



Government
of Canada

Gouvernement
du Canada

Wireless Communication and Health

An Overview



Canada 

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Les communications sans fil et la santé - Un aperçu.

A quick summary



What is the purpose of this handbook?

Wireless communications play an integral role in Canadian society. Millions of Canadians now use cellphones in their daily lives and nearly all Canadians use some sort of wireless device daily. For Canadian society to benefit from wireless technologies, including television and radio that entertain and inform us, all Canadians experience low levels of exposure to radiofrequency (RF) fields. This handbook describes what is known about the potential health risks from these fields. It also describes how the Government of Canada protects Canadians from excessive RF exposure.

What are radiofrequency fields and what do they have to do with cellphones?

When you, a friend or family member use a cellphone or any other wireless communications device, the information (voice, video, pictures, text message, email etc.) is carried through the air using RF fields from its antenna. A nearby outdoor antenna receives the information and responds in the very same way.

RF fields are produced by a variety of sources. In fact, even natural sources such as the sun and the earth emit low-level RF fields. In addition to cellphones, RF fields are used by baby monitors, cordless phones and various other consumer items in your home. As well, certain non-wireless devices, including computers and other digital devices, also emit RF fields.

How does the Government of Canada control public exposure to radiofrequency fields?

The Government of Canada has determined that there is no clear evidence that the use of wireless communications devices, including cellphones and their networks, is dangerous for human health provided its RF exposure guidelines are respected. The government has set exposure limits based on its knowledge of the effects of RF fields.

What are the health effects of radiofrequency fields?

Scientists have been studying the potential health effects of RF fields for decades. RF fields, no matter the source, can cause heating which can be harmful if uncontrolled. However, heating can also be very useful when used in devices that are properly designed: microwave ovens, for example, safely heat your food using RF. Scientists also know how much heat the human body can safely handle when exposed to the sun, RF or any other source. Based on this information, the Government of Canada has established RF field exposure guidelines.

Are there other effects?

Physical changes that do not involve heating are called non-thermal effects. The Government of Canada keeps current with research on these effects and asked an independent expert group (the Royal Society of Canada) to evaluate the scientific evidence on non-thermal effects of RF fields. The consensus of experts both in Canada and around the world is that there is no clear evidence of harm to human health from any of the known non-thermal effects of RF fields.

The word “radiate” is sometimes used to describe RF fields leaving an antenna, but it should not be misinterpreted for the word “radioactivity.” Radioactive material can be harmful. The radiating RF field is not a form of radioactivity so it does not present a health concern if exposure limits are met.

The Government of Canada continuously monitors the scientific literature on both thermal and non-thermal effects. This ensures that RF exposure limits are consistent with the current scientific consensus so that known potential health effects are prevented.

How will this handbook help me?

This handbook starts by explaining the basic nature of the RF fields that are used in wireless communications. It uses light as an example to explain a few important points about RF. Next, it describes ways in which the human body can be affected by RF fields. It then discusses how the Government of Canada sets limits to protect the public and how it ensures that those limits are respected. Finally, helpful suggestions are offered if you prefer to limit your RF exposure from your cellphone handset.

Understanding radiofrequency fields



What are radiofrequency fields and how are they used in wireless communications?

RF fields come from various sources and humans have always been exposed to them. In fact, the light that allows you to read this handbook is similar to RF fields.

Light travels from a source (the sun or a lamp) to the handbook and then reflects into your eyes. The light carries information in this handbook to your eyes through the specific pattern of light reflected by this handbook. Wireless communications work in a very similar way.

An outdoor antenna sends RF fields out into the local environment, much like a street lamp shines light on the surrounding area. A cellphone can detect the signal from the outdoor antenna and then understand the specific patterns of energy within the RF field. Simply put, the cellphone “sees” the RF fields and can “read” the information contained in them, similar to how your eye and brain can receive and process information sent in the form of visible light. This exchange of RF back and forth from the outdoor antenna to your cellphone allows you to talk with your friends, surf the web, and send and receive text messages and other information.

For a cellphone network to work properly, areas are divided into “cells.” Within the cell is a cell site, usually near the centre. Each cell site contains an antenna installation, usually on top of a tower, building or other tall structure, and your call automatically goes to the nearest one as you move about.

