

Generation, transmission and use of electricity are associated with human exposure to electric and magnetic fields, not only under high voltage power lines but also in homes and offices. On a daily basis, most Canadians are exposed to electric and magnetic fields produced by household wiring and lighting. There are electric and magnetic fields wherever there is electric power. When we consider what effects these fields may have on our health, we must concern ourselves not just with power lines but with all other sources of these fields.

Power lines are certainly highly visible, but our daily exposure comes mostly from the use of electricity in our homes and offices. Even in houses close to power lines people may be exposed to weaker fields than people far away. Many factors determine the actual exposure. Recognizing that we are practically continuously exposed to electro-magnetic fields, it certainly is important and prudent to consider whether these fields may detrimentally affect our health.

Public concern about high voltage power lines developed in the late 1960s as extra high voltage lines comprising large towers were built. The initial concern was about the aesthetic and ecological impacts and various nuisance effects.

The nuisance effects are audible noises, radio interference, and shocks and sparks when people touch ungrounded metal objects such as trucks or farm vehicles close to power lines. By the late 1970s and early 1980, some scientific evidence emerged that electric and magnetic fields could affect living organisms and that possibly some of these effects might prove to be harmful to man.

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The Department of National Health and Welfare recognized this problem a few years ago and has done a thorough review and assessment of the existing scientific evidence. Let me briefly review this evidence for you.

Health effects of electric and magnetic fields produced by power lines have been studied in the U.S. and Europe for over two decades with intensified efforts during the last five years. Until recently conventional wisdom has held that these fields pose no threat to human health. Two reasons are behind this thinking.

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First, the fields are low energy and unlike X-rays and other ionizing radiation they do not break chemical bonds, and unlike microwaves they do not cause heating.

Second, all cells in the body have large natural electric fields across their outer membranes.

However, despite the low energy electric and magnetic fields at power line frequencies can cause biological effects. While very many studies have showed a lack of effects, some research has unequivocally demonstrated that under some conditions these fields interact with biological systems.

Evidence today indicates that electric and magnetic fields can affect critical changes to cells in laboratory experiments. Examples of such changes are the modulation of ion flows, interference with DNA synthesis and RNA subscription, interactions with hormones, enzymes and neurotransmitters and perturbations to the immune response of cells and interactions with cancerous cells. The observed interactions with cancerous cells suggest a possibility of electro-magnetic field effects on tumour development as promoters or co-promoters with other agents such as toxic chemicals.

This hypothesis appears plausible because electro-magnetic fields have been shown not to cause genetic effects and cell mutations. What makes it very difficult in evaluation of these effects is that more is not necessarily worse, as we used to think.

It has been observed for some effects that a stronger field does not cause a specific effect while a weaker field does. It must be kept in mind that it is hard to predict whether and how these biological effects on cells in the laboratory translate into health effects on the animal or man.

On the level of studying the whole animal, as I mentioned before, many studies do not show any effect. Most animal experiments were screening experiments looking for all kinds of effects.

Very many studies were performed with very strong electric fields, higher than those encountered under high voltage power lines. No effects were found on blood and the immune system and on the reproductive system of rodents, but malformations in chick embryos were observed under some conditions. The best documented effects in experimental animals are shifts in daily circa-