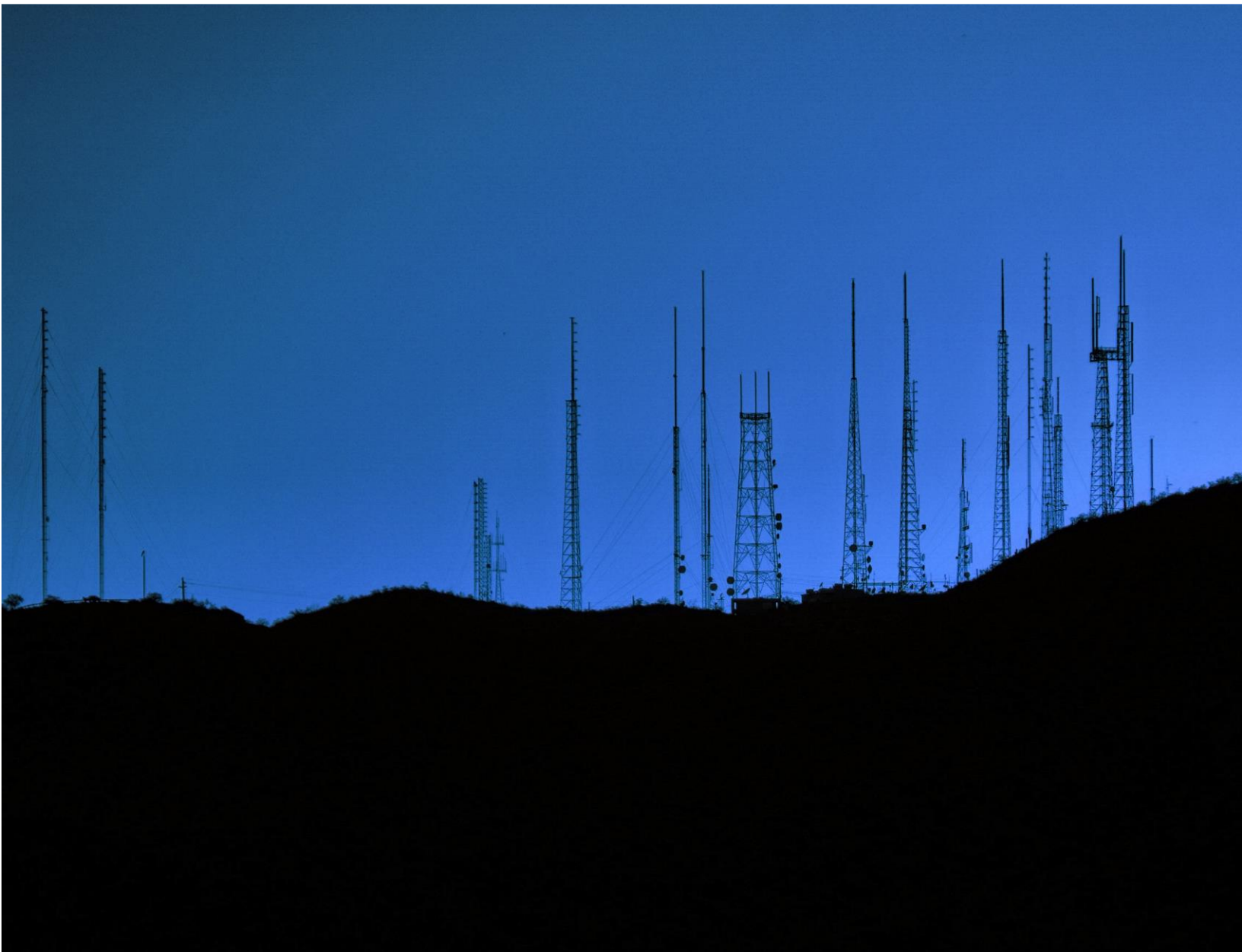


Proceedings from a Symposium on the Impacts of Wireless Technology on Health

Edited by Riina Bray MD and David Fancy PhD



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We would like to extend our heartfelt gratitude to all those who helped in the planning and delivery of this Symposium and consequent transcription and publication of the material herein.

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Biographies		iii
--------------------	--	-----

Introduction: Impacts of Wireless Technology on Health Proceedings from a May 31st, 2019 Symposium	Riina Bray	1
---	------------	---

SCIENCE

Implications of International Agency for Research on Cancer (IARC) Position	Anthony B. Miller	4
--	-------------------	---

EMFs 101: Impacts on Health in the Community	Magda Havas	10
---	-------------	----

Wireless (MW/RF) radiation harms without heating: How we know, and implications	Meg Sears	19
--	-----------	----

CLINICAL

Clinical Observations and the Evolution of Practice Guidelines for EHS	Riina Bray	30
---	------------	----

Impacts of Wireless technology on Health, EMR Canaries Clinical Experiences	Jennifer Armstrong	42
--	--------------------	----

POLICY & ADVOCACY

Health Canada's <i>Safety Code 6</i> and Global Trends Regarding Radiofrequency/Microwave Radiation Safety	Frank Clegg	48
---	-------------	----

Wireless Justice from Precaution to Prevention	André Fauteux	58
---	---------------	----

Using Law and Advocacy to win Accommodations for Clients with Electromagnetic Hypersensitivity (EHS)	David McRobert	64
---	----------------	----

National NGOs in Ontario & Advocacy	Barbara Payne	91
--	---------------	----

Electrical Hypersensitivity (EHS) and the "Social Model" of Disability	David Fancy	98
---	-------------	----

Impacts on Learning Institutions, Students, and Teachers	Shelley Wright & Frank Clegg	105
---	------------------------------	-----

The Invisible Made Visible: No Place to Hide, A Global Phenomenon— Systems and Mitigation	Robert Steller	115
--	----------------	-----

Patient Advocacy Driven by Personal Experience	Melissa Chalmers	122
---	------------------	-----

BIOGRAPHIES

Dr. Jennifer Armstrong is Director of the Ottawa Environmental Health Clinic in Ottawa, Canada, for the last 22 years. The Clinic looks at the root cause of illness through the lens of environmental influences such as food allergies, chemical sensitivities, inhalant allergies, chemical and metal toxicities, and now electromagnetic radiation effects. Dr. Armstrong's formal medical education is from the University of Toronto (1977), and further training is from the American Academy of Environmental Medicine with a Diplomate of Environmental Medicine (Equivalent to a Fellowship) obtained in 2009. She has taught courses in Environment and Health at the University of Ottawa.

Dr. Riina Bray is a chemical engineer and Doctor of Medicine with Master's degrees in addictions, toxicology, and public health. She is the Medical Director of the Environmental Health Clinic at Women's College Hospital and Assistant Professor in the Department of Family and Community Medicine with cross appointment to the Dalla Lana School of Public Health, University of Toronto. She is heavily involved in academic medicine, research, and patient advocacy.

Melissa Chalmers was an airline pilot for 25 years. She was Captain on the A320 when she went on paid medical leave for electromagnetic hypersensitivity (EHS) after being injured by cell towers built behind her home in 2010. Melissa has lived with severe EHS for nine years and had to refugee from her home for extended periods of time in West Virginia at the only zone in the world that legally prohibits wireless; the prohibition intends to protect telescopes, not people. Whenever able, she has worked to improve quality of life for hundreds of people and their families who contacted her for help. Melissa now works directly with government, utilities, and health care professionals/organizations on accommodations for all who have fallen ill from electromagnetic pollution so they can participate in society, access proper medical care, return to work, have safer homes, and relieve some of their sufferings.

Frank Clegg is the founding CEO of Canadians for Safe Technology (C4ST), a national, not-for-profit, volunteer-based coalition of parents, citizens, and experts. C4ST's mission is to 1) educate and inform Canadians and policy makers about the dangers of the exposures to unsafe levels of radiation from technology; and 2) to work with all levels of government to create healthier communities for children and families. Mr. Clegg is co-Chair of the Business Advisory Group to the Environmental Health Trust (EHT). In addition to its education and advocacy work, EHT performs cutting edge research on exposure to cell phone and other wireless radiation. Mr. Clegg has spent his entire career in the technology industry. He retired from his most recent position as President of Microsoft Canada.

David Fancy PhD is Professor in the Department of Dramatic Arts, Marilyn I Walker School of Performing Arts, Brock University. He brings his theoretical and philosophical interests in immanentist thought to the intersection of a range of disciplines including philosophy, theatre studies, performance studies, science and technology studies, and critical disability studies. Dr. Fancy is co-founder (2005) of the Canadian Initiative to Stop Wireless, Electric, and Electromagnetic Pollution. He is a patient advocate who works with dozens of Canadians with electrical hypersensitivity.

André Fauteux is a former *Montreal Gazette* reporter (1988). He publishes and edits Canada's oldest magazine dedicated to Healthy and Sustainable Housing, *La Maison du 21e siècle*, which celebrates its 25th anniversary this year. For 30 years, André has written extensively about preventing and mitigating environmental health problems such as MCS and EHS, developing a vast international network of contacts in the field of EMFs and Health. Beginning in 1990, he was very close to Canada Mortgage and Housing Corporation (CMHC) researchers who launched a national Healthy Housing initiative. André organized CMHC's first Indoor Air Quality Investigators' training in Quebec, wrote research highlights, and trained Reno Depot employees in Healthy Renovations for the Crown Corporation responsible for housing.

Magda Havas PhD is Professor Emerita at Trent University in Peterborough, Canada. She is internationally recognized, both for her previous work on acid rain and metal pollution and for her current research on the biological effects of electromagnetic pollution and beneficial effects of electrotherapies. Dr. Havas works with people who have developed an intolerance to electromagnetic frequencies and advises health care providers on how to diagnose and treat people with this sensitivity. She has authored more than 200 publications, has given more than 360 invited talks in 30 countries, and is co-author of *Public Health SOS: The Shadow Side of the Wireless Revolution*. Dr. Havas serves as a science advisor to various government and non-government organizations and has provided expert testimony on the health effects of power lines, occupational magnetic field exposure, and radiofrequency radiation.

David McRobert is an environmental lawyer based in southern Ontario, and retired Adjunct Professor. He was *pro bono* counsel on the Board of the Wireless Radiation Safety Council of Canada from 2011 to 2013. He has worked with numerous clients on a range of wireless radiation safety, air pollution, water pollution, and chemical sensitivity issues. David served for 16 years as In-House Counsel and Senior Policy Advisor at the Environmental Commissioner of Ontario. David has a BSc in Biology and a Master's in Environmental Studies on Biological Conservation. He graduated from Osgoode Hall Law School, undertook graduate law studies, and was admitted to the Ontario Bar in 1990. David taught law to undergraduate and graduate students at York University, Osgoode Hall Law School, the University of Toronto, and Humber College between 1987 and 2011. He has published dozens of books, journal articles, and articles. Book titles include *Risky Business: A Guide to the Use, Handling and Transportation of Asbestos* and *My Municipal Recycling System Made Me Fat and Sick*.

Dr. Anthony B. Miller is Professor Emeritus, Dalla Lana School of Public Health, University of Toronto. A physician-epidemiologist, he was trained in internal medicine. He was Director of the Epidemiology Unit of the National Cancer Institute of Canada 1971 to 1986 and Chair of the Department of Preventive Medicine and Biostatistics, University of Toronto, 1992 to 1996. He served as a special expert in the Division of Cancer Prevention, US National Cancer Institute, 1997, Senior Epidemiologist, International Agency for Research on Cancer 1998 to 1999, Head, Division of Epidemiology, German Cancer Research Centre, Heidelberg, 2000 to 2003, Associate Director, Research, Dalla Lana School of Public Health, University of Toronto, 2008 to 2010. He has been a consultant to the World Health Organization and to its Eastern Mediterranean Region.

Barbara Payne, President of Electromagnetic Pollution Illnesses Canada Foundation (EPIC), a not-for-profit organization in support of persons affected by electromagnetic pollution, provides an outline of the advocacy terrain in "National NGOs in Ontario & Advocacy." EPIC raises awareness about everyday, artificial, biologically-active electromagnetic fields, aiming for significant reduction in emissions and exposures in indoor and outdoor environments.

Meg Sears PhD is a senior clinical research associate with the Ottawa Hospital Research Institute and chairs the civil society, science-based organization Prevent Cancer Now. She is a broad-based environmental health scientist, with knowledge of health effects of low-level environmental factors (including substances and electromagnetic radiation) and scientific methods for toxicant assessment, to make least-toxic choices for healthier populations and environment. Dr. Sears authored *Medical Perspectives on Environmental Sensitivities* for the Canadian Human Rights Commission. She also partnered in a broad CIHR-funded scoping review of arsenic, cadmium, lead, and mercury, including sources and routes of exposure, health effects, and responses for individuals, public health, and in clinical practice.

Robert Steller is the President of Breathing Easy. He is a certified Building Biology Environmental Consultant and Inspector. From 2004 to 2006 he was the Director of the International Institute for Building Biology in Clearwater, Florida. He has consulted on new home construction in Germany, USA, Brazil, and Canada. Robert is an expert panel member for Healthy Indoors Partnership, which, together with Health Canada, CMHC, and the National Research Council, is creating a Buyer's Guide for products and services with low chemical emissions.

Shelley Wright has taught elementary students for 28 years. She is a political activist promoting inclusive spaces for environmentally sensitive teachers within her union.

Introduction: Impacts of Wireless Technology on Health Proceedings from a May 31st, 2019 Symposium

Riina Bray MD

Medical Director, Environmental Health Clinic, Women's College Hospital, Toronto, Canada

I would like to begin with a series of statements that are substantiated by the literature; together, these comprise the justification of why we are here today:

- There is a range of evidence that adverse health effects can result from increased exposure to interconnected wireless devices and infrastructures that emit non-ionizing microwave or radiofrequency radiation (MW/RFR).
- Such effects can include: impairment of reproduction, increased inflammation, immunological disturbances, amplification of effects of other toxic agents, and contribution to chronic disease.
- Additionally, at exposure levels of MW/RFR commonly tolerated by the general population, some patients experience acute and chronic symptoms including fatigue, tinnitus, headaches, neurological dysfunction, and cardiac dysfunction—related to electromagnetic fields (EMF).
- There is significant evidence to suggest that existing safety standards for a whole range of electromagnetic emissions are too lax—for both persons experiencing symptoms and the general population.

The presenters gathered here today have extensive experience as clinicians, researchers, advocates, contributors to policy, and have lived experience of electromagnetic injury. We are grateful for the collaboration of my colleagues here today, as well as to Women's College Hospital for providing the venue, and the CME and the Continuing Professional Development Centre of the Faculty of Medicine at University of Toronto.

My intention as the convenor of this Symposium—and I believe I can speak on behalf of the entire organizing committee—is to provide up-to-date and convincing evidence, drawn from the literature, that suggests that we need:

- To continue to improve our detection and treatment of electrical sensitivities and other forms of electromagnetic injury.
- To bring up-to-date science to bear on discussions of what constitutes reasonable safety standards for electromagnetic emissions moving forward.
- To build capacity and increase knowledge transmission across disciplinary boundaries within the patient care continuum.
- To intensify and strengthen ties between researchers, clinicians, patient advocates, and policy makers, all of whom approach this complex issue from different angles.

We have been advised by the Ontario Public Health Association, in response to news of today's Symposium, that: "Public Health Ontario's position remains the same as 2010 that there is no conclusive evidence of adverse effects on health at RF levels below Health Canada's SC-6 guidelines." "As public health agencies are required to use evidence-informed decision-making in our practice, whether health promotion, risks communication or policy development, we rely on our sciences researchers at PHO and Health Canada (our own internal specialists) to review the evidence. With respect to RFs, while individual studies may present conflicting results, we rely on a weight of evidence approach as PHO explains in their 2010 report. As pointed out in the Royal Society of Canada's Expert Panel Report, additional

research is important, but I believe it is equally important to convey the current scientific understanding in terms of the weight of evidence.”

In his paper entitled “Health Canada’s *Safety Code 6* and Global Trends Regarding Radiofrequency/Microwave Radiation Safety,” Frank Clegg with Canadians for Safe Technology and the Environmental Health Trust makes a case for “A moratorium on 5G and other deployment of microwave radiation infrastructure to which the public is exposed is required until the sciences shows it is safe.” He draws on studies and proclamations from scientists and physicians globally to call for a “shift (of) responsibility to industry to prove technology is safe before it is released to the market.”

André Fauteux, Editor/Publisher, *La Maison du 21e siècle* magazine, traces in his contribution the emergence of notable regulatory EMF standards across the globe during the last 40 years. His chapter, entitled “Wireless Justice from Precaution to Prevention,” demonstrates the laxity of Canadian standards for EMF exposure in the global context.

In his paper, lawyer David McRobert provides a comprehensive analysis of legal protections available in Canada for those living with electromagnetic hypersensitivity, as well as analyzes the relationship between law, scientific advances, and the role of metapolicy in developing policies that do or do not protect vulnerable persons and overall populations. His paper, entitled “Using Law and Advocacy to win Accommodations for Clients with Electromagnetic Hypersensitivity (EHS),” deals, amongst other things, with the role played by medical doctors in providing accommodation for EHS.

Barbara Payne, President of Electromagnetic Pollution Illnesses Canada Foundation (EPIC), a not-for-profit organization in support of persons affected by electromagnetic pollution, provides an outline of the advocacy terrain in “National NGOs in Ontario & Advocacy.” She reminds medical audiences of the important advocacy role that physicians play in calling for more protective exposure standards in a Canadian context.

Patient advocate David Fancy, PhD, describes in “Electrical Hypersensitivity (EHS) and the ‘Social Model’ of Disability” how physicians can benefit from not simply conceiving of disability to be a biological phenomenon and product. Instead, adopting many aspects of the social model of disability can provide for a much better care experience for the patient.

School teacher Shelley Wright and former Microsoft Canada and C4ST president Frank Clegg contribute perspectives from and for the secondary school system in their contribution, “Impacts on Learning Institutions, Students and Teachers.” Wright provides a patient testimonial of her experience living with electromagnetic hypersensitivity, and she and Clegg provide an analysis of what constitutes accessible hospital and secondary school environments for vulnerable and general populations.

Robert Steller is a certified Building Biology Environmental Consultant and Inspector. In his contribution, “The Invisible Made Visible: No Place to Hide, A Global Phenomenon, Systems and Mitigation,” he outlines mitigation strategies for electromagnetic pollution at residential and other structures.

Melissa Chalmers, a former Commercial Airline pilot affected by electromagnetic hypersensitivity, shares perspectives in her testimonial, “Patient Advocacy Driven by Personal Experience.” She speaks eloquently about ways diagnosing physicians can best assist patients living with electromagnetic hypersensitivity.

Meg Sears, PhD, points out that regulators state two requirements before recognizing relationships between low exposures to microwave or radiofrequency radiation and adverse effects on health: 1) evidence of mechanisms by which biological effects may occur; and 2) evidence of effects that are both “established” and “adverse.” Microwave catalysis—an established, commercialized tool of chemists—greatly accelerates chemical reactions and influences product distribution, with lower energy inputs and at lower temperatures than conventional heating. Microwave irradiation lowers the activation energy for

reactions, and can be more effective in dispersed mixtures that mimic membrane systems. Microwave catalysis is an established mechanism, consistent with cellular and physiological harms observed with exposures at levels below regulatory limits.

Magda Havas, PhD, emphasizes the need for us to make wise, educated choices about how we use wireless technology and that knowledge is key to being empowered to say “No” as necessary.

Riina Bray, MD, has created clinical practice guidelines from her immense experience dealing with patients with EHS since 2005 and is now a world expert in the field.

Jennifer Armstrong, MD, shares her experiences as a medical doctor in the community seeing more and more patients whose illnesses seem strange until connected to MW/RFR exposure.

Anthony B. Miller, MD, is Professor Emeritus, Dalla Lana School of Public Health, University of Toronto. A physician-epidemiologist, Dr. Miller was trained in internal medicine. Dr. Miller cautions us regarding findings that an International Agency for Research on Cancer working group categorized radiofrequency radiation as “*possibly* carcinogenic to humans” in 2011 (Group 2B); it is likely that if a further working group were to re-review the evidence, the hazard category would be changed to Group 1 (“*carcinogenic* to humans”), since there is now sufficient evidence.

Implications of International Agency for Research on Cancer (IARC) Position

Anthony B Miller MD

Professor Emeritus, Dalla Lana School of Public Health, University of Toronto, Canada

Abstract

There is now considerable evidence on the carcinogenic effects of radiofrequency radiation, both from human epidemiology studies in Sweden and elsewhere and two large animal carcinogenicity studies. These effects in humans occur from prolonged use of cell phones, especially if usage begins early in life. Although brain cancers (glioblastoma) are the cancers that are increased to the greatest extent, other cancers (including breast and salivary gland cancers) are also increased. Two large animal carcinogenicity studies have shown that radiofrequency radiation is an animal carcinogen. An International Agency for Research on Cancer working group categorized radiofrequency radiation *possibly* carcinogenic to humans in 2011 (Group 2B); it is likely that if a further working group were to re-review the evidence, the category would be changed to Group 1, *carcinogenic* to humans, a categorization which governments and the public could not ignore. We need to adopt the ALARA principle, reduce our exposure to radiofrequency radiation to As Low As Reasonably Achievable.

We have to be extremely cautious about increasing the population's exposure to radiofrequency radiation (RFR). The telecom industry ignores the fact that the International Agency for Research on Cancer (IARC) of the World Health Organization categorized in 2011 all RFR, including that emitted by cell phones and Wi-Fi from cell towers and routers as in some schools and many homes, as a possible (Group 2B) carcinogen, a grouping that also includes lead and DDT (IARC, 2011). Since then new science has emerged, both human and animal, confirming that RFR causes cancer.

The human evidence comprises three important sets of case-control (human) studies of mobile phone use and brain cancer:

- The multi-country INTERPHONE study, which found a 2-fold increased risk of glioma after 10+ years of regular use of cell phones, with a dose-response relationship (Interphone Study Group, 2010)
- Several studies by Hardell and his colleagues in Sweden (one of the first countries to introduce cell phones) showing 2- to 5-fold increased risk of glioma after prolonged use, especially when exposure began early in life (Hardell and Carlberg, 2015)
- A large study (CERENAT) in France, which found a 5-fold increased risk of glioma after 5+ years use (Coureau et al, 2014).

Interphone – Appendix 2 for Glioma

Time since start of regular use (years)	Cases	Controls	OR	95% CI
1-1.9	93	159	1.00	
2-4	460	451	1.68	1.16-2.41
5-9	468	491	1.52	1.06-2.22
10+	190	150	2.18	1.43-3.31

Figure 1

Relative Risk Estimates for Glioma Associated with Ten or More Years of Mobile Phone Use

Study	Exposure, in years of use	RR/OR	95% CI	Design
Benson et al, 2013 (UK)	>10	0.8	0.5-1.1	Cohort
Hardell et al, 2013 (Sweden)	10-15	1.4	1.3-3.5	Case-control
	>25	3.0	1.7-5.2	

Figure 2

Cerenat (France)– 231 cases, 446 controls (Coureau et al, 2014)

Brain cancer	Exposure period	OR	95% CI
Glioma	After 2 years	2.9	1.4-5.9
	After 3 years	3.0	1.5-6.3
	After 5 years	5.3	2.1-13.2
Ipsilateral glioma	All	2.1	0.7-6.1
Meningioma	All	2.6	1.0-6.1

Figure 3

These studies all show that the lower the exposure, the less the risk. Although an increased risk of glioma was not reported from a cohort study in the UK (with some misclassification of exposure), there was a doubling of risk of acoustic neuroma (vestibular Schwannoma) with ten or more years of mobile phone use (Benson et al, 2013), as was also found in a case-control study by Hardell et al (2013), though not by Moon et al (2014) from Korea. However, a case-control study, using operator records for exposure, of brain tumors in adolescents in Nordic countries found more than a doubling of risk after 2.8 years since initial subscription for mobile phone use (Aydin et al, 2011).

RFR is probably also an avoidable cause of Breast Cancer, based upon seven unusual clinical case reports of women who kept cell phones in their bras, supported by exposure modeling and toxicology (West et al, 2013).

The incidence of parotid or salivary gland tumors has tripled in Israel: 1 in 5 under age 20 (Czerninski et al, 2011). A rise in the incidence of glioblastoma in the temporal and frontal regions of the brain has been reported from the UK (Philips et al, 2018), while the incidence of neuro-epithelial brain cancers has significantly increased in children, adolescents, and young adults from birth to 24 years in the United States (Gittleman et al, 2015; Ostrom et al, 2016).

Increase in Parotid Gland Tumors in Israel over 30 Years

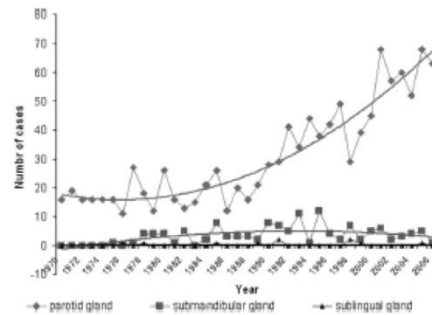


FIGURE. For trend analyses, we added regression lines and calculated R^2 values. Parotid gland cancer: $R^2 = 0.83$; Submandibular gland cancer: $R^2 = 0.36$; Sublingual gland cancer: $R^2 = 0.02$.

Source: Epidemiology, 22, p.130, January 2011

Figure 4

Rise of Glioblastoma in the UK (Philips et al, 2018)

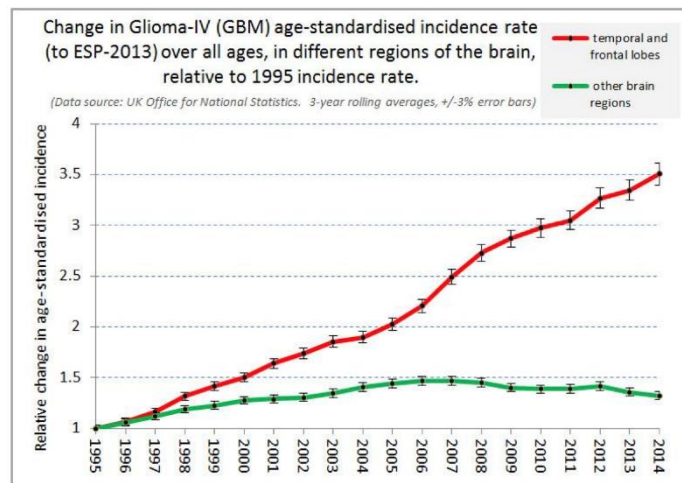


Figure 5

Tumor promotion by exposure to radiofrequency electromagnetic fields (RF-EMF) below exposure limits for humans in RF-EMF exposed mice were first reported in 2010. Lerchl et al (2015) replicated the study with higher numbers of mice per group. They could fully confirm the previous results. No clear dose-response relationship was evident. Lerchl et al (2015) hypothesized that metabolic changes are

responsible for the effects observed. Critical evidence of carcinogenicity of RFR in animals was reported by the National Toxicology Program (US). In male Hsd:Sprague Dawley SD rats exposed to GSM-modulated cell phone RFR at 900 MHz, there was “clear evidence” of carcinogenic activity based on incidence of malignant Schwannoma in the heart and some evidence of carcinogenic activity based on incidence of malignant glioma in the brain. In male Hsd:Sprague Dawley SD rats exposed to CDMA-modulated cell phone RFR at 900 MHz, there was “clear evidence” of carcinogenic activity based on incidence of malignant Schwannoma in the heart and some evidence of carcinogenic activity based on incidence of malignant glioma in the brain. Multiple organs (e.g., brain, heart) also had evidence of DNA damage. These findings were supported by a Life-span Carcinogenic Study from the Ramazzini Institute, in which 2,448 male and female Sprague-Dawley rats had whole-body exposure for 19 hours per day to a 1.8 GHz GSM far field of 0, 5, 25, 50 V/m from prenatal life until natural death. This reproduced the environmental exposure to RFR generated by 1.8 GHz GSM antenna of radio base stations of mobile phones. The findings were a statistically significant increase in the incidence of heart Schwannomas in treated male rats at 50 V/m, a non-significant increase in the incidence of heart Schwann cell hyperplasia in treated male and female rats at 50 V/m, and a non-significant increase in the incidence of malignant glial tumors in treated female rats at 50 V/m (Falcioni et al, 2018).

My colleague Paul Héroux, of McGill University, has suggested that 5G and the Internet of Things (IoT) is a ‘Trojan horse,’ with millions of mini-cell towers soon to be installed every 150 meters in our neighbourhoods which will invade the privacy of every home. Optical fiber is safer, healthier, and faster. With optical fiber, everyone could enjoy a communication speed ultimately 10,000 times faster than wireless, less vulnerable to hacking, and harmless to the health of humans and other species.

An IARC advisory committee recently recommended that RFR should be re-reviewed with high priority. An extensive literary search will be conducted for relevant peer-reviewed publications, members (and chair) of a Working Group will be selected by the IARC Director and the head of the Monographs program, and the members of the working group will be given specific tasks, and then will meet for eight days in Lyon, to reach a conclusion on the carcinogenicity of RFR.

I and many other scientists now believe that RFR should be categorized as a Group 1 Human Carcinogen, in the same Group as cigarette smoking, asbestos exposure, and X-Rays. Government standards must be changed to reflect this. RFR is now ubiquitous, and those who use cell phones or are otherwise exposed to Wi-Fi are increasing the risk of cancer in their bodies, especially after prolonged exposure or exposure beginning in childhood. Even if the risk per individual is low, it is widely distributed and could become a major public health problem, especially if the planned introduction of 5G proceeds. If 5G is rolled out we can expect to see an increase in all of these conditions. A moratorium on the rollout of 5G is essential.

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EMFs 101: Impacts on Health in the Community

Magda Havas PhD

Professor Emerita, Trent University, Peterborough, Canada

Abstract

Our exposure to electromagnetic radiation is increasing exponentially and a growing population is responding by developing cancers, reproductive problems, and/or symptoms of electrohypersensitivity (EHS). Doctors need to be educated on how to diagnose someone with EHS and how to help them recover. The following is a short introduction to the issues that need to be addressed and some of the research conducted on this topic. We all need to practice electromagnetic hygiene.

Today I am going to focus on three things: electrosmog; electrohypersensitivity; and electromagnetic hygiene. Electromagnetic hygiene is part of the solution for those people who have developed a sensitivity to electromagnetic pollution.

Electromagnetic frequencies can be understood through analysis of the electromagnetic spectrum. The spectrum is based on frequency, with low frequency at one end of the spectrum and high frequencies at the other end. Different parts of the spectrum are given different names, and here I focus on radiofrequency, microwaves, and millimeter waves, part of the 5G system, which has a larger bandwidth and higher frequencies.

The spectrum is split into two groups: ionizing radiation and non-ionizing radiation. We have no issues scientifically with ionizing radiation. We know that it is harmful. The controversy revolves around non-ionizing radiation. Many physicists, who do not have a background in biology, do not believe this form of energy can be harmful. However, scientists with a biological or medical background can more readily appreciate how the entirety of the electromagnetic spectrum affects living organisms.

A salient issue, currently, is how electrosmog¹ exposure is increasing. We were introduced to electricity at the turn of the last century. Today electricity has a frequency of 50 or 60 cycles per second (hertz) (Figure 1). Initially in North America, 25 Hz was used but this caused light bulbs to flicker and was deeply annoying to many so they increased the frequency to 60 cycles per second. Artificial radiofrequency came with the invention of the radio—not necessarily by Marconi, who is often given the credit, but by Tesla, who preceded him. We were first exposed to artificial sources of microwaves during World War II with the invention of radar to track enemy aircrafts. The most recent development in terms of electromagnetic exposure is the use of “millimeter waves,” part of the 5G system and the “Internet of Things” or IoT.

The increase in electrosmog is exponential. One way of illustrating this change is with a map of Wi-Fi hotspots around the world (Figure 2).

¹ Electrosmog refers to the entire non-ionizing part of the electromagnetic spectrum.

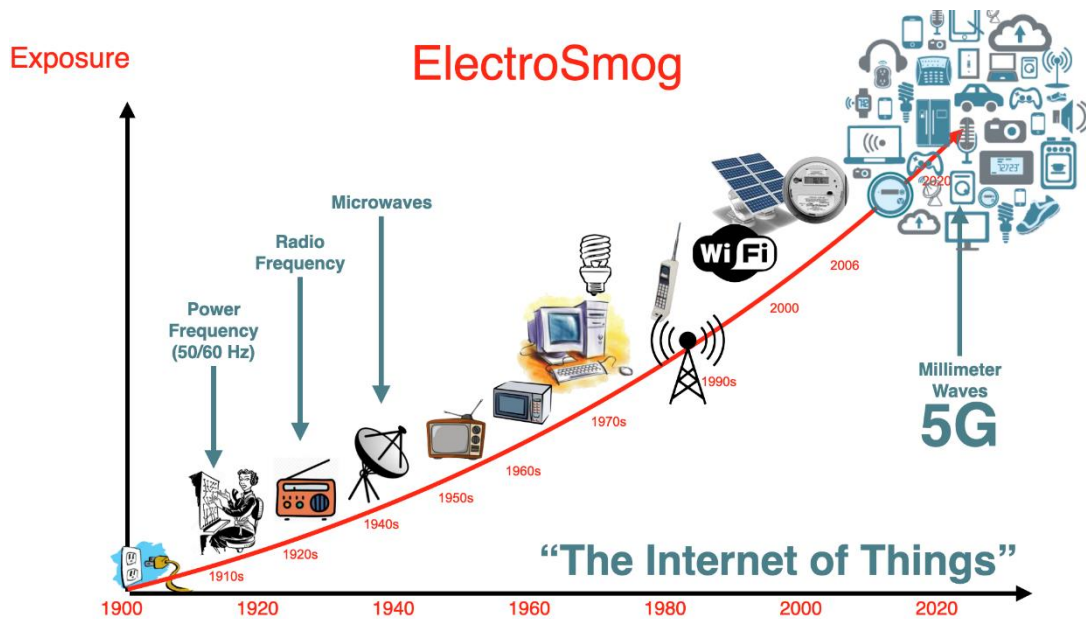


Figure 1

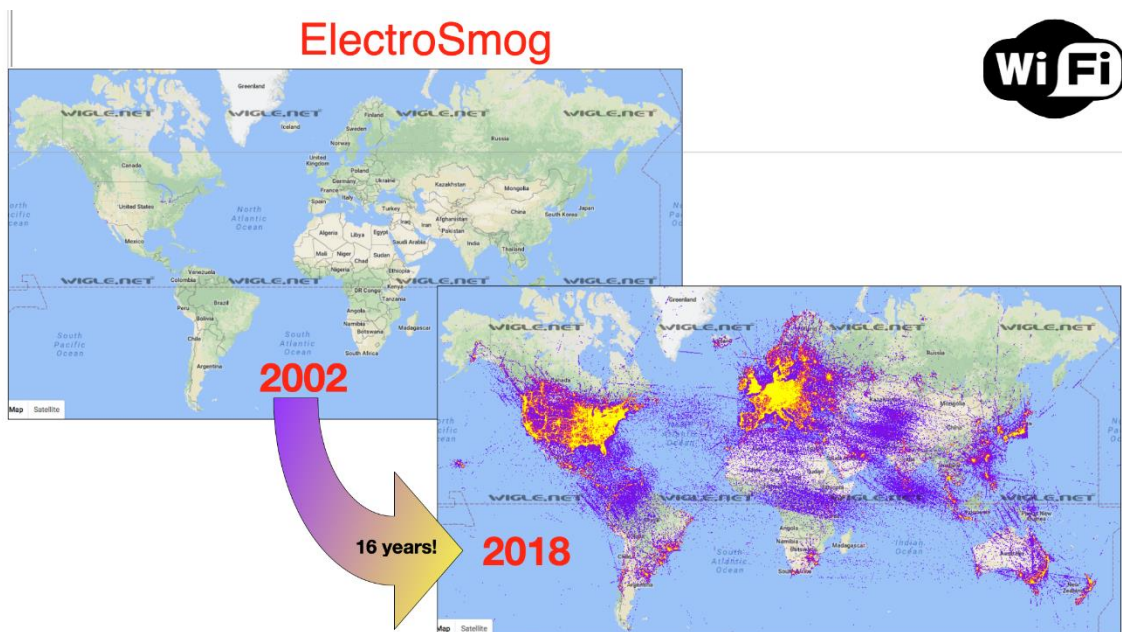


Figure 2

Blue spots are areas with Wi-Fi radiation back in 2002. Wi-Fi was initially used by governments, military, and universities. Over the course of 16 years, by 2018, (Figure 2) Wi-Fi hotspots have proliferated and can now be found virtually everywhere—in classrooms, in city parks, on city streets—and these hotspots can be accessed by cell phone, tablets, and computers. All of this leads to high levels of cumulative radiation exposure.

The good news is that most of our exposure is self-generated. The exposure from cell towers, 5G transmitters, or smart meters is thrust upon us with little or no choice. Yet, some people have been able to get their smart meters replaced with analog meters or moved farther away from their home.

I know an individual who goes into homes and monitors the levels of radiation and then helps people reduce their exposure. The key technologies causing the highest exposure in our homes are our cell phones, Wi-Fi, and cordless phones (Figure 3). These can be replaced with wire technology. Some homes have wireless security systems, baby monitors, wireless Wii games, and personal wearable technology. These technologies cumulatively increase exposure to microwave and radiofrequency radiation.



Figure 3

With cell phones, radiation drops very quickly with distance. Holding your cell phone away from your head even a few centimetres and not keeping it on your body will make a big difference.

Yet, when it comes to Wi-Fi hotspots and cell towers, we have no choice. We have whole-body exposure 24 hours a day. For this reason, I am much more concerned about cell towers than cell phones, as with cell phones you have a choice by determining how and how often you use it.

Microwave frequencies penetrate walls. This is why one can get service inside a home and why we can pick up Wi-Fi from neighbouring homes as well. Metals can reflect, block, or focus radiofrequency radiation. Some people who are electrically sensitive cannot wear metal jewelry as a result.

Keeping metal out of your bedroom is most important. If you keep that area electromagnetically “clean” during the night, your body can heal. Yet, if you have metal springs in your mattress they will act like antennas. If there’s radiofrequency in your bedroom, from something you have generated or from something outside, the metal springs are going to focus the electromagnetic energy in your body while you sleep.

We know microwaves are absorbed by water and this is how a microwave oven works. This is why you can heat a potato but not dried rice in a microwave oven. If you turn on a microwave oven in your kitchen—most ovens leak—it will emit radiation that will also bounce off other metal objects. If you

stand directly in front of the microwave oven, you are getting the lion's share of exposure. If you do microwave your food, which is not something I would recommend, it is important to leave the room and walk as far away as possible from your microwave oven.

People exposed to electrosmog are getting sick with electrohypersensitivity (EHS). One of the best studies that document electrohypersensitivity was conducted by Santini (2001)² in Spain. About 70% of the people living within 10 meters of a cell tower experienced fatigue very often. At 300 meters only 27% experienced fatigue very often. Other symptoms experienced included sleep disturbances and headaches. These symptoms are also more commonly experienced as we age. Consequently, I call this "rapid aging syndrome."

Health effects of EMFs seem to fit into three different categories (Figure 4). The first is cancer associated with broadcast antennas and radar, especially if individuals have worked or lived near these installations.³ Tumors of the head (gliomas, meningiomas, acoustic neuromas, and salivary gland tumors) are associated with cell phones; and leukemia is associated with people living within 300 to 500 meters from a cell tower.⁴ The second issue is reproduction, first recorded with miscarriages among video display terminal operators. The most recent reproductive cases are with sperm damage and the use of cell phones or laptops computers in Wi-Fi mode.⁵ The third category is neurological and hormonal disturbances associated with electrohypersensitivity. These effects were first reported at the turn of the 20th century as neurasthenia, a weakening of the nervous system frequently experienced by telephone operators.

Telephone operators in Toronto won a court case against Bell Canada that was attributed to them developing neurasthenia. Likewise, during World War II, men working at radar installations experienced microwave sickness or radiowave illness.

More recently, they have also reported heart palpitations as symptoms of electrohypersensitivity.⁶

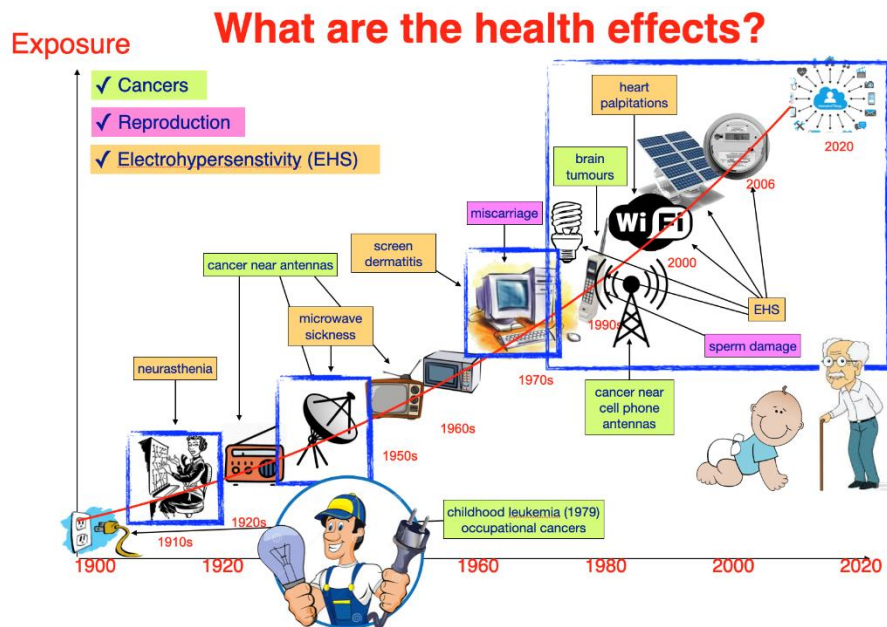
² Santini R et al. Study of the health of people living in the vicinity of mobile phone base stations. *Occup Med (Lond)* 51(6):410–413, 2001.

³ Lester, J.R. and D.F. Moore. 1982. Cancer Mortality and Air Force Bases. *Journal of Bioelectricity* 1(1): 72–82.

⁴ Pachau L. RF radiation from mobile phone towers and their effects on human body. *Indian Journal of Radio & Space Physics (IJRSP)*, 2017.

⁵ Gorpinchenko O. The influence of direct mobile phone radiation on sperm quality. *Central European Journal of Urology*. 2014; 67(1):65–71.

⁶ Electrohypersensitivity (EHS) is an Environmentally-Induced Disability that Requires Immediate Attention. Havas, M. *J Sci Discov*(2019); 3(1):jsd18020; DOI:10.24262/jsd.3.1.18020.



Whereas initially EMF exposures were limited to occupations, currently everyone is exposed as the levels are increasing and sources are ubiquitous. They are virtually everywhere, and it is difficult to get away from them.

In my opinion, we are witnessing an emerging health crisis. Chronic illness is on the increase. The illnesses we associate with the elderly are being increasingly experienced among younger people.

Doctors tell me that the symptoms people are coming in with are not responding to medication. In other words, they increasingly have patients coming in who they simply cannot treat effectively. One contributing reason physicians cannot treat patients may be because they are constantly bathed in electromagnetic pollution and have poor electromagnetic hygiene. So they keep returning to a toxic home environment.

Using mold as an example, no one would question the harmful effects of having serious mold in your home. Likewise, you would not live next to an oil refinery. Few of us relate a “smart home” to poor electromagnetic hygiene, yet, cumulatively, electromagnetic technologies are a significant form of underregulated, poor electromagnetic hygiene. We do not need to treat the symptoms, we need to deal with the original cause of the problem. Everyday antennas are being placed very close to homes where the levels of radiation inside buildings end up being very high. Unfortunately, Health Canada is doing little to nothing to protect public health as it relates to electrosmog.

We do not know how many people in the world are electrically hypersensitive, but the general scientific consensus is that it is less than 10%.⁷ Perhaps somewhere between 1 and 5% have severe sensitivity. Roughly a third of the population have mild to moderate symptoms when they are exposed. If we take the population of Toronto, this is almost 200,000 people who have severe sensitivity; in Ontario it is almost 500,000; and in Canada, more than one million people may have severe sensitivity. People with EHS are going to suffer even more when 5G comes in, as 5G adds another dimension of exposure, not only millimeter waves, but also lower frequencies. It does not replace 4G, it is layered on top of all the other generation technologies that we have.

