



**HOUSE OF COMMONS
CANADA**

**AN EXAMINATION OF THE POTENTIAL HEALTH
IMPACTS OF RADIOFREQUENCY
ELECTROMAGNETIC RADIATION**

**Report of the Standing Committee on
Health**

**Joy Smith, MP
Chair**

DECEMBER 2010

40th PARLIAMENT, 3rd SESSION

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THE STANDING COMMITTEE ON HEALTH

has the honour to present its

TENTH REPORT

Pursuant to its mandate under Standing Order 108(2), the Committee has studied the impact of microwaves on human health and has agreed to report the following:

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AN EXAMINATION OF THE POTENTIAL HEALTH IMPACTS OF RADIOFREQUENCY ELECTROMAGNETIC RADIATION

INTRODUCTION

In recent years, public concerns have been raised regarding the potential negative health impacts of radiofrequency electromagnetic radiation emitting devices, such as microwaves and wireless phones.¹ On March 30, 2010, the House of Commons Standing Committee on Health (hereafter the Committee) agreed to conduct a study examining this issue. During the course of its study, the Committee held three hearings where it heard from a variety of witnesses, including: government officials, interested stakeholder groups and scientific experts. This report summarizes testimony from these hearings, as well as written submissions received by the Committee. Finally, it also identifies ways in which the federal government could take further action in this area.

BACKGROUND INFORMATION

A. Electromagnetic Radiation²

Electromagnetic radiation is defined as waves of electric and magnetic energy that are transmitted through space and travelling at the speed of light. The area where these waves are found is called an electromagnetic field (EMF), which is made up of both an electric and a magnetic fields. Electric fields are created from static electrically charged particles. If these electrically charged particles are put into motion through a conductor, magnetic fields are then also created from the resulting electric current. For example, plugging in an electric appliance will create an electric field; however, it is only when the appliance is turned on and electricity flows that a magnetic field is then also created.

Electromagnetic radiation is measured in units of wavelength and frequency. The wavelength is the distance that a wave travels in one cycle and is measured in meters. The frequency is measured by the number of cycles per second and the unit of measurement is the Hertz (Hz). One cycle per second equals one hertz. The frequency of the wave is inversely related to its length: the higher the frequency, the shorter the wavelength.

1 World Health Organization, *WHO Backgrounder: Electromagnetic fields and Public Health Cautionary Policies*, March 2000, http://www.who.int/docstore/peh-emf/publications/facts_press/EMF-Precaution.htm.

2 Unless otherwise noted, this section is drawn from: University of Ottawa/RFcom.ca, *Frequently Asked Questions*, <http://www.rfcom.ca/faq/answers.shtml#q8>.

B. Sources of Electromagnetic Radiation³

Electromagnetic fields are present everywhere in our environment and are produced by both man-made and natural sources. For example, the main source of electromagnetic radiation is the sun, while other man-made items—such as hairdryers, electrical ovens, fluorescent lights, microwave ovens, stereos, wireless phones and computers—all produce electromagnetic fields of varying intensities.

C. The Impact of Electromagnetic Radiation on the Human Body

The electromagnetic spectrum arranges electromagnetic radiation according to its frequencies and impact on the human body. The electromagnetic spectrum is divided into two main categories: ionizing and non-ionizing frequencies. Electromagnetic radiation with low frequencies ranging up to 300 gigahertz (GHz) are called non-ionizing, meaning they do not breakdown chemical bonds in biological tissue, including DNA, which is the building block of genetic material in the body⁴. However, non-ionizing electromagnetic radiation with low frequencies do produce electrical currents within the human body that could result in increases in body temperature.⁵ Increases in body temperature resulting from electromagnetic radiation are referred to by scientists as “thermal effects”.⁶ For example, radiofrequency (RF) electromagnetic radiation that usually ranges from 30 kilohertz (kHz) to 300 GHz are able to induce electrical currents within the human body, which can produce a range of effects such as heating and electrical shock, depending on their amplitude and frequency range.⁷ RF fields are mainly used in telecommunications, such as mobile phones and other home appliances, such as microwaves. Microwave electromagnetic radiation is considered by scientists to be a subset of radio frequency fields.⁸

It is important to note that some scientists have found that long-term exposure to low level RF electromagnetic radiation could potentially provoke biological and chemical changes within cells that could negatively influence people’s well being.⁹ These biological responses occur at the cellular level and do not involve heating. Scientists refer to them as “non- thermal effects” of RF and microwave electromagnetic radiation.¹⁰ However, these

3 Unless otherwise noted, this section is drawn from: WHO, *What are electromagnetic fields*, <http://www.who.int/peh-emf/about/WhatisEMF/en/print.html>.

