicated that an association is unlikely.” ²⁵
U.K. 2006	“There is no consistent evidence, from research using cells, animals and humans, that EMF exposure is a cause of breast cancer, nor has any mechanism for such an association been demonstrated.” ²⁶
Canada 2005	“To date, the epidemiological evidence in support of an association between PFF [power frequency fields] and breast cancer is weak to nonexistent.” ²⁷
U.S. 2002	“Overall, the published epidemiological studies have not shown such an association [between EMF and breast cancer].” ²⁸

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DNA DAMAGE	
<i>Bio-Initiative Claim</i>	<i>“Extremely-low frequency (ELF) has also been shown to be genotoxic and cause DNA damage.”²⁹</i>
WHO 2007	“Most studies have shown no genotoxic effects after exposure to ELF magnetic fields in several types of mammalian cell, including human cells.” ³⁰
U.K. 2007	“At the cellular level, there is no clear evidence that exposure to power frequency EMF at levels likely to be encountered can affect biological processes that are implicated in causing cancer.” ³¹
Sweden 2006	“The majority of previous animal and in vitro studies have found no evidence of genotoxicity of ELF magnetic fields at field strengths relevant to human exposure.” ³²
Canada 2005	“There is no evidence from in vitro studies that PFF [power frequency fields] is genotoxic.” ³³
U.K. 2004	“[T]here is no convincing evidence to suggest that magnetic fields are directly genotoxic or that they can bring about the transformation of cells in culture.” ³⁴
U.S. 2002	“Nearly 100 studies on EMF genotoxicity have been reported. Most evidence suggests that EMF exposure is not genotoxic.” ³⁵
ALZHEIMER’S DISEASE	
<i>Bio-Initiative Claim</i>	<i>“There is strong evidence that long-term exposure to ELF magnetic field (MF) is a risk factor for Alzheimers disease.”³⁶</i>
WHO 2007	“Altogether, the evidence for an association between ELF exposure and Alzheimer’s disease is inadequate.” ³⁷
Ireland 2007	“The evidence is unconvincing that ELF is a cause of ... Alzheimer’s disease.” ³⁸
Canada 2005	“The Alzheimer’s studies do not provide convincing support for an association between PFF [power frequency fields] and Alzheimer’s disease.” ³⁹
IARC 2002	“The evidence from epidemiological studies of residential and occupational exposure to ELF electric and magnetic fields in relation to the incidence of neurodegenerative disease ... is generally weak and inconsistent.” ⁴⁰

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IMMUNE SYSTEM	
<i>Bio-Initiative Claim</i>	<i>“There is substantial evidence that ELF and RF can cause inflammatory reactions, allergy reactions and change normal immune function at levels allowed by current public safety standards.”⁴¹</i>
WHO 2007	“Evidence for the effects of ELF electric or magnetic fields on components of the immune system is generally inconsistent.” ⁴²
U.S. 2002	“Several clinical studies with human volunteers have evaluated the effects of power-frequency EMF exposure on hormones, the immune system, and blood chemistry. These studies provide little evidence for any consistent effect.” ⁴³
IARC 2002	“[N]o health-related conclusions can be drawn from the data on immunological and hematological effects after exposure to ELF electric and magnetic fields.” ⁴⁴
ELECTRICAL HYPERSENSITIVITY [EHS]	
<i>Bio-Initiative Claim</i>	<i>“Electrical hypersensitivity is reported by individuals in the United States, Sweden, Switzerland, Germany, Denmark and many other countries of the world. Estimates range from 3% to perhaps 10% of populations, and appears to be a growing condition of ill-health leading to lost work and productivity.”⁴⁵</i>
WHO 2007	“Some people claim to be hypersensitive to EMFs in general. However, the evidence from double-blind provocation studies suggests that the reported symptoms are unrelated to EMF exposure.” ⁴⁶
E.C. 2007	“No consistent relationship between ELF fields and self-reported symptoms (sometimes referred to as electrical hypersensitivity) has been demonstrated.” ⁴⁷
Ireland 2007	“No studies have established that EMF exposure leads to the subjective symptoms reported by EHS individuals. ... EHS sufferers do not experience worse symptoms when exposed to EMF fields” ⁴⁸
U.K. 2004	“The phenomenon of electromagnetic hypersensitivity has been reported in some people. However, the suggestion from double blind trials is that the reported symptoms are unrelated to EMF exposure.” ⁴⁹