⁷ Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. Belpomme D. Philippe I. Int. J. Mol. Sci. 2020; 21(6),1915.

To explain electrosensitivity, I use the flood analogy. If the level of water is low, there is no effect, or very minimal effect. Currently, about a third of the population is treading water, which means they are using up a lot of energy just to maintain homeostasis. Once they exhaust their energy, that is when illnesses come in, as the body simply cannot cope. If you are under the waterline, you are classified as electrically hypersensitive. If fewer people can work, we are going to be in dire straits as a society. If 5G becomes a tsunami—what some people are predicting—even Noah’s Ark is not going to make a difference.

5G is untested. We do not know exactly what is going to come with it, but we know that 5G radiation is going to have some adverse biological effects. There is absolutely no reason why this part of the spectrum would not be biologically active when every other part of the electromagnetic spectrum is.

Some people say that electrical hypersensitivity is psychosomatic. While there is a psychosomatic element to it, as there is to all illness, we have tremendous scientific evidence that physiological changes occur in the body as a direct result of electromagnetic radiation. We have done research examining the effects on the heart, the autonomic nervous system, and the blood.

If you prick your finger and examine the blood under the microscope, there is no rouleaux formation in a clean electromagnetic environment, whereas Wi-Fi, a cordless phone, or any kind of microwave radiation for 10 minutes causes these formations (Figures 5 & 6).⁸

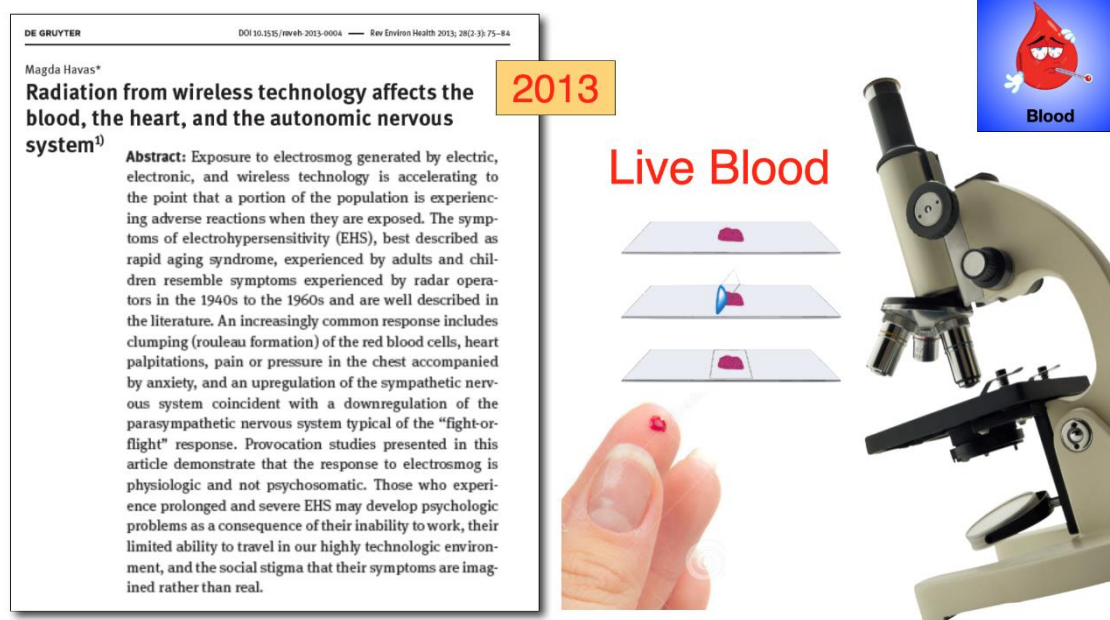


Figure 5

⁸ Havas, M. (2014). Electromog and Electrosensitivity: What Doctors Need to Know to Help their Patients Heal. Havas M. Anti-Aging Therapeutics Volume XV. 2014.

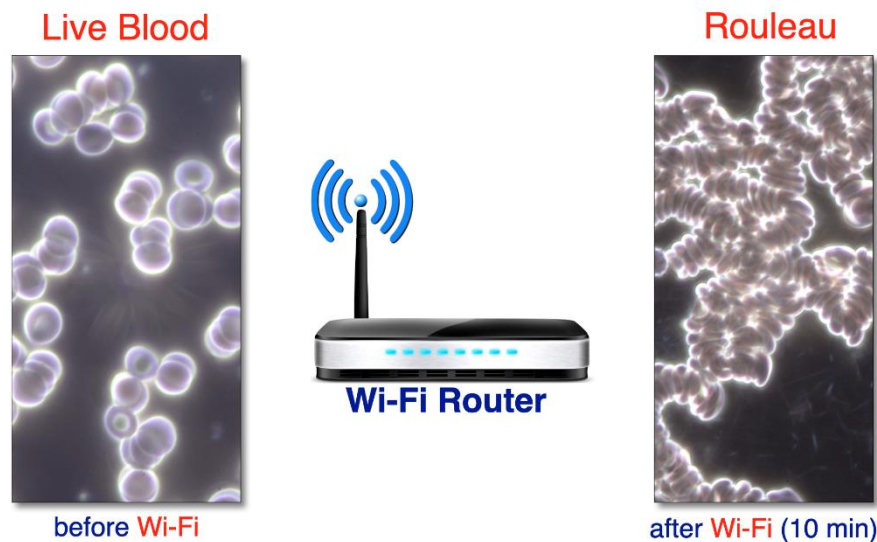


Figure 6

This is my blood and, based on these results, I would classify myself as being electrically hypersensitive, despite not always knowing when I am exposed. Rouleau is going to interfere with the ability of blood to circulate. Symptoms may vary from individual to individual. In very severe cases, it could lead to a stroke or sudden cardiac arrest. While not everyone responds in this way—there are people who do—if you can monitor it with pre- and post-exposure this is one way of diagnosing someone with electrohypersensitivity.

What are some of the solutions? The acronym I use is “RIDE” for treating people who are electrically hypersensitive. **Reduce** your exposure; build up your **Immune** system; **Detoxify** your body; and gently deal with **Emotional** trauma experienced because of loss of access to many places and lack of support by friends and family.⁹

Stress takes on many forms including physical, mental, and emotional. It is a known factor in disease causation. If you are a person who sees a cell tower and reacts strongly emotionally, you are doing damage to your body, regardless of whether or not you are exposed to radiation. Therefore, it is critical to minimize that stress to avoid the “fight-or-flight” response.

Up-regulation of the sympathetic nervous system leads to poor sleep and hence chronic fatigue during the day. A lot of healing is done during the night and that is why it is so important to keep an electromagnetically clean bedroom. As described in the work of Dr. Hans Salye, “Every stress leaves an indelible scar. And the organism pays for the survival after a stressful situation by becoming a little older.” Thus, when I said rapid aging syndrome, there is physiological evidence which actually supports this claim at the cellular level.¹⁰

Heart rate variability is a way of testing the autonomic nervous system. I have published peer-reviewed research on this in a double-blind, sham-controlled study. We asked the question, “Does radiation from a cordless phone affect the heart?” The cordless phone we used emitted radiation constantly when plugged into an electrical outlet. Subjects did not know when they were exposed and when they were not. Dr.

⁹ Dirty Electricity Elevates Blood Sugar Among Electrically Sensitive Diabetics and May Explain Brittle Diabetes. Havas, M. Electromagnetic Biology and Medicine. Vol. 27(2), pp. 135–146. 2008.

¹⁰ Havas, M. (2014). Electromog and Electrosensitivity: What Doctors Need to Know to Help their Patients Heal. Havas M. Anti-Aging Therapeutics Volume XV. 2014.

Jeffrey Marrongelle in Pennsylvania, an expert on heart rate variability, analyzed the data and did not know who was exposed or when.

During testing, a person would lay on a massage table or bed and the base station of a cordless phone would be placed near their head (not visible to the person). Many of the subjects did not respond to this radiation, but some did and they experienced an irregular or a rapid heart rate. These “responders” often experienced an up-regulation of the sympathetic nervous system and down-regulation of the parasympathetic nervous system during exposure. This is a typical fight-or-flight stress response.

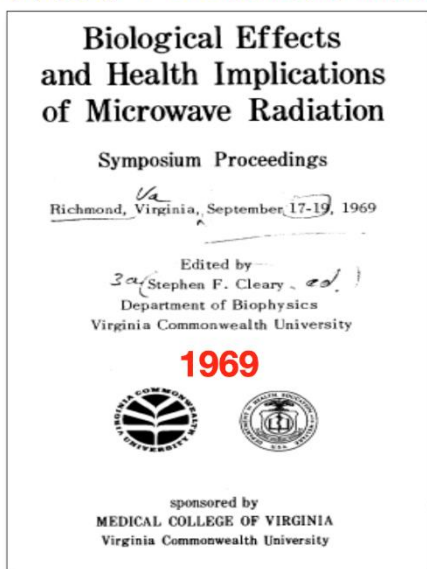
I have worked with a lot of teachers, and they tell me that anxiety levels in the classroom are abnormally high. At least part of this may be due to some combination of Wi-Fi in the classroom, nearby cell phone antennas, and students using cell phones.

Students are complaining of heart palpitations. Some students have been equipped with heart monitors to determine the source of the problem. Several students in a small community in Ontario experienced sudden cardiac arrest after exercise class and after Wi-Fi was introduced to the school. The youngest was a 13-year old. Sudden cardiac arrest in this particular community was 40 times higher than the national average. This happened after Wi-Fi was placed in the school. The schools are taking this seriously and while they are not admitting or willing to determine if this is due to Wi-Fi, they are putting in defibrillators as a precaution.¹¹

We have known that microwaves affect the heart since 1969, if not earlier, when workers in the microwave field had to have cardiac testing to ensure they didn't have some abnormalities (Figure 7). Perhaps that is what we should be doing with students and teachers at the beginning of the school year to determine if they have supraventricular tachycardia (SVT) or any other heart condition that may predispose them to cardiac arrest in the presence of microwave radiation. Neither students nor teachers should be exposed to microwave radiation in their learning environment.

FACT . . . microwave workers

experience heart problems



In the interest of occupational hygiene, many investigators have recommended that cardiovascular abnormalities be used as screening criteria to exclude people from occupations involving radio-frequency exposures.

Students need to be screened at school to ensure that they do not have an underlying heart condition that may be exacerbated with Wi-Fi exposure.

Figure 7

¹¹ Reversed reciprocating paroxysmal tachycardia controlled by guanethidine in a case of Wolff-Parkinson-White syndrome. Harris WE. Semler HJ. Griswold HE. American Heart Journal 67.6 (1964): 812-816.

There is technology that will help reduce exposure. Shield your smart meter, put RF-reflecting film on your windows, reduce exposure by painting walls with special RF-absorbing paint, and put a canopy (silver mesh) around your bed.

There are 12 easy steps to electromagnetic hygiene and these can be found on the Electrosensitive Society website (www.electrosensitivesociety.com). Sheena Symington is the Director of the Electrosensitive Society. Its website is designed to provide valuable information to help healthcare practitioners as well as those who have or know of someone with EHS. We need health providers to become familiar with this phenomena. They need to be able to diagnose this illness and to provide advice on how to help their patients heal.

I really believe that electromagnetic hygiene is the missing link to vibrant health. If we can get rid of electrosmog exposure, a lot of people will have improved health as a result.

Wireless (MW/RF) radiation harms without heating: How we know, and implications

[Summary of presentation May 31, 2019, updated January 2020]

Meg Sears PhD

Sr Clinical Research Associate, Ottawa Hospital Research Institute, Canada
Chair, Prevent Cancer Now

Abstract

Regulators state two requirements before recognizing relationships between low exposures to microwave or radiofrequency radiation and adverse effects on health: 1) evidence of mechanisms by which biological effects may occur; and 2) evidence of effects that are both “established” and “adverse.” Microwave catalysis—an established, commercialized tool of chemists—greatly accelerates chemical reactions and influences product distribution, with lower energy inputs and at lower temperatures than conventional heating. Microwave irradiation lowers the activation energy for reactions, and can be more effective in dispersed mixtures that mimic membrane systems. Microwave catalysis is an established mechanism, consistent with cellular and physiological harms observed with exposures at levels below regulatory limits.

Introduction

With the goal to connect everything to everything else, the number of wireless devices such as cell phones, Wi-Fi, antenna installations, and an increasing plethora of devices in the “Internet of Things” are projected to reach one million per square kilometer,¹ all transmitting and receiving data carried on microwave or radiofrequency radiation (MW/RFR).

Health Canada’s *Safety Code 6* asserts that exposures pose acceptable risks, as long as the level of radiation does not heat tissues excessively. No effects documented at lower exposure levels are considered by regulators to be both substantially “adverse” and “established,”^{2,3} although this guideline was criticized as not being rigorously developed.⁴

MW/RFR is “non-ionizing” radiation, meaning that a single photon does not remove an electron from an atom. Visible light is also non-ionizing, yet the eye can sense exquisitely low exposures—even single photons.⁵ It is not unreasonable that even low levels of non-ionizing photons of MW/RFR, transmitting

¹ Sharma L, Javali A, Sarkar S, Tengshe R, Jha MK, Routray SK. Optical Wireless Hybrid Networks for 5G. In: Janyani V, Singh G, Tiwari M, d’Alessandro A, editors. Optical and Wireless Technologies. Singapore: Springer; 2020. p. 65–71. (Lecture Notes in Electrical Engineering).

² Health Canada, Government of Canada. Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz. Safety Code 6 [Internet]. 2015 [cited 2017 Mar 24]. Available from: http://www.hc-sc.gc.ca/ewh-semt/consult/2014/safety_code_6-code_securite_6/final_finale-eng.php

³ A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields | The Royal Society of Canada [Internet]. [cited 2018 Sep 8]. Available from: <https://rsc-src.ca/en/review-safety-code-6-2013-health-canadas-safety-limits-for-exposure-to-radiofrequency-fields>

⁴ House of Commons Standing Committee on Health - HESA (41-2). Radiofrequency electromagnetic radiation and the health of Canadians - Report 13 - Radiofrequency electromagnetic radiation and the health of Canadians [Internet]. [cited 2016 Nov 15]. Available from:

<http://www.parl.gc.ca/HousePublications/Publication.aspx?Language=e&Mode=1&Parl=41&Ses=2&DocId=8041315>

⁵ Tinsley JN, Molodtsov MI, Prevedel R, Wartmann D, Espigulé-Pons J, Lauwers M, et al. Direct detection of a single photon by humans. Nat Commun [Internet]. 2016 Jul 19 [cited 2020 Jan 16];7. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4960318/>

information with rapid and irregular fluctuations of electromagnetic fields (interlinked electrical and magnetic fields) have biological effects.

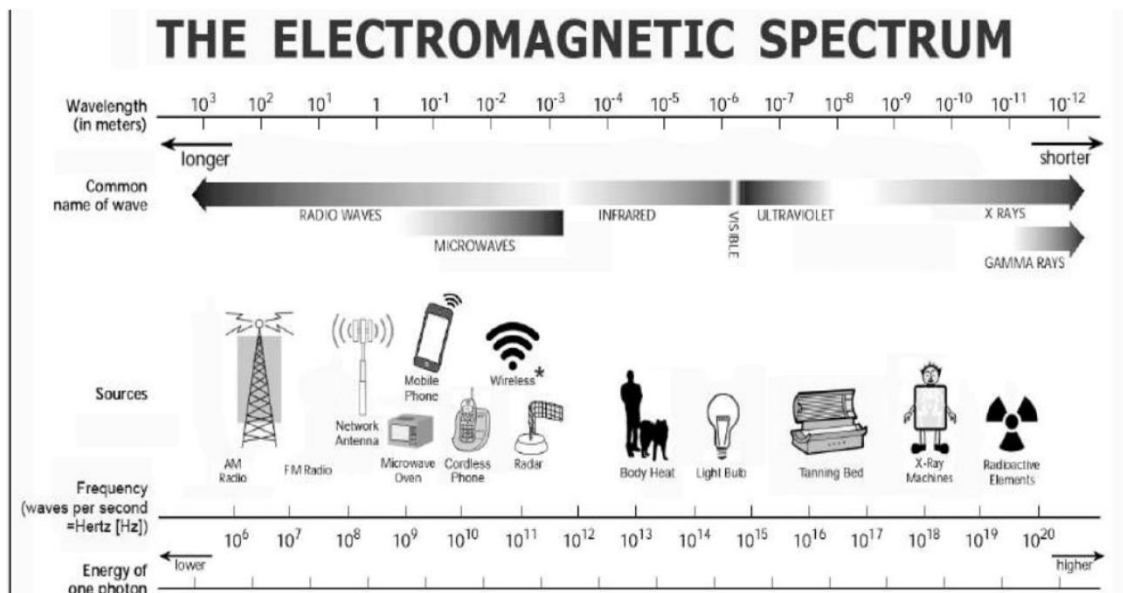


Figure 1

Health Canada’s “no cooking = no harm” premise is challenged by observations of adverse effects from exposures simulated in laboratories and in real life that include impacts on male fertility, early life development, cancer, and amplification of effects of chemical toxicants (e.g., co-carcinogenicity, and effects of lead on child behaviour).^{6,7}

Bridging this disconnect between the regulatory premise regarding harms and scientific observations of effects below regulatory thresholds, experimental observations include subcellular oxidative stress and DNA damage,^{8,9} and interaction with calcium channels through membranes,¹⁰ that may precipitate observed adverse effects and dysfunction.¹¹

Basic research in inanimate systems, however, is another line of evidence that MW/RFR exerts effects independent of heating. This evidence has received less attention in the context of health effects of radiation for telecommunications. “Microwave catalysis”—acceleration of chemical reactions at comparable or even lower temperatures than achieved with heating such as a steam jacket—may underlie observations in more complex, living systems.

⁶ Miller AB, Sears ME, Morgan LL, Davis DL, Hardell L, Oremus M, et al. Risks to Health and Well-Being From Radio-Frequency Radiation Emitted by Cell Phones and Other Wireless Devices. *Front Public Health* [Internet]. 2019 [cited 2019 Aug 13];7. Available from: <https://www.frontiersin.org/articles/10.3389/fpubh.2019.00223/full>

⁷ Belyaev I, Dean A, Eger H, Hubmann G, Jandrisovits R, Kern M, et al. EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. *Reviews on Environmental Health* [Internet]. 2016 [cited 2017 Mar 14];31(3):363–397. Available from: https://www.researchgate.net/publication/305689940_EUROPAEM_EMF_Guideline_2016_for_the_prevention_diagnosis_and_treatment_of_EMF-related_health_problems_and_illnesses

⁸ Yakymenko I, Tsybulin O, Sidorik E, Henshel D, Kyrylenko O, Kyrylenko S. Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation. *Electromagn Biol Med*. 2016;35(2):186–202.

⁹ Blank M, Goodman RM. Electromagnetic fields and health: DNA-based dosimetry. *Electromagnetic Biology and Medicine* [Internet]. 2012 Dec 1 [cited 2019 May 27];31(4):243–9. Available from: <https://doi.org/10.3109/15368378.2011.624662>

¹⁰ Pall ML. Wi-Fi is an important threat to human health. *Environmental Research*. 2018 Jul;164:405–16.

¹¹ Terzi, M., Ozberk, B., Deniz, O. G., & Kaplan, S. (2016). The role of electromagnetic fields in neurological disorders. *Journal of chemical neuroanatomy*, 75, 77–84.

Chemistry, the basis of life

Medically, life is defined on the basis of myriad chemical and electro-chemical reactions and interactions. In order to understand at the most fundamental level how energy from wireless devices can have biological effects, it is helpful to consider effects of MW/RFR on biochemistry.

A chemical reaction is the joining up or breaking apart of atoms and molecules, as electrons shift. As shown in Figure 1, each reaction is via a “transition state” with specific alignment of molecule(s). The speed and reversibility of a reaction is determined in part by the changes in energy to achieve the transition state (the “activation energy”), and to form reaction product(s). Some reactions may proceed in multiple possible ways, with a number of products, and product distribution is related to steric (geometric) issues and energetics. Reversibility of reactions and equilibrium states depends upon a number of factors, including the activation energy for the reverse reaction.

Acceleration of chemical reactions or *catalysis* occurs when the activation energy required to initiate reaction of molecule(s) is lowered. Catalysis of (bio)chemical reactions is well known and additives may be used by chemical engineers and chemists for more rapid, complete, and sometimes more specific chemical conversion. Catalysis also occurs with low-level MW exposure.^{12,13,14} Microwave catalysis was described by chemists and chemical engineers roughly a half-century ago; a 2001 review with 603 references describes hundreds of long-standing “microwave assisted” chemical reactions,¹⁵ and a journal *Current Microwave Chemistry* reports on these effects and efficiencies in chemistry, including biochemistry.¹⁶ For example, a biochemical medical test develops in less than 5 minutes with MW exposure, versus 18 hours using conventional heating,¹⁷ and MW radiation is used to accelerate enzymatic alteration of DNA.¹⁸

There is distinct cognitive dissonance when commercial enterprises can exploit a phenomenon that Health Canada insists does not occur.

¹² Zhou J, Xu W, You Z, Wang Z, Luo Y, Gao L, et al. A new type of power energy for accelerating chemical reactions: the nature of a microwave-driving force for accelerating chemical reactions. *Sci Rep* [Internet]. 2016 Apr 27 [cited 2017 Jan 11];6. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4846869/>

¹³ Kishimoto F, Matsuhisa M, Kawamura S, Fujii S, Tsubaki S, Maitani MM, et al. Enhancement of anodic current attributed to oxygen evolution on α -Fe₂O₃ electrode by microwave oscillating electric field. *Sci Rep* [Internet]. 2016 Oct 14 [cited 2017 Jan 15];6. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5064412/>

¹⁴ Kokel A, Schäfer C, Török B. Application of microwave-assisted heterogeneous catalysis in sustainable synthesis design. *Green Chemistry* [Internet]. 2017 [cited 2018 May 25];19(16):3729–51. Available from: <http://xlink.rsc.org/?DOI=C7GC01393K>

¹⁵ Lidström P, Tierney J, Wathey B, Westman J. Microwave assisted organic synthesis—a review. *Tetrahedron* [Internet]. 2001 Nov 5 [cited 2017 Jan 15];57(45):9225–83. Available from: <http://www.sciencedirect.com/science/article/pii/S0040402001009061>

¹⁶ Current Microwave Chemistry. [cited 2019 Feb 7]. Available from: <https://benthamscience.com/journals/current-microwave-chemistry/>

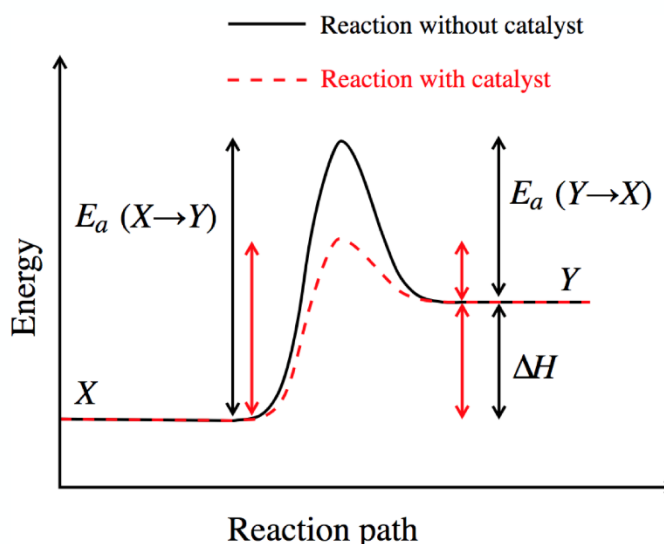
¹⁷ Ahirwar R, Tanwar S, Bora U, Nahar P. Microwave non-thermal effect reduces ELISA timing to less than 5 minutes. *RSC Adv*. 2016 Feb 18;6(25):20850–7.

¹⁸ Das RH, Ahirwar R, Kumar S, Nahar P. Microwave-mediated enzymatic modifications of DNA. *Analytical Biochemistry* [Internet]. [cited 2019 May 21];471:26–8. Available from: https://www.academia.edu/22412981/Microwave-mediated_enzymatic_modifications_of_DNA

SPEEDING UP CHEMICAL REACTIONS – CATALYSIS

Metabolic pathways + molecular synthesis = chemical reactions

- The “energy of activation” E_a has to be overcome for a reaction to proceed.
- Higher activation energy means slower reactions.
- Changing the activation energy changes rates, and steady-state concentrations.
- Enzymes are catalysts that speed up biochemical reactions, mostly by aligning the chemical building blocks.
- Microwave radiation is also a catalyst.



P. Lidström et al. Microwave assisted organic synthesis—a review, Tetrahedron. 57 (2001) 9225–9283. doi:10.1016/S0040-4020(01)00906-1.

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Figure 2: Reaction Pathway and Chemical Catalysis

E_a = energy of activation; X = chemical reactant(s); Y = chemical product(s); (Δ) ΔH = change in free energy between reactants X and products Y

Microwave radiation affects molecules that have an uneven electrical charge distribution, called *polar* molecules. This is seen in everyday life, in microwave ovens, with efficient heating of water (in H_2O the oxygen O is more negatively charged while the hydrogen H atoms are more positively charged), and with poor heating of oil that has a more uniform electrical charge distribution. Heating is the result of vibration of polar molecules.

Microwave catalysis can be optimized in multi-phase systems, with non-polar chemicals dispersed in the reaction mixtures. It is thought that reactants may more readily align on the interface between a polar (e.g., aqueous) and non-polar (e.g., oil or lipid) substance in a suspension. This affects not only the speed of reactions but also the identities of chemical products when more than one outcome is possible.

MW/RFR effects in living systems

Catalysis does not occur equally for all biochemical reactions,¹⁵ so in living systems, the differential acceleration of some reactions may disrupt the finely tuned biochemical cascades of metabolism, genetic replication, transcription into proteins, signal transmission along nerves, and other reactions. The resulting molecular damage, chemical imbalances and dysfunction would be consistent with observed biochemical (e.g., DNA damage, increased ion flux through membranes, and oxidative stress) and health effects in humans, animals, plants, and isolated cells (e.g., as reviewed in the context of buildings).¹⁹

¹⁹ Clegg FM, Sears M, Friesen M, Scarato T, Metzinger R, Lee Russell C, et al. Building science and radiofrequency radiation: What makes smart and healthy buildings. Building and Environment [Internet]. 2019 Aug 6 [cited 2019 Sep 4];106324. Available from: <http://www.sciencedirect.com/science/article/pii/S0360132319305347>

Membranes surrounding cells as well as subcellular features such as mitochondria and nuclei are phospholipid bilayers, with polar phosphate groups on the surfaces, and long lipid (non-polar) molecules intertwined in the centre of the membrane. Differential effects of MW/RFR on polar versus non-polar materials sheds light on the profound effects of MW/RFR on membranes, as the non-polar lipid bilayer is relatively unaffected whereas the polar phospho- groups on the surfaces of membranes, as well as other polar groups listed above, vibrate under the influence of the radiation. This causes stress and potential degradation of membranes and other structures.

MW/RFR AND LIPID BILAYER MEMBRANES

- Broad implications for function -

- ▶ Localized heating of polar constituents causes lipid bilayer membrane damage, shedding of proteins, leakage of ionophores
- ▶ Disruption of membrane-associated reactions (metabolism, synthesis of macromolecules) in mitochondria, ribosomes, nucleus, endoplasmic reticulum, etc.
- ▶ Disruption of barriers – e.g., blood-brain barrier
- ▶ Myelin damage
- ▶ Testes damage
- ▶ Eye damage

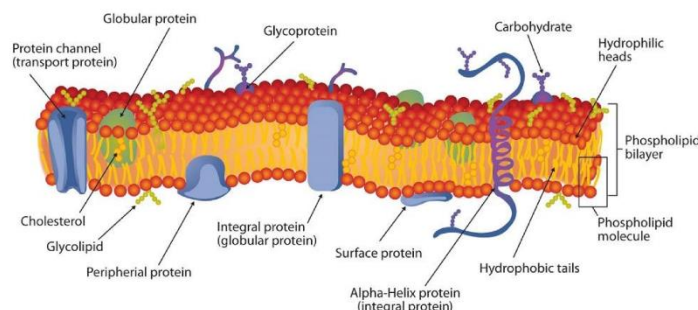


Figure 3

Membrane-embedded systems of enzymes are key features for metabolism, synthesis, and catabolism, for example, in the mitochondria, ribosomes, nucleus, and endoplasmic reticulum. Tissues with rapid metabolism and growth, such as in the testes, are affected.^{20,21} Proteins embedded in cell membranes such as transport channels can be affected, and their stable location in the lipid membrane will be disturbed. Dr. Martin Pall has compiled a large body of research on effects of MW/RFR on calcium channels and increased “leakage” of cations (particularly calcium) across membranes, with beneficial (e.g., enhanced bone growth) or adverse effects.²²

Amino acids in proteins, DNA, enzymes, receptors, and pores to transfer ions and chemicals are embedded in membranes. All of these have non-uniform charge distributions, that are key to their

²⁰ La Vignera S, Condorelli RA, Vicari E, D’Agata R, Calogero AE. Effects of the Exposure to Mobile Phones on Male Reproduction: A Review of the Literature. *Journal of Andrology* [Internet]. 2012 May 6 [cited 2017 Mar 4];33(3):350–6. Available from: <http://onlinelibrary.wiley.com/doi/10.2164/jandrol.111.014373/abstract>

²¹ Adams JA, Galloway TS, Mondal D, Esteves SC, Mathews F. Effect of mobile telephones on sperm quality: A systematic review and meta-analysis. *Environment International* [Internet]. 2014 Sep [cited 2017 Mar 27];70:106–12. Available from: <http://www.sciencedirect.com/science/article/pii/S0160412014001354>

²² Pall ML. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med* [Internet]. 2013 Aug [cited 2019 Jun 27];17(8):958–65. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3780531/>

structures and functions. These interact with MW/RFR, which is *electromagnetic* radiation, with fluctuating electric and magnetic fields. Barnes and Greenebaum describe theoretically and experimentally how very low magnetic fields affect chemical reactions and cellular dysfunction.^{23,24}

Nerves are surrounded by fatty, electrically inert, insulating myelin. The polar structures associated with electrical nerve signal conduction interact with fluctuating electromagnetic fields while the myelin doesn't, causing stress and breakdown of the interface between the interior nerve and its myelin sheath. Children's and adolescents' nervous systems and myelin are still developing, making them more vulnerable to harm from MW/RFR.²⁵

DEMYELINATION AND NEURONAL INJURY

- ▶ Myelin is transparent to MW/RFR but the axon absorbs and may be damaged, shedding its protective layer of myelin

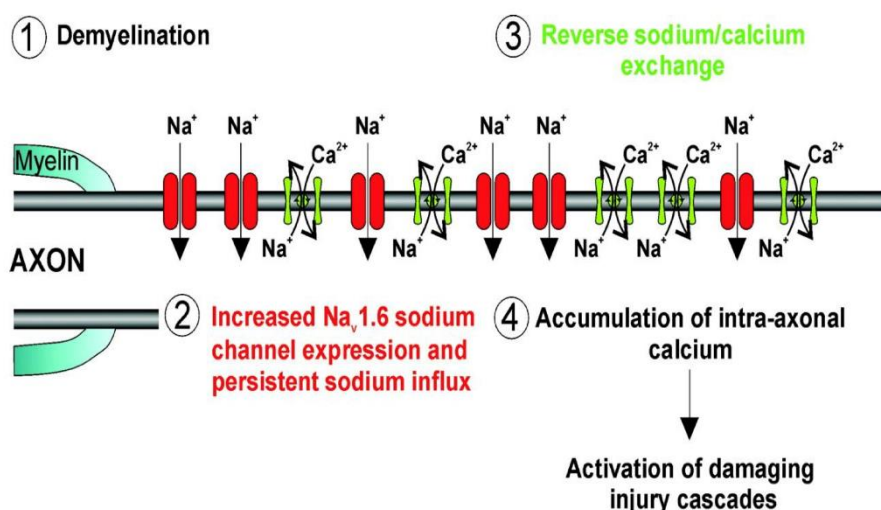


Figure 4

Polarization of membranes and maintenance of concentration differentials of various molecules is central to the function of the nervous system—both of transmission of the action potential along the axon, and increased calcium release via damaged channels at the synapse. Interestingly, calcium channel-blocking medications may help to ameliorate some neuropsychiatric symptoms associated with MW/RFR in sensitive individuals.²⁶

²³ Barnes F, Greenebaum B. Some Effects of Weak Magnetic Fields on Biological Systems: RF fields can change radical concentrations and cancer cell growth rates. IEEE Power Electronics Magazine [Internet]. 2016 Mar [cited 2017 Mar 26];3(1):60–8. Available from: <http://ieeexplore.ieee.org/document/7425396/>

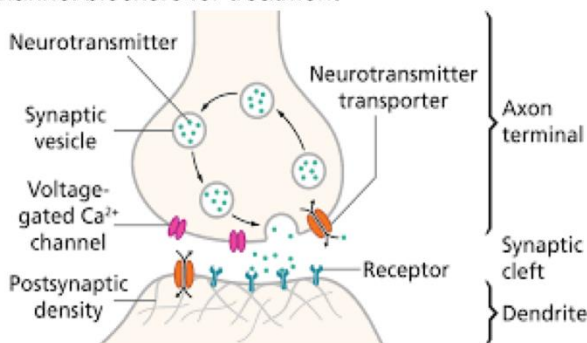
²⁴ Barnes F, Greenebaum B. Role of radical pairs and feedback in weak radio frequency field effects on biological systems. Environmental Research [Internet]. 2018 May 1 [cited 2020 Sep 25];163:165–70. Available from: <http://www.sciencedirect.com/science/article/pii/S0013935118300379>

²⁵ Redmayne M, Johansson O. Could myelin damage from radiofrequency electromagnetic field exposure help explain the functional impairment electrosensitivity? A review of the evidence. J Toxicol Environ Health B Crit Rev. 2014;17(5):247–58.

²⁶ Pall ML. Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression. Journal of Chemical Neuroanatomy [Internet]. 2016 Sep [cited 2017 Jan 13];75, Part B:43–51. Available from: <http://www.sciencedirect.com/science/article/pii/S0891061815000599>

MEMBRANES - VOLTAGE GATED CALCIUM CHANNELS

- ▶ VGCC are present at a very high density in the nervous system and are responsible for releasing neurotransmitters and neuroendocrine hormones
- ▶ Cardiac and neurological symptoms result; there is a possible role for calcium channel blockers for treatment



Pall. 2015 "Microwave frequency electromagnetic fields (EMF's) produce widespread neuropsychiatric effects including depression," *J Chem Neuroanatomy* 75

Figure 5

Decades of research has repeatedly demonstrated DNA damage—both single- and double-strand breaks—in laboratory cultures, blood cells, buccal scrapings, and sperm.⁸ Blank and Goodman proposed a DNA-based metric to assess health effects of MW/RFR based on protein synthesis resulting from stress response.⁹ A 2019 review of DNA damage measurements in cell cultures of human or animal cells called into doubt this finding, indicating that smaller studies are more likely to result in positive findings.²⁷ Unfortunately, in grading of the evidence the authors failed to consider funding,²⁸ baseline DNA status, or the fact that genotoxicity has been poorly predicted using tissue culture studies.²⁹

²⁷ Vijayalaxmi, Prihoda TJ. Comprehensive Review of Quality of Publications and Meta-Analysis of Genetic Damage in Mammalian Cells Exposed to Non-Ionizing Radiofrequency Fields. *rare* [Internet]. 2018 Oct [cited 2019 Jun 27];191(1):20–30. Available from: <http://bioone.org/journals/Radiation-Research/volume-191/issue-1/RR15117.1/Comprehensive-Review-of-Quality-of-Publications-and-Meta-Analysis-of/10.1667/RR15117.1.full>

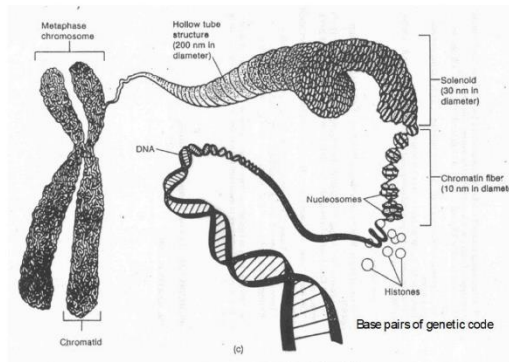
²⁸ Huss A, Egger M, Hug K, Huwiler-Müntener K, Rösli M. Source of Funding and Results of Studies of Health Effects of Mobile Phone Use: Systematic Review of Experimental Studies. *Environmental Health Perspectives* [Internet]. 2007 Jan [cited 2019 Jun 6];115(1):1–4. Available from: <https://ehp.niehs.nih.gov/doi/10.1289/ehp.9149>

²⁹ Corvi R, Madia F. In vitro genotoxicity testing—Can the performance be enhanced? *Food and Chemical Toxicology* [Internet]. 2017 Aug 1 [cited 2019 Jun 27];106:600–8. Available from: <http://www.sciencedirect.com/science/article/pii/S0278691516302903>

DNA DAMAGE

- ▶ Decades of research has repeatedly demonstrated DNA damage, both single- and double-strand breaks – e.g., in blood cells, buccal scrapings and sperm
- ▶ Blank and Goodman proposed a DNA-based metric to assess health effects of MW/RFR based on protein synthesis resulting from stress response

DNA image from Dr. Blank's submission to Canadian Parliamentary Committee, 2015



Human DNA: 2 meters long, 3 billion base pairs, many loop sizes

Blank & Goodman. 2012. Electromagnetic fields and health: DNA-based dosimetry, *Electromagnetic Biology and Medicine*, 31:4, 243-249, DOI: 10.3109/15368378.2011.624662

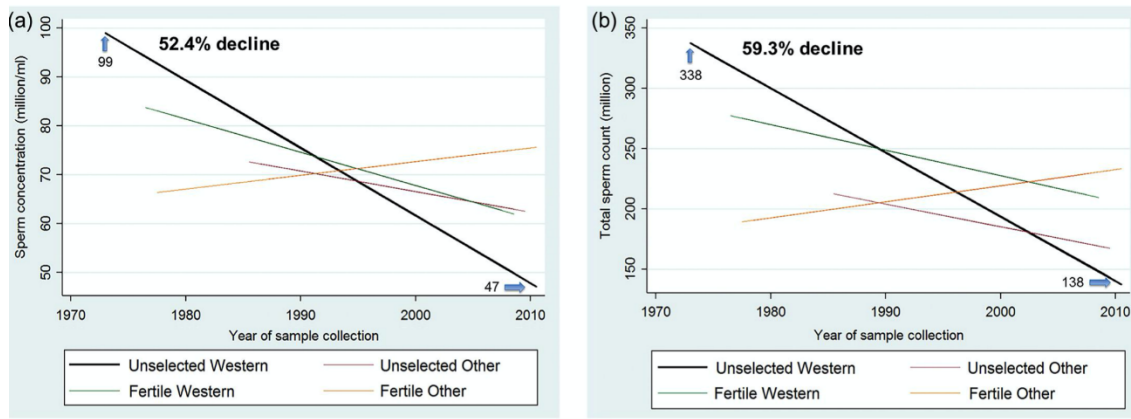
Figure 6

In the face of plummeting male fertility,³⁰ evidence that cell phones in pockets and laptops on laps damage sperm and impair fertility^{20,21} provides strong reasons for changes in technologies and strong precautionary advice.

³⁰ Levine H, Jørgensen N, Martino-Andrade A, Mendiola J, Weksler-Derri D, Mindlis I, et al. Temporal trends in sperm count: a systematic review and meta-regression analysis. *Hum Reprod Update* [Internet]. [cited 2017 Jul 26];1–14. Available from: <https://academic.oup.com/humupd/article/doi/10.1093/humupd/dmx022/4035689/Temporal-trends-in-sperm-count-a-systematic-review>

IN WESTERN MEN, SPERM COUNTS AND CONCENTRATIONS HALVED 1981 – 2013 ~ NO EVIDENCE OF LEVELLING OFF

Sperm quantity and quality are affected by MW/RFR, in two large systematic reviews



From: Temporal trends in sperm count: a systematic review and meta-regression analysis

Hum Reprod Update. Published online July 25, 2017.1-14 doi:10.1093/humupd/dmx022

Adams, Jessica A., Tamara S. Galloway, Debapriya Mondal, Sandro C. Esteves, and Fiona Mathews. "Effect of Mobile Telephones on Sperm Quality: A Systematic Review and Meta-Analysis." *Environment International* 70 (September 2014): 106–12. <https://doi.org/10.1016/j.envint.2014.04.015>

La Vignera, Sandro, Rosita A. Condorelli, Enzo Vicari, Rosario D'Agata, and Aldo E. Calogero. "Effects of the Exposure to Mobile Phones on Male Reproduction: A Review of the Literature." *Journal of Andrology* 33, no. 3 (May 6, 2012): 350–56. <https://doi.org/10.2164/jandrol.111.014373>

13

Figure 7

Another membrane, the blood-brain barrier is impaired with exposure to MW/RFR, and enhanced toxicity of chemicals such as lead has been observed in a study of 2,422 Korean school children, where the children in the quartile with both highest cell phone call times and highest blood lead levels exhibited significantly greater attention deficit hyperactivity disorder symptoms.³¹ Potentiation of toxicities of other exposures by MW/RFR has also been observed in animal studies, particularly of chemical^{32,33} as well as gamma radiation³⁴ co-carcinogens.

Public health and costs

In Canada, public health is declining, such that the historical diseases of aging are no longer the diseases of the aged. Chronic diseases and cancers (associated with obesity) are increasing in younger Canadians.³⁵ At the same time, public health care costs reached \$260 billion in 2019, and are increasing faster than the gross domestic product. In addition are private costs, lost opportunities, lost productivity, and heartache.

³¹ Byun Y-H, Ha M, Kwon H-J, Hong Y-C, Leem J-H, Sakong J, et al. Mobile Phone Use, Blood Lead Levels, and Attention Deficit Hyperactivity Symptoms in Children: A Longitudinal Study. *PLOS ONE* [Internet]. 2013 Mar 21 [cited 2019 May 18];8(3):e59742. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0059742>

³² Lerchl A, Klose M, Grote K, Wilhelm AFX, Spathmann O, Fiedler T, et al. Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans. *Biochem Biophys Res Commun*. 2015 Apr 17;459(4):585–90.

³³ Tillmann T, Ernst H, Streckert J, Zhou Y, Taugner F, Hansen V, et al. Indication of cocarcinogenic potential of chronic UMTS-modulated radiofrequency exposure in an ethylnitrosourea mouse model. *International Journal of Radiation Biology*. 2010 Jul 1;86(7):529–41.

³⁴ Soffritti M, Giuliani L. The carcinogenic potential of non-ionizing radiations: The cases of S-50 Hz MF and 1.8 GHz GSM radiofrequency radiation. *Basic & Clinical Pharmacology & Toxicology* [Internet]. 2019 [cited 2019 Jun 27];0(0). Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/bcpt.13215>

³⁵ Brenner DR, Ruan Y, Shaw E, O'Sullivan D, Poirier AE, Heer E, et al. Age-standardized cancer-incidence trends in Canada, 1971–2015. *CMAJ* [Internet]. 2019 Nov 18 [cited 2019 Nov 18];191(46):E1262–73. Available from: <https://www.cmaj.ca/content/191/46/E1262>

A 2018 review of biological and health effects of MW/RFR concluded that rapidly increasing levels of MW/RFR poses serious global threats,¹¹ with at least 10 reviews demonstrating the following effects associated with typical exposures to MW/RFR:

- Cellular DNA damage
- Changes in testis structure, lowered sperm quantity and quality
- Neurological/neuropsychiatric effects
- Apoptosis/cell death
- Calcium overload
- Endocrine effects.

Is this an *experiment*?

