



INFORMATION ABOUT ELECTROMAGNETIC FIELDS ASSOCIATED WITH ELECTRIC POWER

What are electromagnetic fields?

Electromagnetic fields (EMF) consist of electric and magnetic waves travelling together. They have both a frequency and a wavelength. Frequency is measured in units of hertz (1 Hz = 1 cycle per second). Both magnetic and electric fields are strongest close to the source and diminish with distance.

Any device connected to an electrical outlet, even if the device is not switched on, will have an associated electric field. Electric fields are easily shielded.

Any device connected to an electrical outlet, when the device is switched on and a current is flowing, will have an associated magnetic field. Magnetic fields are measured in units of tesla (T) or gauss (G), and are not shielded by most common materials. That is why burying a power line will not reduce the magnetic field measured above ground.

What are extremely low frequency EMFs?

The electromagnetic spectrum covers an enormous range of frequencies. Electric power (60 Hz in North America, 50 Hz in most other places) is in the extremely low frequency (ELF) range which includes frequencies below 300 Hz. Exposure to ELF fields is primarily associated with the generation, transmission and use of electric energy in the community, home and workplace.

How do we measure exposure to EMF?

Scientists are still uncertain about the best way to measure exposure to EMF. The strength of the magnetic field depends on how much current is flowing and the current flowing in a power line is not constant. It depends on how much electrical power it has to deliver. That is why point readings do not give an accurate estimate of a person's total EMF exposure. Measurements can be made using small meters that are worn constantly and the measurements averaged over the wearing time.

How do electric and magnetic fields from transmission lines compare to those from appliances?

Electric fields close to transmission lines are much stronger than the fields found near electrical appliances. Magnetic fields are often stronger very close to electrical appliances than they are directly beneath power lines. However, appliance fields decrease in strength with distance more quickly than do power line fields.

What happens to exposure levels when there are several power lines together?

Addition of another power line will not simply increase the strength of the EMF around the line. In fact, overall the magnetic field strength may not change with the addition of another line. A complex calculation must be done to estimate the magnetic field strength produced by the addition of another power line.

What are the health effects of EMF?

Biological effects, changes in things we measure in the laboratory that have no effect on the overall health of the animal, have been shown in some laboratory studies but not in others. Typically these effects are seen at much higher EMF strengths than people would normally be exposed to.

Melatonin: Some investigators have reported that ELF field exposure may suppress secretion of melatonin, a hormone connected with our day-night rhythms. It has been suggested that melatonin might be protective against breast cancer so that such suppression might contribute to an increased incidence of breast cancer already initiated by other agents. While there is some evidence for melatonin effects in laboratory animals, volunteer studies have not confirmed such changes in humans.

Cancer: There is no consistent evidence that exposure to ELF fields causes direct damage to biological molecules, including DNA. Since it seems unlikely that ELF fields could initiate cancer, a large number of investigations have been

conducted to determine if ELF exposure can influence cancer promotion. Results from animal studies conducted so far suggest that ELF fields do not initiate or promote cancer.

Epidemiological Studies A large number of studies have been conducted to determine if measured ELF exposure can influence cancer development, especially leukemia in children. Two recent analyses of epidemiological studies suggest that, in a population exposed to average magnetic fields in excess of 0.3 to 0.4 microtesla (4 milligauss), twice as many children might develop leukemia compared to a population with lower exposures. Although uncertainty remains as to whether magnetic field exposure or some other factor(s) might have accounted for the increased leukemia incidence, these epidemiological studies are the basis on which the International Agency for Research on Cancer has classified ELF EMF as *possibly carcinogenic to humans*. This classification is usually based on evidence in humans which is considered credible, but for which other explanations could not be ruled out. Other examples of agents in this category are coffee, styrene, gasoline engine exhaust and welding fumes.

A study looking at thousands of electrical workers has not shown increased rates of cancer of any kind (including leukemia).

Is it safe to live close to a power line?

Living close to a transmission line can increase your overall exposure to EMFs. The answer to this question, therefore, involves:

- judgement about the meaning of existing scientific evidence
- speculation about possible results of future studies
- individual perceptions about the relative importance of various potential health risks.

What can you do to limit EMF exposure?

- Increase the distance between yourself and the EMF source – sit at arm's length from your computer terminal; stand back from an appliance when it is in use.
- Correct any household wiring problems
- Avoid unnecessary proximity to high EMF sources – don't let children play directly under power lines or on top of power transformers for underground lines
- Reduce time spent in the magnetic field – turn off your computer monitor and other electrical appliances when you are not using them.

What can Government and Industry do?

- Provide the public with balanced, clear and comprehensive information on potential EMF risks, as well as suggestions for safe and low-cost ways to reduce exposures.
- Continue to follow the current research in this area. As further evidence becomes available, it will lead to a better overall understanding of the benefits and risks involved in the transmission of electricity to consumers.
- Consult with local authorities and the public when siting new power lines. Obviously power lines must be sited in a way that provides power to consumers. Siting decisions should also take into account esthetics, public sensibilities and ways to reduce peoples' exposure.

Produced in collaboration with Manitoba Health and Cancer Care Manitoba.

For further information you may obtain a copy of the document " A Review of Current Information on the Health Effects of Extremely Low Frequency Electromagnetic Fields" at www.wrha.mb.ca or by calling 926-8083