4 University of Ottawa/RFcom.ca, *Frequently Asked Questions*, <http://www.rfcom.ca/faq/answers.shtml#g8>.

5 Government of Canada, *Wireless Communication and Health: An Overview*, <http://www.ic.gc.ca/antenna>.

6 Ibid.

7 University of Ottawa/RFcom.ca, *EMF Primer*, <http://www.rfcom.ca/primer/index.shtml>.

8 Ibid.

9 WHO, *What are electromagnetic fields?*, <http://www.who.int/peh-emf/about/WhatisEMF/en/print.html>.

10 Government of Canada, “Wireless Communication and Health: An Overview,” <http://www.ic.gc.ca/antenna>.

biological and chemical changes may not necessarily translate into adverse health effects.¹¹

Meanwhile, extremely low frequency (ELF) electromagnetic radiation, which has a frequency of less than 100 kHz, is also able to induce electric currents within the human body, but these induced currents are lower than the electric currents found to be naturally occurring in the human body and therefore do not result in thermal effects.¹² However, strong ELF electromagnetic radiation can produce nerve and muscle stimulation.¹³ ELF electromagnetic radiation can originate from electrical wiring in buildings, electrical appliances and power lines.

Finally, electromagnetic radiation with very high frequencies and short wavelengths is able to produce enough energy to cause ionization, that is, it is able to breakdown chemical bonds in biological tissue, including DNA.¹⁴ The boundary between ionizing and non-ionizing electromagnetic radiation is the frequency of visible light, which ranges between 430 and 750 terahertz (THz).¹⁵ Once electromagnetic radiation reaches a frequency higher than 750THz, it is then capable of breaking chemical bonds in biological tissue. Ionizing radiation can range in frequencies from 756 THz to 4.61 exahertz (EHz). Sources of ionizing electromagnetic radiation include ultraviolet light, X-rays, and gamma rays. Excessive exposure to these sources can cause serious adverse health effects in the human body, such as cancer. Consequently, exposures to these levels of electromagnetic radiation are restricted both in Canada and internationally.

11 WHO, *What are electromagnetic fields?*, <http://www.who.int/peh-emf/about/WhatisEMF/en/print.html>.

12 University of Ottawa/RFcom.ca, *Frequently Asked Questions*, <http://www.rfcom.ca/faq/answers.shtml#g8>.

13 Ibid.

14 Ibid.

15 Jcmiras.Net_01, "The boundary between Ionizing and Non-ionizing Frequency," <http://www.jcmiras.net/jcm/item/82>

Table 1—Select Radiation Emitting Devices on the Electromagnetic Spectrum¹⁶

Electromagnetic Spectrum	Radiation Emitting Device	Frequency in Hz ¹⁷
Extremely Low Frequency	Power Lines	50/60 Hz
Radiofrequency	Microwave Ovens	0.010 GHz to 300 GHz
Radiofrequency	Mobile Phones	800 MHz to 2 GHz
Radiofrequency	Mobile phone base stations	1.8 GHz
Extremely High Radiofrequency	X-ray Machines	1EHz

D. The Regulation of Electromagnetic Radiation Emitting Devices in Canada

Guidelines determining acceptable amounts electromagnetic radiation for safe human exposure are designed to prevent negative health consequences due to thermal effects. The impact of electromagnetic radiation on the human body is measured by the Specific Absorption Rate (SAR), which measures the amount of heat produced in the human body as a result of exposure to radiofrequency fields.¹⁸ It is defined as the rate of energy absorption per unit mass and is expressed in units of watts per kilogram (W/kg). The internal SAR cannot be measured directly in the body, but is estimated by theoretical calculations.