Some characterize the unprecedented, rapid escalation of RFR—from personal use of wireless devices, Wi-Fi, intensive deployment of “small cell” antennae throughout communities, increasing installations on existing towers, and widespread coverage of natural areas from satellites in orbit—as an “experiment.” They deride being treated like lab rats.

In fact, today’s rapid deployment of novel technologies with more frequency bands and complex modulations in intensive arrays is much worse than an “experiment.” We are not tracking exposures to more and more wireless devices and connectivity in nurseries and schools, homes and the community, at work and at play, including around and for use by very young children.

Environmental exposures and effects on birds and insects, critical to ecosystems, are little known. Simplistic research and campaigns focus on one factor at a time rather than integrating radiation, pesticides, climate change, and habitat loss.

Characterization of rollout of 5G / “Internet of Things,” with untested exposures and expected adverse effects, is unscientific.

An ethical “experiment” would entail:

1. a justifiable hypothesis that there will be “no adverse effect”;
2. approval of experimental design and data collection for exposed and unexposed populations;
3. ethics approvals that are mandatory for all human and animal experimentation;
4. informed consent from every participant (that is, everyone);
5. interim analyses to halt the experiment at the first sign of problems; and
6. analyses, public reporting of results, and discussion and implementation of logical next steps.

None of this is in place. There is no “unexposed population.” What is unfolding is unscientific, even reckless. As with other harmful exposures, vested interests downplay effects and ascribe them to other factors. Meanwhile, harms to human health increase, countered only at great personal cost by those who both recognize the sources of their symptoms and have the wherewithal to address exposures. In this complex world, with sufficient data collection (personal exposures are not measured or recorded today), effects on human and ecological health might eventually be broadly recognized—hopefully before considerable harm has accrued.

Healthier solutions

Wireless mobile communications offer hazards as well as conveniences. Although public health advantages of mobile communications in emergency response are self-evident, the risk/hazard trade-off is not met for a plethora of applications that could be physically connected. Examples include Internet and

intranet connections in schools and workplaces, wireless sensors and transmitters for fixed applications such as in buildings,¹⁹ frivolous applications in toys for all ages, and applications or entertainment that could be downloaded through a fixed connection before utilization.

Just because you *can* do something wirelessly, doesn't mean that you *should*. Optical fibre is being developed as a "backbone" for Internet with higher speed and bandwidth, and lower latency. Fibre needs to reach the "fingers and toes" across communities and throughout buildings.¹ Fibre (including wires) is more reliable, secure, resilient, and results in much lower greenhouse gas emissions than wireless.³⁶ Deployment of MW/RFR-emitting satellites for extensive, remote coverage will cause untold ecological harm to insects, birds, and higher fauna as a result of the radiation, atmospheric ozone layer damage from launches,³⁷ and disruption of weather forecasting,³⁸ stargazing and astronomy.³⁹



Figure 8

³⁶ Schoechle T. Re-Inventing Wires: The Future of Landlines and Networks [Internet]. National Institute for Science, Law & Public Policy. Washington DC, USA; 2018 [cited 2019 May 27]. Available from: <http://electromagnetichealth.org/wp-content/uploads/2018/05/Wires.pdf>

³⁷ Ross M, Toohey D, Peinemann M, Ross P. Limits on the Space Launch Market Related to Stratospheric Ozone Depletion. Astropolitics [Internet]. 2009 Mar 5 [cited 2020 Jan 18];7(1):50–82. Available from: <https://doi.org/10.1080/14777620902768867>

³⁸ Witze A. Global 5G wireless networks threaten weather forecasts. Nature [Internet]. 2019 Apr 26 [cited 2019 May 15];569:17. Available from: <http://www.nature.com/articles/d41586-019-01305-4>

³⁹ Staedter T. Stargazers fight to save the dazzling dark [Internet]. Experience Magazine. 2020 [cited 2020 Jan 20]. Available from: <https://expmag.com/2020/01/stargazers-fight-to-save-the-dazzling-dark/>

Clinical Observations and the Evolution of Practice Guidelines for EHS

Riina Bray MD

Medical Director, Environmental Health Clinic, Women's College Hospital, Toronto, Canada

Abstract

Medical doctors require guidance in managing patients with electromagnetic field hypersensitivity. After 15 years of observations, assessments, and management of these patients at the Environmental Health Clinic, preliminary guidelines have been developed to help today's doctors navigate this rising medical illness. Internationally, experts in this field have published guidelines that have been of great assistance.

This presentation focuses on clinical observations made over the last 15 years at the Environmental Health Clinic. In conjunction with the European practice guidelines for Electromagnetic Hypersensitivity (EHS) created by the European Academy of Environmental Medicine,¹ we have attempted to manage these patients given the constraints created by our Canadian health care system. The Environmental Health Clinic at Women's College Hospital is an academic unit affiliated with the Faculty of Medicine, University of Toronto. Ideally, this Clinic would run as a multidisciplinary clinic. It is the only one of its kind in Ontario and one of three in Canada. It was established in 1996 by the Ministry of Health and Long-Term Care, and is a Provincial resource. Patients with environmentally-linked, chronic, complex conditions travel in from all parts of Ontario.

Environmental Health Clinic

- Women's College Hospital, Faculty of Medicine, University of Toronto
- Unique multidisciplinary clinic, and the only one of its kind in Ontario (1 of 3 in Canada)
- Established in 1996 by the Ministry of Health and Long-Term Care to be a provincial resource
- Promoting environmental health
- Improve health care for people with environmentally-linked conditions
- (CMI – Chronic Multisystem Illnesses, Chronic Complex Conditions).

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Figure 1

What is environmental health? It is the study of effects upon human beings of external physical, chemical, and biological factors impacting on the general population. It is a public health-based discipline that is a determinant of health. It is a very important part of our public health domain.²

¹ EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses.

Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2016; 31(3):363–397.

² Electromagnetic hypersensitivity: fact or fiction? Genuis SJ. Lipp CT. Sci Total Environ. 2012; 414:103–12.

Over the past 15 years, we have had an increasing number of referrals of people who have electromagnetic hypersensitivity. It has presented as a huge burden of illness on the patient, for which our medical system and society are not prepared. Most patients come in self-diagnosed and finally realize that what is making them unwell can't be seen but is pervasive in their environment.

Background

- Past 15 years - referrals increasing yearly.
- Burden on the medical system and society due to illness.
- Largely undiagnosed – self-diagnosis occurs most often.
- **Gaps in knowledge and understanding** in the medical community and the general public.
- Can affect all age groups and is not gender specific.
- Anecdotal evidence gathered: empirical observations and patient reports

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Figure 2

We have such a gap of knowledge in this subset and poor understanding of this problem. It can affect all age groups and genders. Over the years, we have been gathering anecdotal evidence, making empirical observations, documenting, and counseling my peers.

The definition of electromagnetic hypersensitivity is an awareness and or adverse symptomatology in response to electromagnetic fields.^{3,4} There are multiple variations of the same theme. The incidence of EHS has been rising exponentially over the years. EHS is a functional impairment. It is a spectrum disorder. In other words, there is a wide variety of degrees of impairment that one can exhibit.⁵

³ Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): A systematic review of identifying criteria. Baliatsas C. Van Kamp I. Lebet E. et al. BMC Public Health. 2012; 12(1).

⁴ Electrosensitivity and electromagnetic hypersensitivity. Leitgeb N. Schrottner J. Bioelectromagnetics. 2003; 24(6):387–94.

⁵ Reported functional impairments of electrohypersensitive Japanese: A questionnaire survey. Kato Y. Johansson O. Pathophysiology. 2012; 19(2):95–100.

Definition of Electromagnetic Hypersensitivity



- “Awareness and/or adverse symptomatology in response to electromagnetic fields (EMF) of multiple types”

-Dr. Mallery-Blythe

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Figure 3

Electromagnetic hypersensitivity

- Functional impairment
- Spectrum disorder
- Genetic polymorphisms determine degree of vulnerability
- “Total body burden” dependent
- Ample evidence in the literature that all cells and physiological systems in the body are affected
- **EHS is recognized as a disability under the Canadian Human Rights Commission (Federal and Provincial).**

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Figure 4

Patients may have genetic polymorphisms that determine the degree of susceptibility and vulnerability that renders them at higher risk of becoming electromagnetically sensitive due to an increased total body burden.^{6,7} Total toxic load, or total body burden, is related to a person’s lifetime exposures and stressors (their exposome from preconception until the present)⁸ that render the body a reservoir of inflammation, toxins/toxicants, and physiological malfunction.

⁶ Wi-Fi is an important threat to human health. Martin PL. Environmental Research 2018; 164:405–16.

⁷ Metabolic and Genetic Screening of Electromagnetic Hypersensitive Subjects as a Feasible Tool for Diagnostics and Intervention. De Luca C, Thai JCS, Raskovic D, Cesareo E, Caccamo D, Trukhanov A, Korkina L. Mediators of Inflammation. 2014. <https://doi.org/10.1155/2014/924184>.

⁸ What is new in the exposome? Vineis P, Robinson O, Chadeau-Hyam M, Dehghan A, Mudway I, Dagnino S. Environment International. 2020. 143.

There is ample evidence in the literature about the mechanisms of action surrounding EHS,⁹ which is a recognized disability under the Canadian Human Rights Commission, Federal sector.¹⁰

Patients are reacting to electric fields (measured in volts per meter), magnetic fields (measured in milligauss or nanotesla), dirty electricity, radiofrequency radiation, and/or ground currents. Everyone needs to get on board to try to understand basic physics, in order to make decisions regarding acceptable levels of exposure for themselves and their loved ones. The parameters of radiation exposure include its frequency, intensity, proximity, and duration.¹¹

I want to mention the gene-environment interactions we've been finding through genetic studies, and what is basically rendering these people more vulnerable. The findings overlap with Multiple Chemical Sensitivities, and degree of oxidative stress and nutritional status also make a difference in how this illness manifests.¹²

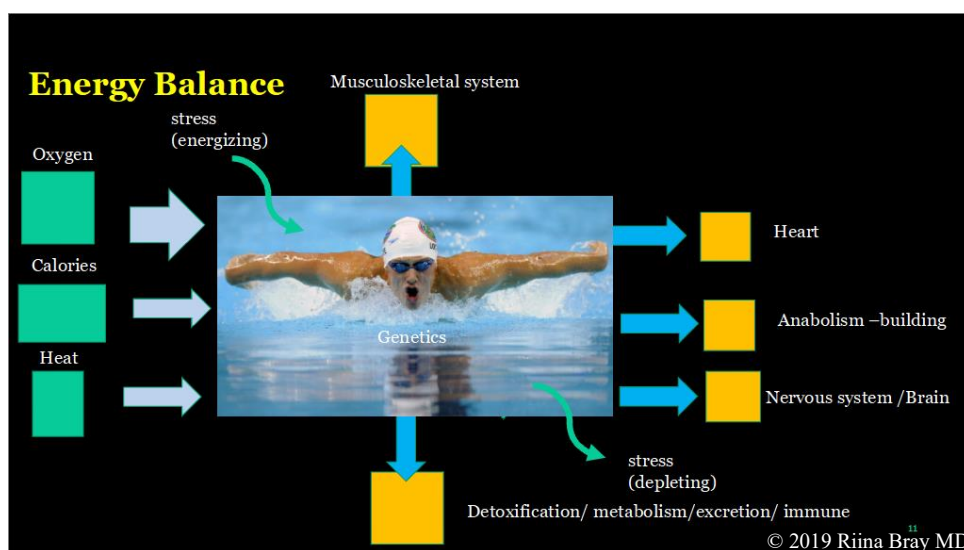


Figure 5

Allostatic load is “the wear and tear on the body” that accumulates as an individual is exposed to repeated or chronic stress, and is a term coined by McEwen and Stellar in 1993. It includes chemicals but also emotional and psychological stress that can tip the balance and cause genuine somatic pathology.¹³

While we have biomarkers established to help us in our diagnosis of susceptibility to EHS, we are restricted because our laboratories do not have the capabilities. Sometimes we have to send samples to the United States for analysis. Under the influence of electromagnetic fields, cerebral blood flow is altered because of hypoperfusion leading to hypoxia scenario and inflammation. Symptoms and signs are in the

⁹ The Medical Perspective on Environmental Sensitivities. Sears ME. Canadian Human Rights Commission. 2007.

https://www.chrc-ccdp.gc.ca/sites/default/files/envsensitivities_en.pdf

¹⁰ Canadian Human Rights Commission. Environmental sensitivity and scent-free policies. <https://www.chrc-ccdp.gc.ca/eng/content/policy-environmental-sensitivities>. 2019.

¹¹ Cognitive and physiological responses in humans exposed to a TETRA base station signal in relation to perceived electromagnetic hypersensitivity. Wallace D. Eltiti S. Ridgewell A. et al. Bioelectromagnetics. 2012; 33(1):23–39.

¹² Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. Belpomme D. Philippe I. Int. J. Mol. Sci. 2020; 21(6),1915.

¹³ Stress and the Individual: Mechanisms Leading to Disease. McEwen BS. Bruce S. Stellar E. Archives of internal medicine 153.18 (1993): 2093–2101.

realms of dermatology, DNA damage, cardiac, nervous system, fatigue, and pain. This is all explained in the literature in detail. The pathophysiology is very clear.¹⁴

Radiofrequency radiation causes:
(Martin Pall; De Luca/ Herbert and Sage)

- Oxidative stress in biological systems, histamine release :**DERMATOLOGICAL**
- Peroxidation, **DNA DAMAGE**, changes to antioxidant enzymes.
- Voltage gated calcium channel dysregulation: **CARDIAC AND NERVOUS SYSTEM**
- Peroxynitrite formation which causes chronic inflammation, damage to mitochondrial function and structure, reduction of ATP. Reduced glutathione and CoQ10: **FATIGUE AND PAIN**

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Figure 6

In her previous talk, Dr. Sears explained the adverse biological effects, which are thermal or non-thermal. We are quite interested in the non-thermal effects. Under the non-thermal category, we see DNA damage, an immune system that gets suppressed, increased blood-brain barrier permeability, and thickening of blood viscosity with rouleaux formation. We also see dysregulation of the cardiovascular, neurological, and endocrine systems, cognitive problems, fatigue, tinnitus, headaches, ECG abnormalities, and disruption of sleep with alpha wave intrusions and reduced REM.¹⁵

The clinical findings are not specific. There is a multimorbid picture of various overlapping problems. When patients come to our clinic, we have to pull and tease apart all those various parameters and factors, and this takes quite a bit of time.

Basic rules to help with diagnosis and management are established by taking an exposure history. If you are not familiar with an exposure history,¹⁶ you can download it at our Environmental Health Clinic website.¹⁷ Obviously, we're ruling out other illnesses and diseases. Often, on physical examination there are usually neurological, dermatological, and cardiac signs.

¹⁴ Microwave frequency electromagnetic fields (EMF's) produce widespread neuropsychiatric effects including depression. Pall. J Chem Neuroanatomy. 2015; 75.

¹⁵ EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2016; 31(3):363–397.

¹⁶ Identifying and managing adverse environmental health effects: 1. Taking an exposure history. Marshall, Lynn, et al. CMAJ 166.8 (2002): 1049–1055.

¹⁷ <https://www.womenscollegehospital.ca/care-programs/environmental-health-clinic/>

Basic rules to help with diagnosis and management

- Taking an exposure history is key
- Must rule out other illnesses and diseases
- Usually a physical exam will reveal neurological, dermatological or cardiac signs.
- Blood tests are expensive and not sensitive or specific but can help guide management if deficiencies or other disease states exist that must be corrected .
- There is no gold standard for EHS diagnosis.
- “EMF sensitive” or “EMF susceptible” rather than “hyper”.
- **This is a spectrum disorder.**

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Figure 7

Symptoms

- **Irritability**, lack of appetite, **memory problems**, **vertigo**, visual, skin and vascular problems. (Gomez-Perretta et al. Subjective symptoms related to GSM radiation from mobile phone base stations, BMJ, 2014)
- **Tinnitus**, **sleep disorders** (disrupted stage 4 sleep) and therefore mood and personality changes (Bhat, Kumar and Gupta. Effects of mobile phone and mobile phone tower radiations on human health. 2013)
- **Headache**, weakness, pressure in the head, **racing or fluttering heart**. (Park and Knudson. Medically Unexplained Physical Symptoms. Statistics Canada 2007)
- Itch, pain, edema, **erythema**, Morgellons disease secondary to transthyretin concentrations (Johnansson O, Disturbances 2009)
- Neurasthenic and vegetative symptoms: **fatigue**, tiredness, **concentration difficulties**, dizziness, nausea, **heart palpitations**, and digestive disturbances (WHO, Electromagnetic Fields and Public Health, December 2005)

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Figure 8

Really, there is no gold standard for the diagnosis of EHS; however, I think we are getting closer to qualitative measures, including heart rate variability.¹⁸

The use of EMF “sensitive” or EMF “susceptible,” rather than “hyper” are better descriptors. It is important to differentiate between those categories because when you label someone as hypersensitive, suddenly there is a stigmatization of their condition. I really appreciate household members giving me feedback about the condition of their loved ones who come in to see us, as they are witnesses of a

¹⁸ Provocation study using heart rate variability shows microwave radiation from 2.4 GHz cordless phone affects autonomic nervous system. Havas, Magda, et al. Non-thermal effects and mechanisms of interaction between electromagnetic fields and living matter. Bologna (IT): Ramazzini institute (2010): 187–218.

phenomenon that is novel and perplexing. We also see serious family conflict, and child custody battles around wireless technology issues.

More often than not, spouses or children witness a double-blinded experiment. They finally figure out that a loved one is not making up a story. They confirm my suspicions unequivocally. The nocebo effect (opposite to placebo) is excluded. Patients also feel very anxious about this realization because they do not want to be perceived as having paranoia.

The magnetic field of each human is in the shape of a torus, depicting the energetic field around us. Our bodies' electromagnetic fields generated by our nervous system interacts with the electromagnetic outside world and any disruption of this field can affect our nervous system.

Over the last 15 years, I have been able to categorize the patient morbidities/vulnerabilities that I have seen. More research to confirm these findings would be invaluable.

Category I are patients with a toxic metal body burden—most commonly mercury, but it can be nickel or lead. I have not seen enough patients with cadmium or arsenic toxicities to formulate a hypothesis. The high load of mercury is due to overconsumption of contaminated aquatic food. Most fish is now contaminated with mercury. Methylmercury builds up and causes neurotoxic effects, such as axonal demyelination. Zinc/nickel/mercury dental amalgams release elemental mercury vapour, which goes directly into the brain and then is converted to methylmercury, which is neurotoxic. Those patients present with cardiac and neurological manifestation. Patients with metallic hardware implants—such as Harrington rods, braces, wire meshes, pins, and screws—can potentially be affected. Patients with excessive gadolinium from multiple contrast studies are also at risk.

Category II are the group of patients with infectious diseases such as Lyme disease, co-infections, and other infections which affect the nervous system. We've talked about the way electromagnetic fields (EMFs) affect the nervous system through voltage-gated calcium channel disruption.

Category III are patients with lesions of the brain, including tumours, demyelination, microangiopathic changes, diffuse ischemia, inflammation, or neurodegenerative diseases (multiple sclerosis, ALS, and the like).

This brings to mind an area that needs to be studied: the aging population. With the aging population comes the rise in prevalence of dementia and Alzheimer's disease. Through our increasing technology, could we actually be accelerating neurodegeneration? Long-term care units have significant sources of wireless technology.

Category IV are the group of patients with heart rhythm disturbances: either exacerbation of existing conditions or new onset caused by radiofrequency/microwaves. There are periods of poor blood circulation due to Rouleaux formation and there is disturbance of heart conduction. Tachycardic spells, especially at night, can occur. People also experience premature ventricular contractions, premature atrial contractions, atrial flutter and fibrillation. Those with Wolff-Parkinson-White syndrome are especially at risk for sudden cardiac death.¹⁹

Category V includes students and teachers. Shelley Wright will speak more about this, but it is prudent to consider that university students, college students, and high school students are all being exposed to high levels of radiation. They also might be working close to lamps with compact fluorescent lightbulbs. They get eyestrain, and sometimes develop rashes related to this radiation exposure. They can feel quite unwell at times. You wonder about the epidemic of anxiety, depression, and suicide at universities and colleges

¹⁹ Reversed reciprocating paroxysmal tachycardia controlled by guanethidine in a case of Wolff-Parkinson-White syndrome. Harris WE. Semler HJ. Griswold HE. American Heart Journal 67.6 (1964): 812–816.

being fueled by the increased level of agitation and anxiety caused by radiofrequency/microwave radiation effects on mood.

For treatment strategies, I reference the European Academy for Environmental Medicine.²⁰ Basically it suggests the following: reduce exposure. Home inspections are really important. Robert Steller will give us a wonderful demonstration today. Everyone has to be treated individually.

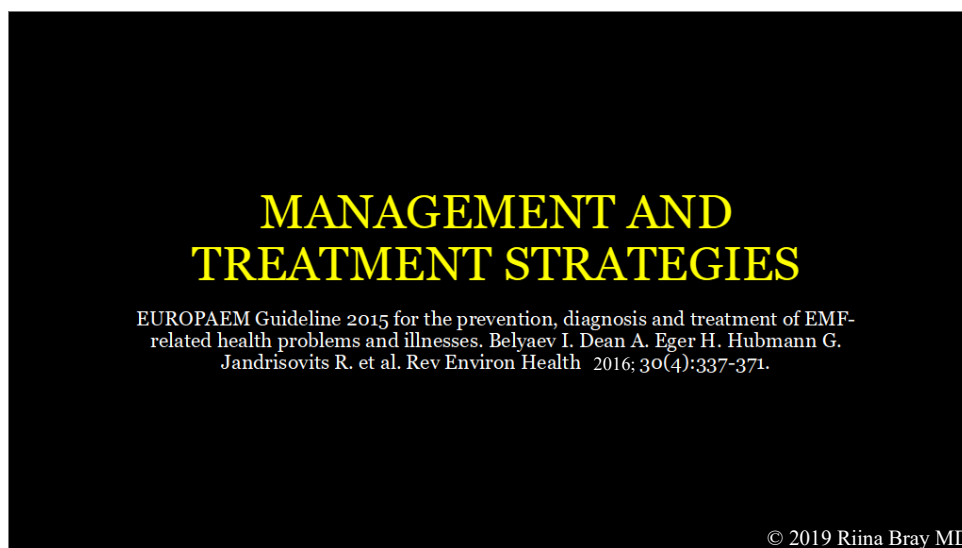


Figure 9

It is very important to reduce total load in these patients, to empty out the physiological barrel, as it were. All these stressors compound the effects of radiation on the body. We have to help patients detoxify by getting rid of stressors, which can be emotional, psychological, genetically induced, environmental, and anything else related to their exposome. Taking a proper exposure history allows us to determine what lifestyle changes a patient could make.^{21,22}

²⁰ EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2016; 31(3):363–397.

²¹ Chemical Sensitivity, Vol 1. Rea, William J. Boca Raton. Lewis Publishers. 1992.

²² Identifying and managing adverse environmental health effects: 1. Taking an exposure history. Marshall, Lynn, et al. CMAJ 166.8 (2002): 1049–1055.

Treatment strategies – (Hagstrom et al. 2012, 2013)

- Firstly, reduce exposure.
- Home inspections recommended.
- Individual therapeutic approaches must be taken.
- Psychotherapy is NOT HELPFUL

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Figure 10

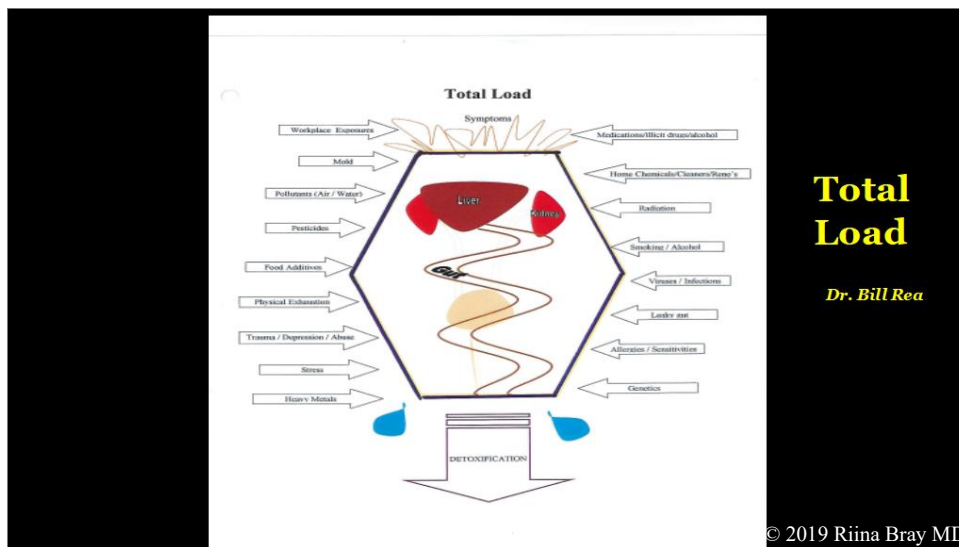


Figure 11

Significant are markers of inflammation, histamine release, autoimmunity markers, including anti-O-myelin sheath antibodies. The products of nitric oxide production are still not able to be determined using our regular laboratory services. Melatonin variations would be useful in determining impacts on the brain, as some studies have shown.²³ Impacts on bone marrow could be reflected in changes of serum protein electrophoresis parameters. Hypoperfusion of the limbic system and thalamus can be determined using a weighted MRI.²⁴

²³ Tordjman S, Chokron S, Delorme R, et al. Melatonin: Pharmacology, Functions and Therapeutic Benefits. *Curr Neuropharmacol*. 2017;15(3):434–443. doi:10.2174/1570159X14666161228122115

²⁴ Microwave frequency electromagnetic fields (EMF's) produce widespread neuropsychiatric effects including depression. Pall. *J Chem Neuroanatomy*. 2015; 75.

Diagnostic testing (Europaem 2015/ Oberfeld, 2016/ Belpomme, 2015)

Biomarkers **in combination** would be helpful, but largely unavailable:

- Inflammation (ESR, hsCRP, CRP, interleukins)
- Hyper-histaminemia
- Autoimmune markers (thyroid antibodies)
- Presence of infectious diseases – screen.
- Mitochondriopathy (intracellular ATP)
- Oxidative stress lipid peroxidation
- O-myelin Abs
- Nitric oxide production - nitrotyrosine
- lowered melatonin
- SPEP – effects on bone marrow
- Hypoperfusion in limbic system and thalamus (weighted MRI).

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Figure 12

To further aid in diagnosis

(Havas, 2010)

- Biomarkers – salivary cortisol, alpha-amylase, transthyretin, blood sugar levels after provocation.
- BP and heart rhythm monitoring for 24 hours (night time changes) for heart rate variability and heart rate abnormalities Histories – anecdotal evidence and data gathering
- Questionnaires

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Figure 13

Questionnaires are also useful. Physiologic tests quantify heart rate variability, blood pressure changes, blood sugar fluctuations, and heart rhythm changes over time, and in real-time monitoring.

To detoxify, one basically must decrease toxicant input, and increase contaminant output. Other treatments include hydration, sauna therapy, enhanced antioxidant reserves through nutritional supplementation, and improved excretion through the bowel and renal function. One should be very well-nourished in order to do the job. If you cannot get what you need, either due to genetic compromise, or just due to lack and imbalance of diet, then supplements are helpful. If you cannot afford supplements, then we have to rely on an excellent diet. The natural methods of detoxification—soluble and insoluble fibres, breathing, relaxation nutritional supplements, sweating, sauna, and exercise—all help enhance the

battle of elimination. I caution against fasting because it does not work for some people who do not have adequate supplies of vitamins, minerals, and other antioxidant substrates in their body.²⁵

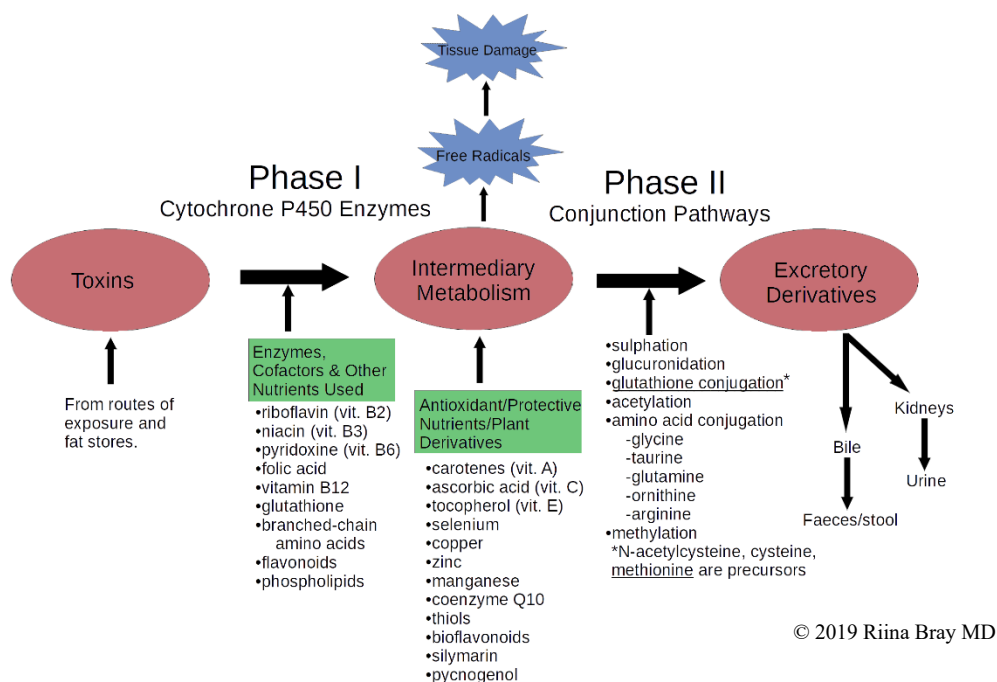


Figure 14

Reduce body burden

- Detoxification – mercury, lead, solvents (CNS) – ALA, NAC, glutathione, vit C, selenium, sauna therapies, proper hydration, exercise
- Correct any dental work with toxic or immunoreactive materials – mercury, lead oxide, gold, titanium. (zirconium dioxide is ok)
- Low copper amalgam : mercury (50%), silver (~22–32%), tin (~14%), copper (~8%)
- BEWARE OF POSSIBLE GENETIC POLYMORPHISMS

(De Luca, 2014).

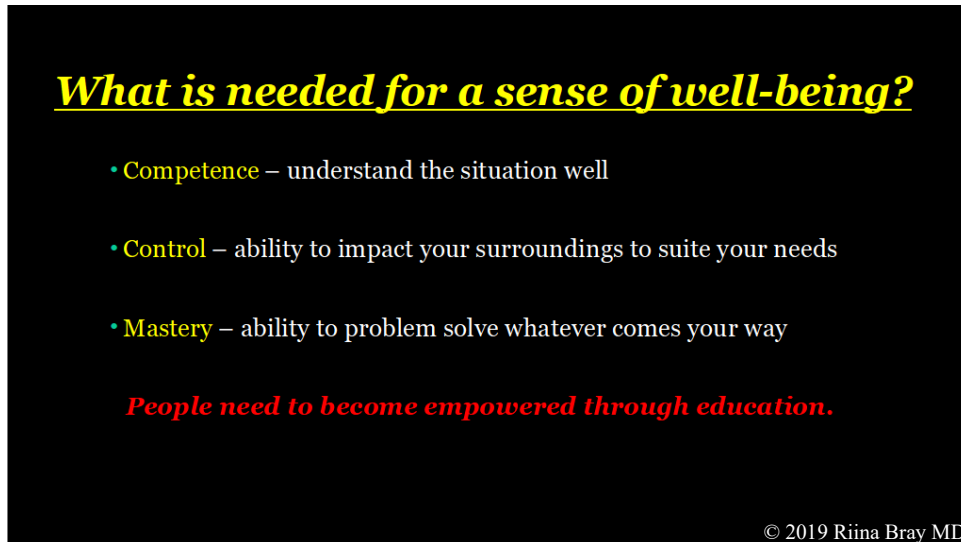
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Figure 15

Finally, patients need a lot of psychosocial support in dealing with and removing stress triggers. Mindfulness-Based Stress Reduction, and a little CBT, can be useful to decrease sympathetic nervous system overdrive. For heart arrhythmias, beta-blockers are helpful. Grounding can be important to

²⁵ Textbook of Functional Medicine. Institute for Functional Medicine. 2010.

balance out the electrons in the body by walking barefoot outside or swimming in a lake. Basically, one is trying to replenish the electrons that have been depleted from the body. By grounding, you can get things back into better balance.



What is needed for a sense of well-being?

- **Competence** – understand the situation well
- **Control** – ability to impact your surroundings to suite your needs
- **Mastery** – ability to problem solve whatever comes your way

People need to become empowered through education.

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Figure 16

Impacts of Wireless technology on Health, EMR Canaries Clinical Experiences

Dr. Jennifer Armstrong BSc, MD, DIBEM
Director, Ottawa Environmental Health Clinic, Canada

Abstract

Understanding the basics of environmental health is critically important for physicians in order to address impacts of environmental exposures on patients. One must consider all aspects of total load and physiological stressors, including comorbidities, in order to reduce the burden of illness. Electromagnetic fields represent one growing pollutant that is difficult to assess without having a proper ground base of knowledge.

When I started in this field of environmental health, we didn't have such a thing as an "electromagnetic radiation public health issue." Mostly, we looked at food allergies, chemical sensitivities, and toxicities. Electromagnetic pollution brings another aspect into our health and is a factor that impacts on our well-being. Traditional doctors and I were trained to look at symptoms of a patient and not necessarily think of how all these symptoms fit together. I always had questions like, "Why does this patient get this kind of dermatitis?" There were never any answers, so I quit asking questions after a while; yet, deep down, I continued to have questions about why people get different types of illnesses.

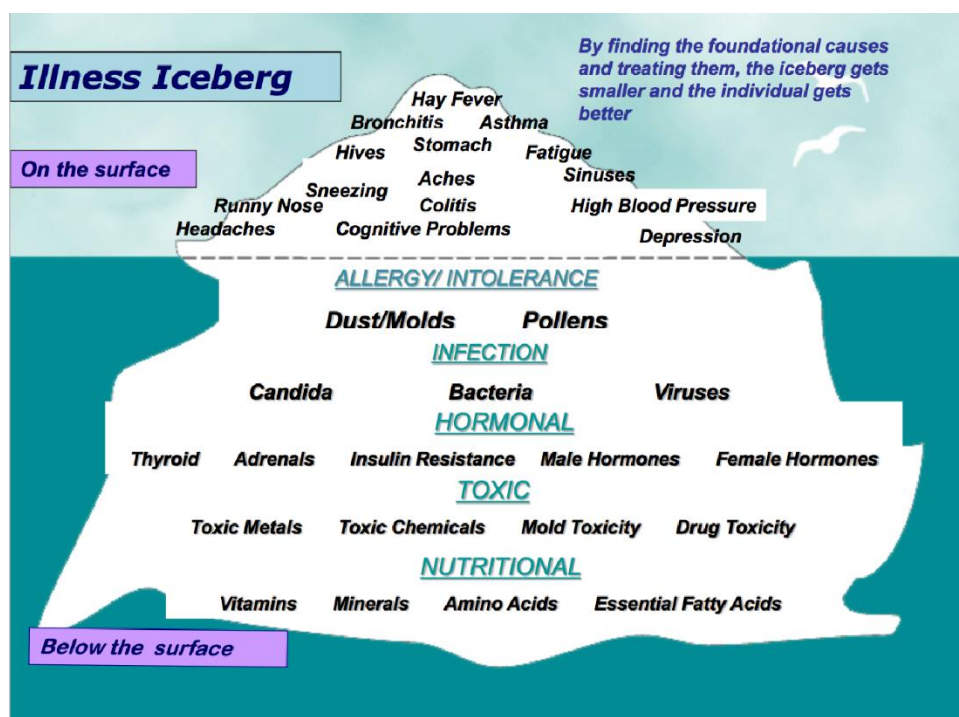


Figure 1

Symptoms

- **Irritability**, lack of appetite, **memory problems**, **vertigo**, visual, skin and vascular problems. (Gomez-Perretta et al. Subjective symptoms related to GSM radiation from mobile phone base stations, BMJ, 2014)
- **Tinnitus**, **sleep disorders** (disrupted stage 4 sleep) and therefore mood and personality changes (Bhat, Kumar and Gupta. Effects of mobile phone and mobile phone tower radiations on human health. 2013)
- **Headache**, weakness, pressure in the head, **racing or fluttering heart**. (Park and Knudson. Medically Unexplained Physical Symptoms. Statistics Canada 2007)
- Itch, pain, edema, **erythema**, Morgellons disease secondary to transthyretin concentrations (Johannsson O, Disturbances 2009)
- Neurasthenic and vegetative symptoms: **fatigue**, tiredness, **concentration difficulties**, dizziness, nausea, **heart palpitations**, and digestive disturbances (WHO, Electromagnetic Fields and Public Health, December 2005)

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Figure 2

In Environmental Medicine we look at root causes. As in Figure 1, if you think of one's symptoms as the tip of an iceberg, you don't attack the symptoms initially—like giving nasal spray for rhinitis or giving an NSAID for headache—instead, one goes below the tip of the iceberg. You look at all the other variables, for example: what sorts of allergies does this person have that enhance their reactions to chemicals in foods? What sorts of infection does this person have—bacterial, viral, fungal? In the bacterial we are seeing more Lyme disease. A lot of hormonal issues are occurring—many of which are disrupted by environmental causes, such as chemicals, even in exceptionally low doses. We now know radiation can also disrupt hormones. We ask, what sort of toxins can this person be harboring, which they could have accumulated over several years? Then at the end, how is that person's nutritional status holding up? Without appropriate nutritional status, the person will not be able to detoxify.

Chemicals such as volatile organic compounds and persistent organic pollutants (POPs) can stay in our body for many years. Different industrial companies, such as Monsanto, have put out a lot over the years. Whatever the body takes in, we must either utilize—process it—or eventually, if we are not going to use it as a nutrient, excrete it. Yet it can also be absorbed and distributed to fat, liver, bone, nerves, brain, and in protein synthesis. There are different ways the body assimilates materials and different ways the body can excrete through biotransformation or detoxification. Pathways of removal include skin through heat and sweat (sauna therapy or exercise assist in this pathway), urine, excreting through our kidneys, liver/bile, breast milk, tears, rashes, and exhalation. We all have different genetic blueprints and we all have different ways we detoxify. Nutrient status is especially important, as is the duration and timing of exposure. Whether the exposures are additive or synergistic is also a cause for concern.

We are exposed to multiple entities. The total load principle looks at the additive effect of chemical and physical exposures and stressors. Electromagnetic field exposure is now a significant player in our society.

Natural Methods to Detoxication

- Nutrition
- Supplements
- Sweating (sauna)
- Exercise
- Enhanced bowel elimination (soluble and insoluble fibres, choleretics)
- Breathing/Relaxation
- (Fasting)

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Figure 3

With free radical production in the body, the cell membrane starts having problems. Free radical production can cascade in a destructive fashion until you get the right nutrients onboard. This is part of Dr. Martin Pall's work in that he talks about how nitric oxide gets out of control, and needs to be controlled so the patient can start recovering.¹ One of the mnemonics we use is, "weed, seed, and feed." How do we figure out what is going on? One of the things that we must do is take a good environmental history, using the CH2OPD2 mnemonic.

CH2OPD2 – body burden (total load of xenobiotics/ EMF exposure)

- **C – community**
- **H – home/hobbies**
- **O – occupation/
school**
- **P – personal**
- **D – diet/drugs**

All these classifications delineate degree of exposure to various sources of EMFs

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Figure 4

First you look at "C": what is going on in their Community? You want to find out if there are any cell phone towers nearby, for example. "H": what kind of electronic devices they are using at Home; and if they are also having chemical exposures. Are they living in a brand-new home? Is there any off-gassing of

¹ Taking an exposure history. Marshall L, Weir E, Abelsohn A, Sanborn MD. Identifying and managing adverse environmental health effects: 1. Taking an exposure history. CMAJ. 2002;166(8):1049–1055.

new materials? The other “H”: what sorts of Hobbies do they have? Are they playing or using wireless devices for long periods of time? Are they being exposed to paints, solder, furniture strippers, for example? “O”: what is happening in their school or Occupation. Is it near cell phone towers? We do not have any laws yet in Canada that prevent cell phone towers from being near schools. “P”: for Personal life. You want to know their dental history and what they use daily. Do they have amalgam fillings, braces, bridges, or metal implants in their mouth? What kind of mattress are they sleeping on—does it have metal springs? Which cellular devices are they using? What is the SAR rating, how are they using their phone, and are they turning off the Bluetooth, cellular data, and Wi-Fi functions appropriately? “D”: is Diet—too much sushi, canned tuna, or just a pescatarian predilection can cause metal overload. Lastly “D”: also stands for Drugs that could be causing an increase in body burden.

Reduce body burden

- Detoxification – mercury, lead, solvents (CNS) – ALA, NAC, glutathione, vit C, selenium, sauna therapies, proper hydration, exercise
- Correct any dental work with toxic or immunoreactive materials – mercury, lead oxide, gold, titanium. (zirconium dioxide is ok)
- Low copper amalgam : mercury (50%), silver (~22–32%), tin (~14%), copper (~8%)
- BEWARE OF POSSIBLE GENETIC POLYMORPHISMS

(De Luca, 2014).

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Figure 5

RULES TO DETOX BY...

1. Decrease input

Minimize exposure to known symptom triggers and toxins, irritants, and sensitizers revealed by CH2OPD2 exposure history

2. Increase output

Induce mobilization from storage (hydration, heat)

Increase metabolic conversion rates (enhance antioxidant reserves and mitochondrial function)

Induce excretion of toxins (optimize bowel and renal function)

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Figure 6

Enhance Natural Detoxification

- Eat a diet rich in antioxidants, organic if possible.
- To decrease body burden of oxidative stress (peroxynitrite ONOO-) take antioxidants
- Selenium, Zn, Cu, Mg protect against MeHg toxicity

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Figure 7

In my practice, electromagnetic issues began about 10 to 15 years ago. As a physician, I listen to and learn from my patients. The following are examples of cases that illustrate the types of impacts that the MW/RFR are having on my patients.

Case #1

77-year old female living in outskirts of Montreal, 2011, with a sudden onset of illness in December. On December 19, 2011—for TSH, the normal range is 0.34 to 5.6—her TSH dropped to 0.01. Her T3f looked normal. But her T4f went way up above normal. It seemed like she might have hyperthyroidism, or Graves' disease. She did have a history of Graves'. By January 10th, her TSH went up to 14.5, and her T3 dropped below the normal range of 3.5 to 5.9, to 3.0. Her T4f dropped below normal (8 to 18) to 3.09. Then on January 24th, her TSH dropped again to 0.08, her T3f went up to 5.4, and her T4f went way up to 27.11. It wasn't a cell tower, it wasn't her phone. She said, "Do you think it could have anything to do with the fact that my son bought me an iPad for Christmas?" She was using it already before Christmas in December. She stopped using the iPad, and immediately started feeling better. Her labs corrected to a normal range within a few weeks. There is a report in the literature of cellular technology affecting the thyroid.²

Case #2

A 29-year old female was offered a job in a Toronto Bay Street restaurant as a manager and started in that position but couldn't stay because they just kept putting in stronger Wi-Fi in the restaurant. She had temporally associated headaches, poor concentration, and fatigue. She began having issues with Wi-Fi in other parts of the city in certain venues. She is finding that she now must live in more remote communities that don't have powerful MW/RFR.

Case #3

A 49-year old female living in a poured concrete house in a rural setting with a history of chemical sensitivities was following rules and eating hypoallergenic food and the air quality was good, but she started developing twitching in her legs and finding it difficult to settle down and sleep; she was generally

² Alterations in TSH and Thyroid Hormones following Mobile Phone Use, Mortavazie S et al, Oman Medical Journal, vol 24, Issue 4, Oct 2009.

feeling unwell. Cell phones did not work well in that house as signals coming in from towers were blocked by the concrete. The house was hardwired and had no Wi-Fi signals. The problem in this situation was a cordless phone that had a DECT base constantly emitting a signal. In this case, the radiation was being reflected back into the house. Removal of the phone helped alleviate the problem.

