Attachment 2: Submission to World Health Organization

Submission to Honourable Rona Ambrose
Minister of Health

Re: Health Canada consultation on proposed revisions to Safety Code 6.

Title: Relevant Scientific Studies (140) Omitted by Health Canada in its Scientific Review of Draft Safety Code 6 (2014), Canada's Safety Guidelines for Safe Exposure to Radiofrequency/Microwave Radiation

by

Canadians for Safe Technology (C4ST)

July 15, 2014 [1]

[1] Amended 5 November 2014:

Appendix 3 has been added with references listed for Appendix 2 studies.
For easier cross-referencing, Table 1 now includes the reference numbers (Appendix 3) for the various studies.

Summary

Health Canada currently determines the guidelines for safe levels of radiofrequency/microwave radiation each Canadian is exposed to from all sources, including cell towers, cell phones, Wi-Fi, smart metres, baby monitors, cordless phones, and other wireless devices.

On May 15th 2014, Health Canada announced a 60 day window for public input into proposed revisions to Safety Code 6. It is the first time in history that Health Canada has asked for scientific input from the public regarding wireless radiation. Officially, Safety Code 6 only covers federal workplaces, but in the absence of any other guideline in Canada, it has become the fall back for all levels of government, school boards, utility companies, hospitals, offices and microwave exposure from smart metres or nearby cell towers.

In our analysis of the scientific aspects of Health Canada's latest update, C4ST discovered that at least 140 relevant scientific studies, that show harm from wireless radiation, were omitted.

Health concerns range from immediate health effects to long term consequences of cancer and impairment of young and old. Canadian doctors are reporting an increasing number of patients across the country with symptoms of electrohypersensitivity related to radiofrequency/microwave radiation from wireless devices. There are untold numbers of people suffering, and taxing our healthcare system.

The omitted studies (some studies cover multiple topics) have been grouped into the following topics:

- Cancer and Genetic Damage - 25
- Male and Female Infertility - 14
- Impairment to Development, Learning and Behaviour from Conception to Old Age - 31
- Harmful Effects on the Brain and Central Nervous System - 44
- Effects on the Eyes - 6
- Cardiovascular Effects - 4
- Electrohypersensitivity (EHS) - 9
- Biochemical Changes - 65

At least 140 studies are missing from Health Canada's rationale document and literature review, as well as the report from the Royal Society of Canada and the largest, most recent European review. Of these 140 studies, 103 studies (74%) were submitted by C4ST to Health Canada in 2013, yet were still omitted.

The scientific basis of Safety Code 6 is clearly in disarray. Meanwhile, C4ST regularly hears from Canadians who report being sickened and disabled by exposures to radiofrequency/microwave radiation. The immediate response should be to take measures to ensure that exposures are recognized, and *As Low As Reasonably Achievable* (ALARA). This involves public education, training of medical personnel, minimization of use of wireless technologies in schools and workplaces, safe areas for those with EHS (and to prevent development of EHS), safer technological advancements and more. We present some preliminary recommendations to accomplish this.

Table of Contents

Background

Canada's guidelines for maximum exposure to radiofrequency/microwave radiation are established by Health Canada in Safety Code 6 (SC6). Today, as wireless communications devices and associated infrastructure increase exponentially, exposures are increasing too. Situations will increasingly occur when the sum of exposures from devices plus supporting infrastructure will approach the SC6 limits. It is more important than ever that these limits be based on the best available science, to protect all Canadians and their environment, especially the most vulnerable. The only way to ensure that SC6 is based on today's scientific knowledge regarding health effects of RF energy is to examine the scientific literature thoroughly and systematically, in an objective, unbiased manner.

In 2013, Health Canada retained the Royal Society of Canada (RSC) to review SC6. The RSC panel also conducted a day of public hearings in October 2013, and accepted submissions. Among these submissions was an extensive list of potentially relevant literature, the "Friesen Update." A proper systematic review would capture these records, and with the services of a specialist librarian even more relevant literature. Health Canada did not review this science nor conduct a full literature review.