The Government of Canada is responsible for setting the limits for safe human exposure to electromagnetic radiation from radiofrequency emitting devices in order to protect the health and safety of Canadians. Under the *Radiation Emitting Devices Act*, Health Canada is responsible for regulating radiation emitting devices.¹⁹ The safety limits that Health Canada has set for safe human exposure to RF electromagnetic radiation is in the frequency range of 3 kHz to 300 GHz.²⁰ This limit is referred to as Safety Code 6 and results in an average SAR of 0.08 W/kg, which is deemed safe for all members of the population including the elderly, individuals with health concerns, children and pregnant women.²¹

16 This table is based upon information provided in the following document: University of Ottawa/RFcom.ca, "Frequently Asked Questions," <http://www.rfcom.ca/faq/answers.shtml#q8> and University of Ottawa/RFcom.ca, "EMF Primer," <http://www.rfcom.ca/primer/index.shtml>.

17 One cycle per second equals one hertz; one kilohertz (kHz) equals 1,000 Hz; one megahertz (MHz) equals one million Hz; one gigahertz equals one billion Hz; one terahertz equals 10¹² Hz; and one EHz equals 10¹⁸ Hz.

18 University of Ottawa/RFcom.ca, *Frequently Asked Questions*, <http://www.rfcom.ca/faq/answers.shtml#q8>.

19 *Radiation Emitting Devices Act*, R.S., c.34 (1st Supp.), s.1.

20 Health Canada, *Health Canada's Radiofrequency Exposure Guidelines*, http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php.

21 University of Ottawa, *Frequently Asked Questions*, <http://www.rfcom.ca/faq/answers.shtml#q8>.

Industry Canada is responsible for regulating radio-communication in Canada, including authorizing the installation of radio-communication towers and sites and the approval of RF equipment such as cell phones and assessing their compliance with their standards.²² Industry Canada derives this authority from the *Department of Industry Act*, as well as the *Radiocommunications Act*, which specifically provides the authority to approve antenna supporting structures.²³ Industry Canada has chosen the RF exposure standard developed by Health Canada in Safety Code 6 as its basis for the regulation of mobile phones, base stations, Wi-Fi technologies and other radio-communication transmitters.²⁴

WHAT THE COMMITTEE HEARD

A. The Development and Implementation of Safety Code 6

The Committee heard from Health Canada officials that Canadians are protected from harmful exposure to radiofrequency electromagnetic radiation through Safety Code 6, which establishes the safe limit for human exposure to electromagnetic radiation from various devices.²⁵ The Committee heard that Safety Code 6 is developed through a thorough review process that includes an evaluation of scientific evidence and literature on the effects of radio frequency radiation on biological systems.²⁶ According to officials, this review process is consistent with guidelines provided by the World Health Organization for the development of health-based electromagnetic frequency standards.

During the course of its review, Health Canada examines scientific evidence from animal, cell culture and epidemiological studies carried out worldwide.²⁷ Officials further clarified that it examines studies that focus on both the thermal effects of electromagnetic radiation, as well as those that examine non-thermal effects occurring at the cellular level.²⁸ In addition, the Committee heard that Health Canada has conducted its own studies on this topic, which have been published in peer-reviewed journals. In its evaluation of the existing data, Health Canada considers the quality of the individual studies, as well as the consistency of observed effects across laboratories. The

22 Canadian Wireless Telecommunications Association, *Connecting Canadians: Wireless Antenna Towers Siting in Canada*, June 2008, http://www.cwta.ca/CWTASite/english/pdf/CWTA_Connecting09_08.pdf, p.14 and p. 20.

23 Ibid, p. 14.

24 Ibid, p. 21.

25 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>

26 Ibid.

27 Ibid.

28 House of Commons Standing Committee on Health, Evidence, October 28, 2010, No. 34, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4738168/HESAEV34-E.PDF>

Committee heard that while this review process was last conducted in 2009, Health Canada continues to review the scientific literature on an ongoing basis.