Case #4

A school teacher at recess was wearing a walkie-talkie. She also had an emitting modem in her classroom near her desk. She found that she was unable to stay in her classroom for more than 30 minutes. She developed headaches and total inability to concentrate, both of which affected her for days afterwards. She had challenges communicating to me due to severe brain fog. She was not able to teach her class, so she asked for the modem to be moved but was denied. She had to go on disability, and was never able to return to teaching. As physicians, there is not a lot of time left over to be advocates for patients—you can write letters, but it doesn't matter if employers such as the school board do not want to listen.

Case #5

A 5-year old boy was normal until 18 months old after immunizations. He was next seen by a doctor at age 2 1/2 years at which point he was hyperactive, did not recognize his parents, had no speech other than odd numbers and letters muttering to himself, but didn't really communicate with anybody. He was put on a gluten-free diet, along with soy-free, casein-free, and no sugar, as well as nutritional supplements, digestive enzymes, and probiotics. There were some minor improvements. By age 3, his condition was still active and severe, and his parents noted he was addicted to using their laptop computer. They also noticed that there were overlapping signals from 30 other routers in the neighbourhood. They decided to stop the boy from accessing the laptop and within days he began to respond to his name. All Wi-Fi was removed from their home, and they purchased a Faraday canopy for him to sleep in at night. His parents started noticing progressive increases in his understanding and interactions. His frequent night awakenings stopped. His hyperactivity decreased when all the Wi-Fi was removed.

How to locate cell towers near you

<https://www.scadacore.com/tools/rf-path/cell-tower-map-canada/>

Put in your address and you can see the towers on the map; click on each tower to see how far away it is and what properties it has.

Health Canada's *Safety Code 6* and Global Trends Regarding Radiofrequency/Microwave Radiation Safety

Frank Clegg

CEO, Canadians for Safe Technology; co-Chair, Business Advisory Group to the Environmental Health Trust

Abstract

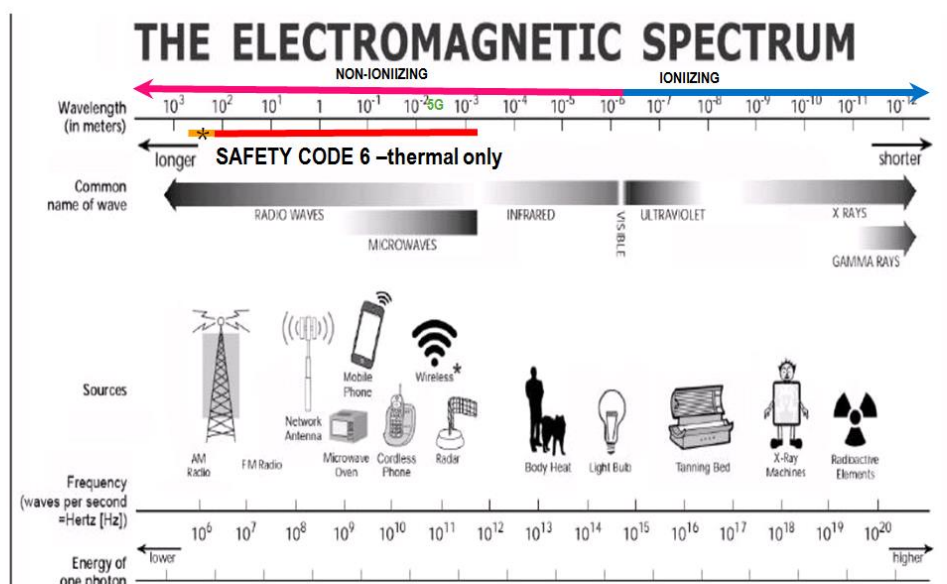
Through research and education, Frank Clegg, past President of Microsoft Canada, works with all levels of government to create healthier communities for Canadian families, mitigating microwave radiation hazards, which pervasively emanate from cell towers and Wi-Fi devices. Clegg presents the electromagnetic spectrum and explains Health Canada's *Safety Code 6* safety limits, which were originally intended for federally regulated sites. He expresses concern that Health Canada recommends limits but does not regulate public exposures. Clegg reports that guidelines haven't changed to reflect the exponential increase in wireless devices. He points out the shortcomings of *Safety Code 6* in classroom settings. A comparison of international standards and an explanation of how international authorities on RF guidelines are created will be discussed, highlighting the shortcomings of thermal measures which can negatively impact students. International medical expert warnings to reduce exposures, and Canadians For Safe Technology recommendations, are presented, including a moratorium on 5G.

Introduction

I have spent my entire career—over 40 years—in the technology sector. My most recent position before retiring was that of President of Microsoft Canada. I have seen the tremendous benefits that technology can provide if it is implemented properly. I have also seen the tremendous harm that can happen if technology is not implemented in a safe manner. After five years of my own personal research, including time spent time with international experts, I am convinced that our current implementation of wireless technology is absolutely not safe.

That is why I co-founded Canadians for Safe Technology in 2014. We focus on raising awareness and educating Canadians on how to use technology safely. We are a not-for-profit, completely volunteer-based, national coalition of parents, citizens, and experts. Our goal is to educate and inform Canadians about the dangers of the exposures to unsafe levels of radiation from wireless technology, and to work with all levels of government to create healthier communities for children and families from coast to coast. I joined the Environmental Health Trust two years ago not only because of their advocacy work, but because they are the only non-profit in the world today that carries out high-level critical research on controllable environmental health hazards and also works directly with local communities, teachers, parents, and students, as well as policy makers, to understand and mitigate these hazards through research, education, and advocacy.

As per **Figure 1** (below), the length of waves of the electromagnetic spectrum begin at long wavelengths measured in meters and are about the length of a soccer field. As one moves towards the right of **Figure 1**, one sees X-rays and gamma rays—the wavelengths here are around the size of water molecules. In simple terms, as the wavelengths become longer, the frequencies are lower. And as the wavelengths become shorter, the frequencies are higher.



Common wireless devices: 600 MHz to 6 GHz, Wi-Fi: 2.45 and 5 GHz
5G (5th Generation): > 6 GHz, includes millimeter wavelengths

Figure 1: Davis, D. et al, (2017). Microwave/Radiofrequency wireless radiation and human health: clinical management in the digital age.¹

What is open for debate is the area in the middle of the spectrum. Scientists make distinctions between “non-ionizing” radiation and “ionizing” radiation. If the radiation has enough energy to knock an electron out of its orbit, then it is considered ionizing radiation. We know ionizing radiation is harmful. The debate that continues concerns non-ionizing radiation. This debate has been going on since the 1920s, centering on the idea that if there is not a thermal effect on the environment as a result of the non-ionizing radiation, then there is no harm. In other words: if it doesn’t cook, it does not harm. I believe there is enough scientific evidence to show that there are effects on humans without needing to heat tissue.

Health Canada’s *Safety Code 6* establishes safety limits for human exposure to radiofrequency (RF) fields in the frequency range from 3 kHz to 300 GHz.² *Safety Code 6* is only a guideline and not a mandate. When it was established in 1979, its purpose was to set safety limits for workers or visitors to federally regulated sites. It has now expanded to include coverage for all Canadians. *Safety Code 6* has undergone minor revisions in 1991, 1993, 1999, 2009, and 2015.

Health Canada can only recommend limits for safe human exposure; it does not regulate the general public’s exposure to RF radiation. Many provinces, territories, and school boards apply the exposure limits in *Safety Code 6* for general public exposure. Industry, Science and Economic Development Canada (ISED) uses *Safety Code 6* guidelines to regulate wireless devices and their associated infrastructure (such as cell towers and Wi-Fi), which are required to comply with *Safety Code 6*.

In 1979, the regulatory emphasis was on “far-field” (> 20 cm) and power density, such as with radar-emitting devices or cell tower antennae. This measurement deals with the rate of flow of energy per unit of area. As of 1991, with the onset of cell phones and personal devices, we needed something to measure the actual devices in “Near Field” (< 20 cm). A specific absorption rate (SAR) is used to measure the rate

¹ Retrieved from <https://oxfordmedicine.com/view/10.1093/med/9780190490911.001.0001/med-9780190490911-chapter-10>

² Consumer and Clinical Radiation Protection Bureau, Environmental and Radiation Health Sciences Directorate, Healthy Environments and Consumer Safety Branch, Health Canada (2015). Retrieved from <https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html>

of energy emitted from phones, tablets, and anything that is held close to or near your body. This is a measure of the rate of energy and the way that energy is absorbed by the body. SAR is set at 1.6 W/kg per 1 gram of a cube of tissue and is calculated from tissue conductivity.

Of critical importance is understanding that by 1991 we were barely using cell phones, and did not have smart phones or tablets. And yet the guidelines have not changed in any significant way since 1991. Despite evidence to the contrary, the only established health effect of non-ionizing radiation that Health Canada acknowledges is the thermal one. If the radiation is not heating the body nor heating any organism, then in their view there is no harm.

Evidence for Non-thermal Effects

In 2017, Martin Pall summarized over 170 review studies throughout the world that demonstrate biological and or health effects of RF radiation on humans and animals without heating the tissue (unpublished report, referenced here with permission). Cumulatively, the review studies cite over 2,000 peer-reviewed studies that show heat is not required for non-ionizing radiation to cause effects and/or harm to living tissue.

Shortcomings of *Safety Code 6*

As you have read elsewhere in these Symposium papers, Health Canada has stated that it relies on a “Weight of Evidence” approach in its analysis. For the last five years, Canadians for Safe Technology has formally requested Health Canada to publish the weight of evidence material; and we are still waiting. One of the key components of transparency with regard to international guidelines is to publish evaluation criteria.³ *Safety Code 6* does not take into account the aforementioned proven biological effects, only tissue heating. There have been no significant changes since its first publication in 1979 for power density and in 1991 for SAR. Moreover, SAR compliance testing is based on science conducted on a 220 pound (100 kilogram) mannequin. There is no distinction for children, elderly, or other sensitive groups, such as EMF-sensitive individuals or pregnant women. ISED does not measure the output from cell towers/antenna they license under *Safety Code 6*.

For example, if you are a student in a classroom, you can have 16 or 20 of your nearby peers using cell phones and tablets. You could be sitting as a student or a teacher with a smart meter on the side of the building, and there could be a cell tower down the road. There are no measurements taken for the cumulative effect from multiple devices over a 24/7 timeframe by Health Canada or ISED. What they measure is each individual device as long as it passes *Safety Code 6* guidelines. Health Canada will argue that there is a buffer, but published information now shows that the buffer is not adequate to cover the cumulative effect. There is currently no analysis, no summary, and no investigation of the exposure 24 hours a day or seven days a week. We do not have any of that information.

Lastly, and perhaps most concerning, is that 5G is automatically assumed to be safe since it lies between the arbitrary limits of *Safety Code 6* of 3 kHz to 300 GHz, established in 1979. We have met, as C4ST, with over 50 Members of Parliament over the last 3 or 4 years. Every time we bring up this topic of 5G they say, “I don’t know, it must be okay because it falls within Canada’s guidelines.”

³ Rooney, A. A., et al. (2014, July 1). Systematic Review and Evidence Integration for Literature-Based Environmental Health Science Assessments. Environmental Health Perspectives. Retrieved from <https://doi.org/10.1289/ehp.1307972>.

Global Trends Regarding Radiofrequency/Microwave Radiation Safety

Comparison of International Standards

For power density—such as what emits from cell towers and Wi-Fi routers that are further away from persons—countries like China, Italy, Russia, and Switzerland all have guidelines at least 50 times safer than the ones we have courtesy of Health Canada.

However for SAR, Canada and the US are marginally safer than most other countries. Our standard is 1.6 W/kg (over 1 gram of tissue), compared to 2.0 W/kg (over 10 grams of tissue).

International Authorities on RF/MW Guidelines

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an industry group that has become an NGO. If you read the biographies of all the individuals on that Commission, they are all tied to industry. Another authority is the World Health Organization's EMF Project, which is currently working on a monograph for RF/MW radiation to be used as a basis for guidelines. However, the draft released to the public for comment is still incomplete, and five of the six members of the core group are also ICNIRP members.⁴

Exposure guidelines used by many agencies worldwide are based only on established short-term thermal effects. Too often they prioritize industry and are not accountable to any other neutral body. Other authorities include the World Health Organization (WHO) International Agency for Research on Cancer (IARC), which reviews agents for carcinogenicity. The last review by IARC, completed in 2011, involved a working group of about 30 experts and designated radiofrequency/microwave radiation as a Group 2B *possible* carcinogen. IARC published a comprehensive monograph that describes its findings on thermal and non-thermal effects. IARC recently announced it will again review RF/MW radiation. We are hopeful IARC will update its 2011 designation.

Medical Experts Worldwide Recommend Reducing Exposure

There are many medical institutions from around the world that have formally expressed concerns with current guidelines. I reference two examples here. The International EMF Scientist Appeal at EMFscientist.org has over 250 scientists and researchers (from over 40 countries), who sent formal proclamations to the WHO, and to the United Nations and its Member States, stating they are very concerned about the use of RF radiation and its effect on humans, especially children, and are also extremely concerned about the 5G technology.⁵ The American Academy of Pediatrics has expressed concern and set guidelines for parents on limiting how much time their children spend in front of screens.⁶

⁴ Hardell, L. (2017). World Health Organization, radiofrequency radiation and health - a hard nut to crack (Review). *International Journal of Oncology*, 51(2), 405–413. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/28656257>.

⁵ (2015, May 11) International Appeal, Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure. Retrieved from <https://www.emfscientist.org/index.php/emf-scientist-appeal>.

⁶ The American Academy of Pediatrics. (2016, Oct. 21). Retrieved from <https://pediatrics.aappublications.org/content/138/5/e20162591>

Medical Experts Worldwide Recommend Reducing Exposure*



Figure 2

Legislation in Other Countries

As early as 2000, Greece was one of the first countries to pass legislation reducing RF radiation exposures, in this case near schools, nurseries, and hospitals. China, Russia, Italy, and Switzerland have guidelines at least 50 times safer than Canada and the United States (see **Figure 3**, below).

France has been one of the more aggressive countries in their protection, particularly for children in schools and nurseries. In 2017, France banned cell phones in all areas of elementary and middle schools. In 2015, France banned Wi-Fi in nursery schools and placed restrictions on advertisements promoting cell phones.

Taiwan in 2015 placed a ban on children under the age of two using electronic devices.

In 2014, Belgium made it illegal to market cell phones to children less than 14 years of age, and phones designed for children under 7 years are prohibited from sale.

Korea in 2014 mandated SAR labeling on cell phones and portable devices, and released public health recommendations to reduce exposure to cell phone radiation.

Chile in 2012 passed the “Antennae Law” prohibiting cell antennae/towers in “sensitive areas” (educational institutions, nurseries, kindergartens, hospitals, clinics, nursing homes).

India in 2012 introduced limits at EMF levels to one-tenth of the ICNIRP guidelines.⁷

⁷ Retrieved from <https://ehtrust.org/policy/international-policy-actions-on-wireless/>.

Outdoor Pulsed RF Radiation Exposure Limits

Country Comparison (uW/cm2)

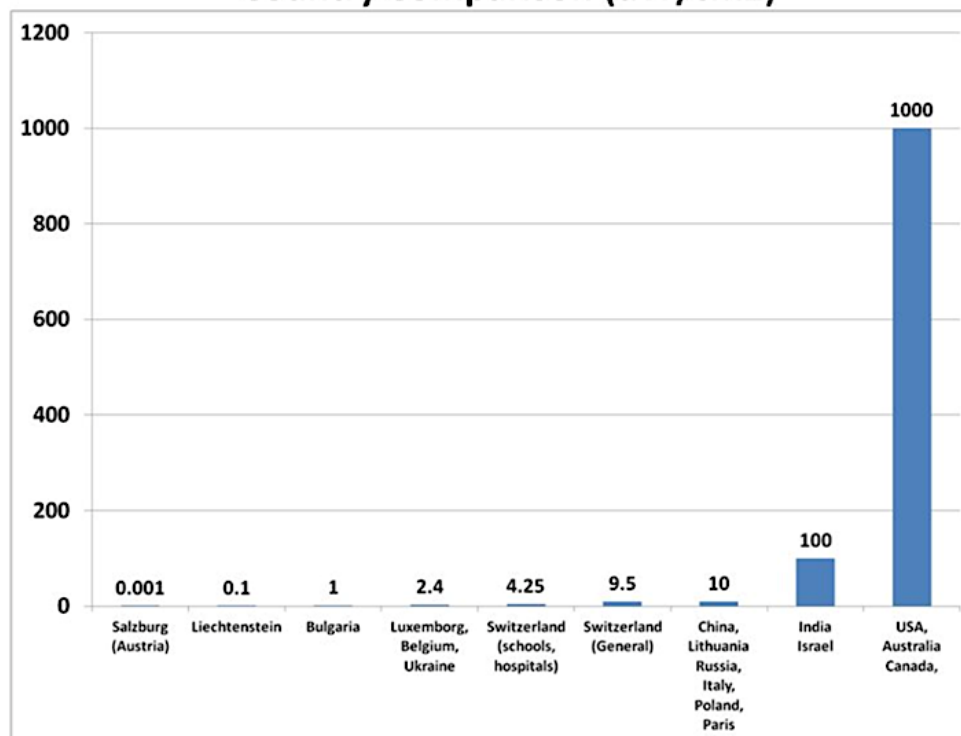


Figure 3

These are some of the countries around the world that are stepping up to protect their citizens. When we talk to Health Canada about this, it responds that these countries are not making these decisions using evidence-based science. When we ask to see Health Canada's evidence-based science, we do not get a response.

National Policies, Recommendations, and Warnings

In 2018, Sri Lanka's Ministry of Health issued a press release to reduce exposure. In 2016, France made a declaration to protect workers against the risks arising from EMFs. In 2015, France mandated SAR Radiation Labeling on cell phone packages. In 2016, the European Academy for Environmental Medicine released "EMF Guideline for the prevention, diagnosis and treatment of EMF-related health problems and illnesses." In 2016, the Italian Society for Preventive and Social Pediatrics made an official call to prohibit cell phones for children under 10 years old. In 2009 and 2015, Finland Radiation and Nuclear Safety Authority made recommendations to reduce exposure, especially to children.⁸

Why we are concerned: A Brief History of Wireless Device Proliferation

The more I learn about 5G, the more concerned I become. In 1984 there were 150,000 subscribers worldwide. In 1994, the first mass-produced GSM phone was introduced to the market and there were approximately 55 million subscribers worldwide. In 2019, there were 9 billion mobile connections

⁸ Retrieved from <https://ehtrust.org/policy/international-policy-actions-on-wireless/>.

worldwide, for 7 to 7.5 billion people. In 2019, there were also 23 billion Internet-connected devices worldwide. In the world today, per person, we now have more cell phones than toilets. By 2030, Cisco predicts 500 billion Internet-connected devices (equates to 59 devices per person, given the UN projection of 9.7 billion people). In developed countries, such as Canada and the United States, we will have far more than the average of 59 devices per person. In our immediate world, there will be at least 60 devices per person talking to each other using Wi-Fi or some other frequencies that emit RF radiation.

C4ST Recommendations

A moratorium on 5G and other deployment of microwave radiation infrastructure to which the public is exposed is required until the science shows it is safe. We must shift responsibility to industry to prove technology is safe before it is released to the market. The days have passed where we get to ship something to the market and evaluate it to see if it has an impact. If we consider all the announcements of breaches of private information, the technology industry has lost the public's trust. Finally, we need protection for those with electromagnetic hypersensitivity (EHS) and other vulnerable populations. Neighbours are allowed to install Wi-Fi systems that impact someone next door and there is no recourse. We are educated that if this involved a peanut allergy, it has to be addressed.

Stay current and educated

<https://ehtrust.org/> and <https://www.saferemr.com/> and <http://grassrootsinfo.org/>

Practice Safe Tech

<http://c4st.org/reduce-exposure-from-wireless-transmitting-devices/>

Actual Use vs. Tested Emissions

Most industry warnings are buried several layers inside the cell phone manual. CBC's *Marketplace* published an article along with its episode "The Secret Inside your Cell Phone"—81% of Canadians have not seen the warning message in their phone or manual, 67% of Canadians say they carry their phones in their pocket or directly against their body. All 3 phones tested for the episode had emissions 3 to 4 times above Health Canada guidelines. The National Frequency Agency (ANFR) of France found 90% of the 450 phones tested exceeded guidelines. The percentage increase in SAR from the recommended distance to against the body ranged from 10% to 25%.⁹ When asked about cell phone safety, my industry states, "We meet Federal Guidelines if used correctly."

History – Biological Effects and Setting of US Standard

1885 to 1940: early work on benefits of short-waves and therapy.

1928: with medically accepted applications, debate over thermal and thermal effects "started in earnest."

1929: "the burden of proof still lies on those who claim any biological action of high frequency currents other than heat production."

early 1940s to 1960s: shift in research from medical benefits to military and industrial concerns about hazards to health.

1942: US military concerned about health effects reported by radar workers (headaches, flushing) "... radar was virtually the only source of concern re public health over microwaves until the marketing of microwave ovens."

⁹ (2019, April 11). *Microwave Emissions From Cell Phones Exceed Safety Limits in Europe and the US When Touching the Body*. Retrieved from <https://ieeexplore.ieee.org/document/8688629>.

1996: adoption of US standard for exposure to microwave radiation (based on thermal effects only).¹⁰

C4ST: An example of evidence not assessed by Health Canada

C4ST identified 140 studies that showed harm at levels at, or below, *Safety Code 6* that the Royal Society's Panel omitted in its 2015 report.¹¹ Health Canada ignored all of this evidence-based information but did admit that some of the studies meet their criteria, however, no weight-of-evidence analysis was provided (**Figure 4**, below). When inquiries were made about the reasoning in excluding this evidence, Health Canada provided an unpublished discussion paper "Safety Code 6 (2015) – Rationale" that has no rationale except to cite other authorities.

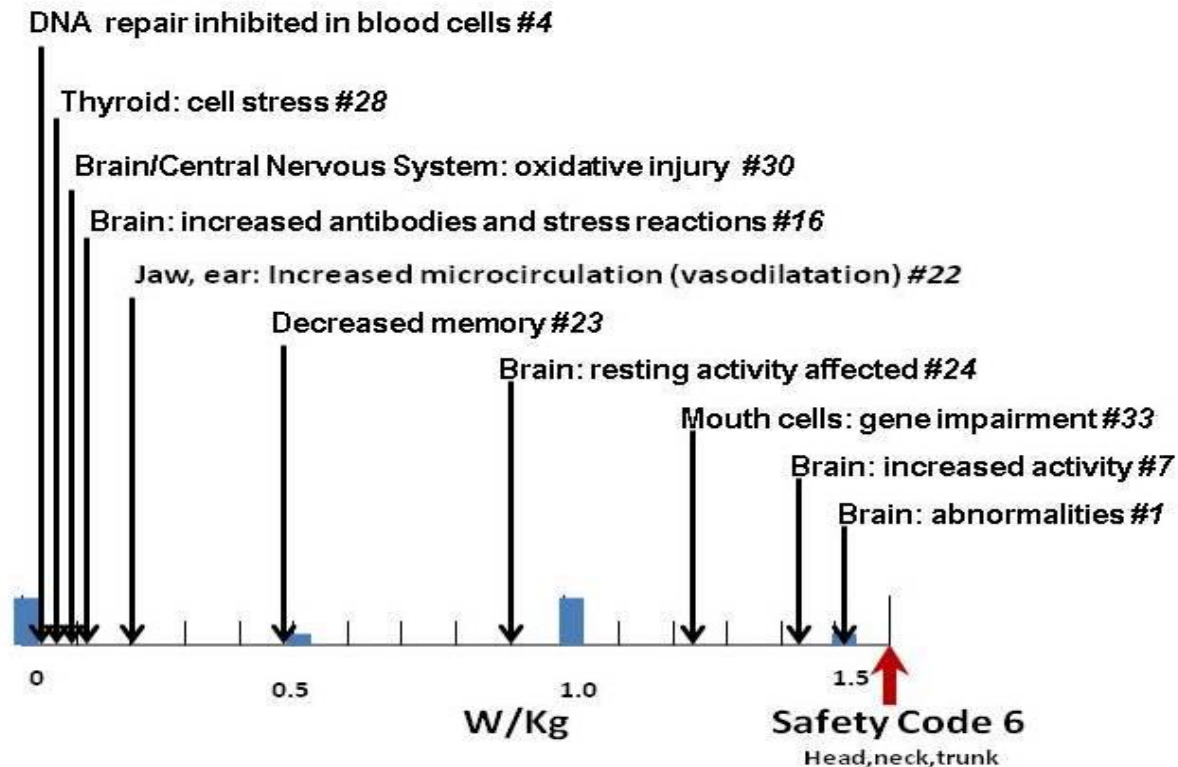


Figure 4: Biological effects deemed “in scope” by Health Canada for which no Weight-of-Evidence analysis has been provided

Safety Code 6 Controversy

External reviewers Dr. Anthony Miller and Martin Blank PhD of the Royal Society of Canada (RSC) 2014 report are critical of lack of adequate revisions to *Safety Code 6* (2009). There are a series of articles by Paul Webster in the *Canadian Medical Association Journal* (CMAJ) that outline some of the issues with the RSC Panel. I list these here:

Webster, P. (2015, June 16). *Scientists decry Canada's outdated Wi-Fi safety rules*. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4467923/>.

¹⁰ Steneck, N. H. (1980, June 13). *The origins of U.S. safety standards for microwave radiation*. Retrieved from <https://science.sciencemag.org/content/208/4449/1230>. Cook, H.J. (2006, August 22). *Early research on the biological effects of microwave radiation: 1940-1960*. Retrieved from <https://www.tandfonline.com/doi/abs/10.1080/00033798000200271>.

¹¹ Friesen, M. (2014, July 15). *Title: Relevant Scientific Studies (140) Omitted by Health Canada in its Scientific Review of Draft Copy Safety Code 6 (2014), Canada's Safety Guidelines for Safe Exposure to Radiofrequency/Microwave Radiation*. Retrieved from <https://www.scribd.com/document/339243061/Friesen-C4ST-Amended-Input-HC-Safety-Code-6-140-Omitted-Studies-224p>.

Webster, P. (2014, June 10). *Federal Wi-Fi safety report is deeply flawed, say experts*. Retrieved from <https://www.cma.ca/content/186/9/E300?rss=1>.

Webster, P. (2013, June 8). *Canadian Medical Association exposes undisclosed conflict of interest with chairman of a wireless safety panel*. Retrieved from <https://www.emfacts.com/2013/06/canadian-medical-association-exposes-undisclosed-conflict-of-interest-with-chairman-of-a-wireless-safety-panel/>.

Thirty-six (36) studies Health Canada determined to be “in scope” for Safety Code 6 Risk Assessment:

1. Ammari (2010). GFAP [Glial Fibrillary Acidic Protein] expression in the rat brain following sub-chronic exposure to a 900 MHz electromagnetic field signal. *International Journal of Radiation Biology*, (France)
2. Augner (2010). Effects of Exposure to GSM Mobile Phone Base Station Signals on Salivary Cortisol, Alpha-Amylase, and Immunoglobulin A. *Biomedical and Environmental Sciences*. (Austria)
3. Bas (2009) 900 MHz electromagnetic field exposure affects qualitative and quantitative features of hippocampal pyramidal cells in the adult female rat. *Brain Research*. (Turkey)
4. Belyaev (2009). Microwaves from Mobile Phones Inhibit 53BP1 Focus Formation in Human Stem Cells Stronger than in Differentiated Cells: Possible Mechanistic Link to Cancer Risk. *Environmental Health Perspectives*. (Sweden)
5. Bouj (2012). Effects of 900 MHz radiofrequency on corticosterone, emotional memory and neuroinflammation in middle-aged rats. *Experimental Gerontology*, 47(6). (France)
6. Byun (2013). Mobile phone use, blood lead levels, and attention deficit hyperactivity symptoms in children: a longitudinal study. *PloS One*. (Korea)
7. Carballo-Quintás (2011). A study of neurotoxic biomarkers, c-fos and GFAP after acute exposure to GSM radiation at 900 MHz in the picrotoxin model of rat brains. *Neurotoxicology*. (Spain)
8. Cervellati (2013). 17- β -estradiol counteracts the effects of high frequency electromagnetic fields on trophoblastic connexins and integrins. *Oxidative Medicine and Cellular Longevity*. (Italy)
9. Céspedes (2010). Radio frequency magnetic field effects on molecular dynamics and iron uptake in cage proteins. *Bioelectromagnetics*, (Japan)
10. Coureau (2014). Mobile phone use and brain tumours in the CERENAT case-control study. *Occupational and Environmental Medicine* (France)
11. Dahmen, (2009). Blood laboratory findings in patients suffering from self-perceived electromagnetic hypersensitivity (EHS). *Bioelectromagnetics*. (Germany)
12. Deshmukh (2013). Detection of Low Level Microwave Radiation Induced Deoxyribonucleic Acid Damage Vis-à-vis Genotoxicity in Brain of Fischer Rats. *Toxicology International* (India)
13. Divan (2010). Cell phone use and behavioural problems in young children. *Journal of Epidemiology & Community Health*. (USA-Denmark data)
14. Esmekaya (2011). 900 MHz pulse-modulated radiofrequency radiation induces oxidative stress on heart, lung, testis and liver tissues. *General Physiology and Biophysics*. (Turkey)
15. Furtado-Filho (2014). Effect of 950 MHz UHF electromagnetic radiation on biomarkers of oxidative damage, metabolism of UFA and antioxidants in the livers of young rats of different ages. *International Journal of Radiation Biology* (Brazil)
16. Grigoriev (2010). Confirmation studies of Soviet research on immunological effects of microwaves: Russian immunology results. *Bioelectromagnetics*. (Russia)
17. Hardell (2013a). Using the Hill viewpoints from 1965 for evaluating strengths of evidence of the risk for brain tumors associated with use of mobile and cordless phones. *Reviews on Environmental Health*. (Sweden)
18. Hardell (2011). Re-analysis of risk for glioma in relation to mobile telephone use: comparison with the results of the Interphone international case-control study. *International Journal of Epidemiology*. (Sweden)
19. Hardell (2013). Pooled analysis of case-control studies on acoustic neuroma diagnosed 1997–2003 and 2007–2009 and use of mobile and cordless phones. *International Journal of Oncology*. (Sweden)

20. Liaginskaia. (2010). [Autoimmune processes after long-term low-level exposure to electromagnetic fields (the results of an experiment). Part 5. Impact of the blood serum from rats exposed to low-level electromagnetic fields on pregnancy, foetus and offspring development of intact female rats]. *Radiatsionnaia biologii, radioecologii / Rossiiskaia akademiia nauk.* (Russia)
21. Liu (2014) Association between mobile phone use and semen quality: a systemic review and meta-analysis. *Andrology.* (China)
22. Loos (2013). Is the effect of mobile phone radiofrequency waves on human skin perfusion non-thermal? *Microcirculation* (France)
23. Lu (2012). Glucose administration attenuates spatial memory deficits induced by chronic low-power-density microwave exposure. *Physiology & Behavior.* (China)
24. Lu (2013). The alteration of spontaneous low frequency oscillations caused by acute electromagnetic fields exposure. *Clinical Neurophysiology: Official Journal of the International Federation of Clinical Neurophysiology.* (China)
25. Maaroufi (2013). Spatial learning, monoamines and oxidative stress in rats exposed to 900MHz electromagnetic field in combination with iron overload. *Behavioural Brain Research.* (France)
26. Maskey (2010). Effect of 835 MHz radiofrequency radiation exposure on calcium binding proteins in the hippocampus of the mouse brain. *Brain Research.* (South Korea)
27. Megha (2012). Microwave radiation induced oxidative stress, cognitive impairment and inflammation in brain of Fischer rats. *Indian Journal of Experimental Biology.* (India)
28. Misa Agustino (2012). Electromagnetic fields at 2.45 GHz trigger changes in heat shock proteins 90 and 70 without altering apoptotic activity in rat thyroid gland. *Biology Open* (Spain)
29. Moretti (2013). In-vitro exposure of neuronal networks to the GSM-1800 signal. *Bioelectromagnetics* (France)
30. Naziroğlu (2012). Melatonin modulates wireless (2.45 GHz)-induced oxidative injury through TRPM2 and voltage gated Ca (2+) channels in brain and dorsal root ganglion in rat. *Physiology & Behavior.* (Turkey)
31. Ni (2013). Study of oxidative stress in human lens epithelial cells exposed to 1.8 GHz radiofrequency fields. *PloS On* (China)
32. Sonmez (2010). Purkinje cell number decreases in the adult female rat cerebellum following exposure to 900 MHz electromagnetic field. *Brain Research.* (Turkey)
33. Souza (2014). Assessment of nuclear abnormalities in exfoliated cells from the oral epithelium of mobile phone users. *Electromagnetic Biology and Medicine.* (Brazil)
34. Valbonesi (2014). Effects of the exposure to intermittent 1.8 GHz radio frequency electromagnetic fields on HSP70 expression and MAPK signaling pathways in PC12 cells. *International Journal of Radiation Biology* (Italy)
35. West (2013). Multifocal breast cancer in young women with prolonged contact between their breasts and their cellular phones. *Case Reports in Medicine.* (USA)
36. Zhang (2013). Effects of 1.8 GHz radiofrequency radiation on protein expression in human lens epithelial cells. *Human & Experimental Toxicology.* (China)
36. Zhang (2013). Effects of 1.8 GHz radiofrequency radiation on protein expression in human lens epithelial cells. *Human & Experimental Toxicology.* (China)

Wireless Justice from Precaution to Prevention

André Fauteux

Editor/Publisher, *La Maison du 21^e siècle* magazine (www.maisonsaine.ca/english)

Abstract

As a political scientist and a journalist, it has become apparent to me that major Canadian media does not adequately address electromagnetic pollution and health. While other countries are taking action via the implementation of guidelines and limits, Canada is lagging behind. Now with the arrival of 5G, industry and governments are pushing ahead with the installation, while citizens and advocates, who fear for their health, are fighting against it. Cancers have been directly linked to radiofrequency radiation and microwave exposures, and now is the time for dialogue around ethics and social responsibility during this wave of flagrant capitalism.

Introduction

I have been writing about healthy housing and sustainable housing since 1989 and EMFs since 1992. I am a political scientist and also a journalist. I was a reporter at the *Montreal Gazette* in 1988 and have been publisher of *La Maison du 21^e siècle* magazine (maisonsaine.ca/electrosmog) since 1994. Therefore, I am not a pure scientist, nor a legal expert.¹

We need to understand why the major media are not covering the issue of electromagnetic pollution properly. We have a few examples where I am based in Quebec with Videotron, which has the TVA TV network. Telecoms often control big media:

- Comcast (Xfinity wireless): NBC
- AT&T: Warner Bros, CNN
- Videotron: TVA in Québec
- Rogers: Macleans/L'actualité.

It is not surprising that these organizations do not cover EMFs and health as well as publications such as Newsweek (with fewer telecom connections) has done in the US.

It is clear from my vantage that Canada's *Safety Code 6* is outdated and that there is a trail of global evidence that supports the fact that EMFs present a health risk and that EHS is a demonstrable medical condition. For example, the American FDA, EPA, and NIOSH have said that the American FCC standards—equivalent to *Safety Code 6*—were outdated² because of what we have long known about non-thermal effects of radiofrequency radiation on living systems. The New York Supreme Court in 1982 recognized radio wave sickness. Electrosensitivity was actually first diagnosed in 1932. In the court of Rome, in the 1990s, Radio Vatican owned the most powerful FM antenna in the world. It was convicted for causing cancers in their neighbors. The Cardinal responsible for Radio Vatican was not jailed. However, the station was obliged to lower the power of the antennas and later dismantled them. In 2000, eight Nordic countries in Europe, including Sweden, as the "Nordic Council of Ministers" recognized EHS as "electromagnetic intolerance," saying that symptoms disappear in non-electrical environments.

¹ See the book *Cell Phone Task Force* by Arthur Firstenberg for an overview of the history of EMF.

² <https://www.cellphonetaskforce.org/governments-and-organizations-that-ban-or-warn-against-wireless-technology/>

Other early warnings

- 2007: European Environmental Agency, Europe's top environmental watchdog, calls for immediate action to reduce exposure to radiation from Wi-Fi, mobile phones, and their masts.³
- 2008: International Commission on Electromagnetic Safety (composed of scientists from 16 nations) recommends limiting cell phone use by children, teenagers, pregnant women, and the elderly.⁴
- 2008: Paris, France removes Wi-Fi from four public libraries because of health concerns.⁵
- 2008: Russian National Committee for Non-Ionizing Radiation Protection warns that cell phones are unsafe even for short conversations. Children under 16, pregnant women, epileptics, and people with memory loss, sleep disorders, and neurological diseases should never use cell phones.⁶
- 2010: French Parliament passes a law that prohibits advertising cell phones to children under 14, prohibits children up to age 14 from using cell phones in pre-schools and public schools, and requires cell phones to be labeled with SAR values and a recommendation to use headsets.⁷
- 2011: Council of Europe passes a Resolution recommending wired Internet connections in schools and the creation of radiation-free zones to protect electrosensitive people.⁸
- 2011: The Israeli Ministry of Education publishes guidelines strictly limiting the use of mobile phones on all school grounds, citing children's and youths' increased risk of malignant tumours and the "passive exposure" experienced by children who do not use phones.⁹

Some Elements of the Canadian Context

In 2008, Toronto adopted a policy of "prudent avoidance" for cell towers on city lands, mandating that telecom companies installing new cell towers keep radiation levels 100 times below the *Safety Code 6* limit. For its part, Quebec was the first province to ban cosmetic use of pesticides based on the precautionary principle. In 2016, in *Rogers vs. Chateauguay*, citizens tried to block a cell tower based on the precautionary principle, mentioning health effects. However, the Supreme Court ruled that municipalities cannot act on the precautionary principle. However, my opinion is that this is a mis-ruling as their decision should take into an account a 2001 ruling that cities can protect citizens' health.

Montreal lawyer Charles O'Brien, and others, attempted to launch a class action lawsuit, which was rejected and called frivolous by the judge. It was quite ambitious because the plaintiffs were suing the Attorney Generals of Canada and Quebec, Hydro Quebec, several municipalities, the entire telecommunications industry, and others in the transportation and tourism industries. Hopefully, other lawsuits will follow and will be accepted by the court. In November 2019, O'Brien filed a new class action alleging Apple and Samsung cell phones exceed radiofrequency radiation limits by up to 500%, based on French government tests.¹⁰

Recently, there was an article in the *Journal de Montréal* daily saying that 40,000 to 60,000 antennas or small cell antennas would be required by 5G technology just for the island of Montreal.¹¹ Experts suspect antennas could be placed every two to ten houses.¹²

³ http://www.nzherald.co.nz/world/news/article.cfm?c_id=2&objectid=10463870

⁴ <http://www.icems.eu/resolution.htm>

⁵ <https://lavieverte.wordpress.com/2008/05/23/public-libraries-in-paris-shut-down-wifi-in-response-to-health-worries/>

⁶ <https://www.who.int/peh-emf/project/mapnatreps/RUSSIA%20report%202008.pdf>

⁷ <https://www.ewg.org/enviroblog/2010/12/french-law-informs-protects-cell-phone-users>

⁸ <https://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=17994>

⁹ <http://norad4u.blogspot.com/2011/09/israeli-ministry-of-education-is-going.html>

¹⁰ <https://topclassactions.com/lawsuit-settlements/consumer-products/electronics/canada-apple-samsung-class-action-alleges-radiation-exposure-from-phones/>

¹¹ <https://www.journaldemontreal.com/2019/05/28/reseau-5g-jusqua-60-000-antennes-seraient-necessaires-a-montreal>

¹² <https://mdsafetech.org/problems/5g/>

The *Canadian Medical Association Journal* quotes Swedish oncologist and epidemiologist Dr. Lennart Hardell, who says, speaking of the 5G matter, “This is a disaster to public health.”¹³ I met Dr. Hardell in Brussels in 2015, where I was invited to cover an EHS/MCS conference featuring several EMF and health experts. Dr. Hardell reminded me that since the late ‘70s, he was one of the first scientists to publish on the carcinogenicity of dioxin and later PCBs, glyphosate (or Roundup), and, more lately, cell phones. Industry continues to attack the credibility of independent scientists who speak inconvenient truths and to finance those whose work sows more doubt about EMF health effects.

A Representative Comparison of European and other International Standards

Government and industry RF exposure limits, ranging between 41 and 61 volts per meter for 900 and 1800 MHz frequencies (<https://www.saferemr.com/2018/>), are influenced by politics and lobbying. Yet even at the 6 V/m precautionary level targeted in certain European cities, mitochondria are damaged and significant memory loss occurs. Several studies have shown the levels should be 100 times lower, or 0.6 V/m, as recommended by the BioInitiative Working Group and the Austrian Medical Association.

The Dutch government compared international policies on EMF. A first group of countries has set legal limits derived from a non-binding EU recommendation, and there is a precautionary policy in some countries. Group two, which includes Austria, Sweden, and the UK, has no legal limits or limits less strict than the EU recommendation, with a precautionary policy in some countries. The third group has stricter limits than in the EU recommendation, and includes Italy and Poland.¹⁴

China has a national environmental protection law which sets limits for environmental exposure of EMFs, but it does not apply to wireless communication terminal equipment.

India has a limit 33% of the reference levels in the EU recommendation for electric and magnetic field strength and 10% for power density. In 2013, Mumbai, India, a city of 20 million, banned cell towers near schools, colleges, and hospitals and ordered existing towers in those locations to be removed.

In France, several occupational and disability tribunals have recognized EHS since 2013. Marine Richard was the first French citizen to be compensated for EHS. In the US, the *Americans with Disabilities Act* (ADA) for access for people with disabilities, as well as the Quebec and Canadian Human Rights Commissions, recognize EHS as a *bona fide* disability.

Laurence Abeille is a Green politician who proposed France’s Law No. 2015-136 of 9 February 2015, known as the “Abeille” law, relating to sobriety, transparency, information, and consultation on exposure to electromagnetic waves, and it reinforces the role of mayors:

- Mayors of municipalities receive and make publicly available information files transmitted by radio station operators for the implementation or substantial modification of a site;
- Mayors may require a simulation of the exposure to waves emitted by a facility before it is installed;
- Mayors may require an inventory of existing facilities.

Wireless access to the Internet in France includes the following forms of regulation and practice:

- Public buildings such as town halls and libraries offering public Wi-Fi access must mention this fact clearly by means of a pictogram in the entrance.
- The law prohibits Wi-Fi in spaces dedicated to reception, rest, and activities of children under 3 years of age.

¹³ <https://lennarthardellenglish.wordpress.com/>

¹⁴ See National Institute for Health and the Environment Report: <https://www.rivm.nl/sites/default/files/2018-11/Comparison%20of%20international%20policies%20on%20electromagnetic%20fields%202018.pdf>.

- In primary school classes where the municipality has installed Wi-Fi, it must be shut off when it is not used for educational activities. For any new installation, the municipality must inform the school council beforehand.
- Local elected representatives will be represented on the national committee of dialogue on the level of public exposure, under the aegis of the ANFR.

In 2015 in Brussels, I met with Jean Huss, the European Parliament elect who was behind the Council of Europe's Resolution 1815 on EMF Potential Health Risks, which was adopted unanimously. He explained it was not influenced by lobbying but rather was science-based, the work of independent scientists, and then recommended to all the Ministers of different EU countries. Resolution 1815 should be read by all politicians, and doctors. The information is well summed up in that paper, which mentions, notably, protecting the electrosensitive.

Four Swiss Cantons have opposed 5G technology rollout with independent studies on its possible health and other effects. Currently, its RF exposure limits are about 10% of the EU recommendation for sensitive places such as apartments, schools, and children's playgrounds near mobile phone antennas. Switzerland, while far from perfect, has a better than average record of trying to apply precautionary limits.