Health Canada and the RSC also relied upon other "authoritative reviews," so this exploration of the rigour of Canada's review was extended to the rigour of reviews upon which they were building. The present SC6 review process follows a 2009 review; albeit of unknown quality. For this reason, examination of citations was limited to scientific articles published in 2009 and later. The exception is for cancer and related Genetic Damage, which was reviewed from 2011 on, because the World Health Organization's International Agency for Research on Cancer published a monograph reviewing studies up to 2011.

Objective

High quality scientific review is comprehensive, transparent and unbiased. The present project explores the thoroughness of the Health Canada and RSC reviews of the scientific literature, as well as the previous "authoritative reviews" to which they refer.

Methods and Results

The comprehensiveness of Health Canada's review of health effects of radiofrequency/microwave radiation was examined by comparing reference lists in key documents with recent (2009-on) scientific references available through publicly available scientific searches (e.g. US Library of Medicine).

References were managed using Zotero open source software.

Summaries are presented of scientific publications describing biological and possibly harmful health effects omitted from reference lists of all of:

1. Health Canada Safety Code 6 (2014) Draft - posted on the Health Canada website 16 May 2014. An earlier version had been reviewed by the RSC Expert Panel, that recommended no substantial changes;
2. Health Canada's Safety Code 6 (2014) - Rationale;
3. Chapter 7 "Reported Adverse Health Effects" in The Royal Society of Canada Expert Panel: A Review of Safety Code 6 (2013): Health Canada's Safety Limits for Exposure to Radiofrequency Fields. Spring 2014 (RSC SC6 (2014)); and
4. Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR): Preliminary Opinion on Potential Health Effects of Exposure to Electromagnetic Fields (EMF) December 2013 (cited in Safety Code 6 (2014) Draft).

Full abstracts are presented with underlined highlights indicating significant, potentially harmful effects. Availability at the time of publication, and whether the study is among the references in the above four reports is summarized. Publications are listed by year (starting in 2014), and then alphabetically by first author. The numbers of publications relevant to each topic, as well as the number of these that were provided to the Royal Society of Canada in 2013 are summarized in Table 1 (primarily 2014 publications were not provided).

Limitations

Limitations of this work include that the literature search was not conducted by an information specialist. This undoubtedly under-estimates the volume of relevant scientific information that is not being considered in setting Canadian guidelines for exposure to radiofrequency/microwave radiation. As well, the analysis is based upon the contents of the abstracts, not the full text publications.

Table 1. Publications (2009 to 2014) indicating significant effects of radiofrequency/microwave radiation that were not reviewed by Health Canada, the Royal Society of Canada, nor the European Commission's Scientific Committee on Emerging and Newly Identified Health Risks

Topic	Total number of studies not reviewed in Safety Code 6 2014 update	The number of these studies that were provided to Health Canada by C4ST in 2013
A1. Cancer (2011-2014)	11	7
A2. Genetic Damage (2011-2014)	14	10
B. Male and Female Infertility	14	10
C. Impairment to Development, Learning and Behaviour from Conception to Old Age	31	25
D. Effects on the Brain and Nervous System	44	31
E. Effects on the Eye	6	5
F. Cardiovascular Effects	4	2
G. Electrohypersensitivity (EHS)	9	8
H. Biochemical Effects	65	47
TOTAL UNIQUE PUBLICATIONS[1]	140[2]	103[3]

Reference number in Appendix 3.