Based upon this scientific review process, Health Canada has determined that human exposure to RF electromagnetic radiation in the frequency range from 3 kHz to 300 GHz is safe.²⁹ Officials articulated that this limit is well below the threshold for any potential harm and it was designed to provide protection to all age groups, including children, if exposed on a continual basis. They further noted that in the development of Safety Code 6, models of children's bodies and brains were used to examine the potential effects of radiation exposure on tissue similar to that of a child's, as studies cannot be directly conducted on children due to ethical reasons.³⁰ Finally, officials articulated that these exposure limits are comparable to those in other jurisdictions, including the United States and the International Commission on Non-Ionizing Radiation Protection, a standard adopted by most European countries.³¹

While Health Canada is responsible for the development of Safety Code 6, the Committee heard that Industry Canada is responsible for its implementation with regards to the regulation of portable radio-communication equipment, such as cell phones, as well as antenna towers and their surroundings.³² In order to ensure that portable radio-communications are in compliance with the standards established through Safety Code 6, Industry Canada requires that they be certified by accredited bodies.³³ Once the equipment is on the market, Industry Canada continues to test individual units of these models to ensure that they continue to meet Safety Code 6 standards.

The Committee heard from Industry Canada officials that a licence is required for the establishment of all new antenna installations.³⁴ Industry Canada will only issue a licence if emissions from an antenna in areas accessible to the public are within the limits of Safety Code 6. Furthermore, the measurement of emissions also takes into account the cumulative effects of other antennas in the vicinity. Once a tower is operational, it remains a condition of its licence under the *Radiocommunication Act* to respect these limits at all

29 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

30 House of Commons Standing Committee on Health, Evidence, October 28, 2010, No. 34, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4738168/HESAEV34-E.PDF>.

31 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

32 House of Commons Standing Committee on Health, Evidence, April 29, 2010, No. 13, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4478290/HESAEV13-E.PDF>.

33 It is important to note that Industry Canada officials did not specify which accredited bodies were providing certification of portable radio-communication equipment.

34 House of Commons Standing Committee on Health, Evidence, April 29, 2010, No. 13, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4478290/HESAEV13-E.PDF>.

times.³⁵ The Committee also heard that Industry Canada continues to perform audits and tests on antenna installation sites after licensing to ensure that they remain compliant.

Finally, the Committee heard that both Health Canada and Industry Canada work together to produce documents for Canadians concerned about RF exposure.³⁶ They have produced a document entitled, “Frequently Asked Questions on RF Energy and Health”³⁷ in order to address various questions related to RF exposure, as well as a handbook and numerous information sheets related to wireless communication and health.³⁸

B. Concerns Raised by Witnesses Regarding Safety Code 6

Some witnesses appearing before the Committee were of the view that limits established by Safety Code 6 were not stringent enough to protect Canadians from potential negative health impacts of long-term exposure to RF electromagnetic radiation.³⁹ According to some scientists appearing before the Committee, the findings of their research indicated that there were non-thermal biological effects resulting from exposure to RF electromagnetic radiation that was below the frequency limit established by Safety Code 6. In their view, these biological effects could result in negative health outcomes for humans, and in particular children.

For example, one scientist appearing before the Committee conducted a study which found that electromagnetic radiation produced from mobile phone handsets had resulted in a 60% reduction in insect reproductive capacity.⁴⁰ The scientist further indicated that these findings were in line with other studies that had reported DNA damage in mammalian cells and subsequent links to human infertility. Other scientists outlined studies that had found other potential negative health outcomes as a result of exposure to electromagnetic radiation, such as links between cell phones and the development of brain tumours among children, and links between cordless DECT phones and affects on the heart such as arrhythmia and tachycardia.⁴¹ These scientists further articulated that many of the studies demonstrating that long-term exposure to low level radiofrequencies had not resulted in negative health outcomes had been funded by the wireless industry; and

35 Ibid.

36 Ibid.

37 Industry Canada and Health Canada, “Frequently Asked Questions on RF Energy and Health” [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/faq-energy-health.pdf/\\$FILE/faq-energy-health.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/faq-energy-health.pdf/$FILE/faq-energy-health.pdf).

38 Ibid.

39 House of Commons Standing Committee on Health, Evidence, April 29, 2010, No. 13, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4478290/HESAEV13-E.PDF>.

