



# IT'S YOUR HEALTH



## Electric and Magnetic Fields At Extremely Low Frequencies

### The Issue

There are concerns that daily exposure to electric and magnetic fields (EMFs) may cause health problems. These concerns are reflected in a number of reports that have attempted to link EMF exposure to a variety of health issues, including childhood cancer.

### Background

Electricity delivered through power lines plays a central role in modern society. It is used to light homes, prepare food, run computers and operate other household appliances, such as TVs and radios. In Canada, appliances that plug into a wall socket use electric power that flows back and forth at a power frequency of 60 cycles per second (60 hertz).

Every time you use electricity and electrical appliances, you are exposed to electric and magnetic fields (EMFs) at extremely low frequencies (ELF). The term “extremely low” is used to describe any frequency below 300 hertz. EMFs produced by the transmission and use of electricity belong to this category.

### Electric and Magnetic Fields (EMFs)

Electric and magnetic fields are invisible forces that surround electrical equipment, power cords and wires that carry electricity, including outdoor power lines. You cannot see or feel EMFs.

**Electric Fields:** These are formed whenever a wire is plugged into an outlet, even when the appliance is not turned on. The higher the voltage, the stronger the electric field.

**Magnetic Fields:** These are formed when electric current is flowing within a device or wire. The greater the current, the stronger the magnetic field.

Electric and magnetic fields can occur separately or together. For example, when you plug the power cord for a lamp into a wall socket, it creates an electric field along the cord. When you turn the lamp on, the flow of current through the cord creates a magnetic field. Meanwhile, the electric field is still present.

### The Strength of EMFs

Electric and magnetic fields are strongest when close to their source. As you move away from the source, the strength of the fields fades rapidly. This means you are

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exposed to stronger electric and magnetic fields when standing close to a source (e.g., right beside a transformer box or under a high voltage power line), and you are exposed to weaker fields as you move away. When you are indoors at home, the magnetic fields from high voltage power lines and transformer boxes are weaker than those from household electrical appliances.

## Canadian Exposures to EMFs at ELF

On a daily basis, most Canadians are exposed to EMFs generated by household wiring, fluorescent lighting, and any electrical appliance that plugs into the wall, including hair dryers, vacuum cleaners and toasters. In the workplace, common sources include video display terminals (computer monitors), air purifiers, photocopiers, fax machines, fluorescent lights, electric heaters and electric tools in machine shops, such as drills, power saws, lathes and welding machines.

## Exposures in Canadian Homes, Schools and Offices Present No Known Health Risks

Research has shown that EMFs from electrical devices and power lines can cause weak electric currents to flow through the human body. However, these currents are much smaller than those produced naturally by your brain, nerves and heart, and are not associated with any known health risks.

There have been many studies about the effects of exposure to electric and magnetic fields at extremely low frequencies. Scientists at Health Canada are aware that some of these studies have suggested a possible link between exposure to ELF fields and

certain types of childhood cancer. The International Agency for Research on Cancer (IARC) has evaluated the scientific data and has classified ELF magnetic fields as being “possibly carcinogenic” to humans. IARC based this classification on the following:

- human health population studies showing weak evidence of an association with childhood leukemia; and
- a large database of laboratory study results showing inadequate evidence of an association with cancer in animals.

To put this into context, it is important to understand that the “possibly carcinogenic” classification is also applied to coffee, gasoline engine exhaust and pickled vegetables, and is often used for agents that require further study. In summary, when all of the studies are evaluated together, the evidence suggesting that EMFs may contribute to an increased risk of cancer is very weak.

## Concerns about Electromagnetic Interference

In certain circumstances, EMFs can cause interference with electronic devices. For example, office workers may notice image movement (jitter) on their computer screens if the computer is in an area where magnetic fields are slightly elevated above background levels. Some sources that generate these slightly elevated levels are the cables that bring electrical power into an office area, and common electrical equipment, such as power transformers.

Magnetic fields that are capable of causing jitter on computer screens do not present any known risks to human health. To solve the jitter problem,

simply move the computer to another part of the room where the magnetic fields are weaker.

## Minimizing Your Risk

You do not need to take action regarding daily exposures to electric and magnetic fields at extremely low frequencies. 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.

## Health Canada’s Role

Health Canada, along with the World Health Organization, monitors scientific research on EMFs and human health as part of its mission to help Canadians maintain and improve their health. At present, there are no Canadian government guidelines for exposure to EMFs at ELF. Health Canada does not consider guidelines for the Canadian public necessary because the scientific evidence is not strong enough to conclude that exposures cause health problems for the public.

Some national and international organizations have published health-based exposure guidelines for EMFs at ELF. However, these guidelines are not based on a consideration of risks related to cancer. Rather, the point of the guidelines is to make sure that exposures to EMFs do not cause electric currents or fields in the body that are stronger than the ones produced naturally by the brain, nerves and heart. EMF exposures in Canadian homes, schools and offices are far below these guidelines.

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## Need More Info?

For further information contact:

The Consumer and Clinical Radiation Protection Bureau  
Health Canada  
775 Brookfield Road  
Ottawa, ON K1A 1C1  
Telephone: (613) 954-6699  
Fax: (613) 952-7584  
E-mail: [CCRPB-PCRPPC@hc-sc.gc.ca](mailto:CCRPB-PCRPPC@hc-sc.gc.ca)  
[www.hc-sc.gc.ca/ahc-asc/branch-dirgen/hecs-dgsesc/psp-psp/ccrpb-bpcrpcc-eng.php](http://www.hc-sc.gc.ca/ahc-asc/branch-dirgen/hecs-dgsesc/psp-psp/ccrpb-bpcrpcc-eng.php)

Also, see the following Fact Sheets on the World Health Organization (WHO) Web sections:

Electromagnetic Fields and Public Health: Exposure to Extremely Low Frequency Fields, at: [www.who.int/mediacentre/factsheets/fs322/en/index.html](http://www.who.int/mediacentre/factsheets/fs322/en/index.html)

Electromagnetic Fields and Public Health: Extremely Low Frequency(ELF), at: [www.who.int/docstore/peh-emf/publications/facts\\_press/efact/efs205.html](http://www.who.int/docstore/peh-emf/publications/facts_press/efact/efs205.html)

Electromagnetic Fields and Public Health: Extremely Low Frequency Fields and Cancer, at: [www.who.int/docstore/peh-emf/publications/facts\\_press/efact/efs263.html](http://www.who.int/docstore/peh-emf/publications/facts_press/efact/efs263.html)

For more information visit the following Web sites:

The International Agency for Research on Cancer (IARC), Static and extremely low frequency (ELF) electric and magnetic fields. Report No. 80, at: [www.iop.org/EJ/abstract/0952-4746/21/3/604](http://www.iop.org/EJ/abstract/0952-4746/21/3/604)

IARC Carcinogen Classifications, at: <http://monographs.iarc.fr/ENG/Classification/index.php>

The U.S. National Institute of Environmental Health Sciences (NIEHS), Questions and Answers about EMF at : [www.niehs.nih.gov/health/topics/agents/emf/](http://www.niehs.nih.gov/health/topics/agents/emf/)

*It's Your Health*, Safety of Exposure to Electric and Magnetic Fields from Computer Monitors and Other Video Display Terminals at : [www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/monit-eng.php](http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/monit-eng.php)

For additional articles on health and safety issues go to the *It's Your Health* Web section at:

[www.healthcanada.gc.ca/iyh](http://www.healthcanada.gc.ca/iyh)  
You can also call toll free at 1-866-225-0709 or TTY at 1-800-267-1245\*