Israel is another leading the reduction, or prudent avoidance, of wireless exposure in schools. The Israeli Ministry of Education is involved, but there is a debate about how it is being implemented. At the very least they are discussing EMF exposure and taking measures, but parents, teachers, everyone has to exert more pressure to make sure that it is being applied.

Taiwan removed 1,500 cell towers in 2007; and now parents can be fined the equivalent of \$1,600 US dollars if a child under the age of 2 is using a tablet computer.

US, 6 February 2019:	US Senator Blumenthal definitively establishes that no safety studies have been done on 5G. At least 21 US cities/regions have passed ordinances restricting “small cell” installation, and many are charging “recertification fees” to make it unprofitable for the wireless industry.
USA, 24 March 2019:	Portland Oregon city officials state clear opposition to the installation of 5G networks around the city, supported by the mayor and two commissioners.
Italy, 28 March 2019:	Florence applies the precautionary principle , refusing permissions for 5G and referring to “the ambiguity and the uncertainty of supranational bodies and private bodies (like ICNIRP)”, which “have very different positions from each other, despite the huge evidence of published studies”.
Italy, 28 March 2019:	One Roman district votes against 5G trials , with others expected to follow. Other motions to Stop 5G are expected in the four regional councils, one provincial council and other municipal councils of Italy.
Russia, 28 March 2019:	The Russian Ministry of Defense refuses to transfer frequencies for 5G , which effectively delays any 5G rollout there for several years.
Belgium, 31 March 2019:	The Belgian Environment Minister announces that Brussels is halting its 5G rollout plans , saying, “The people of Brussels are not guinea pigs whose health I can sell at a profit.”
Germany, 4 April 2019:	Germans sign a petition en masse to force the German Bundestag to debate 5G .
Netherlands, 4 April 2019:	Members of Parliament in the Netherlands insist that radiation research must be carried out before any approval of the 5G network.
USA, 5 April 2019:	California Supreme Court Justices unanimously uphold a 2011 San Francisco ordinance requiring telecommunications companies to get permits before placing antennas on city infrastructure.
Switzerland, 9 April 2019:	The Canton of Vaud adopts a resolution calling for a moratorium on 5G antennas until the publication this summer of a report on 5G by the Swiss Federal Office for the Environment.

Table 1

Other Recent Actions Against 5G

The Russian National Committee on Non-Ionizing Radiation Protection is calling for the release of new EMF hazard warning signs for wireless users of mobile phones and other EMF sources.¹⁵

More than 20 US cities and regions are currently fighting 5G. Overall, property values will likely be affected. In many ways 5G is an unprecedented attack on local control. States such as New Hampshire and Montana, and cities such as Hallandale Beach, Florida and Greendale, Wisconsin, are fighting this in the US, while the federal government is basing its actions on the *Telecommunications Act of 1996*, so that no one can prevent towers going up based on environmental safety. There is an ongoing debate as to

¹⁵ <https://www.radiationresearch.org/articles/new-russian-list-of-emf-hazard-and-prohibition-signs-for-wireless-users-and-general-public/>

whether health is included in this *Act*, as it is not explicitly mentioned. Susan Clark, a Harvard Graduate, is quoted as saying that environmental effects do not include health effects:

All pre-emption law is black-letter law not susceptible to alteration, modification, or interpretation beyond that “black letter.” In brief, the actual term in that Section is “environmental effects,” not merely “environment.” And as you well know, “health” does not appear at all. “Environmental” is defined as what is outside, beyond, or not the human body. Therefore, any claim that “environmental effects” includes “health effects” should be thrown out the window as outrageous.

Other US Actions Against Wireless Radiation

Arthur Firstenberg and the Santa Fe Alliance for Public Health and Safety sued the city of Santa Fe, New Mexico for its failure to protect its citizens from EMFs.

Massachusetts is leading the nation with five bills to protect and inform citizens. Notably, it is looking at the effects of smart meters and informing scientists, as well as the public, about the effects of exposure.

The proposed Maine Wireless Act, Bill LD1030, which was not adopted, would have been the strictest in the nation, requiring manufacturers to provide information on radiofrequency exposure, and for it to be visible on the outside of cell phone product packaging. San Francisco, California did it, but the law was struck down. Berkeley, California came up with another municipal law, a “Right to Know” ordinance, but was successfully defeated by the industry. Berkeley’s “Right to Know” ordinance survived industry challenges right up to the US Supreme Court.

Acoustic neuroma and glioma (the deadliest form of brain cancer) have been linked directly to cell phone use on the same side of the head for many years. Many courts are increasingly taking into account duration of exposure—revealing the literature is sufficient for a causal link for these tribunals, even in the absence of clear conclusive scientific evidence. I hope that other tribunals around the world will look at these judgments. There have been five decisions already from national courts in Italy. In 2012 and 2017, two Italian workers were compensated (notably by Italy’s Supreme Court) for brain tumors that developed after they spent years using a cell phone 4 to 6 hours a day for up to 15 years.

It should be noted that in the insurance industry, underwriters at Lloyd’s have refused “[t]o insure mobile phone manufacturers against the risk of damage to users health.”¹⁶ Sooner or later, there will be major convictions, and the industry will have to pay. This is why the insurance companies refuse to cover these risks, specifically the link between mobile phones and brain tumours.

¹⁶ <https://www.theguardian.com/uk/1999/apr/11/sarahryle.theobserver>

Using Law and Advocacy to win Accommodations for Clients with Electromagnetic Hypersensitivity (EHS)^{1,2}

David McRobert³

Abstract

Electromagnetic hypersensitivity (EHS) is explicitly recognized as a disability in many nations. However, individuals with EHS who make disability claims often are not accommodated by employers or service providers and tend to have limited success in the legal system. This paper provides an analysis of legal protections available in Canada for those living with EHS, and discusses the relationship between law, scientific advances, and the role of metapolicy in developing preventative policies that protect vulnerable persons and overall populations. The paper deals with, amongst other things, the role played by medical professionals in providing accommodation for EHS.

Recognizing and validating EHS is challenging for a number of reasons. Electromagnetic fields (EMF) and electromagnetic radiation (EMR) are odourless and invisible, and there are numerous sources of it in homes, workplaces, and public spaces. Thus, professional electromagnetic surveys are typically needed to identify sources of EMF and EMR. Industry experts and some medical specialists have argued that EHS cannot be diagnosed using traditional physiological techniques due to psychological factors, the range of non-specific symptoms, and a resemblance of symptoms to those associated with illnesses such as multiple chemical sensitivities (MCS). Consequently, there is a great deal of skepticism towards EHS, especially amongst industry-employed professionals, engineers, and scientists, as well as many medical experts, judges, and lawyers. These factors often present problems for the Canadian courts and tribunals when considering medical evidence on EHS. Establishing proof of a workplace-related triggering exposure is a key difficulty in EHS cases due to variations in reaction severity—even between several EHS-impacted employees—and because symptoms tend not to cease when the workplace source is removed.

Many of the frustrations that EHS advocates experience with legal and policy systems are related to meta-policies, particularly related to prevention of health impacts and requisite standards of evidence. For instance, Health Canada's official position is that there is no scientific evidence connecting EMF exposure to the symptoms attributed to EHS, raising the question of whether this stance is truly reflective of evidence. Telecommunications companies seeking to expand markets for new devices and 5G technology have also shaped current EMF/EHS meta-policy, resulting in growing levels of EMFs in public and shared spaces.

¹ This paper is not legal advice and only provides general information about how the legal system can be used. Patients seeking specific legal advice should contact the Lawyer Referral Service of the Law Society of Ontario or appropriate organization in their jurisdiction and retain a lawyer.

² The author gratefully acknowledges the work of Dr. Meg Sears, Chair of Prevent Cancer Now, past and current clients, and Canadian medical researchers in preparing this presentation.

³ The author is an environmental lawyer based in southern Ontario, and retired Adjunct Professor. He was pro-bono counsel on the Board of the Wireless Radiation Safety Council of Canada from 2011 to 2013. He has worked with numerous clients on a range of wireless radiation safety, air pollution, water pollution, and chemical sensitivity issues. David served for 16 years as In-House Counsel and Senior Policy Advisor at the Environmental Commissioner of Ontario. David has a BSc in Biology and a Master's in Environmental Studies on Biological Conservation. He graduated from Osgoode Hall Law School, undertook graduate law studies, and was admitted to the Ontario Bar in 1990. David taught law to undergraduate and graduate students at York University, Osgoode Hall Law School, the University of Toronto and Humber College between 1987 and 2011. He has published dozens of books, journal articles, and articles. Book titles include *Risky Business: A Guide to the Use, Handling and Transportation of Asbestos* and *My Municipal Recycling System Made Me Fat and Sick*.

Addressing alleged injury caused by toxic substances through tort lawsuits faces several challenges including: 1) identifying pathways, 2) calibrating dosages, 3) difficult diagnoses due to long latency periods, and 4) a duty on potential plaintiffs of workplace or health insurance claimants to mitigate harm. Many EHS tort cases are addressed through insurance programs when available. Some cases involving workplace exposures are also submitted to the Ontario Workplace Safety and Insurance Board (WSIB), which has consistently refused to recognize EHS claims as legitimate disabilities. Accommodations for EHS claimants are typically achieved through government legislation that protects the rights of individuals with ongoing disabilities and/or health impacts. These accommodations can raise conflicts due to competing rights, making creativity and a willingness to compromise essential in the development process. The *Accessibility for Ontarians with Disabilities Act* (AODA) was expected to significantly advance accessibility in Ontario. However, it is unclear whether any of the committees created through the AODA are examining accessibility standards for individuals suffering from EHS or similar conditions. The good news is that in several cases, organizations, public utility providers, landlords, and workplaces have been adopting a range of measures and accommodations for EHS-sensitive individuals. The bad news is that these individuals often have to make persistent efforts to obtain these modest accommodations.

In the absence of constitutional amendments, mirror laws can address the regulatory and jurisdictional gaps that arise in the Canadian context and mitigate harms related to EMF/EMR, though this would have to be developed on the basis of sound meta-policies. Practical accommodation options that consider competing rights can be used in the short term. In the long run, development of well thought-out EMF/EMR meta-policies and related laws and policies preventing EHS would be an excellent place to start.

Introduction

A growing number of residents in many developed nations are adversely affected by electromagnetic radiation (EMR), electromagnetic fields (EMFs), and related phenomena. While some individuals report mild to moderate symptoms and mitigate the effects by avoiding the fields and radiation sources as best they can, others are so severely affected that they cease work and change their entire lifestyle.⁴ This illness is referred to as “electromagnetic hypersensitivity” or EHS and now is explicitly recognized as a disability in many nations.

The World Health Organization⁵ defines EHS as “...a phenomenon where individuals experience adverse health effects while using or being in the vicinity of devices emanating electric, magnetic, or electromagnetic fields (EMFs)... This reputed sensitivity to EMF has been generally termed “electromagnetic hypersensitivity” or EHS.”

The symptoms most commonly experienced include, “dermatological symptoms (redness, tingling, and burning sensations) as well as neurasthenic and vegetative symptoms (fatigue, tiredness, concentration difficulties, dizziness, nausea, heart palpitation, and digestive disturbances). The collection of symptoms is not part of any recognized syndrome.”

Many individuals and potential clients are suffering from EHS—they come to lawyers with evidence of harm, and allege employers or service providers have failed to accommodate their disabilities by reducing electromagnetic field (EMF) exposure. Their success in having laws and the legal system address their concerns tends to be limited, even when they have ample financial resources. There also tends to be a degree of skepticism about EHS, especially amongst engineers and scientists employed by industry, many medical experts, and many judges and lawyers. These potential clients and their advocates working in the

⁴ Dr. Margaret Sears, “The Medical Perspective on Environmental Sensitivities,” Report prepared for the Canadian Human Rights Commission, May 2007. <https://www.chrc-ccdp.gc.ca/eng/content/medical-perspective-environmental-sensitivities>

⁵ World Health Organization, Electromagnetic fields and public health: Electromagnetic hypersensitivity, Background, December 2005. <https://www.who.int/peh-emf/publications/facts/fs296/en/>

medical, health, and legal fields find they must battle for institutional recognition of EMF disability rights and challenge the power of industries and government agencies that attempt to downplay the potential risks to the public posed by new and existing wireless technologies.

EMF and electromagnetic radiation (EMR) sources are numerous but typically include cell towers, wireless equipment, and personal devices such as cell phones, tablets, and laptops. Electric and magnetic fields also are generated by household wiring, lighting, and electrical appliances such as microwave ovens, hair dryers, and toasters. Other common sources include computer monitors, photocopiers, fax machines, and fluorescent lights. Power lines and electric tools also emit EMFs. Some medical applications of EMFs include short-wave diathermy and magnetic resonance imaging (MRI). Electrical currents and fields also arise as “stray voltage” from inadequate grounding of buried cables and wiring. Patients and litigants also suggest that wind turbines cause EHS. While historical exposures were generally several orders of magnitude under the limits in internationally accepted standards, there is growing evidence that more recent chronic exposures sometimes exceed them.⁶

Nonetheless, technological “fixes” and providing accommodations can be simple and effective in certain circumstances. Professional electromagnetic surveys can identify sources of lower frequencies such as power lines, improperly wired circuits (e.g., with ground return), and fluorescent lights, as well as sources of higher frequencies, such as computers or the “Internet of Things.” Wireless systems can be replaced with wired ones, returning organizations to configurations typical in homes and workplaces in the 1990s and 2000s.

Addressing the health impacts of EMFs or radiation presents challenges, as these EMFs cannot be seen and have no odour. This often presents problems for the courts and tribunals as procedural and substantive rights related to traditional disabilities such as mobility, visual, and hearing impairments continue to evolve in developed nations.⁷

Accordingly, the Canadian courts and tribunals are struggling with medical evidence on EHS and other sensitivities. Experts retained by industries involved in causing EMFs often argue that EHS has a large psychological component and resembles multiple chemical sensitivities (MCS), a disorder associated with environmental exposures to chemicals. Moreover, for the past 15 to 20 years many government regulators and industry officials have argued that both EHS and MCS are characterized by a range of non-specific symptoms that cannot be independently verified using traditional toxicological or physiological techniques.⁸

In contrast, the courts regularly award damages for mould in real estate cases because reductions in property value can be quantified using accepted techniques that have been developed by real estate and property appraisal experts since about 1900. At the same time, the courts struggle with making damage awards to litigants on the basis that moulds can synergistically help to cause Multiple Chemical Sensitivities (MCS) and/or Environmental Sensitivities (ES) or depression, despite strong evidence that biochemical mechanisms of mycotoxins can spur MCS and ES.⁹

⁶ See, for example, some of the presentations made at the conference on EHS and EMF at Women’s College Hospital on 31 May 2019.

⁷ Lisa Vanhala, *Making Rights a Reality?: Disability Rights Activists and Legal Mobilization*. Cambridge Disability Law and Policy Series (2011). Cambridge University Press. ISBN 9781107000872

⁸ According to Dr. Meg Sears, scientific thinking and regulator attitudes in Ontario about MCS and EHS took a progressive leap forward when the Ontario government established an MCS task force. Sears reports she has worked on presentations about MCS with EHAQ recently and this work has resulted in more positive views about EHS science as well. Personal Communication to author, Dr. Meg Sears, 10 Jan. 2020.

⁹ It has been estimated by environmental health experts that 3 to 5% of Canadians have been diagnosed with Environmental Sensitivities. People with this condition become extremely sick with even slight exposures to everyday chemicals such as fabric softeners, flame retardants, and pesticides. In 2007, Sears estimated that 3% of Canadians were affected by ES: See Dr. Margaret Sears, “The Medical Perspective on Environmental Sensitivities,” Report prepared for the Canadian Human Rights Commission, May 2007. <https://www.chrc-ccdp.gc.ca/eng/content/medical-perspective-environmental-sensitivities>; Personal Communication, Dr. Meg Sears, Prevent Cancer Now, May 2019.

Yet, despite institutional reluctance to recognize the health effects of EMFs and EMR, there are many signs of severe implications of electromagnetic fields. These include:

- Biological effects can be measured at radiation levels thousands of times below current standards; and
- Electromagnetic “smog” levels are increasing rapidly (orders of magnitude more coming with 5G technology).

The extent of EMF in the city of Salt Lake City in surveys undertaken in 2010s is represented in **Figure 1**. This figure shows the results of modeling of electromagnetic fields in Salt Lake City and illustrates peaks from telecommunications point sources and reflections.¹⁰

Law, Science, and Meta-policy

Communities and researchers pushing back against regulators and arguing that EMFs and EMR are sources of serious health impacts are at the edge of paradigm shifts in both law and science, carrying out novel science, exploring new biochemical and biological phenomena and connections, and advocating for new ideas.

Law and science share common features: both claim authority over evidence and conclusions; both claim a monopoly over what counts as “rational”; both claim what counts to be a credible witness. “Normal” science and law are seemingly decentralized, yet both activities are subject to financial forces and particular values and biases despite varying claims of degrees of objectivity by their practitioners.

Unlike law reform processes or court decision making, science is largely independently verifiable by replication or re-examination of original data and flawed decision-making is open to self-correction. Fundamental laws of nature are immutable (though our understanding improves over time), whereas court decisions and laws are human-made, mutable, and even reversible at the stroke of a pen.

Both science and law strive to function on the basis of core principles such as accountability and transparency, but law reform and court decision-making processes are more vulnerable to ideological pressures because of the constant interaction between political, social, and legal systems. Consequently, law reform can fail to achieve its intended objectives.

Some key roles of the courts and tribunals¹¹ include: 1) to deconstruct experts and limit abuse of science by powerful actors such as corporations and government agencies; 2) to educate the public through civic education about reasonable behaviour; and 3) to redress wrongs and address some of the problems inherent in government decision-making systems by permitting judicial reviews by the courts, which can overturn decisions. At the same time, it is important to bear in mind that the courts cannot offer miracle cures, and difficult and complex cases often result in bad court precedents.

Differences between law and science include that law strives for closure, while science advances through hypothesis testing—as argued by Sir Karl Popper and others.¹² Fact-finding in law is designed to

¹⁰ Note that this modelling work was undertaken in the early 2010s. Levels would be much higher now, and are projected to increase significantly in the coming years as 5G infrastructure is implemented.

¹¹ Relevant administrative tribunals and adjudicators include: the Canadian Human Rights Commission, Human Rights Tribunal of Ontario (HRTO), Workplace Safety and Insurance Board (WSIB), Ontario Landlord and Tenant Board (OLTB), Environmental Review Tribunal (ERT), Ontario Ministry of Labour – OHS. Other Canadian Tribunals include: provincial and federal Worker Compensation agencies, Landlord and Tenant Board, Employment, Federal Dept. of Labour, arbitrators, mediators, and special commissioners or appointees. There are also agencies like Canada Revenue, which make decisions that have a bearing, such as **providing access to funds if you have a disability**.

¹² See, for example, M. Wilkinson, Testing the null hypothesis: the forgotten legacy of Karl Popper?, *J Sports Sci.* 2013;31(9):919–20. doi: 10.1080/02640414.2012.753636. Epub 2012 Dec 19. As explained in the abstract for the paper, “[t]esting of the null hypothesis is a fundamental aspect of the scientific method and has its basis in the falsification theory of Karl Popper. Null hypothesis testing makes use of deductive reasoning to ensure that the truth of conclusions is irrefutable. In contrast, attempting to

persuade in short-term, but this is not so in science. Litigation and law reform are often based on narratives created by lawyers and public relations (PR) experts, while science advances through new evidence that can usher in paradigm shifts.¹³

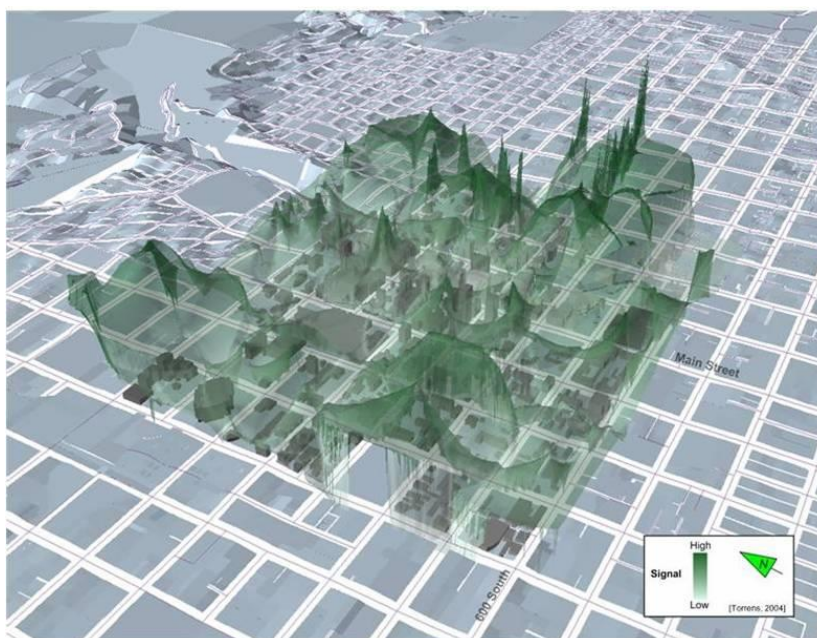


Figure 1: This figure shows the extent and results of modeling of electromagnetic fields in Salt Lake City and illustrates peaks from telecommunications point sources and reflections.

Legal rules often are not “scientific” because the courts and regulators have to take into account uncertainty and conflicting evidence. One key consideration is that law relies on the concept of precedent. Precedent seeks to provide residents, business and property owners, financial investors, and other organizations with reassurance about the stability of rules in legal decisions on property, contracts, and torts and security and confidence about our legal and political systems. As such, the legal system is loyal to concepts of equity and justice in ways that can seem counterfactual and illogical (and even seemingly unethical), while striving to be consistent with historical patterns.

In essence, our legal and government decision-making systems tend to be based on “meta-policies.” Meta-policies can be defined as policies on how to make policies.¹⁴ As such, they deal with: 1) the characteristics of policymaking systems (structure, process patterns, personnel, inputs, and stipulated outputs); and 2) master policies (strategies, overall goals, basic assumptions, conceptual frameworks, policy instruments, and similar inter-policy directives). One of the main utilities of the concept of meta-policy is to stimulate research, study, contemplation, design, and analysis focusing explicitly on the meta-policy level. Meta-policies also can provide a framework that sets out to define the range of compliance

demonstrate the new facts on the basis of testing the experimental or research hypothesis makes use of inductive reasoning and is prone to the problem of the Uniformity of Nature assumption described by David Hume in the eighteenth century. Despite this issue and the well documented solution provided by Popper's falsification theory, the majority of publications are still written such that they suggest the research hypothesis is being tested. This is contrary to accepted scientific convention and possibly highlights a poor understanding of the application of conventional significance-based data analysis approaches.” Research on health policy should be driven by conjecture and attempted falsification such that it is always the null hypothesis that is tested. The write up of our EMF and EHS research studies should make it clear that we are indeed testing the null hypothesis and conforming to the established and accepted philosophical conventions of the scientific method.

¹³ Thomas Kuhn, *The Structure of Scientific Revolutions*, 1962.

¹⁴ Yehezkel Dror, *Social Science Metapolicy: Some Concepts and Applications*. Santa Monica, CA: RAND Corporation, 1970. <https://www.rand.org/pubs/papers/P4372.html>. Also available in print form.

documents (e.g., regulations, policies, procedures, protocols) and establishes a classification system which groups them (e.g., financial, information technology). In addition, meta-policy should identify and describe the processes by which the compliance documents are developed, reviewed, and made available to stakeholders.

Meta-policies underpin laws and policies

When activists and advocates for law reform criticize or challenge particular laws or policies, it often is because they disagree with overarching meta-policies shaping those laws and policies. Reliance on science and evidence and long-term prevention goals must inform the core meta-policies underpinning laws on EMF to prevent EHS illnesses. For example, those advocates wishing to change a specific policy or address a regulatory challenge such as the use of wireless devices and Wi-Fi in hospitals, arguably, have to deconstruct the meta-policies and values underlying the current policies and practices.

Many of the frustrations that EHS advocates experience with Canadian legal and policy systems are related to incomplete and dated meta-policies that do not seem to be based on scientific evidence and the core values of prevention of health impacts and diseases such as cancer. For instance, Canada's current meta-policy governing health care emphasizes expenditures on treatment to the detriment of investments in preventative care and education. Prevention and lifestyle change must become the meta-policy for health care in the long run because treatment is extremely expensive. Currently, both prevention and treatment must occur simultaneously. In the past 50 years, there have been numerous efforts to shift the policy framework for the health care system to place more emphasis on prevention and less on treatment.¹⁵ One of the first concerted policy efforts was the report prepared for then-federal Health Minister Marc Lalonde.¹⁶ ("Lalonde report") This Report was prepared in 1973 by a former Deputy Minister asked to draft an overarching policy on health care for Canada that stressed the importance of prevention. The report, and subsequent reports, have noted that implementing prevention also is challenging because the overall health care system faces significant funding constraints, limited access to educational resources to retrain existing professionals, communication barriers, and other challenges.

With respect to the specific health threats posed by EMR/EMF and the causes of EHS, the effective Canadian policy (and by default Canada's meta-policy) was articulated by Health Canada¹⁷ in 2009:

The causes of these symptoms are unclear. There are suggestions that they might arise from environmental factors unrelated to EMFs (e.g. "flicker" from fluorescent lights or glare and other visual problems with computer monitors). Other possible factors include poor indoor air quality, stress in the workplace or living environment, or pre-existing medical conditions.

Similarly, a 2010 Health Canada fact sheet on EMFs called "It's Your Health"¹⁸ reviews some of the studies and evidence relating to the concerns about exposure to EMFs and concludes, "Health Canada does not consider guidelines for the Canadian public necessary because the scientific evidence is not strong enough to conclude that exposures cause health problems for the public."¹⁹

¹⁵ See Dr. Bruce Lanphear, *Prevention Paradox: Why We are Failing to Prevent Disease* (2018). <http://littlethingsmatter.ca/2018/03/19/prevention-paradox-why-we-are-failing-to-prevent-disease/> retrieved 10 Jan. 2020; See also: How many Canadians will be diagnosed with diabetes between 2007 and 2017? Assessing population risk, D.G.Manuel DG, L. Rosella, M. Tuna M, C. Bennett, June 2010. <https://www.ices.on.ca/Publications/Atlases-and-Reports/2010/How-many-Canadians>; retrieved 10 Jan. 2020.

¹⁶ Government of Canada, *A New Perspective on the Health of Canadians: a Working Document* ("the Lalonde report"). Ottawa: Ministry of Supply and Services, 1974. The final report was presented in the House of Commons on April 1, 1974.

¹⁷ Health Canada, *Environmental and Workplace Health: Electromagnetic Hypersensitivity* (2009). <http://www.hc-sc.gc.ca/ewh-semt/radiation/cons/electri-magnet/electromagnet-eng.php> Date Modified: 2009-01-22

¹⁸ Health Canada, *It's Your Health* (2010; updated in 2011). <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/everyday-things-emit-radiation/power-lines-electrical-appliances.html>

¹⁹ Ibid.

In summary, Health Canada's official position is that there is no scientific evidence the symptoms attributed to EHS are actually caused by exposure to EMFs. Moreover, even though the links between EMF radiation and cancer have been studied extensively, Health Canada claims that there is no scientific basis for claims that RF radiation causes cancer.²⁰

In contrast, the International Agency for Research on Cancer (IARC, the independent global authority) determined in 2011 that RF-EMF radiation is a Group 2B, possible human carcinogen.²¹ In 2019, IARC outlined recent strong findings including human epidemiology plus two multi-million-dollar animal studies, and announced that re-evaluation is a high priority.²² The only large Canadian cell phone cancer study, published in 2017, found that compared with those who were not regular users, the risk of glioma, a malignant type of brain cancer, was doubled with 558 hours talking on cell phones held to the head.²³ Similarly, in the past decade, families who make claims for glioma brain cancers and deaths are being compensated by courts and tribunals in Italy, France, and elsewhere; and some European insurance companies have expressed serious concern about the risks associated with future EMF liability.²⁴ As noted below, many insurers (including workplace agencies such as the Ontario WSIB) in Canada and other common law jurisdictions (e.g., USA, UK) are refusing to cover claims of harms from EMF exposures and EHS.

While some advocates for greater regulation of EMR sources would argue Health Canada's position is evidence of "regulatory capture," industry and government officials insist that their approach adequately protects human health. These statements are reflective of an obvious skepticism towards EHS, indicating a lack of belief that low-dose frequencies cause EHS and simultaneous confidence that the standards set out by Health Canada in *Safety Code 6*²⁵ (SC6) are sufficient. An important critical question to raise in response is whether Health Canada's position is in fact reflective of evidence. In 2015, Dr. Meg Sears wrote and edited a paper published by Canadians for Safe Technology (C4ST) on more than 150 low-exposure studies, below SC6 limits. The C4ST report showed significant biological effects, published within a narrow window of time, that were not referenced by Health Canada (HC) or the Royal Society of Canada (RSC) in evaluating SC6. The C4ST report also identified a number of references in the RSC and

²⁰ Health Canada, Understanding Safety Code 6: Health Canada's radiofrequency exposure guidelines: Safety Code 6 is one of a series of safety codes that provides radiation protection guidance for radiation emitting devices. Retrieved 26 Oct. 2020. <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html>. The Health Canada fact sheet states: "[m]ost research does not support a link between radiofrequency EMF and cancer," citing 2011 IARC report. The fact sheet was updated In October 2020 to also clarify that there is no connection between EMF and COVID-19. This was a response to the burning of cell towers in France, the UK, and Quebec by anti-cell tower activists who asserted a link between EMF and COVID-19.

²¹ International Agency for Research on Cancer (IARC), Non-ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans (2011). Volume 102, IARC. <https://publications.iarc.fr/126>. This conclusion was based in part on evidence showing an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use.

²² IARC Monographs on the Identification of Carcinogenic Hazards to Humans Report of the Advisory Group to Recommend Priorities for the IARC Monographs during 2020–2024 (2019); https://monographs.iarc.fr/wp-content/uploads/2019/10/IARCMonographs-AGReport-Priorities_2020-2024.pdf

²³ F. Momoli, J. Siemiatycki et. al., Probabilistic Multiple-Bias Modeling Applied to the Canadian Data From the Interphone Study of Mobile Phone Use and Risk of Glioma, Meningioma, Acoustic Neuroma, and Parotid Gland Tumors, *Am J Epidemiol.* 2017 Oct 1; 186(7): 885–893. Published online 2017 May 23. doi: 10.1093/aje/kwx157; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5860390/>

²⁴ Swiss Reinsurance, SONAR—Emerging Risk Insights (June 2013). <https://www.swissre.com/institute/research/sonar/sonar2020.html> According to the report, the "unforeseen consequences of electromagnetic fields" could result in a flood of insurance claims that would translate into significant liability losses for the industry. The report considers the risk of increased insurance claims about electromagnetic field, or EMF-related health risks to be "high."

²⁵ Health Canada, Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz: Safety Code 6 (2009). HC Pub.: 091029 www.hc-sc.gc.ca/ewh-semt/pubs/radiation/index-eng.php; See also: Canadians for Safe Technology (C4ST), What is Safety Code 6? <http://c4st.org/safety-code-6/>; Retrieved: 10 Jan. 2020. *Safety Code 6* was developed and approved by Health Canada in the 1970s and originally was intended to ensure the protection of federal employees and visitors to federal buildings. Its purpose is to establish safety limits for human exposure to radiofrequency (RF) electromagnetic energy in the frequency range from 3 kHz to 300 GHz. This is the energy given off by all wireless electronic devices including, but not limited to, cell and portable phones, baby monitors, smart meters, wireless appliances, Wi-Fi, and cell phone towers. These guidelines may also be adopted by the provinces, industry, or other interested parties. It has been adjusted to include Wi-Fi, smart phones, smart meters, and cell phone towers and has not had any major revisions in the last 30 years.

Health Canada reports, including many from other periods, and others that did not critically analyze significant effects associated with EMF and EMR.²⁶

Critics argue that current EMF/EHS meta-policy has been shaped by transnational post-industrial capitalism, supercharged by corporations like Apple, Samsung, and Huawei that are seeking to expand markets for new devices and 5G technology. This results in growing levels of electromagnetic phenomena, and the popularization of Wi-Fi access in public and shared spaces (e.g., the strong interest in expanding wireless technology into public spaces such as parks, allegedly to promote economic development and tourism).

Differences Between Law and Policy

Public laws, such as those passed by legislatures on employment standards, occupational health and safety (OHS), and health protection, have a vital role to play in ensuring government regulations, policies, and practices prevent or reduce the risk of regulatory capture.

Public and administrative laws often are intended to address problems in the private law system such as the expense of litigation and the desire to provide access to justice. They usually provide remedies through tribunals, which are supposed to be more accessible and economical. Moreover, modern laws enacted by legislatures are based on concepts such as natural justice and fairness.

In contrast to laws which are enacted by legislatures in typically lengthy procedures, policies and programs can be changed more easily; however, they also can be incorporated by reference, which gives them legal status. Policies and programs, which usually are based on an overarching meta-policy, are not binding on courts, tribunals, or other decision makers unless they are “incorporated by reference.” For example, an ISO standard on equipment or procedures may be referenced in a regulation or even a public law. It is important to understand that most Canadian Human Rights Commission (CHRC) policies are only legal policies, rather than public law.

Tort Law

Tort Law is a core form of private, civil law that addresses harms and injuries caused by individuals, corporations, or governments (ICGs) to other ICGs. In essence, tort law is the law of accidents and personal injury which inherently encodes and prescribes appropriate types of behaviour and penalizes other behaviours. Tort laws historically were shaped by the courts and have increasingly been reshaped by legislatures, particularly in areas such as automobile accident compensation where damage awards often are limited. In many areas, tort laws have become very effective in promoting improved ICG behaviours. Lawyers believe that tort litigation provides a valuable mechanism of social integration and control, as they are used to deter risky activities and spread out the costs of risk. The importance of tort litigation varies to plaintiffs, defendants, judges, lawyers, insurers, and the public.

For example, in the 1980s tort law was replete with examples of large torts awards against doctors for alleged negligence during surgical procedures. This encouraged doctors and hospitals to adopt better practices such as checklists to ensure surgical instruments and sponges were removed from the surgical site and not left inadvertently in a patient’s stomach after an operation was concluded.

Harm must be proven on a balance of probabilities, e.g., 50% plus one. It must show there was a duty of care on the part of the defendant or that some expected standard of behaviour or a duty to warn was not provided. Most standards are set through a duty of care, and the duty of care evolves over time. Likewise,

²⁶ Canadians for Safe Technology (C4ST), References of over 200 scientific studies and six (6) reviews reporting potential harm at non-thermal (not heating) levels of radiofrequency/microwave radiation that are below Safety Code 6 (2015), March 5th, 2017. <http://c4st.org/200-scientific-studies-reporting-potential-harm-non-thermal-levels/>

the duty to warn has evolved because government regulators have set minimal standards on appropriate types of warnings.

Environmental and toxic torts often have high stakes for victims and huge liability for defendants. Many legal experts would argue that toxic tort lawsuits are a poor way to address health impacts caused by new technology, leading to the question, how can we better regulate risks associated with the technologies we develop and introduce into schools, workplaces, and homes, to prevent future health problems related to wireless technology?

Further challenges with undertaking tort litigation relating to alleged injury caused by toxic substances include:

- Pathways can be hard to identify;
- Dosages can be hard to calibrate;
- Latency periods tend to be long, making diagnosis difficult; and
- Where contractual relationship is involved such as an employment or service provision, there is a duty on plaintiffs suffering from the EHS impact to mitigate the harm.

Wireless device manufacturers increasingly are concerned about liability issues related to their products. Many Canadians remain unaware that since the early 2010s cell phone manufacturers, such as Apple, have advised their smart phone users to not hold their phones within as much as a couple of centimeters from their ears and other parts of their bodies because of the possible cancer risk.²⁷ This is an explicit—although somewhat minimal and difficult to find—effort by Apple to warn its device users of the risks inherent in its wireless technologies and possibly reduce future liabilities related to anticipated increases in cancer incidences and other health impacts.²⁸

Mass toxic torts and class action lawsuits also provide a means of access to justice. For example, the Agent Orange case was the first mass toxic tort allowed to proceed as a class action lawsuit.²⁹ These types of cases usually consolidate separate (individual) cases and involve a network of law firms and experts who collaborate.

Most courts understand that causation testimony without an EMF/EMR dose assessment is scientifically questionable and inadmissible. Other judges, however, have struggled with the debate between plaintiff and defence experts, and the difficulty of determining how much exposure is enough.³⁰ Tort lawyers representing government agencies and corporations often argue that low-dose cases should presumably face a major hurdle since scientific evidence usually does not link minimal exposures to disease or injury. In the late 1990s and 2000s, lawyers and experts for asbestos plaintiffs addressed this by adopting a

²⁷ iPhone 5 RF Exposure information, <https://www.apple.com/legal/rfexposure/iphone5,1/en/> [Retrieved: 7 Jan. 2020]. Apple's Legal Notice states:

iPhone has been tested and meets applicable limits for radio frequency (RF) exposure. Specific Absorption Rate (SAR) refers to the rate at which the body absorbs RF energy. The SAR limit is 1.6 watts per kilogram in countries that set the limit averaged over 1 gram of tissue and 2.0 watts per kilogram in countries that set the limit averaged over 10 grams of tissue. During testing, iPhone radios are set to their highest transmission levels and placed in positions that simulate uses against the head, with no separation, and when worn or carried against the torso of the body, with 10mm separation.

To reduce exposure to RF energy, use a hands-free option, such as the built-in speakerphone, the supplied headphones, or other similar accessories. Cases with metal parts may change the RF performance of the device, including its compliance with RF exposure guidelines, in a manner that has not been tested or certified.

²⁸ It is noteworthy that California right-to-know provisions on the health effects of wireless devices have been upheld by a Supreme Court in that state.

²⁹ The Agent Orange case involved 600 legal actions, 1,500 law firms, 15,000 named individuals, as well as 2.4 million US military veterans, their wives and children. There were seven large defendants including the US government.

³⁰ See *In re Garlock Sealing Techs., LLC.*, 504 B.R. 71, 73, 75 (Bankr. W.D.N.C. 2014) ("It is clear that Garlock's products resulted in a relatively low exposure to asbestos to a limited population and that its legal responsibility for causing mesothelioma is relatively de minimis Garlock's products exposed people to only a low-dose of a relatively less potent chrysotile asbestos and almost always in the context where they were exposed to much higher doses of more potent amphibole asbestos.").

unique and controversial form of causation testimony—most widely known as either the *every exposure* or *any exposure* theory.³¹ The causation theory underlying this approach is that any level of exposure to asbestos should be presumed by the courts to possibly cause illness and even lung cancer.³²

However, in our current political climate, more and more cases that lawyers and advocates for injured individuals thought were established as legally viable are being rejected. For instance, in November 2018, New York’s highest court issued a decision in an asbestos case that has significant impact beyond asbestos litigation. In the *Juni* case, the New York Court of Appeals affirmed a 2017 decision tossing out a \$11M asbestos verdict related to mesothelioma alleged to have been caused by asbestos found in Ford Motor Company’s brakes, clutches, and gaskets. At first instance, Mrs. Juni, the auto mechanic’s widow, obtained an \$11 million jury verdict against the Ford Motor Company. However, on appeal the court ruled that the relied-on expert opinions were deemed insufficient under reliability standards established in prior rulings. Exposure to asbestos was “not enough for a determination of liability against Ford; a causation expert must still establish that the plaintiff was exposed to sufficient levels of the toxin ... to have caused his disease.” Even if it is not possible to quantify a plaintiff’s exposure, “causation from exposure to toxins in a defendant’s product must be established through some scientific method” Currently, tort liability in wealthy states is growing. New York has a resulting tort liability of \$20 billion which is approximately \$2,700 per household. New York state has an estimated 177,000 lawyers, or one for every 112 residents. According to some critics, New York’s litigious environment “is not helping the state’s image” with employers.³³

Will this climate of concern about low-dose litigation cause a backlash against low-EMF/EMR dose causation cases? It is impossible to know but certainly some pushback should be expected and factored into strategies employed by lawyers and the experts they retain.

Importance of Experts

Experts are absolutely key to the success of proceedings in the Canadian courts and at administrative tribunals. Law societies in Canada provide very detailed rules for lawyers on competence and their requirements to retain and work with qualified experts on behalf of their clients and the courts.³⁴ Experts must be viewed as credible and have a duty of loyalty to the courts “to provide opinion evidence that is fair, objective and non-partisan.”

Courts and tribunals have struggled with medical evidence on EHS and other sensitivities for the past 15 years. Currently, lawyers representing EHS clients and clients with other environmental sensitivities often

³¹ Mark A. Behrens & William L. Anderson, The “Any Exposure” Theory: An Unsound Basis for Asbestos Causation and Expert Testimony, 37 SW. U. L. REV. 479, 480 (2008)

³² Joseph Sanders, The “Every Exposure” Cases and the Beginning of the Asbestos Endgame, 88 TUL. L. REV. 1153, 1183 (2014) (“Many of the plaintiffs in the preceding cases have been exposed to lower doses of asbestos than was typically the case in the past.”); and Mark A. Behrens, What’s New in Asbestos Litigation?, 28 Review of Litigation 501, 528 (2009) (noting “an increasing number of plaintiffs are bringing claims for de minimis or remote exposures”)

³³ William L. Anderson and Kieran Tuckley, How Much Is Enough? A Judicial Roadmap to Low Dose Causation Testimony in Asbestos and Tort Litigation (2018) American Jour. Of Trial Advocacy [Vol. 42:39]

³⁴ In 2014, Law Society of Ontario’s Rules of Professional Conduct were amended to incorporate the Federation of Law Societies of Canada’s Model Code of Professional Conduct and came into force in October 2014. The competent lawyer rule, now Rule 3.1-2, relating to experts was modified to mirror the Federation of Law Societies of Canada’s Model Code. The rule on Professional Conduct states: “The lawyer should also recognize that competence for a particular task may require seeking advice from or collaborating with experts in scientific, accounting, or other non-legal fields, and, in such a situation, when it is appropriate, the lawyer should not hesitate to seek the client’s instructions to consult experts. [emphasis added] All experts have a duty of loyalty to the court. Rule 4.1.01 states:

1) It is the duty of every expert engaged by or on behalf of a party to provide evidence in relation to a proceeding under these rules: (a) to provide opinion evidence that is fair, objective and non-partisan (b) to provide opinion evidence that is related only to matters that are within the expert’s area of expertise, and (c) to provide such additional assistance as the court may reasonably require
2) The duty in sub-rule (1) prevails over any obligation owed by the expert to the party by whom or on whose behalf he or she is engaged. The Rules also allow for the court to appoint an expert for the proceeding. Under Rule 50.06, the presiding pre-trial judge or master will consider the advisability of having the court appoint an expert.

are unable to identify experts who can be properly qualified by the courts.³⁵ As noted above, the courts regularly award damages for mould in real estate cases but struggle with assessing damages that should be provided to individuals or families afflicted by illnesses such as EHS, MCS, or other environmental sensitivities that moulds and other related environmental effects may synergistically help to cause.

Yet the cost of securing credible, objective expertise is high. The number of academics and consultants working on EHS issues is limited and they usually (and frequently) are asked to provide testimony on a *gratis* basis. Sometimes the problem is part of a wider need to improve the use of science in judicial decision-making, educate the judiciary, promote “science literacy” among jurors, and address issues surrounding the existing culture of what constitutes an expert witness. A contrary view is that the judiciary should not be making policy on issues such as low-dose toxicity and do not have jurisdiction to do so; instead policy would be set in legislative processes.³⁶

An illustration of the importance of experts is provided by the decision rendered by Human Rights Tribunal of Ontario (HRTO) on EHS and EMF related to electricity ground returns (a.k.a. “stray voltage”) in 2014.³⁷ In a summary hearing before the HRTO, the complainant, Michael Thompson, advised the tribunal he did not intend to call any experts on EHS and ground-return EMF and wished to rely on reports he had located on the Internet³⁸ and a four-year old letter by a doctor working at Women’s College Hospital (WCH) related to a prior case. The tribunal was unconvinced that the reports retrieved from the Internet and the letter provided adequate evidence to support his case, and this undoubtedly was an important factor in explaining why the complainant consequently lost.³⁹ (For further discussion, see below.)