40 Ibid.

41 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

therefore, more publically funded studies examining the health impacts of electromagnetic radiation were necessary.⁴²

Another witness appearing before the Committee articulated that in his view, the science behind the development Safety Code 6 did not take into account the interaction between electric currents naturally occurring in the human body and the RF electromagnetic radiation resulting from the environment.⁴³ He articulated that he presented his findings to Health Canada and Industry Canada, but found that they were not taken seriously.⁴⁴

The Committee also heard from community organizations representing parents who were concerned about their children’s exposure to RF electromagnetic radiation in schools and the environment from Wi-Fi and wireless telephone base stations.⁴⁵ These organizations articulated that both adults and children in their communities had experienced symptoms of headaches, sleep disturbances, problems with concentration, dizziness and heart irregularities. They further attributed these symptoms to exposure to Wi-Fi and wireless telephone base stations, a condition called “electromagnetic sensitivity”.⁴⁶ They articulated that governments and industry should recognize “electromagnetic sensitivity” as an illness.⁴⁷ In addition, the Committee received numerous letters from interested individuals describing similar symptoms which they attributed to their exposure to cell phones, Wi-fi and wireless telephone base stations. These individuals also requested that “electromagnetic sensitivity” be recognized as an illness.

Based upon these concerns, these scientists and community organizations argued that Health Canada should take a precautionary approach to human exposure to RF electromagnetic radiation.⁴⁸ In their view, a precautionary approach is a public policy approach for risk management of possible but unproven adverse health effects.⁴⁹ The

42 Ibid.

43 House of Commons Standing Committee on Health, Evidence, October 28, 2010, No. 34, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4738168/HESA/EV34-E.PDF>.

44 Ibid.

45 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESA/EV12-E.PDF> and House of Commons Standing Committee on Health, Evidence, October 28, 2010, No. 34, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4738168/HESA/EV34-E.PDF>.

46 Ibid.

47 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESA/EV12-E.PDF>.

48 Ibid.

49 House of Commons Standing Committee on Health, Evidence, October 28, 2010, No. 34, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4738168/HESA/EV34-E.PDF>.

precautionary principle is applied when there is only some evidence and that evidence remains inconclusive.⁵⁰ According to these witnesses, in practice the application of the precautionary principle in relation to human exposure to electromagnetic radiation means that there should be a reduction of the exposure limits set out in Safety Code 6.⁵¹ Witnesses recommended that exposure limits in Canada be reduced to levels outlined in the *Bioinitiative Report* of one tenth of a microwatt per centimetre squared or 0.614 volts per meter.⁵²

However, the Committee also heard from other scientists who were of the view that there was significant evidence to support the current guidelines for exposure to electromagnetic radiation under Safety Code 6, therefore lower levels were unnecessary.⁵³ They pointed out that since World War II, thousands of studies had been undertaken on the bioeffects and potential health risks related to electromagnetic radiation, which includes over 1,200 studies examining electromagnetic radiation from mobile phones.⁵⁴ According to these witnesses, this literature had been authoritatively reviewed in the last two years by: the World Health Organization, the Ireland Expert Group on Health Effects of Electromagnetic Fields, the European Commission, the United States National Research Council Expert Panel, the Royal Society of Canada and the Committee on Man and Radiation. In their view, these authoritative reviews have concluded that there is no compelling body of evidence of adverse health effects associated with electromagnetic radiation at levels below internationally accepted limits.⁵⁵

However, these scientists also pointed out that there were certain gaps in the existing literature related to long-term low-level exposure and brain functions and reproductive outcomes, as well as the effects of long-term exposure among children using mobile phones.⁵⁶ They consequently recommended that more long-term studies were necessary, as well as continuous review of the scientific literature. Furthermore, they suggested that while they supported the existing guidelines, individuals who did have

50 Ibid.

51 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

52 House of Commons Standing Committee on Health, Evidence, April 29, 2010, No. 13, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4478290/HESAEV13-E.PDF>.

53 Ibid.

54 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

55 Dr. Riadh Habash, "Potential Impact of Electromagnetic Radiation on Human Health," Brief submitted to the House of Commons Standing Committee on Health.