A1: 30, 37, 69, 70, 71, 106, 110, 112, 126, 136, 137.
A2: 8, 20, 23, 26, 46, 50, 59, 61, 72, 87, 91, 124, 129, 132.
B. 3, 6, 60, 61, 63, 83, 84, 85, 88, 91, 92, 123, 124, 130.
C. 5, 14, 18, 21, 22, 24, 27, 33, 41, 47, 51, 52, 54, 56, 57, 62, 66, 68, 73, 74, 75, 77, 90, 96, 98, 105, 115, 116, 117, 125, 139.
D. 1, 5, 7, 11, 13, 14, 22, 25, 27, 28, 29, 33, 36, 41, 42, 43, 46, 48, 53, 57, 66, 68, 75, 76, 77, 80, 93, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 109, 111, 116, 118, 120, 128.
E. 4, 12, 119, 138, 139, 140.
F. 49, 94, 108, 113.
G. 10, 39, 40, 44, 67, 78, 79, 82, 134.
H. 1, 2, 3, 7, 8, 9, 15, 16, 17, 19, 20, 22, 23, 25, 31, 32, 33, 34, 35, 38, 41, 42, 43, 45, 46, 49, 50, 53, 55, 57, 58, 59, 64, 65, 66, 72, 76, 77, 80, 81, 86, 87, 89, 91, 93, 95, 96, 98, 101, 102, 103, 105, 107, 113, 114, 118, 120, 121, 122, 127, 131, 132, 133, 135, 138.

[1] Some publications cover more than one topic area

[2] Virtually all publications were available to Health Canada when the Safety Code 6 (2014) Draft was posted online May 16, 2014.

[3] 103 of 140 (74%) of the publications were submitted to Health Canada in 2013.

Topic Overviews

A 1. Cancer

Eleven omitted studies include:

- a 2014 case series of multifocal invasive breast cancer cases in four young women, where they customarily tucked their cell phones into their bras;
- a May 2014 case-control study of 253 gliomas, 194 meningiomas and 892 matched controls in France, demonstrating double to triple the risk of brain tumours for highest users of cell phones, measured as numbers of calls, and cumulative hours of use;
- a 2014 study of vestibular schwannoma (acoustic neuroma) indicating increasing tumour volume with use of mobile phones;
- two studies from Lennart Hardell's group in Sweden. This is the only group to assess exposures to radiation from both cell phone and cordless phones, along with habitual side of phone use. This group has found higher risks of brain tumours than other researchers. Risk increases with time of use, and is higher for individuals who started using phones at younger ages;
- re-analyses of a study of brain tumours in adolescents, highlighting that the data supported elevated risks, the opposite of the authors' conclusion;
- a critique of the Danish Cohort Study. This was fundamentally flawed research wherein "exposed" individuals had a private cell phone subscription in the mid-nineties. The supposedly "unexposed" individuals either had a corporate cell phone subscription or started using a cell phone after enrollment. This study is among the most highly criticized studies on the British Medical Journal website and is not credible; and
- publications addressing brain tumour incidence and cell phones.

The Rationale for the present draft of Safety Code 6 includes references to one report of the Interphone study (that interprets findings as "no increased risk"), as well as three analyses of cancer rates. The premise that increased brain tumours would be an early indicator that cell phones cause cancer is a highly criticized approach, because: 1) many factors may contribute to risks for brain tumours so a large surge in cell phone related cancers must occur before a significant increase would be detected; and 2) if other contributors (e.g. chemical exposures) were decreasing at the same time, an increase from cell phones would be masked by a decrease from other causes.

A 2. Genetic Damage

Fourteen studies reported damage to genetic material.

In people exposed to cell phones genetic damage was reported in:

- hair root cells where a phone is placed; and
- cells from inside the cheek (oral epithelium) of cell phone users;

At a somewhat higher exposure, DNA was damaged in the blood of marine workers.

In animals, evidence of genetic damage with exposure to microwave radiation was seen in:

- male rats in 2 studies (DNA damage in brain cells and liver cells; excretion of a DNA building block)
- rats of various ages. DNA damage increased with dose, and was greater in younger rats compared with mature ones;
- embryonal cells in quail eggs; and
- eggs (oocytes) in female fruit flies.

In the laboratory DNA damage from low level microwave exposure was seen in:

- human sperm exposed to mobile phones;
- a mouse sperm cell line; and
- calf thymus tissue.