Many EHS, MCS, and ES tort cases are addressed through insurance programs if this compensation is available to the injured party. This can prove challenging for litigants (and their lawyers when retained) because insurance agencies, providers, and companies will badger doctors for the patient. A good lawyer can be a shield but it is important to engage counsel at early stages. Some cases involving claimants affected by workplace exposures are also submitted to the Ontario Workplace Safety and Insurance Board (WSIB) although the OWSIB and the BC Workers Compensation Board are notorious for refusing to recognize EHS, MCS, and ES claims.⁴⁰

Medical controversy about a diagnosis such as EHS, MCS, and Environmental Sensitivities (ES) can sometimes undermine a claimant’s attempts to prove a disability. However, the onus is on EHS claimants

³⁵ Keller and Heckman’s litigators work with over 25 in-house scientists, almost all of whom have PhDs or other graduate level degrees and expertise in relevant areas such as chemistry, toxicology, risk assessment, and the fate and transport of chemicals in the environment.

<https://www.khlaw.com/Environmental-and-Toxic-Tort-Litigation>

³⁶ National Judicial Institute, Science Manual for Canadian Judges (2013). Ottawa: NJI.

<https://www.nji-inm.ca/index.cfm/publications/science-manual-for-canadian-judges/>

³⁷ Thompson v PUC Distribution Inc., 2015 HRTO 407 (CanLII), <http://canlii.ca/t/gh117>, retrieved on 2020-01-09; Reconsideration: Thompson v. PUC Distribution Inc., 2015 HRTO 1191 (CanLII), <http://canlii.ca/t/g1578>, retrieved on 2020-01-09.

³⁸ As noted in the reported decision, the applicant’s submitted materials included: the 2007 study by Dr. Meg Sears entitled “The Medical Perspective on Environmental Sensitivities” produced for the Canadian Human Rights Commission (“CHRC”); a guide to living with environmental sensitivities produced by Women’s College Research Institute; a 2006 article entitled “Electrohypersensitivity: State-of-the-Art of a Functional Impairment” authored by a member of the Department of Neuroscience at the Karolinska Institute in Stockholm, Sweden; an unpublished 2007 article entitled “The Biological Effects of Weak Electromagnetic Fields” by Andrew Goldsworthy; and an undated document produced by the American Academy of Environmental Medicine on the health effects of EMF. The Tribunal declined to recognize Dr. Sears’s CHRC report as proof that EMF stray voltage caused EHS in this particular case and there has been no incorporation by reference of the Sears report at the HRTO thus far. A principal reason why is that Dr. Sears framed her analysis of the available evidence at that point (2006–2007) as more equivocal than current information. Her subsequent published work on EHS has been more definitive in clarifying the links between EMR and EHS.

³⁹ In its 2015 Thompson decision, the HRTO left open the possibility that a future applicant would be able to establish at a full hearing (as opposed to a summary hearing) that he is a person with a disability as a result of EHS condition. The language of decision is convoluted because the case was a summary hearing and some of the evidence submitted was provided for the 2012 smart meter case at the HRTO.

⁴⁰ Usually multiple internal appeals are necessary before a WSIB applicant is able to get a proper adjudication of a complex MCS or EHS claim.

to prove on a balance of probabilities that they are disabled, and the claimant or injured person is not required to have medical consensus on the diagnosis.⁴¹

Sometimes conditions such as EHS, MCS, and ES are difficult to diagnose, particularly where the focus of the doctors is on trying to determine the cause of the condition. There may be disagreement among treating practitioners about the major contributors to the illness as well as the actual diagnosis of the condition. There may be agreement that a person is suffering but no agreement as to the cause.

Issues in Achieving Accommodations

Accommodations for EHS and MCS claimants typically are achieved under the rubric of government legislation that protects human rights once sufficient evidence of ongoing disability and/or health impacts are provided to employers, landlords, organizations, and/or appropriate regulators. Usually, what is relevant from a human rights perspective is whether there is legal proof (such as a medical certificate) that the person has a disability.⁴² Where accommodation is being requested, it is critical that the worker have medical evidence establishing the worker's restrictions related to the disability and identifying what aspects of the workplace interfere with those restrictions.

Often, suggested accommodations can raise conflicts or are framed by competing rights—for instance, the desire for users (e.g., students, the public) to access the Internet in public or university libraries can impinge on the right of EHS sufferers to work in WiFi-free environment in the same facility. In larger libraries, the EHS sufferer can likely be accommodated through provision of a WiFi-free area (or “white zone”) and perhaps through provision of wired computers. In smaller libraries, accommodation may require users to adopt other more complex solutions such as specific periods of time when all wireless devices are shut down. Creativity and imagination, as well as a willingness to compromise, are essential in developing accommodations.⁴³

The Canadian courts have not set a clear formula or analytical approach for addressing conflicts between competing rights. The courts do stipulate that only actual burdens on the rights of other persons trigger conflicts. A trivial burden on an employer such as provision of a wired connection or a private enclosed office to an EHS sufferer should not trigger the need for a court or tribunal adjudication or a grievance arbitration.

The courts also have provided some guidance where actual rights appear to be in conflict because the Charter of Rights of Freedoms requires decision-makers to try to “reconcile” both sets of rights. For the most part, there are no “bright-line rules” (i.e., obvious rules) for dealing with competing rights claims. Legal decisions provide general direction on how to deal with and what to avoid in these types of scenarios. The courts have recognized that the specific facts will often determine the outcome of the case.

Contrary to popular belief, no rights are absolute, there is no hierarchy of rights, and rights may not extend as far as claimed. The full context, facts, and constitutional values at stake must be considered, and the extent of interference must be looked at. At the same time, the core of a right is more protected than its periphery, and there is the overall aim to respect the importance of both sets of rights. Statutory defences may restrict rights of one group and give rights to another. Organizations must consider these legal principles when they deal with competing rights situations.

Is a perceived disability an adequate ground to lead to a human rights claim?

⁴¹ See: MacDonald v. Sunlife Assurance Co. Of Canada, [2005] P.E.I.J. No. 60)

⁴² Brewer v. Fraser Milner Casgrain, [2006] A.J. No. 625 (Brewer)

⁴³ Frank M. Clegg, Margaret Sears, Margaret Friesen, Theodora Scarato, Rob Metzinger, Cindy Lee Russell, Alex Stadtnier, Anthony B. Miller, Building science and radiofrequency radiation: What makes smart and healthy buildings (Aug. 2019).
<http://www.sciencedirect.com/science/article/pii/S0360132319305347>;
<https://doi.org/10.1016/j.buildenv.2019.106324>

An important concept aspect of Canadian human rights law is that perceived disabilities are protected under Canadian Human Rights legislation because perception is an implied part of “disability.” This explains why most Canadian tribunals do not dismiss EHS complaints out of hand. *Quebec v Boisbriand (City)*, decided by the Supreme Court of Canada in 2000, is the key precedent that established this principle in Canadian law. *Boisbriand*, a triumvirate of three SCC decisions, examined whether a perceived disability is adequate grounds to launch a human rights claim.⁴⁴ The decision resulted in the Canadian Government accepting a broader definition of disability in the 1980s and 1990s, and these subsequently became operative. Yes, the government is currently accepting the broadening concept of disability. Once disability claim is accepted, the onus shifts and the defendants try to show undue hardship.

While courts are bound by precedent, tribunal decisions are not binding on subsequent adjudicators, despite previous tribunal decisions often having strong precedential value. Previous decisions have persuasive value as they address a similar set of facts and conclusions based on a thorough review of the submitted current medical and scientific literature.

Ontario Human Rights Code

Section 10(1) of the Code defines the term “disability” as follows: “‘disability’ means, (a) any degree of physical disability, infirmity, malformation or disfigurement....” One reported case on EHS that refers to two disputes filed with the HRTO by Michael Thompson in 2012 and 2014 was located in preparation of this paper.⁴⁵

In 2012, Thompson filed an HRTO application (File No. 2012-10640-I) against the respondent respecting the installation of a smart electricity meter at his residence.⁴⁶ It was the applicant’s position that the smart meter, which uses wireless technology, had a substantial impact upon him due to his EHS. The applicant submitted a letter dated November 4, 2011 written by Dr. Kathleen Kerr of Women’s College Hospital in support of this Application. The letter stated that the applicant suffers from ES, including sensitivities to EMF frequencies, and summarized the findings of several scientific and health studies to support the contention that EMF can have health effects on the general public. The respondent utility ultimately agreed to replace the wireless smart meter with an analogue meter in February 2012 and the 2012 application was settled with minutes of settlement signed on October 25, 2012.

In 2015, the applicant Thompson asserted the utility had further failed to accommodate his EHS disability by reducing the EMF coming from the underground electrical cables which provide electricity for his home. In response to the applicant’s complaints, the respondent tested the EMFs at his house and found them to be typical of those that would be measured throughout any municipal electrical distribution system.⁴⁷ As noted above, the tribunal was unconvinced by the evidence submitted. It also was apparent that the respondent utility had made considerable efforts to accommodate the concerns raised by the applicant. In the aggregate, these factors likely explain why the tribunal decided that there was no “reasonable prospect that the applicant will be able to provide evidence that will establish, on a balance of probabilities, that there is a link between his claimed disability, EHS, the respondent’s conduct and the transmission of electricity through the respondent’s underground cables that lead to the applicant’s home” and dismissed the claim.⁴⁸

⁴⁴ *Quebec v Boisbriand (City)*, [2000], SCR Reports.

⁴⁵ *Thompson v PUC Distribution Inc.*, 2015 HRTO 407 (CanLII), <http://canlii.ca/t/gh117>, retrieved on 2020-01-09; Reconsideration: *Thompson v. PUC Distribution Inc.*, 2015 HRTO 1191 (CanLII), <http://canlii.ca/t/g1578>, retrieved on 2020-01-09.

⁴⁶ HRTO application (File No. 2012-10640-I) as cited in *Thompson v PUC Distribution Inc.*, 2015 HRTO 407 (CanLII).

⁴⁷ In an attempt to address the applicant’s concerns, the respondent briefly disconnected the applicant’s underground electrical service in order to perform some tests and conduct some switching work. Secondary tests were performed and EMF measurements were taken near the applicant’s home which did not indicate any material change in EMF levels. The respondent also verified that all secondary connections to the applicant’s home were functioning properly and no defects were observed in the electrical system.

⁴⁸ *Thompson v PUC Distribution Inc.*, 2015 HRTO 407 (CanLII), <http://canlii.ca/t/gh117>, retrieved on 2020-01-09, at para. 34.

In Ontario, workers also are protected under the Human Rights Code from discrimination based on disability. The term “disability” is broadly defined under the Code. In its website materials, the Ontario Human Rights Commission (OHRC) describes the definition of disability as including environmental sensitivity⁴⁹ and includes the CHRC Policy on Environmental Sensitivities⁵⁰ in its list of applicable policies. Adjudicators in employment-related cases have also interpreted disability broadly enough to include environmental sensitivity and have determined that workers with such conditions may require accommodation by their employers.⁵¹ To date, disability provisions of the Code have been infrequently applied to cases involving EHS claimants.

Examples of requests for accommodation made by persons suffering from environmental sensitivities have included placement in environments with the following conditions: minimal exposure to triggering substances, such as perfumes, tobacco smoke; minimal exposure to fabric usage such as carpet, curtains, or upholstered furniture; guaranteed frequent cleaning routines; alteration of existing ventilation processes and opportunity for additional ventilation; restrictions on the type of cleaning products used in the work area; access to respiratory protective equipment; isolation from visitors to the workplace who may not be aware of or be bound by the workplace scented products policy.⁵²

Ontarians with Disabilities Act, 2001 (ODA)

In 2001, the Ontario government enacted the *Ontarians with Disabilities Act, 2001*, requiring government ministries and agencies to adopt practices that eliminate barriers to participation of individuals with disabilities.⁵³

The ODA received Royal Assent on December 14, 2001 and came into force on February 7, 2002. The Bill’s original purpose had been to achieve a barrier-free Ontario for persons with disabilities—a right of full participation.⁵⁴ The *Act* required all government ministries and municipal governments to prepare accessibility plans to identify, remove, and prevent barriers to participation throughout their operations and make provincial websites accessible by 31 Dec. 2002.⁵⁵

Those who supported the idea of an ODA hoped that it would require government bodies, and others bound by law, to identify the barriers that they have which impede persons with disabilities from full participation, and to design reasonable plans consistent with their resources to remove these barriers and to prevent new ones from being created, all within reasonable timelines. They wanted it to allow for the enactment of regulations with input from disability groups, business interests, and others, to set out measures to be implemented to achieve the ODA’s goals and reasonable timelines for their achievement. The ODA was meant to incorporate an effective, fair, and timely process for enforcement. Such practices would be adopted by consultation with groups and individuals affected by or representing those with disabilities. These include defining building and structure guidelines, only leasing properties compliant

⁴⁹ “Disability” covers a broad range and degree of conditions, some visible and some not visible. A disability may have been present from birth, caused by an accident, or developed over time. There are physical, mental and learning disabilities, mental disorders, hearing or vision disabilities, epilepsy, mental health disabilities and addictions, environmental sensitivities, and other conditions. See: OHRC, “Disability,” http://www.ohrc.on.ca/en/code_grounds/disability; retrieved 20 May 2019.

⁵⁰ Canadian Human Rights Commission, Policy on Environmental Sensitivities (2014); see OHRC, Disability, http://www.ohrc.on.ca/en/code_grounds/disability; retrieved 20 May 2019.

⁵¹ Guibord and Treasury Board (Transport Canada) (1995), 28 PSSRB Decision 12 (December 18, 1995); Halton and Ontario Nurses Association (1991), 18 L.A.C. (4th) 428).

⁵² Hutchinson v. Canada (Minister of the Environment), [2003] 4 F.C. 580 (Fed. C.A.); (Brewer). Sheilagh Turkington, Environmental Sensitivity and the Workplace, Apr 1, 2008; <https://www.cavalluzzo.com/resources/publications/publication/environmental-sensitivity-and-the-workplace>

⁵³ Other public institutions required to provide annual plans addressing accessibility issues included public transportation systems, hospitals, district school boards, universities, colleges of applied arts and technology, and other government agencies.

⁵⁴ Charles Beer, Charting A Path Forward: Report of the Independent Review of the Accessibility for Ontarians with Disabilities Act, 2005, (February 2010). Report to the Ontario Ministry of Community and Social Services. Archived from the original (PDF) on April 10, 2015. Retrieved 3 Jan. 2020.

⁵⁵ Professor Mayo Moran, University of Toronto, Second Legislative Review of the Accessibility for Ontarians with Disabilities Act, 2005. (Nov. 2014). Report to the Ontario Ministry of Community and Social Services. Retrieved 21 May 2019.

with the guidelines, and sourcing products which “must have regard to their accessibility for persons with disabilities.”⁵⁶

The ODA legislation was regarded as weak, as it had no enforcement, imposed no penalties, and set out no compliance deadlines.⁵⁷ Consequently, disability groups and advocates lobbied the Ontario government to improve the legislation and made this a prominent 2003 Ontario election issue.

Accessibility for Ontarians with Disabilities Act, 2005 (AODA)

In June 2005, the Ontario government passed a new law called the *Accessibility for Ontarians with Disabilities Act, 2005* (AODA).⁵⁸ The AODA provides for the development, implementation, and enforcement of accessibility standards with a vision of a fully accessible Ontario by 2025.

The AODA replaced the previous *Ontarians with Disabilities Act* and was expected to spur significant advances in the accessibility of Ontario’s goods, services, facilities, accommodation, employment, buildings, structures, and premises. As advocated for a number of years by organizations such as the OHRC,⁵⁹ the AODA creates a mechanism for developing and implementing accessibility standards in both the public and the private sectors. The AODA sets out a process for the development of accessibility standards for specific industries, economic sectors, or classes or persons or organizations. Standards development committees will be established, consisting of persons with disabilities, industry or sector representatives, and representatives of relevant government ministries.⁶⁰ These committees will determine long-term accessibility objectives to be achieved by January 1, 2025, and the measures required to meet these objectives. The committees will develop plans for progressive implementation of measures to meet the long-term objectives.

The committees have been tasked with developing proposed standards, which will set out measures, policies, practices, and requirements for the identification and removal of barriers. The proposed standards gradually are being made public, and the public has had the opportunity to submit comments. The finalized standards will then be established by regulations. Objectives, proposed measures, and standards will be reviewed every five years. It is unclear if any of the committees are examining whether accessibility standards for individuals suffering from EHS, MCS, and ES are being developed by and for specific industries, economic sectors, or classes or persons or organizations.⁶¹

Relationship between AODA and OHRC

AODA, Section 3 states: “Nothing in this Act or in the regulations diminishes in any way the legal obligations of the Government of Ontario or of any person or organization with respect to persons with disabilities that are imposed under any other Act or otherwise imposed by law.” In this way, the organizational requirements of the AODA and its Regulations do not replace or change legal obligations towards persons with disabilities under the Ontario Human Rights Code, 1990 (e.g., a request to accommodate an individual student or employee with a disability) or any other Act such as the *Ontario Building Code Act, 1992*. Accordingly, compliance with the requirements of the AODA and/or the Building Code is not enough. It may be vulnerable to a human rights complaint to the extent that their premises and practices continue to fall short of the requirements of the Human Rights Code. The AODA

⁵⁶ <https://www.ontario.ca/laws/statute/05a11>

⁵⁷ Professor Mayo Moran, University of Toronto, Second Legislative Review of the Accessibility for Ontarians with Disabilities Act, 2005. (Nov. 2014). Report to the Ontario Ministry of Community and Social Services. Retrieved 21 May 2019.

⁵⁸ S.O. 2005, c. 11. The AODA received Royal Assent and came into force on June 13, 2005.

⁵⁹ OHRC, Submission of the OHRC Regarding Consultations to Strengthen the Ontarians with Disabilities Act, March 31, 2005; OHRC, Submission of the Ontario Human Rights Commission Concerning Barrier-Free Access Requirements in the Ontario Building Code, March 2002, See www.ohrc.on.ca.

⁶⁰ Rita Mason, J. Truelove, and C. Dakai (eds), Canadian Master Labour Guide (28th ed., 2015). CCH Canadian Limited. ISBN 1553675622.

⁶¹ Alison M. Konrad, K. Leslie, and D. Peuramaki, “Full accessibility by 2025: will your business be ready?” Ivey Business Journal, Oct. 2007. Retrieved 14 March 2012.

is “standards-driven” (not complaints-driven) and covers the public/private/not-for-profit sectors, whereas HRTO and CHRC are complaints-driven. Compliance is based on preparation of plans; and large organizations tend to post these on their web sites.

AODA Standards

By 2015, five AODA standards have been established by the Ontario government under the AODA regulations.

Customer Service Regulation

The first AODA standard established was the “Customer Service Standard” contained in O. Reg. 429/07 which took effect on 1 January 2008. This standard requires that individuals with disabilities are able “to obtain, use and benefit from goods and services.”⁶² This includes businesses granting access to service animals and support people in publicly-accessible areas, providing accessible customer service, and implementing a feedback system. The public sector was required to comply by January 1, 2010; private and not-for-profit sector deadline was January 1, 2012. To date, one of the largest OHRT awards made for lack of compliance with the AODA customer service regulation involved the failure of a restaurant owner to allow a service dog to accompany a patron into his facility.⁶³ This regulation was incorporated into the “Integrated Accessibility Standards Regulation” in 2011 (see below), and O. Reg. 429/07 was revoked in July 2016.

Integrated Accessibility Standards Regulation

The Integrated Accessibility Standards Regulation took effect on 1 July 2011.⁶⁴ Initially, it consisted of three component standards addressing accessibility of Information and Communications, Employment, and Transportation. On 1 January 2013, the “Design of Public Spaces (Built Environment)” standard took effect, and became part of the Integrated Accessibility Standards Regulation. Implementation of these standards is ongoing and will continue until 2021.

The Information and Communications Standards provisions of the regulation set out how organizations are required to create, provide, and receive information and communications that are accessible for persons with disabilities. The employment standards set out specific requirements for the recruitment, retention, and accommodation of paid employees with disabilities.

Types of Accommodations

Organizations have adopted a range of measures in their efforts to accommodate workers, customers, and others who are EHS sensitive.

These include:

- White zones – a designated area intended to be free of the electromagnetic radiation released by communications antennas and other wireless devices. To achieve a true white zone for those people who are EHS sensitive, emphasis must be placed on use of fibre optic technologies and other means.

⁶² Ontario Regulation 429/07. This regulation now has been incorporated into the Integrated Regulation made the AODA, O. Reg. 191/11.

⁶³ Asha Rampersad, “Canada: \$25K awarded against restaurant owner who prevented employee from serving employee’s mother because of service animal,” 27 April 2015, CC Partners Blog. Retrieved 15 May 2019.
[http://ccpartners.ca/blog/details/the-employers-edge/2015/04/23/\\$25k-awarded-against-restaurant-owner-who-prevented-employee-from-serving-employee-s-mother-because-of-service-animal](http://ccpartners.ca/blog/details/the-employers-edge/2015/04/23/$25k-awarded-against-restaurant-owner-who-prevented-employee-from-serving-employee-s-mother-because-of-service-animal)

⁶⁴ O. Reg. 191/11, Integrated Regulation made under the AODA, 2005. Latest amendments: December 22, 2012. See also: Integrated Guide to the AODA, <https://www.aoda.ca/integrated/>.

- Cell Phone Free Quiet areas
- Other EMR restricted zones
- Personal Devices Off (PDO) signs – another means for establishing white zones
- Analogue smart meters – can be substituted as a means to accommodate a client or patient suffering from EHS or environmental sensitivities
- Community warnings – communities post on 5G cell towers notices saying this is being used to test for 5G operation and if a person has sensitivities, there is a risk of harm

Public Utilities

Public utilities in some jurisdictions are increasingly agreeing to replace wireless smart meters with analogue meters, often if the property owner is willing to pay for the replacement costs. As in the Thompson v. HRTO case, this often arises in the settlement of advocacy at tribunals or threats to litigate disputes.⁶⁵



Figure 2: Kingston Library Notice of WiFi-free Zone

⁶⁵ Unreported case cited in Thompson v PUC Distribution Inc., 2015 HRTO 407 (CanLII), <http://canlii.ca/t/gh117>, retrieved on 2020-01-09. As explained in the 2015 decision, Thompson was settled by minutes of settlement signed on October 25, 2012. The author is unaware of a systematic study on this.

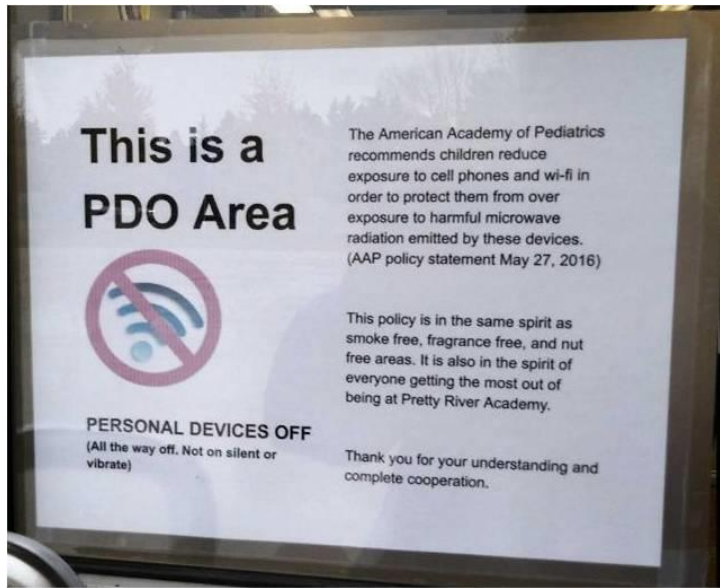


Figure 3: Notice of Personal Devices Off (PDO) Area, Pretty River Academy, Collingwood, Ontario, 2018

Photo credit: Professor Magda Havas, Trent University

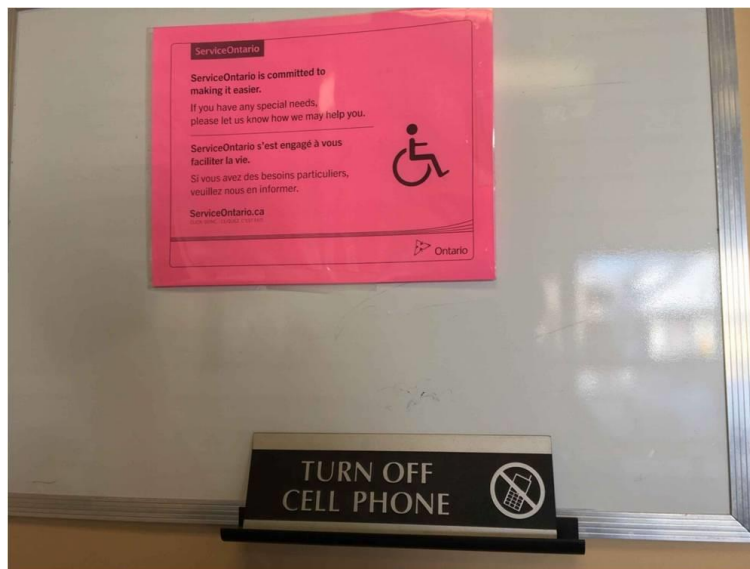


Figure 4: Cell Phone Off Zone, Stittsville, Ontario

Photo credit: Dr. Meg Sears, Chair, Prevent Cancer Now

Surveying the Current Canadian Landscape

There are many situations and cases where EHS is being recognized and accommodated, which represents an essential first step. The bad news is that individuals often have to make Herculean efforts to obtain modest accommodations. The best protected workers seem to be those represented by unions and professionals who have access to expertise. It is unclear how workers stricken by EHS fare in smaller,

poorly organized workplaces and where employers are less aware of EHS, the *Occupational Health and Safety Act* (OHSA), the OHRC, and other laws. As the CHRA policies apply to venues under federal control, and disabled people also have the right to accommodation, environmental sensitivities are recognized in some provinces. However, generally, provincial tribunals are not as comprehensive as the statutes incorporated into the CHRC.

One source of conflict is determining who controls the introduction of new technology in the workplace and public space. While Sweden and Nordic nations established laws in the 1970s and 1980s requiring consultation with workers and unions, in North America, introduction of new technology is considered a management right by courts and tribunals, which reflects a reduction in the power of workers.



Figure 5: Community Notice of 5G Test

Best Practices in Workplace Accommodation

There is an important obligation on the part of the employee to raise the issue and talk with management about accommodation for EHS sensitivity. Management can participate on a workplace health and safety committee. In turn, together the group can identify solutions (e.g., educate other employees, offer a change in work location, telecommuting, flexible work hours), and sensitize and inform patrons or clients. They can provide leadership for healthy workplace policies such as “lunch and learn” discussions or polls to support policy development.

Management can also consult the affected individuals, as sensitivities triggers vary, and individuals often can identify solutions that will work for them. Overall, it is vital to maintain calm, informative

relationships, and report harassment or discrimination to a superior.⁶⁶ A third party may be of assistance in some cases.

Much like legal rights, the right to accommodation is not absolute. It is subject to a balancing of factors and reasonableness, and measures are limited, not to cause “undue hardship” on the part of the employer. The reverse perspective offers some insight however, as in Sweden, an environment that does not support optimum functioning is considered to be the “problem”—not the person.

Universities, colleges, and schools can pose a challenge to those advocating for EHS clients. Often the administrators argue that wireless networks and devices are key components of teaching. It’s generally assumed that university and college students will use laptops for lectures, and frequently access online learning materials during classes. What’s more, many private companies use “clicker” technology where students have portable wireless “clicker” devices that interact with a responding screen infrastructure.⁶⁷ Similar patterns are identifiable in schools, especially private schools.

When the individual suffering from EHS is an employed university faculty or staff member, it may be possible to identify accommodations. For example, in one case of university accommodation, the university: 1) helped a Faculty member find a low-EMF office; 2) installed filters that remove radiofrequency transients and harmonics from the power source at the fuse box local to the office; 3) allowed the affected individual to teach in a building near campus with lower EMFs than the main campus; and 4) removed wireless nodes near the current office to make for a more low-EMF environment. In addition, the university agreed to form an official Electromagnetic and Health Subcommittee of its JHSC to address ongoing issues of EMF radiation and safety.⁶⁸

Benefits under the *Workplace Safety and Insurance Act* (WSIA)

Claims for benefits under the WSIA for environmental sensitivities have generated many cases and mixed results. Put simply, benefits will only be paid where it may be proved that the disabling condition arose out of the course of employment. There needs to be proof that the workplace substantially contributed to the development or exacerbation of the disabling health condition.

A key difficulty in EHS cases is establishing proof of a triggering exposure, particularly because many people in the workplace may have no reaction to the exposure even though one or a few people with EHS or environmental sensitivities are disabled by it. A further difficulty in establishing the workplace as the significant contributing factor in such cases is that claimants’ symptoms often do not cease on removal from the workplace environment. Thus, the employer often will question whether the triggers causing the reaction are in the workplace, only in the claimant’s home, or in the environment more broadly.

The appellate body is the Workplace Safety Insurance Appeals Tribunal (WSIAT), the final level of decision-making under the WSIA. Further appeals are directed to divisional court, Ontario Court of Appeal (OCA), and Supreme Court of Canada (SCC). WSIAT has reviewed numerous claims based on a diagnosis of Multiple Chemical Sensitivity (MCS). The benefits will only be paid when it can be proven that the disabling condition arose out of the course of employment, and that the workplace substantially contributed to the development or exacerbation of the disabling condition. Claimants have made successful MCS claims under this legislation.

WSIAT considers several factors in environmental and MCS cases, including the following:

- the nature and extent of exposure that has occurred in the workplace
- any temporal relationship between the exposure and onset symptoms

⁶⁶ Perceived favouritism may foster conflict and should be avoided.

⁶⁷ See, e.g., <https://tophat.com>

⁶⁸ Confidential communication from a Canadian university faculty member to David McRobert, May 2019.

- the existence of prior health problems
- results of medical tests
- the worker's condition upon removal from the substance or exposure
- other potential contributing factors
- the existence of non-compensable psychological problems



Figure 6: Notice of Wi-Fi Free Research Space, Trent University
Photo credit: Professor Magda Havas, Trent University

Other Tribunals and Agencies on EHS and MCS:

Landlord and Tenant Board (OLTB)

EHS is a very tough problem for landlords to address on behalf of tenants with EHS, because most other tenants set up their own wireless services and often do not seek to examine alternatives such as wired connections or consult with tenants in adjacent units. In addition, wired connections can be complex for property owners to implement in many buildings. Cell towers often are built on top of buildings in downtown areas, and many landlords who run rooming houses or smaller units provide wireless services to simplify arrangements. There have not been many OLTB decisions on the issue. In contrast, the OLTB is doing a much better job on MCS. The OLTB manages well defined accommodations effectively in most cases as required by the OHRC.

British Columbia Human Rights Tribunal

In 2013, the British Columbia Human Rights Tribunal (BCHRT) issued a decision respecting wireless smart electricity meters. In *Citizens for Safe Technology Society obo others v. B.C. Hydro and Power*

Authority,⁶⁹ the BCHRT considered whether there is a nexus between EHS and smart meters. The BCHRT undertook a “thorough review” of the submitted scientific literature on EHS and EMF, and similarly found at paragraph 135 that having considered the whole of the material, it could not conclude that “there was no reasonable prospect that the complainants can establish that EHS is a disability under the British Columbia HRC.” Thus, the tribunal demonstrated that it is open to the argument that EHS is a disability but found in this case the complainants had not established adequate grounds to justify the requested changes in practice by the B.C. Hydro and Power Authority.⁷⁰

Canada Revenue Agency (CRA)

The Canada Revenue Agency (CRA) plays an adjudicative role in determining who can qualify for medical benefits as a disabled person under the *Income Tax Act* (ITA) and can play a key role in deciding what accommodations can be undertaken by homeowners, landlords, and others. However, the CRA’s approach to EHS, MCS, and ES often has proven problematic.

The Burstyn case provides an instructive example.⁷¹ Varda Bustyn suffered from a severe reaction to mould that triggered ES and needed a ramp to make her home wheelchair accessible. Burstyn and her husband applied for tax credits offered to people needing to retrofit their homes for medical reasons. Yet the Canada Revenue Agency rejected the claim. However, the story didn’t end there. Ecojustice agreed to take up her case with the CHRC and were able to achieve a confidential settlement on her behalf.

Burstyn has described her experiences in detail⁷² and her words are worth quoting at length here.

So, my battle was about a disability, right? But it was also an environmental battle about the need for institutional recognition of the rights of people disabled by exposure to the many chemicals that manufacturers, such as the members of the American Chemistry Council lobby want us to believe are safe.

One of the reasons you probably don’t know these things is that many Environmental Sensitivities sufferers—of which I am one—are hidden away. We have to create chemical-free homes so we can survive, so you don’t often see us. A U.S. study pegged the average cost to make a home safe for someone like me at US\$57,000—a massive financial hit at the very moment that people lose most or all of their earning ability due to the onset of severe Environmental Sensitivities. Being confined to our homes makes it very hard for us to fight to change perceptions about these issues and to reduce our exposure to toxic chemicals, while a well-funded chemical industry lobby maintains a campaign to paint people with chemical sensitivities as emotionally troubled, not physically injured.

When Ecojustice decided to support me, it demonstrated real enlightenment. A chemically safe house is considered the most important medical treatment for those with Environmental Sensitivities, but the CRA prevented me from claiming those tax credits. Ecojustice understood what was at stake: it’s unjust if our major institutions are allowed to refuse official acknowledgment of the consequences of toxic injury and deny financial support that can improve the lives of Canadians.

My battle lasted almost four years. Ecojustice intervened in the last year and a half, when the CRA attempted to stop the CHRC from completing its own investigation of my complaint. Back then, I wanted to quit. But Ecojustice helped me beat back this barrage and assisted me all the way through to the Canadian Human Rights Tribunal. ARCH, the disability rights legal assistance organization, worked with Ecojustice staff lawyers... Together, we have fought for systemic recognition and

⁶⁹ Citizens for Safe Technology Society obo others v. B.C. Hydro and Power Authority (No. 3), 2014 BCHRT 211

⁷⁰ Other cases include Smart Meter cases, and the aforementioned HRCO: Thompson cases of 2012, 2015.

⁷¹ See: J. Swaigen, A victory for victims of environmental sensitivities or multiple chemical sensitivities, March 22, 2013.

<https://www.ecojustice.ca/a-victory-for-victims-of-environmental-sensitivities-or-multiple-chemical-sensitivities/>

⁷² J. Swaigen, Ibid.

procedures that will make it more possible for people with Environmental Sensitivities to apply for the same tax credits open to people with other disabilities and impairments.

Prior to my hearing at the CHRT, we had an opportunity to discuss a possible settlement. Mediation is the final step before a full hearing, which can be expensive and time-consuming. In Dec. 2013 we met with the CRA. The result of these hearings is almost always bound by confidentiality agreements, and this was the case here.

Making Professional Offices Accessible

Under the *Occupier's Liability Act*,⁷³ patients and clients are “invitees” and owed a higher duty of care than a trespasser or other visitor. For this reason, professionals such doctors, lawyers, therapists, etc. have a duty to protect those suffering from EHS, MCS, and ES from certain harms in their offices once they become aware of the sensitivity to wireless radiation. Fortunately, the ARCH Disability Law Centre has assembled some very good general advice on a wide range of practices and excellent tips on providing accessible legal services for persons with disabilities.⁷⁴

The Canadian Courts

The Canadian courts have not developed any policies on EHS accommodation. While the Judges Technology Advisory Committee did prepare a “Model Wireless Networking Policy for the Canadian Courts” in 2014,⁷⁵ there are no express references to EHS although numerous Canadian courts’ staff and lawyers are known EHS sufferers.

Addressing Regulatory Gaps in EMF Decision Making Related to the Canadian Constitution Act, 1867

Since the 1930s, telecommunication has been interpreted primarily as a federal power despite not being enumerated in the *Constitution Act, 1867*. The constitution does not assign jurisdiction over telecommunications, *per se*, to either Parliament or the provincial legislatures. As Ryan⁷⁶ explains, the division of authority rests instead primarily on whether a particular telecommunications service provider (TSP) is an interprovincial or international “Work” or “Undertaking.” Only those entities that are interprovincial or international in character fall within federal jurisdiction. A consideration of the division of powers therefore involves an assessment of two distinct issues, one “horizontal” and the other “vertical” in nature. The horizontal issue involves the identification of the entities that qualify as interprovincial or international works or undertakings. The vertical issue concerns the extent of the reach of federal power over these entities.⁷⁷

In the Supreme Court’s Radio Reference case of 1931, a majority of the justices ruled that regulating radio communications is an exclusive federal power.⁷⁸ Justice Robert Smith, for instance, decided that legislation regarding radio technologies does not deal directly with property or civil rights in the province. Most of the Justices found that such activities fall under the federal government’s power, since all powers not specifically enumerated are granted to the federal government under the “residual powers” doctrine.

⁷³ R.S.O. 1990

⁷⁴ ARCH Disability Law Centre, Tips on providing accessible legal services for persons with disabilities, 2017 <http://www.archdisabilitylaw.ca/sites/all/files/Tips%20on%20providing%20accessible%20legal%20services%20-%20FINAL%20-%20September%202017.pdf>

⁷⁵ Canadian Judicial Council, Judges Technology Advisory Committee, “Model Wireless Networking Policy for the Canadian Courts” (2014). Prepared by Martin Felsky, PhD, JD for the Judges Technology Advisory Committee (“JTAC”), Draft 04 – rewritten 2014-01-17; Draft 02 – approved in principle by JTAC, 2008-02-01 Draft 03 – incorporates recommended changes arising out of the JTAC meeting of 2008-02-01.

⁷⁶ M. Ryan, TELECOMMUNICATIONS AND THE CONSTITUTION: RE-SETTING THE BOUNDS OF FEDERAL AUTHORITY (2010), Can. Bar Review, Vol. 89.

⁷⁷ Ibid, p. 1.

⁷⁸ See *Re: Regulation and Control of Radio Communication in Canada*, [1932] AC 304 (PC) [Radio Reference]. The SCC decision was upheld by the Privy Council of the UK, then Canada’s appellate body.

However, two out of the five Justices found that Parliament's jurisdiction was not exclusive, since the "receiving apparatus" is a piece of equipment, or property, that must be erected within the province.

In the 1970s, the federal government established the Canadian Radio-television and Telecommunications Commission (CRTC) to provide more consistency in administration of decision making on allocating the broadcasting spectrum amongst various commercial providers such as radio and TV stations, government agencies such as the police, radio clubs and organizations, and individual users.⁷⁹ For decades, the CRTC required applicants for broadcasting licences to comply with municipal regulations.⁸⁰ In its 1987 decision 87-376, the CRTC approved the location of a transmitter site conditional upon "evidence that (the applicant) has satisfied the zoning and land use requirements of the municipal authority with respect to the use of that site."

Cell tower siting became controversial in many communities beginning in the mid 2000s as the number of personal devices in use exploded. In 1999, after Toronto Public Health assessed the available health, environmental, and technical data, the Board of Health adopted a Prudent Avoidance Policy for the location of new telecommunications towers and antennas.⁸¹ This policy recommended that levels of exposures to radiofrequency (RF) for the general public be kept 100 times below Health Canada's guidelines.⁸²

In 2006, the City of Toronto attempted to challenge federal jurisdiction to site a new cell tower for Telus.⁸³ However, the city lost. Currently there are thousands of towers in the GTA, mostly in Toronto.⁸⁴ The antennas and electronic equipment communicate with cellphones, laptops, and various other personal devices.

In response to growing concern, the Federation of Canadian Municipalities (FCM) and the Canadian Wireless Telecommunications Association (CWTA) jointly developed a protocol to create a harmonized process to review antenna siting procedures. This includes a requirement to provide notice to communities when a tower is to be built. Some would argue that this protocol is largely symbolic politics of no legal force and effect because municipalities are creatures of province and lack powers with regard to federally-regulated activities.

Communities across Canada continue to struggle with the implications of the federal approval system for new cell towers and cellular infrastructure. The most recent precedent is *Rogers Communications Inc. v. Châteauguay (City)*.⁸⁵ In this case, the SCC reversed a decision of the Quebec Court of Appeal, and affirmed that the Federal Government has exclusive jurisdiction over radiocommunication in Canada, including the authority to determine the location of radiocommunication infrastructure.

The case concerned the construction of a new radio antenna in Châteauguay, Québec, to address a gap in Rogers' wireless network coverage in the City. Rogers identified a site and initiated consultations with Châteauguay regarding installation of an antenna at the site in March 2008, in accordance with the

⁷⁹ *Capital Cities Communications Inc v Canadian Radio-Television Commission*, [1978] 2 SCR

⁸⁰ M. Ryan, *TELECOMMUNICATIONS AND THE CONSTITUTION: RE-SETTING THE BOUNDS OF FEDERAL AUTHORITY* (2010), Can. Bar Review, Vol. 89; <https://cbr.cba.org/index.php/cbr/article/download/4181/4174>

⁸¹ Toronto Public Health reviewed available research and concluded that there were still uncertainties in the science regarding the potential health risks associated long-term exposures to RF. Dr. David McKeown, then Toronto's Medical Officer of Health, recommended that the Board of Health and City Council endorse a continued prudent avoidance approach when selecting sites for new telecommunication towers and antennas until this scientific uncertainty was addressed. He further recommended that the City encourage cell phone carriers to voluntarily adopt a proposed Prudent Avoidance Policy.

⁸² <https://www.toronto.ca/legdocs/mmis/2007/cc/bgrd/cc7.5.pdf>

⁸³ *Telus Communications Co. v. Toronto (City)* (2007), 84 O.R. (3d) 656, 8 at para 57. [Telus].

⁸⁴ https://www.thestar.com/news/insight/2013/06/17/cellphone_towers_ofen_unwelcome_neighbours.html

⁸⁵ [2016], SCC. <https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/16016/index.do>; For a summary, see McMillan, *The Supreme Court of Canada Renders a Long Awaited Ruling regarding the Power to Situate Radiocommunication Antenna Systems* (2016). <https://mcmillan.ca/The-Supreme-Court-of-Canada-Renders-a-Long-Awaited-Ruling-regarding-the-Power-to-Situate-Radiocommunication-Antenna-Systems>

consultation process established by the federal Minister of Industry and Industry Canada (now Innovation, Science and Economic Development Canada, ISED). Châteauguay objected to the installation of an antenna at the site. The Minister of Industry approved installation of the antenna at the site identified by Rogers, and Rogers informed the City that it intended to proceed with construction. However, just as Rogers was about to commence construction, Châteauguay served Rogers with a notice of reserve, prohibiting Rogers from proceeding.

A majority of the SCC held that the “pith and substance” of the notice of reserve was the location of radiocommunication equipment, which is a matter that falls within exclusive federal constitutional jurisdiction. The Court concluded that “when the purpose of a municipal measure is to prevent or block the spectrum holder from, or to delay it in, constructing its antenna system at the location approved by the Minister pursuant to federal legislation, the municipality is, for the purpose of the pith and substance analysis, exercising the federal power to choose the location of the antenna system.” The Court also held that the reserve notice was inapplicable to Rogers under the constitutional doctrine of inter-jurisdictional immunity. The Court noted that the facts suggested strongly that Châteauguay acted with the sole purpose of preventing Rogers from establishing an antenna at the location authorized by the Minister of Industry.⁸⁶

Next Steps: Mirror Legislation

What is needed to address the complex gaps and overlaps arising because of jurisdictional issues related to the *Constitution Act, 1867*? Mirror legislation, as explained in separate publications, has been employed to address jurisdictional gaps and overlaps and could be used to address other wicked environmental problems such as plastics waste diversion.⁸⁷ Mirror laws have been developed to provide the basis for national systems to regulate the transportation of dangerous and most hazardous materials in Canadian workplaces, and provide a uniform system for the protection of privacy in commercial and institutional transactions on Internet.