In an area where there are many cellphone users, more cell sites are required. The antenna installation is carefully designed and installed so that the established Canadian RF exposure standards are respected at all times. A cell site’s design, including its antenna height and emitted RF, ensures good coverage within the area while not interfering with neighbouring cells. The cell network then allows the greatest number of people to connect with the highest quality of service.



Does the location of the antenna and my distance from it affect my exposure?

An RF field diminishes very quickly as you move further away from its source. Think of a street lamp near your home. The street lamp needs to light a large area. If you were sitting in your home, trying to read this handbook, the street lamp would not provide enough light for reading.

While a street lamp lights up a wide area below, cell antennas are more like lighthouses. A lighthouse will cast a horizontal beam to communicate with ships that are far from it. Similarly, most cell tower antennas will cast a horizontal beam to communicate with cellphones that are around the tower.

The bottom line is that exposure to RF fields from antennas is very low: usually hundreds to thousands of times below the established limit.

Effects of radiofrequency fields



What are some of the ways that radiofrequency fields could affect me?

It is important to keep in mind that although some things in life can affect you, their impact is not necessarily harmful. A number of scientific studies have looked into whether RF fields can cause adverse health effects. We can separate the effects of RF fields into two categories: thermal and non-thermal effects.

What are thermal effects?

Thermal effects are increases in body temperature that may be caused by the absorption of RF fields. Since the body has many ways to cope with slight increases in temperature, a certain amount of heating can be tolerated easily. Wireless communications equipment is designed and installed in order to ensure that the amount of heating that the public may experience is well below the level that might cause health problems.

It is important to note that although you may feel warmth while using your cellphone, you are likely only feeling the effect of your hand holding the phone at the side of your head and not due to RF exposure.

What are non-thermal effects?

Non-thermal effects are effects that may occur from RF exposure at levels that are low enough such that there is no noticeable rise in temperature. These effects can include various subtle biological and chemical changes within the cells that make up human tissue. It is important to remember that biological effects do not necessarily lead to adverse health outcomes. The current scientific consensus is that there is no clear evidence that cellphones and their cell sites cause non-thermal effects that are harmful to human health.

Are all Canadians protected?

Canadian safety guidelines for exposure to RF fields specifically include protection limits for the general public. These guidelines recognize that public exposure can be unavoidable. Because of this, an additional safety factor is included in these limits to provide for all possible conditions. General public exposure limits are set to ensure the protection of all Canadians, including pregnant women, the aged, children and the chronically ill.

How much do scientists know about thermal effects and non-thermal effects?

Thermal effects are well known to medical scientists and are relatively easy to measure and predict. Your body also has a variety of mechanisms for coping with changes in temperature. For example, the circulation of blood in your body is constantly transferring heat from warmer spots to cooler spots, regardless of the source of the warmth.

Some may wonder why scientists have not concluded that non-thermal RF exposure is absolutely safe. As with all scientific research, it is very difficult to prove that something has no harmful effect. An example of this is the inability to test for every interaction between every potential use of RF fields and every potential biological effect.

Cellphones have been in use for a relatively short period of time so scientific research on their effects is still ongoing. While some biological effects are known to occur, there is no evidence that these effects are harmful to health. The inability of science to identify adverse health effects cannot be taken as absolute proof that adverse health effects are impossible. However, there is within the scientific community, a high degree of confidence that RF exposure from wireless communications devices, including cellphones and cell sites, is safe.

Setting limits to protect the public



Why is the public being exposed to radiofrequency fields?

Wireless communications is strongly desired by the vast majority of Canadians. This is clear from the widespread and increasing use of wireless technology throughout Canadian society. You, your friends and family can benefit from wireless communications by being able to communicate and, more importantly, communicate in an emergency. In Canada, approximately 50 percent of 911 calls are initiated by someone using a cellphone. Even if you do not use a cellphone, you or your family may, at some point, benefit from someone who does. Cellphones also improve personal security, which is most often appreciated when we feel physically vulnerable.

The use of RF fields for wireless communications is similar to many other societal decisions about new technologies. In many cases, our society accepts the risks and benefits provided the technology is properly controlled. Access to wireless communications essentially requires that everyone in our communities experience exposure to RF fields. Most Canadians have chosen to use wireless technology in one way or another — it is usually just a matter of degree.