B. Male and Female Infertility

Fourteen studies that were not examined during Canada's review of Safety Code 6 show strengthening evidence that phones in pockets bode poorly for future parenthood.

In 2014 a large, high-quality systematic review and meta-analysis found that cell phone radiation reduced human sperm motility and viability by a factor of 4, while effects were 2 to 4 times worse in animal studies. Another research study of human sperm then found more DNA fragmentation and less motility with exposure to a mobile phone. Early human embryonic development was also reduced with exposure to cell phone radiation.

In animals:

- mobile phone radiation reduced sperm viability and motility, with increased oxidative stress in two studies in rats;
- cell phone radiation induced testicular damage in rats;
- rats exposed in utero had fewer eggs in the ovaries; and
- fruit flies developed damaged eggs when exposed to GSM radiation.

C. Impairment to Development, Learning and Behaviour from Conception to Old Age

A multitude of events orchestrate the progression from a fertilized egg to a newborn infant, through childhood and adolescence, and stages of adulthood. If radiation changes embryonic development, the trajectory of a life is altered.

This collection of 31 publications includes research that reports behaviour or cognition, and/or that involved chronic or pre-natal exposure. Cancer as a result of long term exposure is reported in Section A1 but a discussion of children's risk of brain tumours (not in Section A1) is included here. This section also includes two discussions of exposure assessment of particular relevance for children, as well as Harvard paediatrician Dr. Herbert's extensive review of EMFs and autism, that she submitted to the RSC.

In humans:

- prenatal and postnatal exposure to cell phone exposure was associated with behavioural problems during childhood. This study replicates previous findings; and
- children with higher exposure to mobile phones exhibited more symptoms of Attention Deficit Hyperactivity Disorder (ADHD), only among those who also had higher levels of lead. It is thought that greater membrane permeability with radiofrequency exposures (see section H) increases access of many toxins to the cell, and so will magnify the toxicity of many toxins including metals such as lead, mercury, etc. Examination of toxic exposures in isolation, without consideration of co-exposures, leads to under-estimation of risks.

In animals:

- in numerous studies, rats exposed to *in utero* had higher oxidative stress in the brain and liver early in life, loss of brain cells [pyramidal cells in the hippocampus], poorer learning and working memory, and lower passive avoidance (potentially associated with anti-social behaviour);
- injection of serum from exposed rats, to pregnant rats, impaired development and led to higher foetal loss, presumed due to auto-antibodies;
- cell phone radiation damaged pregnant and foetal rat brains;
- across four studies radiofrequency/microwave exposure from a GSM phone affected grooming and rearing of adolescent rats, a month of exposure (1 h/day) altered passive avoidance behaviour and hippocampal morphology, as well as learning and memory, and also decreased locomotion;
- in two studies, long term exposure of rats to a cell phone impaired memory and increased error rates, with changes in the hippocampus. One study reported an age-dependent variation. A further study reported formation of auto-antibodies;
- exposure of rats reduced the efficacy of a pain-killer;
- in two studies, mice exposed *in utero* had impaired memory and were hyperactive because neuronal programming was altered. Exposed mice embryos had impaired bone and cartilage formation;
- the neuro-immune system of middle-aged rats was affected by GSM exposure, in a manner distinct from younger rats;
- formation of the retina of the eye was deranged in chicks;
- ants' memory was severely impaired by exposure to GSM 900 MHz radiation; and
- honeybees exposed to mobile phones gave signals of warning/distress that may trigger swarming.

D. Effects on the Brain and Nervous System

Forty-four studies address neurological effects. Many of the effects listed here were replicated in numerous studies.

Four studies of human volunteers found that:

- short term exposure to radiofrequency energy decreased spontaneous brain activity in multiple regions of the brain, measured with functional MRI;
- mobile phone exposure reduced cochlear nerve compound action potential (CNAP) during surgery;
- GSM mobile phone (cell phone) exposure caused lower amplitude of P300 waves; and
- alterations in brain wave activity with exposure were different according to gender.