56 House of Commons Standing Committee on Health, "Evidence," April 29, 2010, No. 13, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4478290/HESAEV13-E.PDF>.

concerns could take individual measures to limit their exposure, such as limiting their use of mobile phones.⁵⁷

Wireless industry stakeholders appearing before the Committee also supported the need for long-term studies in order to ensure the long-term safety of their products.⁵⁸ However, they also noted that a restrictive precautionary approach to electromagnetic radiation could have potential negative impacts as well. For example, they suggested that if Canada's safety guidelines were stricter than international guidelines, manufacturers would have to produce special phones for Canada, which in turn would drive up costs.⁵⁹ Furthermore, they articulated that restrictive approaches to electromagnetic radiation emitting devices failed to take into account the benefits that they provided to society: over half of 911 calls are made through cell phones.⁶⁰

In responding to concerns raised by witnesses, Health Canada officials indicated that they agreed that long term studies on the effects of low level electromagnetic radiation, as well as ongoing review of the scientific literature were necessary.⁶¹ However, they articulated that from their point of view a precautionary approach towards exposure to low levels of electromagnetic radiation was unnecessary as there was a significant body of scientific evidence available supporting Safety Code 6.⁶² They further emphasized that a precautionary approach was only undertaken by the department when limited scientific evidence was available.⁶³ In addition, they pointed out that the studies that Health Canada had reviewed regarding electromagnetic sensitivity had failed to establish a causal relationship between the symptoms experienced by study participants and electromagnetic radiation, but further research was necessary in this area.⁶⁴ Finally, officials from Health Canada expressed their willingness to work with individuals, communities and school boards to address their concerns regarding exposure to electromagnetic radiation.⁶⁵

57 Ibid.

58 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

59 House of Commons Standing Committee on Health, Evidence, April 29, 2010, No. 13, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4478290/HESAEV13-E.PDF>.

60 House of Commons Standing Committee on Health, Evidence, April 27, 2010, No. 12, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4467140/HESAEV12-E.PDF>.

61 House of Commons Standing Committee on Health, Evidence, October 28, 2010, No. 34, 3rd Session of the 40th Parliament, <http://www2.parl.gc.ca/content/hoc/Committee/403/HESA/Evidence/EV4738168/HESAEV34-E.PDF>.

62 Ibid.

63 Ibid.

64 Ibid.

65 Ibid.

COMMITTEE OBSERVATIONS AND CONCLUSIONS

During the course of its study, the Committee heard from several witnesses, including department officials, that Canadians were protected from excessive exposure to RF electromagnetic radiation by Safety Code 6, a standard developed by Health Canada through a rigorous review of the extensive available scientific evidence. The Committee also heard that Canadian standards were in line with those in other jurisdictions, as well as recommendations provided by international bodies, such as the World Health Organization. However, the Committee also heard that some studies had found that there were negative health effects resulting from exposure to low levels of radiofrequency electromagnetic radiation. It also heard that there were gaps in the scientific literature related to children's exposure, effects on brain function and possible effects on reproductive capacity. Moreover, the Committee heard that long-term studies on the effects of radiofrequency electromagnetic radiation were necessary, as well as ongoing review of the scientific literature. Finally, the Committee also heard from witnesses that more publicly funded studies examining the health impacts of radiofrequency electromagnetic radiation were necessary. The Committee therefore recommends that:

RECOMMENDATIONS:

- 1. The Government of Canada consider providing funding to the Canadian Institutes of Health Research in support of long-term studies examining the potential health impacts of exposure to radiofrequency electromagnetic radiation.**
- 2. Health Canada request that the Council of Canadian Academies or another appropriate independent institution conduct an assessment of the Canadian and international scientific literature regarding the potential health impacts of short and long-term exposure to radiofrequency electromagnetic radiation, which would include an examination of electromagnetic sensitivity and a comparison of public policies in other countries governing exposure to radiofrequency electromagnetic radiation; and report on its findings.**
- 3. Health Canada and Industry Canada develop a comprehensive risk awareness program for exposure to radiofrequency electromagnetic radiation, which would include Health Canada making public in an accessible and transparent way all the studies and analyses undertaken by the Department on the impact of radiofrequency electromagnetic radiation on human health, as well as the provision of information promoting the safe use of wireless technologies.**
- 4. Health Canada and Industry Canada offer to provide information, including awareness sessions on exposure to radiofrequency electromagnetic radiation.**

5. Health Canada ensure that it has a process in place to receive and respond to reports of adverse reactions to electromagnetic radiation emitting devices.