Mirror laws also could provide communities and residents with increased powers to participate in siting cell towers, setting wireless radiation standards, and regulating other wicked environmental and health problems such as EHS. In the absence of constitutional amendments, this appears to be the only way to provide a coherent national system involving communities, workers, and residents.

To mitigate harms related to EMF and EMR, some initial goals for mirror laws could include reducing EMF exposures through the following actions:

- Hardwire everything possible
- Consistent National Rules for “white zones” clear of EMR
- Encouraging institutional organizations and others to turn off all emitting devices at night
- Raising awareness about EMF from appliances
- Consider filters in premises’ electricity systems
- Increased use of corded phones and wired personal devices in many workplace, home, and institutional settings

As noted below, the contours of a well-developed mirror law for regulating EMF would have to be developed on the basis of sound meta-policies and is well beyond the scope of this paper.

⁸⁶ It is unclear what future legal, advocacy, research, and educational activities are being planned in Canada regarding smaller cell towers and 5G technologies.

⁸⁷ For further explanation of mirror legislation, see D. McRobert, Appendix C: Background on Mirror Laws in Canada: An Alternative Approach to Constitutional Dilemmas posed for environmental regulation by the division of powers in the Constitution Act, 1867 in: David McRobert et al., Achieving consistent extended producer responsibility policies for plastics in Canada: Responses to CCME’s Discussion paper, Guidance to facilitate consistent extended producer responsibility policies for plastics, 11 Dec. 2019; http://www.preventcancernow.ca/wp-content/uploads/McRobert_et_al_Achieving_Consistent_EPR_Policies_for_Plastics_12Dec19.pdf

Conclusions

How can we promote law and policy reform on EHS problems? We must start to build a social consensus through advocacy, research, and education. Education will be essential. We must come to a common understanding that sensitivities arise from EMF and EMR, in order best to prevent and to treat conditions such as EHS. If our efforts and demands are seen as reasonable and carefully formulated, the courts and legislatures will respond. There are other precedents that are instructive, e.g., the work by Mothers Against Drunk Driving (MADD) on intoxicated vehicle driving, Pay Equity, LGBTQ rights, etc.

By resisting *Safety Code 6* and the FCM/CWTA Tower Siting Process, communities and activists send a strong message both to ISED and to the telecommunications companies.

Resistance to cell tower applications also engages citizens who otherwise care little about politics and alerts local and senior government politicians of the need to heed their concerns. Municipal and resident resistance to cell towers encourages industry to withdraw applications and ISED to reject tower applications. Hopefully, ISED will become more receptive to the concerns of local communities in making its final decisions, even though it is not constitutionally bound to do so.

In the short term, EHS sufferers and their lawyers also need to consider how to develop practical options on accommodations that are not perceived as completely trumping other interests such as the desire for access to the Internet.⁸⁸

In the long run, development of well thought-out EHS meta-policies would be an excellent place to start. These meta-policies need to be developed using transparent and accountable processes that engage experts, afflicted persons, and others. Conversely, poor, untraceable, or incoherent processes often can result in the development of highly questionable laws and policies that lack social licence.

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⁸⁸ Frank M. Clegg, Margaret Sears, Margaret Friesen, Theodora Scarato, Rob Metzinger, Cindy Lee Russell, Alex Stadtner, Anthony B. Miller, Building science and radiofrequency radiation: What makes smart and healthy buildings (Aug. 2019). <http://www.sciencedirect.com/science/article/pii/S0360132319305347>; <https://doi.org/10.1016/j.buildenv.2019.106324>

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National NGOs in Ontario & Advocacy

Barbara Payne

President, Electromagnetic Pollution Illnesses Canada Foundation (EPIC)

Abstract

For decades, topic-specific NGOs in Canada have been dedicated to improving awareness and advocacy among healthcare professionals, the general public, and regulators regarding illnesses caused or exacerbated by electrosmog—goals being prevention, diagnosis, and treatment of illnesses, including by significant reduction in controllable electrosmog (indoor and outdoor) and adoption of electromagnetic-hygiene practices essential for wellbeing. A brief history of three active national NGOs based in Ontario, Canada is presented. Observations are provided about this advocacy in Canada from 2007 to 2019, current gaps in care that require urgent attention, and necessary outlooks.

Canada has a few national NGOs based in Ontario that do advocacy work.

Since 2007, there has been WEEP, the Canadian Initiative to Stop Wireless, Electric and Electromagnetic Pollution. I ask you to notice here that the goal is informing the public about potential effects; disseminating scientific information and encouraging the precautionary principle. For years, WEEP was the absolutely best source for updates, and all their archives are open and available to read on the Internet. Two examples of timeless information are: “Living with Electro Hypersensitivity: A Survival Guide” and “Talking To Your Doctor.”



Figure 1

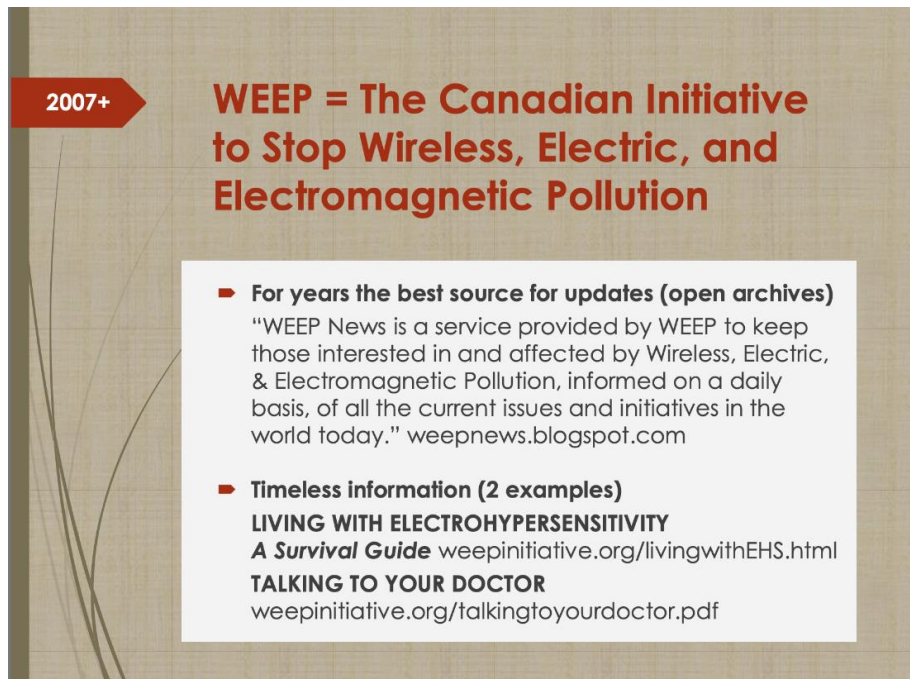


Figure 2

Since 2012, Canadians for Safe Technology (C4ST) has been a not-for-profit, completely volunteer-based coalition of parents, citizens, and experts whose mission is to educate and inform Canadians and their policy makers about the dangers of the exposures to unsafe levels of radiation from technology, and to work with all levels of government to create healthier communities for children and families across Canada. As they note in **Figure 3** (below): “It is critical that all levels of Government: Acknowledge that current assumptions about the safety of electromagnetic radiation are outdated and must be revised. Offer protection and choice for pregnant women, children and electrosensitive and other vulnerable individuals who are exposed to EMR in their homes, schools and places of employment.”

2012+ **C4ST = Canadians For Safe Technology** [excerpted from c4st.org/about-c4st]

[C4ST] is a not-for-profit, completely volunteer-based coalition of parents, citizens and experts whose mission is to educate and inform Canadians and their policy makers about the dangers of the exposures to unsafe levels of radiation from technology, and to work with all levels of government to create healthier communities for children and families across Canada.

- **It is critical that all levels of Government:**
Acknowledge that current assumptions about the safety of electromagnetic radiation are outdated and must be revised. Offer protection and choice for pregnant women, children, electrosensitive and other vulnerable individuals who are exposed to EMR in their homes, schools and places of employment.
- **Health Canada must overhaul its process for updating Safety Code 6 and update its guidelines to protect Canadians.**
- **Industry Canada needs to play a leadership role in protecting Canadians.**

Figure 3

2012+ **C4ST = Canadians For Safe Technology**

- **Collaboration with 55 MDs in Canada**
2014 Declaration: Doctors Call for Protection from Radiofrequency Radiation Exposure
Physicians Call for Health Canada to Provide:
(i) Wireless safety standards that are more protective of the health of Canadians; and
(ii) Guidelines and resources to assist Canadian physicians in assessing and managing health problems related to microwave radiation.
Full text and signatories list: c4starchives.org/images/documents/hc-resolutions/medical-doctors-submission-to-health-canada-english.pdf
- **One result of work to educate our federal government**
House of Commons Standing Committee on Health (HESA, 2015) Recommendations on Radiofrequency Electromagnetic Radiation and the Health of Canadians
Recap & submissions: c4st.org/hesa-2015-recommendations
Full text: publications.gc.ca/collections/collection_2015/parl/xc62-1/XC62-1-1-412-13-eng.pdf

Figure 4

In 2014, 55 MDs collaborated across Canada to make a declaration. They called for Health Canada to provide standards that are more protective, and guidelines and resources to assist physicians in assessing and managing health problems related to microwave radiation.¹

The 2015 House of Commons Standing Committee on Health produced a report,² which recommends a series of important suggestions³ moving forward [*emphasis added*]:

1. That the Government of Canada, in collaboration with the health departments of the provinces and territories, examine existing cancer data collection methods to improve the collection of information relating to wireless device use and cancer.
2. That Statistics Canada consider including questions related to electromagnetic hypersensitivity in the Canadian Community Health Survey.
3. That the Government of Canada, through the Canadian Institutes of Health Research, consider funding research into electromagnetic hypersensitivity testing, diagnosis and treatment, and its possible impacts on health in the workplace.
4. That the *Canadian Medical Association*, the *Royal College of Physicians and Surgeons*, the *College of Family Physicians of Canada*, and the World Health Organization consider updating their guidelines and continuing education materials regarding the diagnosis and treatment of electromagnetic hypersensitivity to ensure they are based on the latest scientific evidence and reflect the symptoms of affected Canadians.
5. That the Government of Canada continue to provide reasonable accommodations for environmental sensitivities, including electromagnetic hypersensitivity, as required under the *Canadian Human Rights Act*.
6. That Health Canada ensure the openness and transparency of its processes for the review of *Safety Code 6*, so that all Canadians have an opportunity to be informed about the evidence considered or excluded in such reviews, that outside experts are provided full information when doing independent reviews, and that the scientific rationale for any change is clearly communicated.
7. That the Government of Canada establish a system for Canadians to report potential adverse reactions to radiofrequency fields.
8. That an independent scientific body recognized by Health Canada examine whether measures taken and guidelines provided in other countries, such as France and Israel, to limit the exposure of vulnerable populations, including infants, and young children in the school environment, to radiofrequencies should be adopted in Canada.
9. That the Government of Canada develop an awareness campaign relating to the safe use of wireless technologies, such as cell phones and Wi-Fi, in key environments such as the school and home to ensure that Canadian families and children are reducing risks related to radiofrequency exposure.
10. That Health Canada conduct a comprehensive review of all existing literature relating to radiofrequency fields and carcinogenicity based on international best practices.
11. That the Government of Canada, through the Canadian Institutes of Health Research, consider funding research into the link between radiofrequency fields and potential health effects such as cancer, genetic damage, infertility, impairment to development and behaviour, harmful effects to eyes and on the brain, cardiovascular, biological and biochemical effects.
12. That the Government of Canada and manufacturers consider policy measures regarding the marketing of radiation emitting devices to children under the age of 14, in order to ensure they are aware of the health risks and how they can be avoided.

¹ Full text and signatories list: <http://c4starchives.org/images/documents/hc-resolutions/medical-doctors-submission-to-health-canada-english.pdf>

² <https://www.ourcommons.ca/DocumentViewer/en/41-2/HESA/report-13/>

³ Ibid; pages 25–26

Health Canada also requested the Royal Society of Canada to convene an expert panel, which produced a report, “A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields.”⁴ Published in 2014, the Review has 10 recommendations [*emphasis added*]:⁵

1. Studies investigating the characterization of skin conductivity and the variability of the internal electric field strength in different human anatomical models, from exposure to external magnetic and electric fields, should be carried out in the near future to further test the suitability of the SC6 (2013) reference levels for the 3KHz to 10 MHz frequency range.
2. The effectiveness of the SC6 (2013) reference levels should be examined against a larger number of new dosimetry studies than those specified in the SC6 (2013) Rationale. Additional data should be collected on child exposure, postured adult and postured child exposure, pregnant female and newborn exposure under grounded and isolated conditions.
3. Dosimetry in the 6 GHz to 300 GHz frequency range is still developing and further research is required to examine the effects of exposure to new and emerging technologies.
4. Health Canada should aggressively pursue scientific research aimed at clarifying the RF-cancer issue, which would allow the government to develop protective measures if the risk were substantiated.
5. Health Canada is urged to investigate the problems of IEI-EMF individuals with the aim of *understanding the etiology of their condition, developing criteria for differential diagnosis of the condition, and finding ways to provide effective treatment for such individuals.*
6. Health Canada should develop a procedure for the public to report suspected disease clusters and a protocol for investigating them. This could be based on the US Centers for Disease Control protocol or on the 2011 Alberta protocol.
7. Health Canada should expand their existing risk communication strategy to address consumer need for more information around RF energy, the types of devices that use RF technologies and the levels emitted. In addition, Health Canada should incorporate additional suggestions into their recommendations on practical measures that Canadians can take to reduce their exposure around cell phone use (for example, limiting use in areas with low signal strength, and using an earpiece).
8. Health Canada should *encourage inclusion of basic education on non-ionizing radiation in the curriculum of Canadian Medical Schools.*
9. Health Canada should pursue research to expand our current understanding of possible effects of exposure to RF energy at levels below SC6 (2013).
10. Health Canada should evaluate the need for a document to encompass all aspects of MRI safety.

There has yet to be any meaningful or comprehensive response from Health Canada to either of these reports.

Another volunteer-based non-profit advocacy organization, EPIC—an acronym for Electromagnetic Pollution Illnesses Canada Foundation—has now been in existence since 2016. EPIC provides support and services to persons affected, and has created public educational campaigns such as “Practice Safe Tech,” “ElectroSmog and You,” “WiresRock,” and “Top E-Hygiene Tips.”

EPIC has made a couple of submissions to the federal government: “Petition to the Commissioner of the Environment and Sustainable Development (2017)” and regarding “Bill C-81 An Act to ensure a barrier-free Canada (2019).” Both submissions focus on accessibility. Bill C-81 makes important points about community inclusion, removing barriers to inclusive accessibility, and removing attitudinal barriers.

⁴ Demers, Paul (chair), Richard Findlay, Kenneth R. Foster, Bryan Kolb, John Moulder, Anne-Marie Nicol, Frank Prato, Rianne Stam. (2014). Expert Panel Report on A Review of Safety Code 6 (2013): Health Canada’s Safety Limits for Exposure to Radiofrequency Fields. Royal Society of Canada, Ottawa, ON. ISBN: 978-1-928140-00-9 https://rsc-src.ca/sites/default/files/SC6_Report_Formatted_1.pdf

⁵ Ibid, pages 119–120.

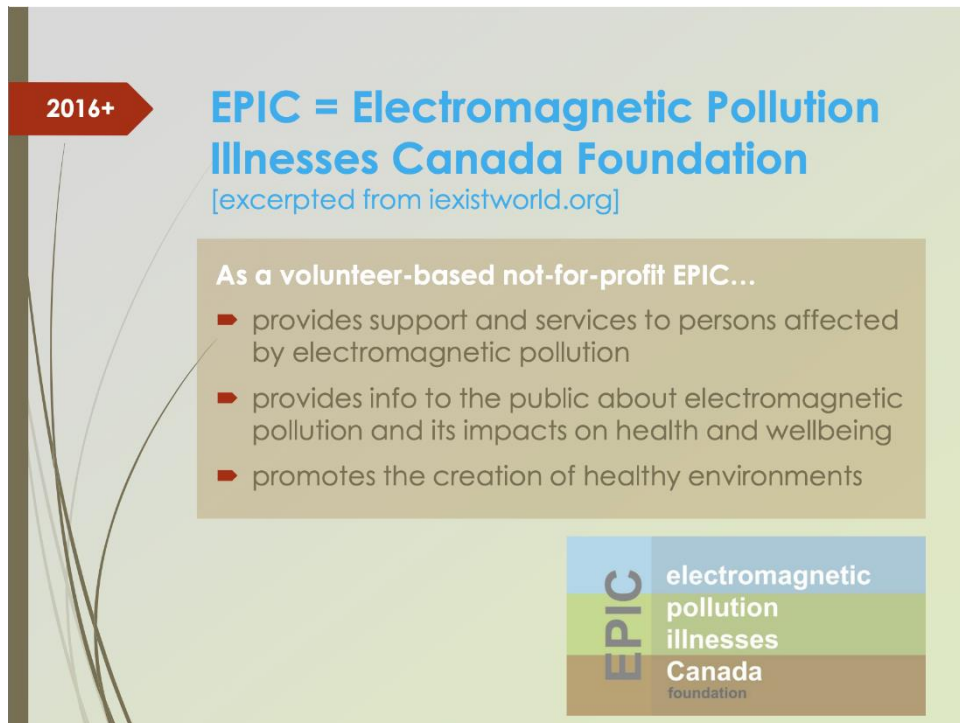


Figure 5

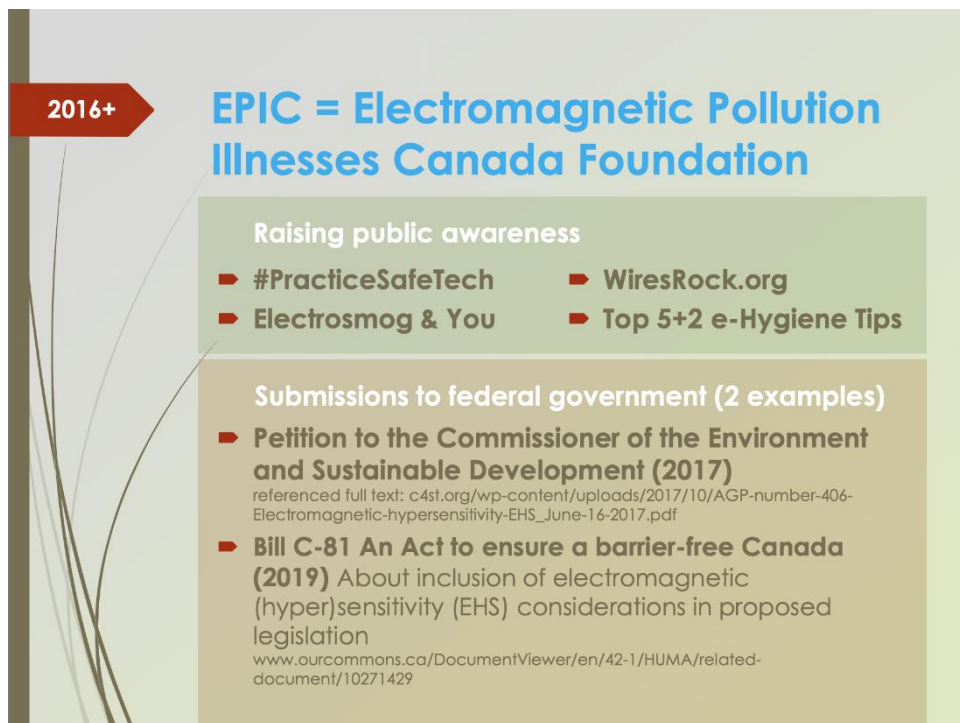


Figure 6

I have been involved in advocacy work since 2008. I became involved when I realized I experience moderate to severe illness. To this day, I require continuous practice of prudent avoidance and my quality of life is still severely impaired. EPIC was founded to fill a specific gap. It must become easier and quicker for anyone who is ill, anyone prevention-minded, and caregivers to interact with people/places/information/solutions, heal, and prevent EPIs (electromagnetic pollution illnesses). Only through caring for oneself, all persons, and all environments can we have a decent quality of life and opportunities to survive and thrive.

EPIC is always involved in information gathering, various aspects of knowledge transfer, and catalyzing ideas in collaboration with other advocates, NGOs, scientists, and healthcare professionals in North America and elsewhere.

Electrical Hypersensitivity (EHS) and the “Social Model” of Disability

David Fancy PhD

Professor and Chair, Department of Dramatic Arts, Brock University, Canada

Abstract

Dr. David Fancy, EHS patient advocate, employs language from critical disabilities studies to explore the realities of how electrosensitivity is understood and categorized as a disability. Fancy underscores the differences between the medical model of disability, which often conceptualizes disability as a biological product, and the social model of disability that instead sees disability as a result of socially constructed barriers to access. He explores the beneficial implications of understanding electrosensitivity from the perspective of the social model of disability.

I received the diagnosis of electrical hypersensitivity or EHS in 2005 from the Environmental Health Clinic at Women’s College Hospital. Like many EHS folks, I’ve spent various periods of time functionally homeless, living in cars or outdoors in tents. I worked closely with physicians, naturopaths, and a range of other care providers to reduce my sensitivity substantially. Thanks to the highly evolved care and follow up provided by the Environmental Health Clinic under Dr. Riina Bray, I’ve received various accommodations from my employer to assist in lowering the electromagnetic environment in my work and teaching spaces.¹ I collectively collaborate with other EHS advocates and activists to assist others affected by this frequently debilitating condition.

Which “model” or “models” of disability are appropriate to think about EHS?

What models already exist?

What implications do each of these models have for how EHS is treated?

What implications do each of these models have for how EHS individuals are understood, viewed, and accommodated (or not) in our current social and technological moment?

In my professional life as a researcher, I have undertaken multi-year arts-based projects with intellectually disabled survivors of institutional abuse using methodologies and concepts from the fields of disability studies and critical disability studies. Today, I’ll apply some of these concepts to the ways in which we might think about EHS as a disability specifically in the Canadian and Ontario contexts. A useful starting point is to remind ourselves that EHS can in fact be considered a disability. I follow here the work of Cara Wilkie and David Baker in their 2007 report for the Canadian Human Rights Commission entitled, “Accommodation for Environmental Sensitivities: the Legal Perspective,” where they argue that, like multiple chemical sensitivities, sensitivities to electromagnetic fields can serve as important barriers to accessing social spaces and services—as such, they constitute disabilities.²

There are a variety of different models used to talk about disability in the critical literature, including historical religious perspectives, the medical model, and the social model. Some models are current, others have fallen out of use. Dominant notions of disability—whether historical or contemporary—have

¹ I stress “highly evolved” because, unlike many medical practitioners, the doctors at the EHC integrate medical and social models of disability in their practice.

² http://publications.gc.ca/collections/collection_2008/chrc-ccdp/HR21-76-2007E.pdf

emerged from specific social, political, and scientific contexts. They have significant influence over perception, treatment, and policy regarding disability. For example, in European cultures disability was historically understood in Judeo-Christian terms as a sign of moral corruption in the community and as an opportunity for miraculous cure via divine intervention.

The discourse of the exotic or monstrous status of disability frequently resulted, in these contexts, in exclusions of disabled individuals from community life. Such prejudicial and religious-based models have been replaced over the past fifty years or so with two prominent models of disability: the medical and the social models. Unlike previous models governed by religious authority, the cognitive authority in this context is the scientist or doctor. A disability is generally understood from this perspective as a medical phenomenon resulting from impairments in bodily functions or structures, a deviation from a biological norm, a deficiency, or an abnormality.³

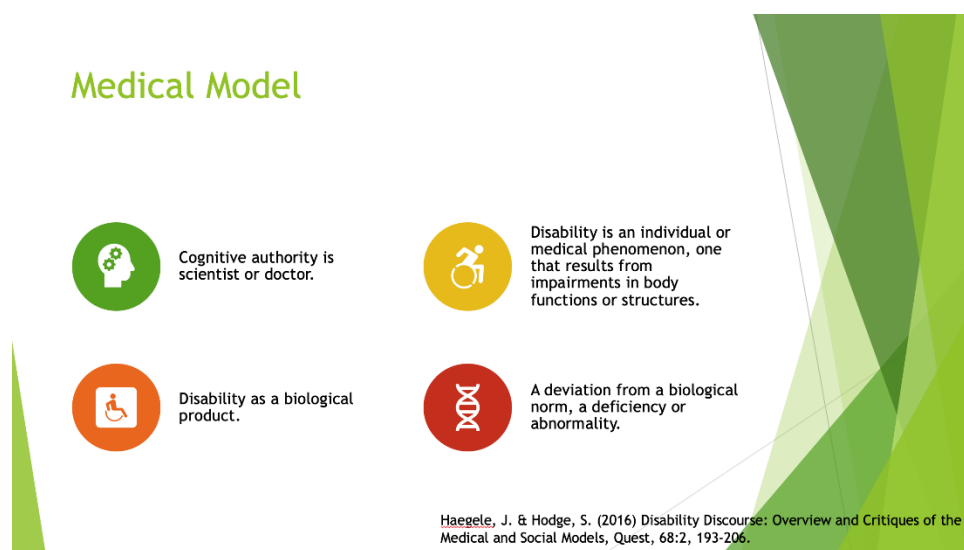


Figure 1

Because members of the medical field generally work from a biological perspective, they often conceptualize disability as a biological product. As a result it often follows that disability is conflated with illness and pathology. In other words, disability equals being sick. Again, the strict version of the medical model, healthcare professionals set out to correct the deviation to the best extent possible, thereby rendering the disabled person normal again; the hoped-for outcome of intervention and curing the person of their disability is once again normalized function. The most normalized function possible under the circumstances allows the disabled individual to become a better-functioning member of the existing society. Frequently, the disability itself risks becoming the defining characteristic of the individual living with a disability.

This will all sound very familiar to the EHS folks fortunate enough to have had the opportunity for a medical diagnosis, as the prospect of receiving an accurate diagnosis can itself be a rare experience.

In December 2018, in the executive summary, “Care Now: an action plan to improve care for people with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS), Fibromyalgia (FM), and Environmental Sensitivities/Multiple Chemical Sensitivity (ES/MCS),” Ray Copes, the Chair of the Task Force on Environmental Health, notes that in Ontario conditions such as environmental sensitivities are “under-recognized under-researched, poorly understood and regularly misdiagnosed and poorly

³ Haeghele, J. & Hodge, S. (2016) Disability Discourse: Overview and Critiques of the Medical and Social Models, *Quest*, 68:2, 193–206.

managed.” He continues by stating that care providers lack the knowledge, resources, and support they need, which means that people with these conditions struggle to get care, support, and accommodation. More often than not, the care provided does not work for patients and their families.

Copes confirms what most EHS folks already know quite intimately. He states that, “Many patients are told that it’s all in your head, which is both frustrating and stigmatizing. In fact, people with these conditions face significant stigma and discrimination within the healthcare system, the workplace and society at large.” The literature notes that the internalization, or “interjection” to use the psychoanalytic term, of these social projections can only contribute to the sufferer’s alienation and eroded mental health.⁴ These attitudinal barriers are only one of the key barriers affecting EHS in Canada. For those fortunate to meet a competent care provider, they are provided with suggestions on how to improve their condition and perhaps engage in some reduction of EMFs in their home environment. This is again generally undertaken with a view to becoming less disabled, and to resume day to day functionality in a world increasingly riven with human-made electromagnetic signals. Importantly, the legitimacy that their condition receives from a simple doctor’s note can provide for workplace accommodations or the possibility of receiving disability tax credit, depending on the patient’s constituency.

Although many EHS self-diagnose, it is not until an official diagnosis is provided that the legitimacy of the condition is established in the individual’s workplace and social familiar circumstances. Yet even with a diagnosis, the legitimacy of the condition is not necessarily respected by family members.

Many capable healthcare practitioners—be they allopathic physicians or complementary health care practitioners—have continued to making very important interventions in the lives of people living with EHS. As Copes et al.’s (2018) attention to the matter of social stigma indicates, many clinicians are motivated by socially contextualized understandings of pathology and wellness. As such, these clinicians move organically beyond the strictly medical model of disability in their own thinking and practice. This genre of physician, such as the ones with the Women’s College Hospital’s Environmental Health Clinic, are to be commended for their pioneering work.

Along with the medical model of disability, various evolving versions of the social model of disability have been popular with disability studies scholars, as well as disability activists and advocates, for some time. Important legislation, including the *Accessibility for Ontarians with Disabilities Act* (AODA), which became law in 2005, applies to all levels of government, non-profits, and private sector businesses in Ontario. It is marked by key tenets of the social model of disability. The AODA emphasizes matters of accessibility and its socially contingent nature, including barriers to accessing private and public spaces. Similarly, the Federal Bill C-81 the *Accessible Canada Act*, passed in June 2019, stresses that it seeks to benefit all Canadians by removing and preventing barriers to accessibility.

⁴ Brittain, I. (2004). Perceptions of disability and their impact upon involvement in sport for people with disabilities at all levels. *Journal of Sport & Social Issues*, 28, 429–452.

Social Model of Disability

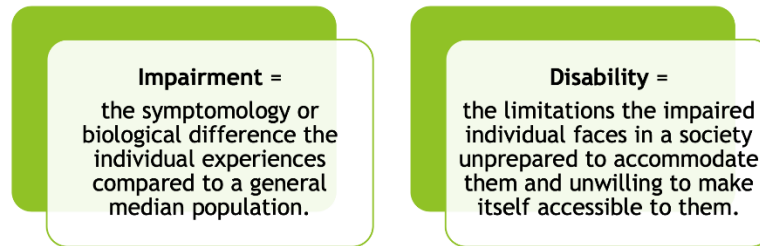


Figure 2

Therefore, the overall characterization of the social model is that society imposes disability on a person when that person has an impairment. This distinction between disability and impairment is key to the social model. And impairment is considered the abnormality, or more affirmatively, the difference, in the body of an individual or individuals. For example, for individuals living with EHS, the abnormality or difference is the cascaded set of physiological responses to varying levels of human-made electromagnetic emissions. The result includes experiences of significant neurological and other discomfort, pain, brain fog, peripheral neuropathy, inflammation, and many other symptoms, that itself is the impairment. The disability, on the other hand is considered to be the restriction in activity and resulting disadvantages caused by a social group, organization, or overall society that does not take into account the impairment of individuals, thereby actively excluding from full participation in community life. Impairment equals the symptomatology or biological differences and individual experiences compared to a general median population. Disability equals the limitations that each of the impaired individuals face in a society unprepared to accommodate them and unwilling to make itself accessible to them.

The distinction between impairment and disability that emerges in the social model of disability is an important one for individuals living with EHS. We—and I include myself in this population, as I have said—might have an impairment. And while we certainly might want to improve our condition by reducing a response rate, the entire burden of responsibility on our frequent inability to participate in aspects of community life cannot rest so solely on our own shoulders. We might have an impairment, but why does it follow that we are essentially rendered disabled by environments increasingly saturated with human-made electromagnetic fields? This lack of accessibility is not of our making, and, yet, we are subject to a host of related barriers, all of which have some element of a social component.

From the perspective of the social model of disability, the lack of access constitutes an active attempt to minoritize individuals with impairments, thereby perpetuating their alienation from their community, and effectively rendering them disabled. At the moment, impairments seem destined to become disability for EHS. This needs to change, and fast. Such a lack of access would not be tolerated for many other impairments, such as those within the challenges faced by those with intellectual disabilities or mobility challenges. Technological proliferation and people's use of technology bear a part of responsibility for EHS lack of access to community life as do difficulties in being diagnosed and receiving continuing care, attitudinal barriers, difficulties accessing public spaces, not to mention difficulties accessing the private space of one's own dwelling.

We also see in the scientific literature a range of statements influenced by the major principles of the social model of disability. Researchers such as Olle Johansson (2006) and Magda Havas (2019) have frequently foregrounded the environmental factors contributing to EHS.⁵ The Johansson 2006 study, “Electrohypersensitivity: state of the art of functional impairment,” draws its definition of EHS from official Swedish government policy of the time that positioned EHS as a functional impairment rather than a disease. This is an important shift.

It is important to note in the title of Magda Havas’ recent 2019 review article entitled, “Electrohypersensitivity is an environmentally-induced disability,” that there is an attribution of the disability to the environmental cause, as opposed to the pathology of the individual themselves. This is significant for the individual living with the stigma, exclusion, and alienation of electrical sensitivity. Havas notes that action is long overdue to minimize exposure to non-ionizing radiation and to provide a safe environment all can enjoy. Thus, the fact that certain researchers speak to environment in context is an excellent ongoing development.

And yet, the future looks relatively promising, despite the technological juggernaut that 5G implementation represents. It looks promising in many ways, at least on paper. These perspectives and models are important levers that can be used to leverage accessibility and accommodation for EHS moving forward, because it is a dismal terrain at the moment.

The *Accessible Canada Act*, which I addressed above, follows the social model of disability’s emphasis on the socially contingent nature of disability when it defines barriers and disability in the following fashion:

Barrier: means anything—including anything physical, architectural, technological or attitudinal, anything that is based on information or communications or anything that is the result of a policy or a practice—that hinders the full and equal participation in society of persons with an impairment, including a physical, mental, intellectual, cognitive, learning, communication or sensory impairment or a functional limitation.

Disability: means any impairment, including a physical, mental, intellectual, cognitive, learning, communication or sensory impairment—or a functional limitation—whether permanent, temporary or episodic in nature, or evident or not, that, in interaction with a barrier, hinders a person’s full and equal participation in society. (handicap)⁶

Of note in these definitions is that in no case is the disability the sole, pathologized responsibility of the disabled individual. These and other statements informed by the social model of disability are important tools to help leverage more accessibility and support for those who experience EHS. Other implications of the social model, specifically against the strictly medical model, include the fact that access to treatment should not simply be via referral by diagnosis. Indeed, resources need to be provided for individuals with experience-driven self-diagnosis so that they can begin taking care of themselves as part of comprehensive care protocols. Rather than focusing solely on normalizing the EHS individual by removing their sensitivity, environmental barriers to access that induce the disability must be reduced and removed. In addition to professionals assisting EHS individuals, more work on networks of allies, and mutual caregiving, can give agency back into the hands of allies and networks. Rather than the individual being perceived as simply faulty, they can be understood to be unique, and thus equally deserving of respect and social inclusion as anybody else. Being impaired can no longer be viewed as being deficient, bad, abnormal, exotic. Instead, it can be a neutral designation resulting from a description of fact. The

⁵ Johansson, Olle. Electrohypersensitivity: State-of-the-Art of a Functional Impairment. *Electromagnetic Biology and Medicine* (2006) 25: 245–258.

Havas, Magda. Electrohypersensitivity (EHS) is an Environmentally-Induced Disability that Requires Immediate Attention. *J Sci Discov* (2019); 3(1):jsd18020.

⁶ <https://www.canada.ca/en/employment-social-development/programs/accessible-people-disabilities.html>

social model is very important in view of the fact that human-made electromagnetic fields are not always beneficial for the human organism, regardless of the level of one's sensitivity to them.

In other words, whereas someone who identifies as EHS might have an impairment response to electromagnetic fields, another person without the experience of immediate impairment may gradually suffer the pathology of generated effects of exposure to electromagnetic fields over a period of time, such as carcinogenicity or any number of other degenerative conditions. Pushing back on socially imposed barriers to access means pushing back on the unproblematic acceptance of highly saturated EMF environments. EHS individuals are actually serving to improve the lives of others in the community.

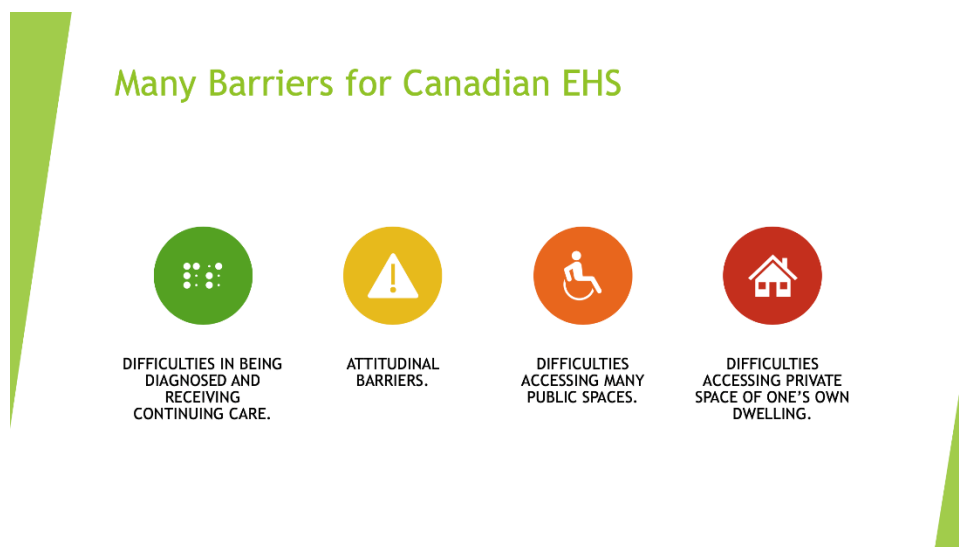


Figure 3

Ultimately, the full implication of the social model is that the notion of sensitivity is an inaccurate designator and is not logical or sustainable as a conceptual model. The term sensitivity tends to direct responsibility back to the sufferer: "I am sensitive." In this patriarchal moment that continues to unfold, sensitivity tends to be feminized and viewed as "lesser-than" in our current discourses. Realistically, though, we've seen that it is simply a biological reality that a significant percentage of the population is affected one way or another, which suggests that the electromagnetic emissions are themselves injurious rather than being a problem of the "sensitive" person. However, for a person living with the condition right now, given that "sensitivity" is the discourse of the moment, it makes sense to adopt EHS strategically in order to gain an accommodation.

Moving Forward...



Figure 4

Environmentally sensitive individuals are often described as “canaries in the coal mine.” Canaries were brought into mines against their will. An initial sign of the presence of toxic gas for the miners who brought the canary was the actual death of the canary. Rather than simply assuming that EHS canaries must suffer, let’s honour the canaries for the way in which they warned us of the impending health crisis to come, and protect them. Those of us in support communities do a lot of frontline work—racing to people’s houses, driving to remote locations, trying to facilitate others’ encounters with the best physicians, so on and so forth. When doing this work you witness a lot of suffering. There are regular stories of EHS folks taking their own lives simply because of the inability to find a safe location to sleep or to rest. It is time for the medical and other establishments to take this disability seriously indeed.

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Impacts on Learning Institutions, Students, and Teachers

Shelley Wright & Frank Clegg

Abstract

Electromagnetic hypersensitivity (EHS) or “microwave sickness” is a scientifically demonstrated physiological intolerance to human-generated electromagnetic emissions. Medical practitioners are learning to recognize EHS symptoms and recommend treatment. Doctors are recognizing the underlying medical conditions for EHS (Lyme disease, immune deficiencies, chemical exposures, or genetic weaknesses). Medical facilities are becoming accessible by reducing EMFs, understanding patient needs, and displaying signage to reduce EMF signals from personal devices. This starkly contrasts Health Canada’s (HC) position which suggests that EHS is not related to electromagnetic, Wi-Fi exposures. Consequently, HC unintentionally creates accessibility barriers and perpetuates negative attitudes. Contrary to HC’s position, scientific evidence of physiological intolerances to RFs will be presented. EHS patients too sick to end the cycle of inequity and lack of accommodations seek unpaid medical leave or premature retirement; need medical support and advocacy. A teacher’s testimony and resolutions to prevent EHS injury are presented. Frank Clegg, past President of Microsoft Canada, reports that commercial grade routers connected to 60 devices are hidden in classrooms. Clegg presents an internationally accepted “Safer Use” model.

Introduction

Hello everyone. I have a zest for the outdoors and I believe in living life to its fullest, living in the moment, and treasuring each day. I have a loving, supportive family, a large circle of friends, and many beautiful memories of holidays, gatherings, and fun times spent together. I’ve learned that hard work leads to success. Throughout my career, I have been a committed, engaged, and enthusiastic teacher; and I have earned the respect of fellow teachers, students, and parents. I am positive, resourceful, and determined, as I climb Mount Everest each day to survive in a toxic workplace.



Figure 1: Please support teachers sensitive to Wi-Fi. Let’s make shared spaces in the workplace inclusive. At home where electromagnetic radiation (Wi-Fi) levels are low, I am free of chronic/intolerable symptoms.

I hope my testimony will provide you with the insight into the daily struggles your electromagnetically sensitive—EHS—patients face. Inclusive and accommodating spaces in medical clinics can provide much needed support to help balance these daily challenges.

Life before wireless was pretty-much perfect. Nothing prepared me for the difficulties of living with debilitating migraines from subsequent exposure to wireless devices, which emit signals in the microwave range. Curled up in a fetal position for hours or days was not my idea of living fully. Debilitating EHS symptoms became an inconvenient truth for my family, friends, and employer. The lack of public accommodations and the daily social isolation became physically and mentally taxing. I was determined to find ways to participate fully in public places.

Health Canada's Position on Electromagnetic Hypersensitivity

I felt injured from electromagnetic signals. I began to use speaker mode to make phone calls and airplane mode on my phone to reduce exposure close to my body. These extra precautions to reduce my exposure to microwave signals surpassed *Safety Code 6* recommendations and yet, on speaker mode, I still got sick. I gave up my cell phone and kept my home router turned off. I discovered that Health Canada claims injury is not possible from wireless signals.

Health Canada's position is based on recommendations and guidelines from the World Health Organization¹ and *Safety Code 6* (SC6).² These health and safety organizations evaluate scientific studies, including industry funded studies, with these latter studies naturally protecting their own corporate interests. Studies funded by the wireless industry suggest that people are not injured by devices emitting radiofrequency, or electromagnetic radiation in the microwave range, even though microwave radiation sickness and a number of negative biological effects have been scientifically documented in numerous independently funded, scientifically sound studies.

Health Canada echoes the World Health Organization RF safety recommendations. It recognizes that "EHS is a real medical condition" but claims "[n]umerous scientific studies to date have failed to demonstrate that these health effects are caused by exposure to electromagnetic fields."³ In May 2019, Health Canada's website attributed EHS symptoms to "poor indoor air quality, stress in the workplace, or pre-existing medical conditions."⁴ This post was modified October 21, 2019. Health Canada no longer attributes these conditions as "triggers" for EHS (microwave sickness). **Health Canada's position, however, does not yet support the independent scientific evidence that EMFs directly cause EHS symptoms.**

Delving into the research to understand my EHS triggers and symptoms, and to find possible solutions, I discovered a number of world-renowned, independent, peer-reviewed studies. In double-blind, physiological provocation studies, effects were recorded without subjective input from the patient. There were also hundreds of studies showing that EMFs directly cause electromagnetic hypersensitive symptoms patterns. Professor Dominique Belpomme studied 673 EHS people. His research showed severe injuries including breakage of the blood-brain barrier, damage to the limbic and thalamus systems,

¹ World Health Organization (2016-01-12) *Electromagnetic Fields and Public Health*. <https://www.who.int/peh-emf/publications/facts/fs296/en/>

² Government Of Canada (2015-01-12) Health Canada. <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/fact-sheet-what-safety-code-6.html>

³ Government Of Canada – Health Canada, (2015-06-05) *Recognition of electromagnetic hypersensitivity*, <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/consultations/2015-revisions-safety-code-6-summary-consultation-feedback.html>, *Busting Myths on Safety Code 6 (para. 5)* <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/fact-sheet-what-safety-code-6.html>

⁴ Post removed from Health Canada website

oxidative stress, autoimmune damage, and neurodegeneration.⁵ This research was quoted by the Council of Europe in a 2011 opinion paper on wireless harms, “*The Potential Dangers of Electromagnetic Fields and Their Effect on the Environment*,”⁶ which reveals that **EHS is a physiological intolerance to electromagnetic fields and radiation**. Other studies provided evidence of heart irregularities and damage to the autonomous nervous system regulation from exposure to RF.⁷ Countless other independent scientists show negative effects on the heart rate, brain waves, thyroid;⁷ reduced intracortical facilitation;⁷ thyroid dysfunction, liver dysfunction and chronic inflammatory processes;⁷ changes in (1) heart rate variability, (2) microcirculation (capillary blood flow), and (3) electric skin potentials.⁷ I knew that my symptoms were directly related to EMF exposures, but from my research, I found the evidence I was looking for. I discovered scientific evidence that revealed negative, biological effects from microwave exposure does exist and can have a devastating effect on sensitive people.