Dozens of studies in rodents found that:

- exposure *in utero* led to lower levels of a range of antioxidants, smaller numbers of pyramidal cells in the hippocampus in month-old pups, inflammation, degenerative nuclear and cellular changes and edema in the brain, electrophysiological impairment of Purkinje cells (the largest neurons in the brain), impaired transmission across synapses, DNA damage, neuronal loss, changed calcium efflux (an indication of breakdown of cellular membranes), and altered electroencephalyogram (EEG) readings;
- in rats, daily exposure caused lower levels of neurotransmitters, DNA damage, degenerative changes, oxidative stress, higher beta-amaloid, extensive changes in various protein levels, altered firing of neurons, changed calcium binding and immunoreactivity along with cell loss;
- shorter term exposure caused cell death in the brain;
- a single exposure affected neuro-immunity, stress and behaviour differently in young versus middle-aged rats, and led to impaired integrity of the blood brain barrier a week later;
- sleep cycles were altered in rats exposed to a modulated radiofrequency signal; and
- in mice, chronic radiofrequency energy reduced neurotropins (chemicals for maintenance of neurons), and caused loss of pyramidal brain cells and alteration of calcium movement across cell membranes.

In two studies of insects, short term exposure affected behaviour, memory and physiology.

Laboratory studies of cell cultures revealed:

- 3 minute exposures to GHz range radiation caused a reversible 30% decrease in firing rate and bursting rate in a synthetic neural network; and
- modulation of heat shock proteins in differentiated neuroblastoma cells (neuron-like cells).

In summary, regular cell phone exposure can lead to altered structure, biochemistry and function of the brain. Function is impaired, with cell death and increased levels of compounds associated with chronic degenerative disease.

E. Effects on the Eye

Six scientific publications highlight effects of low level radiofrequency energy on the eye. Cataract formation with higher levels of a broad range of electromagnetic radiation is well known, and eyes are at risk of thermal effects because they lack blood flow for cooling. Research now points to other effects at lower exposure levels that do not induce heating.

In animals it was found that:

- rat corneal epithelium (the growing layer on the cornea) was thicker in animals exposed to low intensity microwave radiation for two hours daily over three weeks;
- radiation from computer monitors caused changes in rat corneas and lenses, including oxidative stress and indications of genetic damage; and
- development of the retina in chick embryos was disrupted with radiation from a cell phone.

In two laboratory cell culture studies, lens epithelial cells exhibited oxidative stress, altered protein and decreased cell viability following short term (0.5 to 2 hours) exposure to low levels of 1.8 GHz RF radiation.

This research replicates the findings of a 2010 review, that summarized that radiofrequency exposure affects lens transparency, cell growth and cell death, inhibits intercellular communication, and induces stress responses and genetic damage.

F. Cardiovascular Effects

Four research publications identify effects on the cardiovascular system:

- consistent with earlier findings regarding EHS (below) a 2013 study found a “non-thermal” (low exposure) vasodilator effect of cell phone radiation exposure to the jaw and cheek;
- rats exposed to 900 MHz pulse-modulated radiofrequency radiation (similar to phone “talk mode”) daily 20 minutes/day for three weeks experienced oxidative damage to the heart (as well as the lungs, testis and liver);
- a very large study of rats, with a range of exposure durations, found heart damage that increased with dose, as well as higher blood pressure and lower blood calcium levels; and
- in the laboratory, radiofrequency exposure altered the structure of hemoglobin and lowered its capacity to carry oxygen in the blood.

In summary, research indicates that radiofrequency radiation may make the blood carry less oxygen, harm the heart, increase blood pressure and affect blood vessels. Effects identified in people with electromagnetic hypersensitivity (below) include heart rate variability.

G. Electrohypersensitivity (EHS)

We all have our strengths and vulnerabilities, and some people experience diverse symptoms that correlate reproducibly with exposure to electromagnetic energy. Research can tend to find no effect (be "biased to the null") with these individuals, due to delayed onset and resolution of symptoms, as well as other sensitivities that may be provoked in research settings.