How does the Government of Canada protect me?

The Government of Canada takes various steps to protect Canadians from RF exposure that exceeds established limits.

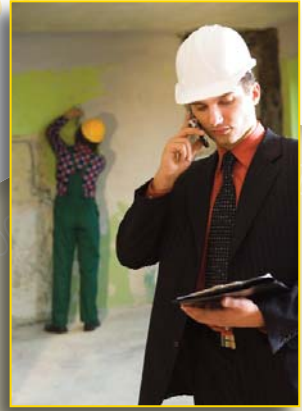
Health Canada is the federal agency that has broad responsibility for the protection of the health of Canadians. Health Canada's RF exposure guidelines are written and maintained with the purpose of protecting Canadians from unsafe levels of RF exposure. These guidelines detail the maximum allowable exposure limits to RF fields, taking into account evidence of both thermal and non-thermal effects.

Industry Canada is the federal agency responsible for regulating wireless communications equipment in Canada. All of this equipment, including cellphones and cell sites, must comply with Industry Canada's RF exposure requirements.

How does the Government of Canada ensure these limits are respected?

The Government of Canada requires that all cellphones and wireless device models be certified as meeting the Canadian RF exposure standards. Additionally, the government operates a post-market surveillance program, which tests a random sample of products available for sale to Canadians against these standards. As a result, manufacturers design and test their products to respect Canadian RF exposure requirements. Wireless carriers must also design and locate their antennas to ensure that public exposure to RF fields from their wireless installations respect Canadian limits at all times.

What do independent experts have to say?



A number of independent expert groups have conducted detailed reviews of the potential health risks associated with RF field exposure. These groups include expert panels convened by the Royal Society of Canada (RSC), the World Health Organization, the American Cancer Society and the British Medical Association. All of the credible scientific reviews completed recently conclude that there is no clear evidence

“The balance of evidence to date suggests that exposures to RF radiation below [safety] guidelines do not cause adverse health effects to the general population.”

National Radiological Protection Board

of adverse health effects associated with low-level RF fields, like those from cell-phones or cell sites. The RSC, in particular, periodically publishes updates to its conclusions based on recent scientific evidence and findings.

Studies continue in order to improve scientific knowledge. Findings to date demonstrate no clear evidence of adverse health effects associated with exposure to low-level RF fields.

“All of the authoritative reviews completed within the last two years have concluded that there is no clear evidence of adverse health effects associated with RF fields.”

The Royal Society of
Canada’s Expert Panel
on Radiofrequency Fields

The Government of Canada has determined that the use of cellphones and cell sites is safe for individuals and society alike provided that Canadian guidelines and standards are met.

Can I reduce my exposure to radiofrequency fields?



Experts do not believe that changes are required to protect your health, but here are some things that you could choose to do to reduce your RF exposure from cellphones:

- Limit the time spent on cellphone calls.
- Alternate between ears periodically to reduce the duration of RF exposure.
- Keep the phone away from your body when it is turned on. For example, you could avoid carrying it in your pocket or very close to your body.
- Avoid making calls in areas where the coverage is poor because it requires the phone to use more power to communicate with the nearest cell site.
- Use a “hands-free” mode or a wired headset to increase the distance between your head and the cellphone. Appropriate use of these products may reduce your RF exposure.

As well, when you are not using your cellphone (during a call or surfing the web, for example) it goes into “sleep” mode and only periodically emits any RF fields.

Where can I find out more?



The following resources are publicly available and may provide additional information on the potential health risks associated with RF exposure.

Industry Canada

Antenna Structures

<http://www.ic.gc.ca/antenna>

Health Canada

<http://www.hc-sc.gc.ca>

Health Protection Agency (UK)

<http://www.hpa.org.uk>

Federal Communications Commission (U.S.A.)

<http://www.fcc.gov>

Food and Drug Administration (U.S.A.)

<http://www.fda.gov>

World Health Organization

<http://www.who.int/en>

Royal Society of Canada

<http://www.rsc.ca>

National Cancer Institute (U.S.A.)

<http://www.cancer.gov>

Sense About Science (UK)

<http://www.senseaboutscience.org.uk>

The Institution of Engineering and Technology

<http://www.theiet.org>