APPENDIX A LIST OF WITNESSES

Organizations and Individuals	Date	Meeting
<p>As an individual Magda Havas, Professor</p> <p>Canadian Wireless Telecommunications Association Bernard Lord, President and Chief Executive Officer Marc Choma, Director of Communications</p> <p>Collectif S.E.M.O. Save our Children from microwave Daniel Fortin, Consultant François Therrien, Spokesperson</p> <p>Department of Health Beth Pieterse, Director General, Environmental and Radiation Health Sciences Directorate, Healthy Environments and Consumer Safety Branch</p> <p>GSM Association Jack Rowley, Director, Research and Sustainability, Public Policy</p>	2010/04/27	12
<p>As an individual Andrew Goldsworthy, Lecturer in Biology (retired), Imperial College London</p> <p>Olle Johansson, Associate Professor, Experimental Dermatology Unit, Department of Neuroscience, Karolinska Institute</p> <p>Anthony Martin Muc, Adjunct Lecturer, Dalla Lana School of Public Health, Occupational and Environmental Health Unit, University of Toronto</p> <p>Dimitris Panagopoulos, Doctor, Department of Cell Biology and Biophysics, Faculty of Biology, University of Athens</p> <p>Department of Industry Marc Dupuis, Director General, Engineering, Planning and Standards Branch, Spectrum, Information Technologies and Telecommunications Sector</p> <p>Peter Hill, Director, Spectrum Management Operations</p> <p>Next-Up Organisation Annie Sasco, Director, Epidemiology for cancer prevention, Institut national de la santé et de la recherche médicale</p>	2010/04/29	13

Organizations and Individuals	Date	Meeting
University of Ottawa Riadh Habash, Doctor, School of Information Technology and Engineering (SITE)	2010/04/29	13
As an individual Anthony Martin Muc, Adjunct Lecturer, Dalla Lana School of Public Health, Occupational and Environmental Health Unit, University of Toronto	2010/10/28	34
Columbia University Martin Blank, Associate Professor of physiology and cellular biophysics, Department of physiology and cellular biophysics		
Department of Health Beth Pieteron, Director General, Environmental and Radiation Health Sciences Directorate, Healthy Environments and Consumer Safety Branch		
Lawson Health Research Institute Frank Prato, Imaging Program Leader, Assistant Scientific Director		
Simcoe County Safe School Committee Rodney Palmer, Member		
Thermographix Consulting Corporation Curtis Bennett, President		

APPENDIX B LIST OF BRIEFS

Organizations and individuals

Anderson, Christopher

Arthur, Joyce

Beaudoin, Brigitte

Brock University

Canadian Wireless Telecommunications Association

Citoyens Responsables et Gestionnaire de CDP La Ligne Verte

Churchill, Arlene

Collectif S.E.M.O. Save our Children from microwave

Committee for the Advancement of Scientific Skepticism

Creelman, Charlene

Deshaies, Solène

Duerichen, Norbert

Ewart, Linda

Goldsworthy, Andrew

Haliburton, Mary-Sue

Havas, Magda

Hudon, Jean

Karow, Hans

Levesque, J.

Lewin, Michelle

Makota, Barb

McCutcheon, Deborah

McIntosh, Dianne

Organizations and individuals

New Denver Area Parent-Children's Association

Orban, Caroline

Penner, Lorraine

Planetary Association for Clean Energy Inc.

Richardson, Heather

Riedlinger, Robert

University of Ottawa

Vernon, E.

Woodcock, Frank

REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the Committee requests that the government table a comprehensive response to this Report.

A copy of the relevant Minutes of Proceedings ([Meetings Nos. 12, 13, 34 and 38](#)) is tabled.

Respectfully submitted,

Joy Smith, MP

Chair

The Conservative Party would like to thank the stakeholders and witnesses who participated in this study.

We support Canada's current guidelines on human exposure to radiofrequency electromagnetic energy as they are science based and not ideologically driven. In fact, our guidelines are the result of an ongoing review of scientific studies and of overwhelming scientific evidence.

In developing these guidelines, Canada followed the process set out by the World Health Organization. Our established limits for human exposure are well below the threshold for any potential harm and are among the most stringent in the world. In fact, the WHO International EMF Project, of which Canada is a partner, was established to assess the scientific evidence of possible health effects.

