

## Electric and Magnetic Fields

Wherever there is electricity, we will encounter electric fields, associated with voltage; and magnetic fields, associated with the amount of current being used. Public and scientific concerns have been expressed over the possibility that these electric and magnetic fields (EMF), associated with our everyday use of electricity, could be a health risk.

We recognize the public interest in this issue and provide information on EMF to our customers and employees. BC Hydro continues to monitor and evaluate the scientific evidence emerging from studies on EMF. We help the public and employees to measure exposure to EMF. This support is directed at providing the basis for an informed decision regarding personal exposure to EMF.

Although electric and magnetic fields have different properties, they are often simply referred to as EMF. The frequency for our electrical system and the fields is 60 cycles per second or 60 hertz (Hz).

These fields are associated with all electrical devices and appliances in our homes and work places. They also come from the wiring that delivers electricity to and in houses and buildings as well as transmission lines and equipment for voltage transformation.

Our exposure to 60 Hz fields has increased from zero about 100 years ago to the levels of today without any clearly established effects on public health. This finding is the result of thousands of laboratory and field studies on the effects of electric and magnetic fields on humans, livestock, laboratory animals, isolated cells and tissues. Scientists have studied the effects of EMF at all levels of exposure including intensities much higher than would ever be experienced by humans or animals in everyday life.

Scientists make a distinction between biological responses or effects, and adverse or deleterious effects. The response of the eye to turning on the light in a room serves as a clear example of a biological effect that is in no way adverse.

Two basic approaches have been used by scientists to explore these biological responses or effects.

1. Laboratory studies using human or animal experimental subjects, or isolated organs and cells.
2. Epidemiologic studies in human populations that look for an association between exposure to electric and/or magnetic fields and various diseases.

Laboratory studies of humans exposed to intense electric and magnetic fields produced no observed changes in blood pressure, body temperature, sleep, appetite or physical functions. Other studies showed mood and behaviour unchanged in human subjects.

However, these studies have documented that very strong electric fields can sometimes be felt due to stimulation of body hair. We sense static electricity, in much the same way, when combing our hair in dry winter weather. Other documented effects include slight changes in brain wave activity and heart rate. These minor changes are generally viewed as not harmful, and in these experiments the subject's awareness, judgment and mood were unaffected.

In 1999, an epidemiologic study of childhood leukemia was carried out in Western Canada and Québec under the auspices of the B.C. Cancer Agency. It was able to build on the findings from earlier studies. The study found no correlation between leukemia and nearness of distribution or transmission lines, nor magnetic or electric field exposure levels. While we must always be cautious about the results of a single study, we do know that this major Canadian study did not support previous claims that the EMF fields are responsible for increases in risk for childhood leukemia.

Epidemiologists and medical specialists have also studied workers exposed to electric and magnetic fields. After examining their physical and psychological well-being they found no indication of adverse effects from these exposures. Studies of adults exposed to residential magnetic fields from power lines have not consistently shown a significant increase in the risk of developing cancer. The National Academy of Sciences of the U.S. concluded, in its 1996 report, that "the current body of evidence does not show that exposure to these fields presents a human health hazard."

The U.S. National Institute of Environmental Health Sciences convened an expert review group at the conclusion of its multi-year research program that reported in 1999 that "there is little probability that EMF exposure poses a health hazard."

In 2000, an Advisory Group to the National Radiation Protection Board of the UK concluded that "in the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or isolated cell, the epidemiological evidence is currently not strong enough to justify a firm conclusion that such fields cause leukemia in children."

International Agency for Research on Cancer (IARC), which is responsible for cancer research for the World Health Organization, reported in 2001 that "overall, extremely low frequency magnetic fields were evaluated as possibly carcinogenic to humans, based on the statistical association of higher level residential extremely low frequency (ELF) magnetic fields and increased risk for childhood leukemia." They also stated that "although many hypotheses have been put forward to explain possible carcinogenic effects of ELF electric or magnetic fields, no scientific explanation for carcinogenicity of these fields has been established."

With regard to residential magnetic fields and the increase risk of childhood leukemia, IARC stated "studies in experimental animals have not shown a consistent carcinogenic or co-carcinogenic effect of exposures to ELF magnetic fields, and no scientific explanation has been established for the observed association of increased childhood leukemia risk with increasing residential ELF magnetic field exposure."

A series of major animal cancer studies around the world have not produced convincing evidence to support the idea that magnetic fields promote or stimulate cancer development. Even when the levels of magnetic field were well above current exposure guidelines. Other researchers have probed the health and reproduction of farm animals living near, or directly under, high voltage transmission lines. Extensive studies in Canada, Sweden and the U.S. indicate that exposure to the fields associated with transmission lines, is not harmful to farm animals.

BC Hydro will continue to monitor new scientific evidence surrounding the health impacts of power frequency EMF. BC Hydro will continue to support EMF research, and continue to liaise with research groups, standards organizations, and public and occupational health agencies. Reference information is regularly updated and available to our customers. This material will assist you in making an informed decision regarding personal exposure to EMF.

**NOTE:** Magnetic fields of five milligauss or more can cause minor computer monitor image interference. This can be corrected by relocating the monitor, changing the monitor refresh rate or by use of a passive magnetic field shield.

BC Hydro is committed to the safe use of electricity. We have been supportive of independent research on EMF in B.C., in Canada and abroad as part of an international effort to address possible health concerns. A "Magnetic Field Measurement Kit" is available for loan at some BC Hydro offices throughout the province. The kit includes a measurement machine, a video and several instruction booklets to assist with your readings. Call BC Hydro for your closest office.

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