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CELLULAR EFFECTS	
<i>Bio-Initiative Claim</i>	<i>“Very low-level ELF and RF exposures can cause cells to produce stress proteins, meaning that the cell recognizes ELF and RF exposures as harmful.”⁵⁰</i>
WHO 2007	“No consistent effects have been seen in the stress-related hormones ... in a variety of mammalian species, with the possible exception of short-lived stress following the onset of ELF electric field exposure at levels high enough to be perceived.” ⁵¹
U.S. 2002	“Cellular studies have investigated potential EMF effects on cell proliferation and differentiation, gene expression, enzyme activity, melatonin, and DNA. Scientists reviewing the EMF research literature find overall that the cellular studies provide little convincing evidence of EMF effects at environmental levels.” ⁵²
EXISTING EMF EXPOSURE GUIDELINES	
<i>Bio-Initiative Claim</i>	<i>The existing EMF exposure guidelines from ICNIRP “are insufficiently protective of public health.”⁵³</i>
WHO 2007	“Compliance with these guidelines [ICNIRP and IEEE] provides adequate protection.” ⁵⁴
WHO 2007	“[T]he evidence for a causal relationship [between EMF and childhood leukemia] is limited, therefore exposure limits based upon epidemiological evidence are not recommended...” ⁵⁵
Ireland 2007	“The ICNIRP guidelines are employed by governments and health advisory authorities worldwide to ensure the protection of citizens from any adverse health effects that might arise from exposure to EMF.” ⁵⁶

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EMF STANDARDS PROPOSED BY BIO-INITIATIVE	
<i>Bio-Initiative Claim</i>	<i>“ELF limits should be set below those exposure levels that have been linked in childhood leukemia studies to increased risk of disease, plus an additional safety factor. ... Measures should be implemented to guarantee that exposure due to transmission and distribution lines is below an average of about 1 mg...”⁵⁷</i>
WHO 2007	“[P]olicies based on the adoption of arbitrary low exposure limits are not warranted.” ⁵⁸
WHO 2007	“[G]iven the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukaemia, the benefits of exposure reduction on health are unclear.” ⁵⁹
WHO 2007	“[I]t is unlikely that the implementation of an exposure limit based on the childhood leukaemia data and aimed at reducing average exposure to ELF magnetic fields to below 0.4 µT, would be of overall benefit to society.” ⁶⁰
UK 2004	“The results of epidemiological studies, taken individually or as collectively reviewed by expert groups, cannot be used as a basis for the derivation of quantitative restrictions on exposure to EMFs.” ⁶¹

¹ *BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic fields (ELF and RF)*, (2007) at Section 1, p. 3.

² *About electromagnetic fields*, World Health Organization (2008), www.who.int/peh-emf/en/ at 2.

³ *Id.*

⁴ *Health Effects of Electromagnetic Fields*, Expert Group on Health Effects of Electromagnetic Fields, Department of Communications, Marine and Natural Resources, Republic of Ireland (2007) at 29.

⁵ *The Annual Report of the Radiation Advisory Committee for the Year Ending September 2006*, State of Victoria (2006) at 11.

⁶ *Health Concerns of Power Frequency Electric and Magnetic Fields*, BC Centre for Disease Control (2005) at 1.

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⁷ *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*, U.S. National Institute of Environmental Health Sciences (1999) NIH Publication No. 99-4493 at 36.

⁸ *Research on Power-Frequency Fields Completed Under the Energy Policy Act of 1992*, National Research Council (1999) at 8.

⁹ *BioInitiative Report*, Section 1 at 8.

¹⁰ *About electromagnetic fields*, World Health Organization (2008) at 2.

¹¹ *Electromagnetic fields and public health*, Fact Sheet 322, World Health Organization (2007).

¹² *Health Effects of Electromagnetic Fields*, Expert Group on Health Effects of Electromagnetic Fields, Department of Communications, Marine and Natural Resources, Republic of Ireland (2007) at 3.

¹³ *EMF and cancer FAQs*, U.K. Health Protection Agency (2007), www.hps.org.uk at Question 3.

¹⁴ *Health Concerns of Power Frequency Electric and Magnetic Fields*, BC Centre for Disease Control (2005) at 1.

¹⁵ *Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0 – 300 GHz)*, Documents of the NRPB, Volume 15, No. 3, National Radiological Protection Board (2004) at 38.