With respect to the recommendation on adverse effect reporting, we would like to reiterate that, to date, there has been no credible science linking exposure to electromagnetic radiation emitting devices and adverse health effects. To establish a process for reporting adverse health effects would not assist us in making that link. Rather, it is the long-term studies and literature reviews that are being proposed that could make the link, if there is one to be made. Until a scientifically supported link is established, a database of adverse reaction reports would simply act as a holding place, as there would be no science to support taking action.

In the interest of ensuring that Canada's guidelines on human exposure to radiofrequency electromagnetic energy remain based in science and not ideology, we would like to suggest the following recommendation:

That Health Canada continue to review emerging science related to the impact of radiofrequency electromagnetic energy (microwave) emissions on human health and take appropriate action should scientific evidence of risks demonstrate that current guidelines are not adequate to protect the health and safety of Canadians

**Bloc Québécois—Supplementary Opinion
Report of the Standing Committee on Health**

***An Examination of the Potential Health Impacts of
Radiofrequency Electromagnetic Radiation***

The Bloc Québécois would like to begin by acknowledging the contribution of the stakeholders and witnesses who participated in this study. The Bloc Québécois agrees with the spirit of the report and all its recommendations, but would like to propose another recommendation that was unfortunately not included in the report due to a lack of support.

RESPECTING MUNICIPAL AND PROVINCIAL REGULATIONS

It is the policy of Industry Canada to seek significant local input regarding antenna tower placement. According to Industry Canada's procedure CPC-2-0-03, promoters must work with local land use authorities and take into account reasonable local requirements. The Bloc Québécois believes this procedure does not allow for adequate consideration of the opinions and will of the citizens and land use authorities, namely, municipal and provincial governments. We feel this policy does not give municipal and provincial bodies sufficient authority over the final decision on the siting of antenna towers. The Bloc Québécois therefore recommends:

That Industry Canada respect municipal or provincial regulations when awarding permits to telecommunication companies for the construction of telecommunication towers.

NDP Complimentary Report—Impact of Microwaves on Human Health

Wireless technology, although new, has become increasingly embedded in our society. Significantly contradictory evidence was presented during the committee hearings and this fact should be addressed.

It seems that the voices of the scientific community speaking to the adverse biological effects of this technology are being marginalized. Defenders of Safety Code 6 point to thousands of peer-reviewed studies. One of the largest and most recent of these studies, the Interphone Study, did show that heavy users have a greater chance of developing a type of brain tumour on the same side of the head as they use their cell phones

Given that there are already warnings in cell phone packaging indicating the distance the device should be held from one's body/head, it is imperative that consumers see these instructions and that they not be lost in fine print. These warnings should be given a prominent place on the phone packaging, or on the devices themselves, and printed in a large, bolded font.

Curtis Bennett's claim - that he has discovered a significant oversight in Safety Code 6 - should be thoroughly investigated by Health Canada, given Mr. Bennett's credentials.

The biggest gap in studies to date has been the effect of wireless technology on children. The findings from studies on adults cannot be extended to children. While the recommendation for further study is warranted, it would also be appropriate to let Canadians know that the safety of this technology is not guaranteed, but only theoretical at this point, particularly in the case of children.

Concerned parents who fear their children are being exposed in classrooms to a dangerous technology, when less-contentious options exist that can deliver the same benefit, must have public options available to them. If the 'unaccepted' science is in fact correct, Canada will face larger health care costs for the treatment of biological effects including cancers and fertility problems. With this in mind, children should not be forced to be exposed to this technology in their schools until it is actually proven safe, not just theoretical acceptable.

Finally, reference was made to the decline in insect populations and we learned of research that showed wireless signals negatively affect the ability of insects to reproduce. This was mentioned in the testimony of Dr. Panagopoulos, Curtis Bennett and Dr. Goldsworthy. We are experiencing a world-wide decline in bee populations known as colony collapse. Given the economic importance of insect pollination, especially honey-bees, it would be negligent not to investigate the role that wireless technology may have in the decline.

Wireless technologies have many measurable benefits and contribute to our modern lives in all manner of ways. It is important to remember that this technology is new and rapidly evolving, making it imperative that Health Canada ensure that the investigation of the biological effects of microwave radiation becomes a priority. We have learned from tobacco and asbestos that many of the worst effects of a product are not always immediately evident, but become known after long periods of exposure. We must keep that in mind as we assess the efficacy of Safety Code 6.

