



**FOR MORE INFORMATION
PLEASE CONTACT**

Loren Knopper, Ph.D.
Senior Environmental Health Scientist
lknopper@intrinsic.com

Christopher Ollson, Ph.D.
Vice President
collson@intrinsic.com

Melissa Whitfield Aslund, Ph.D.
Environmental Health Scientist
maslund@intrinsic.com

6605 Hurontario Street
Suite 500
Mississauga, ON
L5T 0A3

Phone: 905-364-7800
Fax: 905-364-7816

Electromagnetic Fields (EMF), Health & Transmission Lines

What are Electromagnetic Fields (EMF)?

Electromagnetic Fields (EMF; also called electric and magnetic fields) are invisible lines of force that you cannot feel that surround electrical devices and wiring. EMF associated with electricity is called extremely low frequency (ELF; or power frequency). Electric and magnetic fields can occur together or separately and are a function of voltage and current. Electric fields come from electric pressure (for example, when something is plugged into an outlet but not turned on) and are commonly represented in units of volts per metre (V/m). Magnetic fields come from the movement of electric charges (when something is plugged into an outlet and turned on) and are represented by two common units: microtesla (μT) and milligauss (mG). Levels of EMF drop off rapidly with distance from the source.

EMF in Everyday Life

On a daily basis people around the world are exposed to ELF EMF as a result of using electricity in their homes, offices and schools. EMF exists around all common household electronic devices (for example: refrigerator, stove, alarm clock, lamps, household wiring). For some Canadians this also includes exposure to EMF from high voltage power lines and transformer boxes. Health Canada (2012) states:

"When you are inside your home, the magnetic fields from high voltage power lines and transformer boxes are often weaker than those from household electrical appliances".

State of Knowledge on Health Effects and EMF

Concerns about the ever-present nature of ELF EMF and possible health concerns have been raised by some in the global community. The science around EMF and possible health concerns has been extensively researched over the last 30 years. Government and medical agencies including Health Canada, the World Health Organization (WHO), the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the International Agency for Research on Cancer (IARC) and the US National Institute of Health (NIH) and National Institute of Environmental Health Sciences (NIEHS) have all thoroughly reviewed the available information.

Short term exposure to EMF: At high levels EMF is known to cause stimulation in the central nervous system. The ICNIRP, a group recognized by the WHO as the international independent advisory body for non-ionizing radiation protection, established a guideline of 2000 mG for the general public (ICNIRP 2010). To put this level into context, the average magnetic field 60 m from a 230kV transmission line can be expected to be around 2 mG (NIEHS 2002).



Long term exposure to EMF: Based on the available weight of evidence, Health Canada:

“Does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELF. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors”.

It needs to be acknowledged that based on a weak association of childhood leukemia and chronic exposure to magnetic field strength above 3-4mG, the International Agency for Research on Cancer (IARC) and WHO have categorized EMF as a Class 2B possible human carcinogen. Coffee is also a 2B carcinogen.

What does this mean? This means there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. For EMF there are no globally accepted mechanisms that would suggest that low-level exposures are involved in cancer development and animal studies have been largely negative (WHO 2007). **Thus, on balance, the WHO has stated (based on approximately 25,000 articles published over the past 30 years) that the evidence related to childhood leukemia is not strong enough to be considered causal (WHO 2012).**

In addition to childhood cancer, some people have concerns about EMF and a range of other health concerns. The WHO (2007) has stated:

“A number of other adverse health effects have been studied for possible association with ELF magnetic field exposure. These include other childhood cancers, cancers in adults, depression, suicide, cardiovascular disorders, reproductive dysfunction, developmental disorders, immunological modifications, neurobehavioural effects and neurodegenerative disease. The WHO Task Group concluded that scientific evidence supporting an association between ELF [extremely low frequency] magnetic field exposure and all of these health effects is much weaker than for childhood leukaemia. In some instances (i.e. for cardiovascular disease or breast cancer) the evidence suggests that these fields do not cause them”.

Based on the available weight of evidence, Health Canada “does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELFs. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors”.

SUGGESTED READING

Health Canada. 2012. Electric and Magnetic Fields from Power Lines and Appliances. Catalogue # H13-7/70-2012E-PDF, ISBN # 978-1-100-21395-8. <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/enviro/magnet-eng.php>

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Hospital for Sick Children: Electromagnetic radiation and cancer fears. http://www.hydroone.com/OurCommitment/Environment/Documents/EMF/Sick_Kids_Electromagnetic_radiation_and_cancer_fears.pdf