¹⁶ *Electromagnetic Fields: Annual Update 2003*, Health Council of the Netherlands (2004) at 75-76.

¹⁷ *Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (2002) at 16.

¹⁸ *Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields*, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 80 (2002) at 338, 333.

¹⁹ *BioInitiative Report*, Section 1 at 8.

²⁰ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 256.

²¹ *Id.* at 257.

²² *Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields*, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 80 (2002) at 332.

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²³ *BioInitiative Report* at Table 1-1, Section 12.

²⁴ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 307.

²⁵ *Possible effects of Electromagnetic Fields (EMF) on Human Health*, Scientific Committee on Emerging and Newly Identified Health Risks, European Commission (2007) at 43.

²⁶ *Power Frequency Electromagnetic Fields, Melatonin and the Risk of Breast Cancer*, U.K. Health Protection Agency (2006) at 5.

²⁷ *Health Effects and Exposure Guidelines Related to Extremely Low Frequency Electric and Magnetic Fields – An Overview*, Federal-Provincial-Territorial Radiation Protection Committee – Canada (2005) at 264.

²⁸ *Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (2002) at 23.

²⁹ *BioInitiative Report* at Table 1-1, Section 6.

³⁰ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 323.

³¹ *EMF and Cancer FAQs*, U.K. Health Protection Agency (2007) at 2.

³² *Recent Research on EMF and Health Risks*, Swedish Radiation Protection Authority (2006) at 4.

³³ *Health Effects and Exposure Guidelines Related to Extremely Low Frequency Electric and Magnetic Fields – An Overview*, Federal-Provincial-Territorial Radiation Protection Committee – Canada (2005) at 265.

³⁴ *Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0 – 300 GHz)*, Documents of the NRPB, Volume 15, No. 3, National Radiological Protection Board (2004) at 54.

³⁵ *Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (2002) at 27.

³⁶ *BioInitiative Report*, Section 1 at 13.

³⁷ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 8.

³⁸ *Health Effects of Electromagnetic Fields*, Expert Group on Health Effects of Electromagnetic Fields, Department of Communications, Marine and Natural Resources, Republic of Ireland (2007) at 13.

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- ³⁹ *Health Effects and Exposure Guidelines Related to Extremely Low Frequency Electric and Magnetic Fields – An Overview*, Federal-Provincial-Territorial Radiation Protection Committee – Canada (2005) at 264.
- ⁴⁰ *Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields*, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 80 (2002) at 336-337.
- ⁴¹ *BioInitiative Report*, Section 1 at 18.
- ⁴² *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 8.
- ⁴³ *Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (2002) at 24.
- ⁴⁴ *Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields*, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 80 (2002) at 336.
- ⁴⁵ *BioInitiative Report* at Table 1-1, Section 8.
- ⁴⁶ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 6.
- ⁴⁷ *Possible effects of Electromagnetic Fields (EMF) on Human Health*, Scientific Committee on Emerging and Newly Identified Health Risks, European Commission (2007) at 42.
- ⁴⁸ *Health Effects of Electromagnetic Fields*, Expert Group on Health Effects of Electromagnetic Fields, Department of Communications, Marine and Natural Resources, Republic of Ireland (2007) at 18.
- ⁴⁹ *Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0 – 300 GHz)*, Documents of the NRPB, Volume 15, No. 3, National Radiological Protection Board (2004) at 64.
- ⁵⁰ *BioInitiative Report* at Section 1, p. 17.
- ⁵¹ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 7.
- ⁵² *Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (2002) at 25.
- ⁵³ *BioInitiative Report* at Table 1-1 at Overall Summary of Conclusions.

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⁵⁴ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 355.

⁵⁵ *Id.* at 355-356.

⁵⁶ *Health Effects of Electromagnetic Fields*, Expert Group on Health Effects of Electromagnetic Fields, Department of Communications, Marine and Natural Resources, Republic of Ireland (2007) at 21.

⁵⁷ *BioInitiative Report* at Table 1-1, Section 17.

⁵⁸ *Electromagnetic fields and public health*, Fact sheet 322, World Health Organization (2007).

⁵⁹ *Id.*

⁶⁰ *Extremely Low Frequency Fields*, Environmental Health Criteria Monograph No. 238, World Health Organization (2007) at 362.

⁶¹ *Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0 – 300 GHz)*, Documents of the NRPB, Volume 15, No. 3, National Radiological Protection Board (2004) at 38.