Nine publications were identified, including:

- a study of more than 400 participants that identified a suite of biochemical markers for those with EHS;
- an overview of diagnosis of EHS by measuring heart rate variability, microcirculation and electric skin potentials;
- the Guideline of the Austrian Medical Association for the diagnosis and treatment of EMF- related health problems and illnesses (EMF syndrome), a consensus paper of the Austrian Medical Association's EMF Working Group (AG-EMF);
- research indicating that avoidance of radiation from video display terminals allowed affected individuals to return to productivity;
- research comparing individuals with symptoms associated specifically with cell phones, individuals with EHS and healthy controls found that those affected by a broader range of exposures were more likely also to suffer psychological distress than healthy controls or those with symptoms related to cell phones alone;
- an overview of the status of EHS, as a disability that is accommodated in Sweden. Differences in the skin may be markers of this disability; and
- research indicating a higher prevalence of thyroid and liver dysfunction, and chronic inflammation in patients presenting with EHS. It is recommended to check for treatable conditions in these patients.

Research is progressing on diagnosis (traits, symptoms and objective markers), treatment and accommodation of individuals with EHS, with clinical guidelines in place and under review.

H. Biochemical Effects

Research often includes biochemical measurements, so literature touching on biochemical effects is not surprisingly the largest collection of publications indicating significant and potentially harmful effects of radiofrequency radiation. Several themes run through the 65 publications examining laboratory research that were identified, some of which were touched upon above.

In animal studies, radiofrequency radiation affects biochemical parameters that correspond to:

- increased oxidative stress;
- damage to genetic material;
- damage to cellular membranes, with reduced fluidity and increased permeability;
- cellular damage and cellular death, in the brain, heart, liver, testis, blood and reproductive cells (sperm and eggs); and
- changes in neurotransmitters that govern operation of the nervous system.

These findings are replicated and explored further in diverse cell culture systems simulating the nervous system, white blood cells [lymphocytes], sperm cells and tissues.

Conclusions

This collection of 140 recent publications contains highly significant, relevant data related to health effects, ranging from biochemical to subcellular, animal models and human studies. Extensive evidence of harms was not considered in this revision of Safety Code 6. This includes cancer, reproductive, developmental, neurological and cardiac harms, electrohypersensitivity, and the biochemical underpinnings of these conditions.

Across the board, it is clear that the scientific literature has not been completely searched, collated nor assessed. C4ST is particularly concerned, because almost three quarters of these references were provided during consultations. The materials presented here may constitute the tip of the iceberg, because an information professional may well have uncovered considerably more research.

The current evidence base allegedly supporting draft Safety Code 6 is lacking a great deal of information demonstrating the potential for significant harm from low levels of radiofrequency/microwave radiation. It is necessary to follow modern, established international best practices for systematic review in environmental health, with knowledgeable interpretation of study strengths and limitations, with full transparency for Health Canada to bring together a more comprehensive, up to date evidence base.

In the absence of a complete evidence base, it is impossible that Health Canada has founded Safety Code 6 on a "weight of evidence" as claimed. Given the absence of studies showing harm, and suggestions of bias in selection of evidence, Safety Code 6 as it stands will not protect the health of Canadians.

As Low as Reasonably Achievable (ALARA)

C4ST regularly hears from Canadians who report being sickened and disabled by exposures to radiofrequency/microwave radiation. The immediate response to the current scientific shambles and clear public health issue should be to ensure that health effects are recognized and that exposures are *As Low As Reasonably Achievable* (ALARA).

Measures to do so should include, but not be limited to:

- provide guidelines and resources to assist Canadian physicians in becoming apprised of radiofrequency/microwave exposure and related health problems and clinical presentations that may be associated with over-exposure or sensitivity;
- advise Canadians to limit their exposure, especially the exposure of children;
- use of only wired computers in schools and workplaces. If that is impossible, provide individuals the right to turn off the router in the classroom or workplace, and provide "safe havens" for electrosensitive individuals;
- development and urgent deployment of technologies with lower and less frequent emissions:
    - e.g. "smart" devices should send signals rarely and be set up in point-to-point networks rather than multiple layers of a "meshed network";
    - challenge and/or encourage industry to develop safer solutions (Bell, Rogers and Telus have all either presented solutions or signed agreements for emission levels significantly below Safety Code 6 that provide full cell phone coverage);
    - devices with significantly lower emissions that are available in other countries should be approved expeditiously by the CSA. Examples include cordless phones and baby monitors that only transmit when necessary; not continuously.

Appendix 1. Thoroughness of "Authoritative Reviews"

In the Health Canada and RSC documents, reference is made to 16 "authoritative reviews." The numbers of citations published each year from 2009 to 2014, in each of these reviews as well as in the Friesen Update are summarized in Table 2.

While over a thousand relevant recent publications (2009 to 2013) were identified in the Friesen Update and provided to the RSC, the RSC cited less than 15% of the number of studies. Moreover, of the "authoritative reviews" the largest and most recent (SCENIHR Preliminary 2013) cited 34% of the studies. Even if there was no overlap between the Canadian and SCENIHR citations (which is not true), more than half of the easily identifiable relevant studies were not examined. See Table 2 below.

Table 2. Tally of numbers of references 2009 to 2014 cited in the Health Canada Safety Code 6 documents, the Royal Society of Canada report, the Friesen Update submission and various "Authoritative Reviews". Abbreviations are defined on the following page.

	Report	2009	2010	2011	2012	2013	2014	Total cited
Health Canada	SC 6 2013 Draft for RSC review	7	5	2	2			16
	SC 6 2014 Draft posted on HC website 16May 2014	9	6	2	3	3		23
	Health Canada SC6 2013 Rationale	7	3	4	3			17
	RSC SC6 Report 1 April 2014	21	40	36	39	29	3	168
	RSC SC6 Report 1 April 2014 Chapter 7 (Health Effects)	14	26	26	32	22	4	124
	FriesenM UPDATE provided to RSC (2013)	226	257	233	246	205	3 EAP	1170
"Authoritative Reviews" identified by Health Canada	SCENIHR Preliminary 2013	83	94	99	96	28		400
	ANSES 2013□France	84	102	104	64	15		369
	AGNIR 2012□United Kingdom (UK)	116	101	41	3			261
	SSM 2013 Sweden	11	31	113	98	4		257
	NIPH 2012□Norway	51	77	63	8			199
	IARC 2011□WHO Monograph 102	78	69	40				187
	EFHRAN 2012□European Commission	38	29	66	3			136
	The Hague 2013□The Netherlands	16	14	26	5			61
	SSK 2011 Germany	13	20	18				51
	CCARS 2011 Spain	29	14					43
	Latin America Experts□Committee 2010	26	7					33
	Mugdal et al 2013□European Commission*	24	3					27*
	Reuben 2010	13						13
	ICNIRP 2009	10						10
	Victoria Dept Health 2012 Australia			5	2			7
	SCENIHR 2009	5						5
	Part&Jarasinski 2013□European Commission	1	1			2		4

EAP = e-publication ahead of print

* includes mis-entries and duplicates.

Report Title Abbreviations

AGNIR (2012) = Advisory Group on Non-ionising Radiation. “Health Effects from Radiofrequency Electromagnetic Fields”. Health Protection Agency. UK. http://www.ices-emfsafety.org/documents/publications/AGNIR_report_2012.pdf. 2012.

ANSES (2011) = Agence nationale de securite sanitaire de l’alimentation, de l’environnment et du travail. Radiofrequences et sante. Mis a jour de l’expertise. Maisons-Alfort, France;

CCARS (2011) = Scientific Advisory Committee on Radio Frequencies and Health. Report on Radiofrequencies and Health (2009-2010). Madrid, Spain. 2011;

EFHRAN (2012) = European Health Risk Assessment Network on Electromagnetic Fields Exposure. Risk analysis of human exposure to electromagnetic fields (revised). European Commission [Internet]. 2012;

Friesen M. UPDATE 2013 = Selected list of scientific and other literature on wireless radiation including radiofrequency and microwave radiation, for a full evaluation of biological effects by the Royal Society of Canada’s Expert Panel reviewing draft of Safety Code 6 (2013): Update, December 2013. Submitted to the RSC - public consultation process. 2013:108 pp.

Health Canada SC 6 (2013) Draft = Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz: Safety Code 6: 2013 DRAFT. Health Canada; 2013.

Health Canada SC6 (2013) - Rationale . Safety Code 6 (2013) -Rationale. Health Canada. 2013;44.

Health Canada SC 6 (2014) Draft = Health Canada. Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz: Safety Code 6: 2014 DRAFT. Health Canada; 2014.

IARC (2013) = International Agency for Research on Cancer (World Health Organization). Non-ionizing radiation, Part II: radiofrequency electromagnetic fields. IARC Working group on the evaluation of carcinogenic risks to humans. IARC Monographs on the evaluation of carcinogenic risks to humans 102. 2013;

ICNIRP (2009) = International Commission on Non-Ionizing Radiation Protection (ICNIRP). Exposure to high frequency electromagnetic fields, biological effects and health consequences (100 kHz-300 GHz). 2009 May 1]; Available from: http://www.icnirp.de/documents/RFReview.pdf

Latin American (2010) = Latin American Experts Committee on High Frequency Electromagnetic Fields and Human Health Latin American Experts Committee. Non-Ionizing Electromagnetic Radiation in the Radiofrequency Spectrum and its Effects on Human Health with a Review on the Standards and Policies of Radiofrequency Radiation Protection in Latin America. 2010. Available from: http://www.wireless-health.org.br/downloads/originals/LatinAmericanScienceReviewreportFinal-2MR.doc

Mugdal et al. 2013 = Mudgal S, Sonigo P, Toni de A, Johansson L, Rualt C, Schütz J, et al. Promoting healthy environments with a focus on the impact of actions on electromagnetic fields. European Commission.

NIPH (2012) = Norwegian Institute of Public Health. Low-level radiofrequency electromagnetic fields - an assessment of health risks and evaluation of regulatory practice (English Summary). Oslo, Norway [Internet]. 2012;

Part P, Jarosinska D 2013 = same authors as in: Electromagnetic fields. In: Environment and human health — Joint EEA-JRC report (EEA Report No 5/2013). European Commission. 2013;Chapter 8:58–9.

Reuben SH (2010) = President’s Cancer Panel (PCP). Reducing environmental cancer risk: what we can do now. DIANE Publishing. 2010;240.

RSC SC6 (2014) = The Royal Society of Canada Expert Panel: A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields. Spring 2014:164. Released to the public 1 April 2014.

SCENIHR (2009) = Health effects of exposure to EMF. Scientific Committee on Emerging and Newly Identified Health Risks Opinion, European Commission Directorate General for Health and Consumers, Luxembourg. 2009;

SCENIHR (2013) = Preliminary opinion on potential health effects of exposure to electromagnetic fields (EMF). Scientific Committee on Emerging and Newly Identified Health Risks Opinion, European Commission Directorate General for Health and Consumers, Luxembourg. 2013;219.

SSK (2011) = German Commission on Radiological Protection. Biological effects of mobile phone use: an overview. German Commission on Radiological Protection. 2011;64 pp.

SSM (2013) = Swedish Radiation Health Authority. Eighth report from SSM's Scientific Council on Electromagnetic Fields, 2013.

The Hague (2013) = The Health Council of The Netherlands. Mobile phones and cancer. Part 1. Epidemiology of tumours of the head. The Netherlands [Internet]. 2013;2013/11.

Victoria Depart. Health (2013) = Victoria Department of Health. Radiation Advisory Committee Annual Report 2012.pdf. Australia: 20 pp.