Health Canada is beginning to consider vulnerable populations, as it provides excellent recommendations to parents to reduce RF exposure for children because “they are typically more sensitive to environmental agents.”⁸

Health Canada acknowledges there are underlying medical conditions but should list these conditions on its website to remove the stigma that EHS is a “mental health” illness. EHS patients often are more susceptible to injury from microwave signals because they may have either Lyme disease, a history of exposures to chemicals, a head injury, an immune deficiency, or genetic mutations related to inadequate methylation. An incorrect perception that EHS is a “mental health” illness can lead to invasive, unnecessary medical tests, and inappropriate medical treatment.

However, Health Canada does not yet directly acknowledge that microwave emitting devices, hubs, and cell towers can induce microwave sickness in sensitive people. Health Canada’s claims that wireless signals are safe leads to public disbelief that EHS is even associated with exposure to Wi-Fi devices. Until Health Canada makes this connection between microwave exposure (Wi-Fi) and microwave sickness (EHS) on its website, the EHS community will continue to experience negative attitudes or behaviours. Health Canada’s invalidating position that EMFs are not the direct cause of EHS leads to an incorrect public perception that EHS-disabled people are “mentally unsound,” “Tin foil hat people” who experience unexplained or psychosomatic symptoms. This incorrect perception often leads to insults and negative slurs, all of which can have a negative impact on this invisible minority. Health Canada’s position also unintentionally promotes reluctance from employers to provide accommodation in the workplace. This creates stressful working conditions, and exhausting political hoops for EHS-disabled employees.

Health Canada has the opportunity to acknowledge the direct connection between Wi-Fi devices and EHS on its website and to provide recommendations that can promote equity and improve the public perception of EHS-disabled people. Acknowledging that wireless devices emitting microwave signals can make some people sick will also promote compassion, responsibility, and accountability in the workplace to accommodate these disabled employees. This acknowledgement can also significantly reduce social and political hurdles and improve accessibility for this disabled, invisible minority, enabling them to participate more fully in society.

To end the cycle of inequity and lack of workplace accommodations, Health Canada’s guidelines and public policies need to reflect growing evidence from doctors, patients, and independent science that

⁵ Dominique Belpomme, Christine Campagnac, Philippe Irigaray (2015). *Reliable Disease Biomarkers Characterizing and Identifying Electrohypersensitivity and Multiple Chemical Sensitivity As Two Etiopathogenic Aspects Of a Unique Pathological Disorder*. <http://www.ncbi.nlm.nih.gov/pubmed/26613326>

⁶ Parliamentary Assembly, *PACE Resolution 1815 (2011) (sections 8.1.4 & 22)* <https://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=17994>

⁷ Canadians for Safe Technology C4ST, *Electrosensitivity-Was ES Proven Scientifically?*, <http://c4st.org/electrosensitivity/>

⁸ Government Of Canada - Health Canada (2019-10-21), *Cell phones and cell phone towers – Minimizing your exposure* - <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/everyday-things-emit-radiation/cell-phones-towers.html>

wireless signals in the microwave range directly cause “microwave sickness” (EHS) among environmentally sensitive people.

Ten years ago, I felt healthy. When Wi-Fi was installed in schools and cell phone usage increased, I began to feel intolerable migraines, but I didn’t understand why. Concerned, I paid close attention to my symptoms and discovered that when a text was sent, a sharp searing pain went through my head, followed by a vice-like, building, head pressure. With multiple texts, the pain increased and became intolerable. I felt head pressure when I entered a building with Wi-Fi, or when someone was making a phone call I’d move away to avoid the migraine that often followed.

My husband Brian, a Professional Engineer, used a radiofrequency meter to test my sensitivity. This was his “Ah-ha” moment! The meter confirmed that a text sent a short, stronger burst of microwave radiation that was more noticeable than the lower intensity signal from a phone call. These measurements could explain my piercing, intolerable head pains when people texted and why a nearby phone call only caused building head pressure which was often followed by migraines hours later. Severe migraines that lasted eight hours or days. With pervasive eight-hour work exposure, my EHS symptoms mimicked MS symptoms which affected the left side of my body. In an effort to recover, I was forced to work part-time. A neurological test confirmed a differential between the right and left side of my body. My proximity to the source, duration of exposure, and signal strength all had a cumulative impact on my symptoms. Intolerable head pains meant I couldn’t buy groceries for my family. Enclosed spaces like metal elevators became off-limits. After two years of misdiagnosis and invasive medical assessments, including an MRI and CT scan, I knew my health depended on doing some research. Ten years ago, the information was limited. I documented my symptoms and triggers, and it was through best doctors that I discovered Dr. Riina Bray, who diagnosed my condition accurately. Dr. Bray taught me how to balance my health, take supplements to boost my immune system, reduce inflammation, detox, and reduce harmful metals.

Avoiding wireless signals completely is impossible. I’ve had to learn how to ground and recover from exposures. No longer curling up in a fetal position for days, I now entertain my friends and family at home. Through genetic testing, I’ve learned that I’m missing the GSTT1 and the GSTM1 detox genes, and my GSTP1 gene is suboptimal. This leads to the myelin sheath disruption and inflammatory concerns. I carry the MTHFR mutation, which significantly reduces my ability to methylate. Like many EHS patients, I also have multiple chemical sensitivities. When I am 15 m (50 ft) away from microwave radiation emitting devices such as cell phones, tablets, or Wi-Fi hubs and 3 km away from cell towers, I feel great!

Avoiding Public Places To Recover

To reduce debilitating symptoms, I avoid my public library, museum, church, community center, and skating arena. I cannot ride public transit, airplanes, or trains yet, and restaurants are off-limits with the exception of secluded outdoor patios or 10 o’clock dinners. Road trips are calculated carefully to avoid intrusive pain-inducing cell towers. I’ve learned to avoid parks, beaches, ski trails, and downhill skiing resorts that have cell towers close by. Holidays became challenging for my family.

I’m not an anxious person, but I feel anxious when I see wireless devices because I know I will suffer the delayed symptoms. I constantly have to ask people to put phones in airplane mode which can lead to negative reactions. This disability is socially isolating and financially costly. EMF shielding materials and clothing are pricey. Vacations are difficult and more expensive when you need WiFi-absent transportation and accommodations.

24/7 Wireless Radiation In Schools

Swayed by the industry’s luring appeals of wireless technology, school boards have invested in and installed Wi-Fi in most classrooms. These devices can have a negative biological impact on vulnerable students and sensitive teachers. Some students and teachers have reported experiencing heart arrhythmia.

According to cardiologist Dr. Stephen Sinatra, “atrial fibrillation is a common and often life-threatening form of arrhythmia. It can increase the risk for heart failure.” He reports that EMFs can be a cause of arrhythmias like atrial fibrillation. He recommends, “Try limiting exposure to cell phones, cordless phones, cell towers and Wi-Fi routers.”⁹

Environmental doctors suggest that 5% of people in Ontario are living with mild to moderate symptoms, while a smaller percentage of this group is hypersensitive. 5% of 80,000 teachers would mean approximately 4,000 teachers could be feeling the effects.

In Sweden, EHS is considered a functional impairment and long-term disability is available.¹⁰ In contrast, Canadian teachers with environmental sensitivities to wireless signals are forced to work in toxic environments because WSIB and health insurance plans base their decisions on outdated *Safety Code 6* guidelines. *Safety Code 6* suggests wireless technology is safe, despite mounting evidence to the contrary. *Safety Code 6* does not yet consider vulnerable or electromagnetically disabled people and fails to make appropriate recommendations for employers. Employers feel no legal obligation to accept medical letters connecting patient symptoms with wireless triggers, or accommodate EHS-disabled employees, as this disability is not yet supported by Health Canada recommendations which are based on *Safety Code 6*.

EHS professionals share similar stories. They had a stellar attendance record before Wi-Fi installations and they wanted to work full-time in the job they loved. Familiar with the *Accessibility for Ontarians with Disabilities Act*, they naively assumed that their employer would provide accommodations by unplugging one access point in their location. Their employers look to Health Canada for guidance.

As health professionals, you need to know the level of mental stress EHS-disabled patients can experience in the workplace. Some EHS professionals with stellar performance have been interrogated about their disability and questioned about their ability to work effectively in a wireless world. Since long-term disability is not available for EHS, as it is not yet recognized in Canada, highly sensitive teachers feel forced to take unpaid medical leave, short-term disability, or resign to regain their health. The significant loss of income can be devastating. Medical leave is only approved for migraines as long as there's no mention of wireless or electromagnetic sensitivity in the diagnosis.



Figure 2

Wearing an EMF veil can negatively affect the rapport and management of students. Teaching from the corner of the classroom or outdoors can be restrictive, and marking in secluded areas near stairwells can be distracting.

⁹ Sinatra, Stephen (2019-09-19), A-fib Symptoms, Causes and Treatment, <https://heartmdinstitute.com/heart-health/a-fib-the-most-common-serious-arrhythmia/>

¹⁰ Johansson, Olle (2010-05-01), *Aspects of studies on the functional impairment electrohypersensitivity*, https://www.researchgate.net/publication/231105168_Aspects_of_studies_on_the_functional_impairment_electrohypersensitivity

Health Canada's current guidelines discourage accommodations and equity for EHS-disabled employees, even though this environmental disability is medically and scientifically documented.¹¹

Revising Health Canada Guidelines

It is our hope that the World Health Organization and Health Canada will recognize on their public websites that electromagnetic hypersensitivity is directly linked to exposures from wireless signals in the microwave range. I urge you to encourage Health Canada to establish a task force to create specific guidelines that promote respectful and appropriate accommodations for EHS-disabled people in all aspects of public life.

Health Canada guidelines can encourage employers to reduce RF exposure for sensitive employees. These guidelines can recommend EHS disability signs, portable on-off switches, or EMF shielding on the Wi-Fi hubs in classrooms with sensitive staff or students. They can encourage staff training to promote inclusive shared workplaces, recommending that staff put devices in airplane mode.

Ergonomic Hardwired Classrooms



Figure 3

I know EHS teachers who love hardwired technology and teach their students "safer use" strategies when they are using their devices. They teach their students to keep iPads on airplane mode after data is downloaded. Some teachers access online resources using a hardwired classroom computer, connected to their whiteboard. They believe that teaching students to use technology in the safest manner will protect their long-term health. My dream classroom would have child-centred, ergonomically designed, technology stations. Students can use their laptop, plug in their smart phone or whiteboard with a projector and webcam. These child-friendly stations would inspire learning, increase focus, and promote collaboration.

Inclusive Hospital Experiences

In my experience, hospitals have seized the opportunity to build compassionate, inclusive communities focused on optimal health, training, and education. The Royal Victoria Hospital (RVH) and Dr. Bray provided me with excellent accommodations. Dr. Riina Bray's medical diagnosis was accepted by RVH

¹¹ Pall, Martin (2018-07), *Wi-fi Is an Important Threat To Human Health*, <https://www.ncbi.nlm.nih.gov/pubmed/29573716>

when I attended the fracture clinic following my ski accident. My accommodations were seamlessly orchestrated. I received my ID hospital bracelet at the Patient Rep. Office to avoid cell phone exposure at the admissions office. I was escorted to a quiet elevator and back hallway to a low-EMF room near the fracture clinic. Patients were asked to put phones in airplane mode and given an EHS fact sheet upon request. Upon arrival for each visit, the physician announced his phone was left at reception or on airplane mode (with Wi-Fi and Bluetooth signals turned off). Trained staff and specific instructions on “Wi-Fi Alert” posters (similar to “no scent” signs) promoted inclusive healthy spaces for wirelessly sensitive patients. Clinic signs instructed patients to move 15 meters (50 feet) away from the waiting room to make phone calls, send texts, or download information from the Internet.

Medical practitioners can learn to recognize EHS symptoms, diagnose this disability, and recommend treatment. They can also reduce EMFs in clinics and provide environmental sensitivity posters.

Doctor Advocates For Accessibility

EHS patients are an invisible minority and they are often too sick to advocate for themselves. They need medical professionals to be their voice to urge Health Canada to recognize that EHS is a medically supported, scientifically proven disability.

Doctors can encourage Health Canada to provide guidelines that recommend building codes require hardwired systems, which are AODA (*Accessibility for Ontarians with Disabilities Act*) compliant. These guidelines need to include health and insurance policies that provide accessibility for environmentally sensitive people.

Doctors can actively promote inclusive public spaces in their communities, keeping cell towers away from schools, daycares, beaches, campgrounds, and hiking trails to enable their EHS patients to heal and participate fully in society. EHS-disabled patients need doctors to stand up with them against 5G in communities so that EHS-disabled people can safely walk around in their own neighbourhoods.

Teachers Unions Promoting Healthier, Inclusive Schools

A community of EHS-disabled teachers in Ontario passed motions at annual general meetings with 700 members present, representing 83,000 Elementary Teachers' Federation of Ontario (ETFO) members. These motions urged ETFO to lobby the Ministry of Education. Some of these key motions include: to provide accommodations for sensitive teachers and students; to encourage school boards to apply the concept of prudent avoidance by practicing the ALARA principle (minimizing the Wi-Fi signal strength needed to operate wireless devices efficiently in classrooms); and to urge school boards to provide clear, comprehensive, written Internet and email user policies and procedures that include Health Canada's recommendations for safer use of wireless devices and manufacturers' warnings to be distributed to employees, students, and parent(s)/guardian(s). These EHS-disabled teachers also presented motions to urge school boards to give teachers permission to turn off wireless signals or use electromagnetic frequency shielding when wireless signals are not required for instructional purposes; to follow the “Right to Know” Legislation regarding location of Wi-Fi access points under Ontario's *Occupational Health and Safety Act*; to obtain annual informed consent for both students and staff regarding existence of Wi-Fi access points and measured microwave radiation levels and; to develop a hazard control program through their workplace Joint Health and Safety Committees (JHSC). Inclusive workspaces with respectful accommodations will vastly improve the quality of life for EHS employees, students, and their families.

Manufacturers' High-Density Wi-Fi Design Guidelines

My name is Frank Clegg. I want to compare the Wi-Fi environment in schools when it was started several years ago, to the Wi-Fi school environment today. The initial claims, as we experienced with Peel Region, are to state the routers are of residential grade, there are minimal routers in the classroom, and *Safety*

Code 6 says there isn't any harm. In most classrooms in North America, we are now well beyond the residential routers in the hall. We are into commercial grade routers which are High-Density.

SecurEdge recommends to "never use access points that were made for residential environments."¹² And yet the bodies of students and teachers are absorbing more radiation. Sometimes routers are even hidden or placed under seats.^{13,14} In certain locations we're now placing four or even six routers in a classroom. If you're the student sitting at the conjunction point of five routers, the level of radiation you are exposed to is significant.

Multiple Sources of Exposure

What we're also starting to see is students having their phone or tablet as the access point.¹⁵

The old design was to have a phone or tablet go to the router, and then back into the network. Now the design is if you've got devices in the room have them set up as a network where they are all talking to each other, and then the information is transported across them. This would mean that as a student, instead of having to worry about that one device talking to the router, you now have 60 devices in a classroom all talking to each other. You're being heavily irradiated in that environment.

Maximum Signal Strength Exposure In Classrooms

Often the industry installs systems at maximum power to ensure maximum efficiency. There is a perception that if you don't have five bars in your phone then you're not happy. This happens with school installations, where we put everything on maximum power (maximum radiation) to get the maximum response rate. This signal strength far exceeds the response rate that you need for Wi-Fi to function well.

In the public system, we did a pilot project with a local boy's school. We had one of the parents introduce us to the founder of the school, and we met with them. Rob Metzinger and his team went into the school. Rob's team reduced the number of routers, turned the dial down, and reduced the microwave radiation exposure by 90% and still maintained full access to the Internet.

A Safer Use Technology Model in Classrooms

The school board has an opportunity to change its current paradigm; to lead the way, showing how they can protect students and teachers. They could ask industry to provide devices with hardwired features. They could use hardwired connections wherever possible, as they are safer, 100 times faster, more economical in the long run, more reliable, and less vulnerable to security and privacy problems.¹⁶ If hardware connections are unavailable, school boards can install on/off switches for routers in every classroom. They can give teachers the ability to turn off the Wi-Fi access points and devices when not in use. Perhaps a long-term plan could be developed where they start with on/off switches in classrooms just where there are sensitive teachers and students. On/off switches are portable and can be moved from classroom to classroom until the funds are available to maybe eventually provide them for every classroom.

¹² *5 Myths and The Truth About Modernizing Your School Wireless Network*. Retrieved from

<https://www.securedgenetworks.com/blog/5-myths-and-the-truth-about-modernizing-your-school-wireless-network>.

¹³ Satalkar, B. (2010, July 15). *Wireless LAN Design Guide for High Density Client Environments in Higher Education*. Retrieved from https://www.cisco.com/c/en/us/products/collateral/wireless/aironet-1250-series/design_guide_c07-693245.html#_Toc309331095

¹⁴ von Nagy, A. Retrieved from *Aerohive Design & Configuration Guide High-Density Wi-Fi*.

<https://d2cpnw0u24fjm4.cloudfront.net/wp-content/uploads/Aerohive-High-Density-Wi-Fi-Design-Configuration-Guide-v2.pdf>

¹⁵ No author listed (no date). *PC Magazine Encyclopedia, Definition of: wireless mesh network*. Retrieved from <https://www.pcmag.com/encyclopedia/term/54776/wireless-mesh-network>.

¹⁶ Schoechle, T. (2018, May). *Re-Inventing Wires: The Future of Landlines and Networks*. Retrieved from <https://electromagnetichealth.org/wp-content/uploads/2018/05/Wires.pdf>.

School Boards could also provide Wi-Fi hubs on portable carts that would enable teachers and students to access wireless signals as needed. They can establish safer use practices so teachers and students can download programs onto tablets and/or devices prior to lessons. They can prohibit cell phone and other wearables in the classroom or ask students to put them on airplane mode. School boards could seize the opportunity to install hard wiring in new schools or in schools undergoing major renovations. Finally, school boards can promote safer use practices and encourage parents or guardians to provide a safe environment at home to allow for rejuvenation and repair. A timer on our home routers would give us the ability to rest and rejuvenate, as wireless microwave signals interfere with the melatonin that our body produces to repair itself from any damage during the day.

Legislation and Recommendations to Reduce RF Exposure

Some of the examples in the United States of organizations recommending actions in schools to reduce RF exposure are:

- The Collaborative for High-Performance Schools (CHPS). (2016, September). *2014 US-CHPS Criteria New Construction and Renovation*. Retrieved from https://chps.net/sites/default/files/US-CHPS_Criteria_2014_2016%20update_170706.pdf;
- The New Jersey Educational Association. Markowitz, A. (2016, September). *Minimize health risks from electronic devices*. Retrieved from <https://www.njea.org/minimize-health-risks-from-electronic-devices/>;
- The Maryland Children's Environmental Health and Protection Advisory Council (2016, December 13). *Wi-fi Radiation in Schools in Maryland Final Report*. Retrieved from https://phpa.health.maryland.gov/OEHFP/EH/Shared%20Documents/CEHPAC/MD_CEHPAC_SchoolWiFi_022017_final.pdf.

The following countries have passed legislation to protect students and teachers in the classroom:

- France ASSEMBLÉE NATIONALE (2014, June 26). *SOBRIÉTÉ DE L'EXPOSITION AUX CHAMPS ÉLECTROMAGNÉTIQUES, INFORMATION ET CONCERTATION LORS DE L'IMPLANTATION D'INSTALLATIONS RADIOÉLECTRIQUES*. Retrieved from <http://www.assemblee-nationale.fr/14/pdf/propositions/pion2065.pdf>;
- French Polynesia JOURNAL OFFICIEL DE LA POLYNÉSIE FRANÇAISE (2016, December 16) *Texte adopté n° 2016-41 LP/APF du 8 décembre 2016 de la loi du pays tendant à protéger la population en matière d'exposition aux ondes électromagnétique*. Retrieved from [http://lexpol.cloud.pf/document.php?document=325486&deb=15399&fin=15400&titre=VGv4dGUgYWRvcHTDqSBMUCBuwrAgMjAxNjQxIExQL0FQRiBkdSAwOC8xMi8yMDE2](http://lexpol.cloud.pf/document.php?document=325486&deb=15399&fin=15400&titre=VGv4dGUgYWRvcHTDqSBMUCBuwrAgMjAxNjQxIExQL0FQRiBkdSAwOC8xMi8yMDE2;);
- Greece Redmayne, M (2015, June 19). *International policy and advisory response regarding children's exposure to radio frequency electromagnetic fields (RF-EMF)*. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/26091083/>;
- Taiwan Malm, S. (2015, January 28). *Does YOUR toddler play on an iPad? Taiwan makes it ILLEGAL for parents to let children under two use electronic gadgets... and under-18s must limit use to 'reasonable' lengths*. Retrieved from <https://www.dailymail.co.uk/news/article-2929530/Does-toddler-play-iPad-Taiwan-makes-ILLEGAL-parents-let-children-two-use-electronic-gadgets-18s-limit-use-reasonable-lengths.html>;
- The Canadian Teachers' Federation has issued a resolution stating concern about *Safety Code 6* and that we need to protect students and teachers better. Author unknown. (date unknown). *The Use of Wi-Fi in Schools – Briefing Document*. Retrieved from http://c4st.org/wp-content/uploads/sp-client-document-manager/1/ctf_positon_paper_on_wifi_in_schools_and_sc6.pdf;
- More than 40 Canadian medical doctors and a further 50 international scientists signed declarations to Health Canada expressing concern over that *Safety Code 6* does not provide adequate protection, especially to children. Author unknown, (2014, Sept. 28). *Declaration*:

Doctors Call for Protection from Radiofrequency Radiation Exposure. Retrieved from <http://www.c4st.org/images/documents/hc-resolutions/medical-doctors-submission-to-health-canada-english.pdf>;

- The EMF Scientists declaration, from over 250 scientists from 43 nations, appealed to the UN and all member States expressing concern over the effects of RF radiation and specifically calling out children. (2015, May 11) International Appeal, Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure. Retrieved from <https://www.emfscientist.org/index.php/emf-scientist-appeal>.

In short, protecting the long-term health and wellness of students, teachers, and staff in schools should be top priority, over the corporate interests and profits of the wireless industry.

The Invisible Made Visible: No Place to Hide, A Global Phenomenon—Systems and Mitigation

Robert Steller BBEC, BBEI, EE, EMR EMRS, CRMT
President, Breathing Easy

Abstract

Voluntary and involuntary exposure to artificial sources of electromagnetic waves such as Wi-Fi routers, cell phones, and towers are influencing the human body. In the case of cell phone towers, the level of exposure can change due to natural and human-made factors. These can be used to protect against exposure, but they have can have potential disadvantages and if not used properly can even increase exposure.

The German physician Dr. Erwin Schliephake described radio and microwave sickness near transmitters as early as 1932. He found arrhythmia, severe fatigue, exhaustion, sleep disorders, strong headaches, and increased numbers of infections.

A significant concern with current exposures is the 10 hertz peak released from a Wi-Fi router. Every Wi-Fi router emits a 10 hertz peak, which is then expressed in heart-rate variability.

The brain operates primarily on 10 hertz and the Schumann resonances: a synchronized set. However, the 10 hertz router peak renders these rhythms desynchronized. 10 hertz Wi-Fi pulsations have impacts on stress and memory. Once engraved in the brain, these effects can become permanent in the form of irreversible brain damage or EHS for life. That is the biggest Wi-Fi shock ever.¹

An anecdotal example of a case where turning off Wi-Fi routers made a large impact is as follows: in Calgary, a mother in a family works as a physician. The father owns a computer company, and so there were six routers in the house when I visited to do an electromagnetic assessment. As part of the assessment, I went to the basement and turned the entire house's Wi-Fi off.

A 14-year old autistic child living in the house was noticeably impacted by this change, with his behaviour quickly evolving from agitated to calm and then to relaxed. I repeated turning the Wi-Fi on and off several times, and each time the child experienced the same response and behavioural shift.

Another example is from a Toronto condo where the problematic residential exposure was initially thought to be black mold. However, when I entered the condo its Wi-Fi levels were really high. Intervening in this situation was helpful for those living there.

A further anecdotal example deals with an individual who phoned me to explain that he could not sleep. When visiting his place of residence, I found a massive radar signal from a military station across the border blasting into his house.

In sum, we have a problem. Humans are exposed to both natural sources of electromagnetic waves—including light and cosmic microwave radiation—as well as overlapping human-made artificial sources of radiation including but not limited to satellite communications; radar and military sources; security systems; TV; radio; mobile communications; cordless phones; cell phones; retail security systems; baby monitors; microwave ovens; remote control toys; and drones.

¹ von Klitzing, L. (1989). Static magnetic fields increase the power intensity of EEG of man. *Brain research*, 483(1), 201–203.

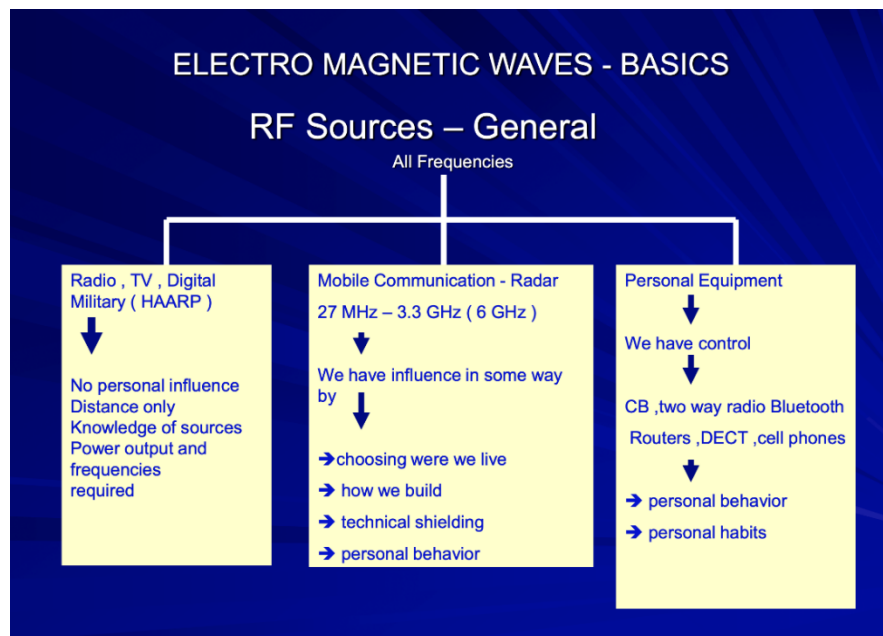


Figure 1

Cell phones operate in cells: in other words, a geographical area receiving a signal from a tower antenna. Cell sites have base stations that emit continuously. While your cell phone is on, it stays in constant touch with the nearest base station. This leads to significant amount of involuntary exposure for citizens. Yet we can have some influence: we can choose where we live; we can choose how we build; we can use technical shielding; and we can change our behavioural interactions with technology.

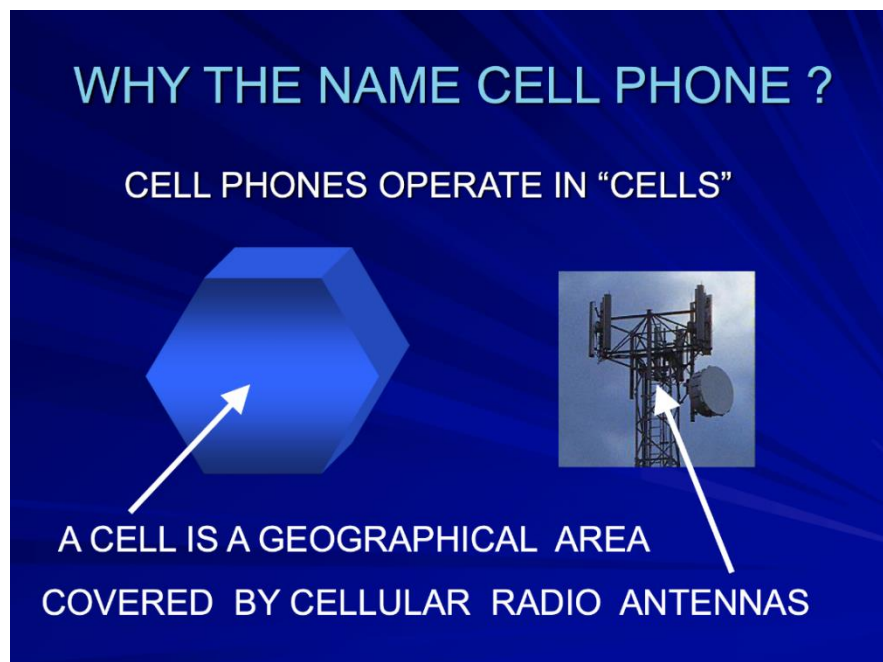


Figure 2

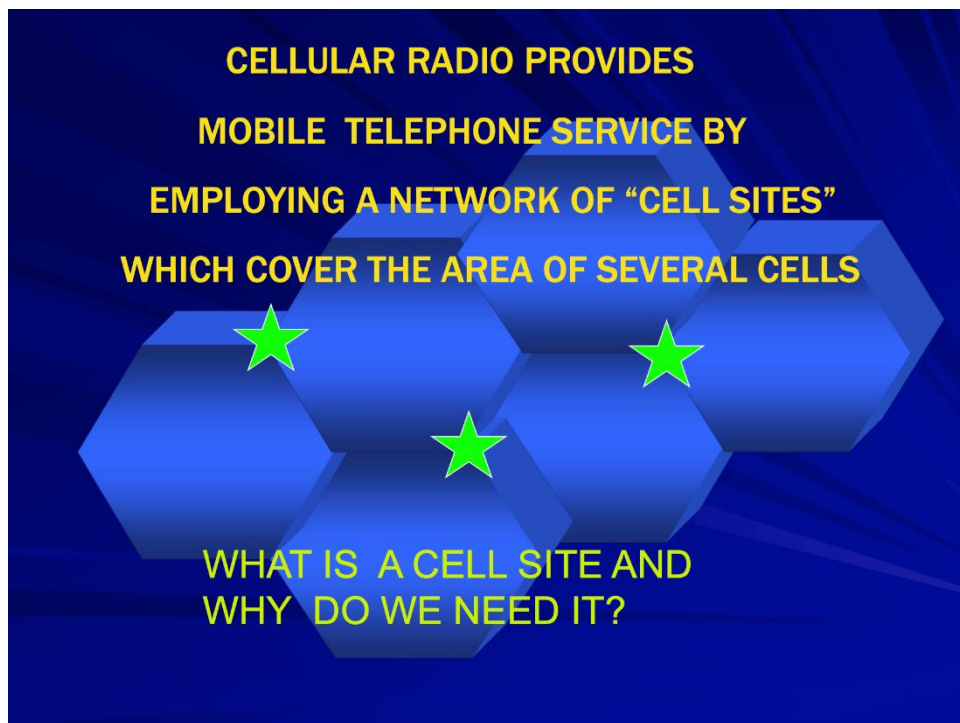


Figure 3

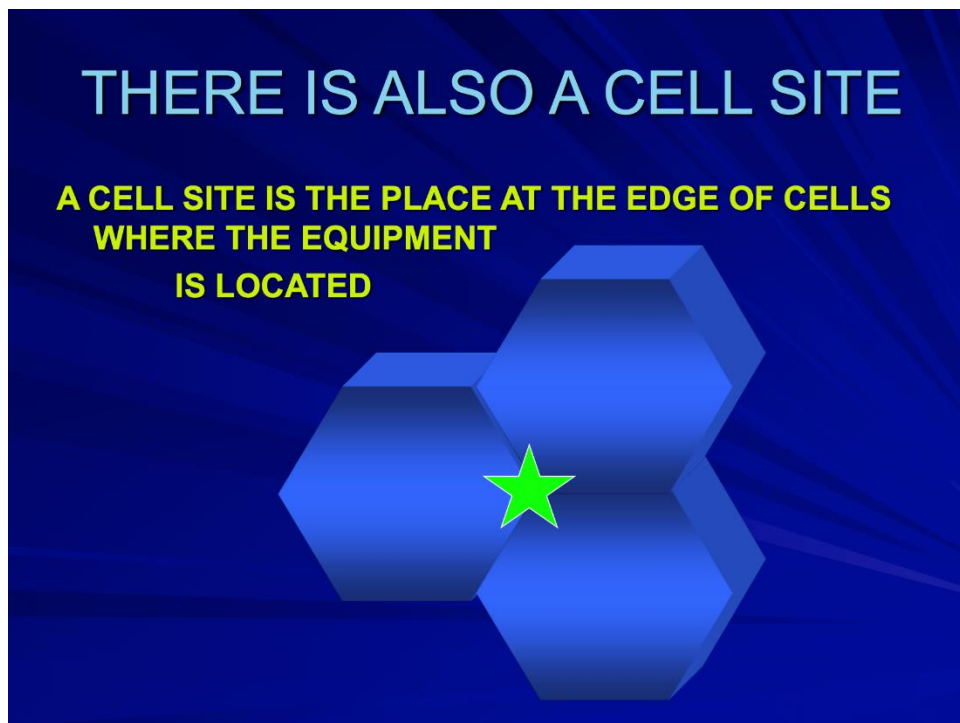


Figure 4

A CELL SITE WITH BASE STATION



Figure 5

CELL TOWER RADIATION CHARACTERISTICS

A FEW THINGS TO REMEMBER

- ANTENNAS ARE OFTEN DIRECTIONAL
- FIELD STRENGTHS IS A FACTOR
- POSITION OF THE MOBILE UNIT
- PULSED SIGNALS VERSUS NON PULSED
- REFLECTION ,ATTENUATION
- BUILDING MATERIALS
- DISTANCE FROM SOURCE

Figure 6

If you walk through Toronto with your phone on, 90% of the 4G signal needed to make a phone call comes from reflection from the city environment rather than directly from towers and their antenna. Landscape and weather also influence signal strength. Other influences on strength of signal include technical shielding, distance to transmitter, and the power output of the transmitter.

With regards to questions of mitigation, we need to first ask: what kind of building materials influence a signal? If high-frequency radiation hits any material it partially penetrates the material, is partially reflected, and is partially absorbed by the material.

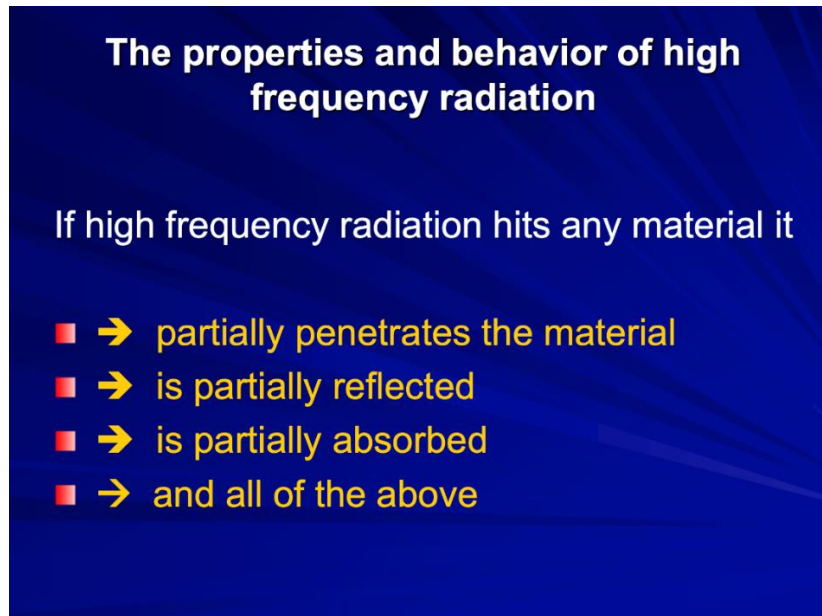


Figure 7

In order to determine actions for proper remediation, it is essential to know the frequencies at hand, their field strength, and questions of internal versus external polarization. For correct shielding actions we need to know what the maximum field level in a certain area or room is. We need to know the direction where the radiation enters a building, as well as what kind of signal we are dealing with. Different antennas are used for different frequencies.

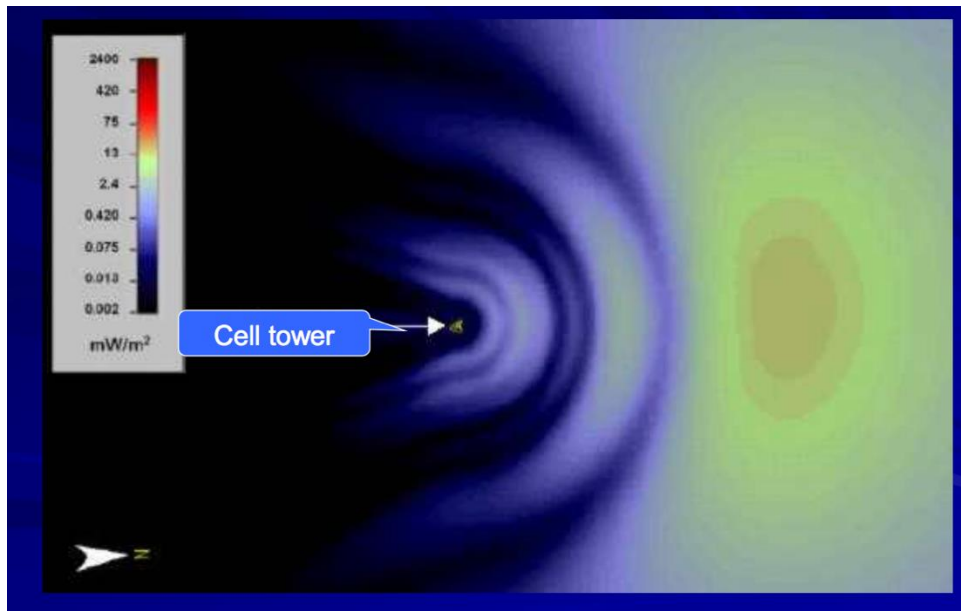


Figure 8



Figure 9

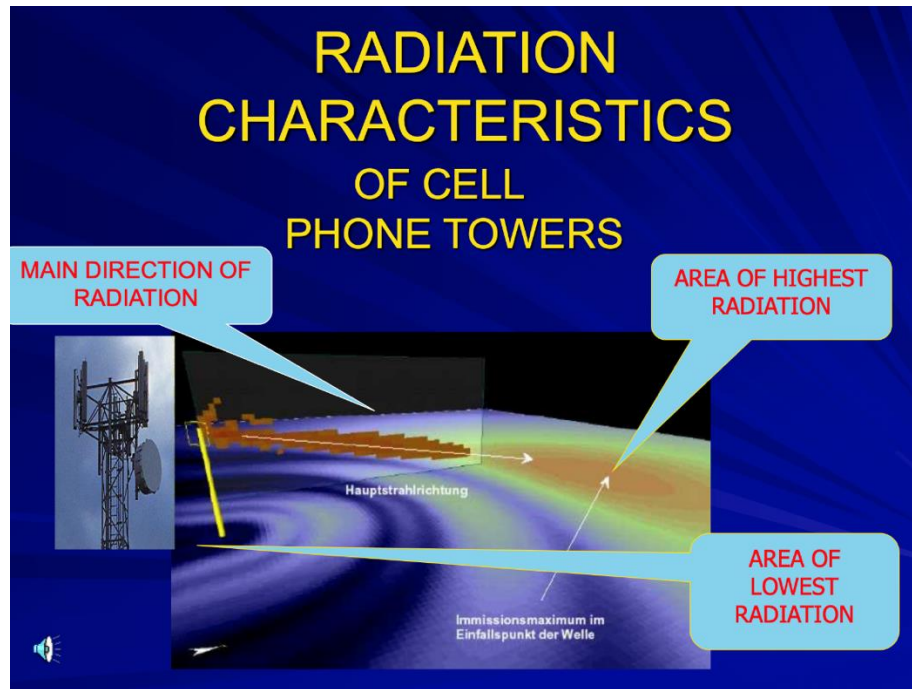


Figure 10

When 5G is rolled out, it will likely, at first, be around the 700 megahertz range.

For building biology remediation we are interested in the protection of human health and therefore have to measure inside buildings, mostly in sleeping and rest areas. One index to use is the sum of signals, paying careful attention to the strongest ones.

Currently, markets for shielding clothing, as well as grounding mats, are expanding. However, these can be potentially dangerous. I have previously measured radiation levels inside types of shielding clothing and discovered they can concentrate radiation levels 10–100 times versus the background level depending on source location and body position, resulting in higher levels inside the clothing than outside. The long-term effects of shielding clothing are unknown.

Grounding mats induce capacitive body coupling and electric potential. This means that grounding forces the body to earth potential, which will attract every electric field surrounding the body, making the human body like a magnet for those fields. There is also risk of backdraft of dirty electricity from the outlet. In North America there is a multi-grounded system, which has potential backdraft from the Earth and induces current flow on the body. Markets for smart meter shielding are also problematic, as there is a risk of amplification inside the house due to reflection and leakage, and the emitting smart meter on the neighbouring property is, from my experience, often the problem.

There are also markets for shielding paint, and shielding nets for the bed, which can be effective if used properly. Overall, however, caution is needed before using shielding materials as you must absolutely fully understand the sources of radiation, direction, and how the resultant radiation is interacting with both indoor and outdoor environments. Proper high-quality measuring instrumentation is needed, as well as a knowledge of physics.

In sum, there is the need to develop effective shielding with limited side effects in order to best assist patients who are exposed to high electromagnetic fields.

Patient Advocacy Driven by Personal Experience

Melissa Chalmers

A320 Captain, Commercial Airline Pilot

Abstract

In this testimonial, airline pilot Melissa Chalmers describes her experience of living with electrosensitivity. From the onset of symptoms, through the work of diagnosis, and the intensification of symptoms, Chalmers explores the myriad challenges of living life as an electrosensitive person. She describes her time living in the radiofrequency-free zone in Green Bank, West Virginia, as well as the challenges of getting housing and care more generally. She makes a plea for the need to increase protection and support for vulnerable electrosensitive persons.

My name is Melissa Chalmers, and I was an A320 Captain in this country. I flew for a total of 25 years, and I am now on permanent disability for being electrosensitive.

I had a wonderful career. Along the way, I traveled the world, visiting places all over Europe, India, and the Americas. It was a challenging job. There was a lot of sacrifice, and I kind of missed my 20s while everybody else was getting married and having kids, but I had more fun than you can imagine. I had the best time and I miss it a lot.

When you are with a big airline, you're always flying with other pilots who you don't know. You share a tiny room in front of the aircraft and you talk for 12 hours a day and get to know these people. We talked about everything from politics to art and literature and, of course, told airplane stories. I got to learn so much from my colleagues along the way about their different perspectives on life, amidst battling weather, navigating, and actually flying the airplane itself. I had the most interesting, social, and adventurous life. It was a dream I'd had since I was five years old when my Mom took me up on my first flight around North Bay. I ended up actually fulfilling that dream of commanding my own aircraft, at the airline I love the most. Then came cellular technology.

Now many of you may be thinking, "Well, aren't you using wireless in the aircraft?" And of course I was, but, unlike radios and transponders, cell towers are a constant day and night exposure that never turns off. You can't go home and recover from that. Your body has no time to relax. As a comparison—and this is prior to Wi-Fi onboard aircraft because I was sick before that—the average radiation levels in my home were 800 times higher than my aircraft.

I was a healthy person. I worked out all the time. I had plenty of time off. I was working only two to three days a week at the most. But I started having symptoms back in 2005. A well intentioned relative gave me a cell phone because I was on the road all the time. I used it for only six weeks before I started getting facial numbness. It was medically investigated, and I was cleared to go back to work. At that time, we decided to not use cell phones further and I had no problems after that.

In 2006, we moved to an apartment near a TV/radio station. The only thing I noticed at that time was that my sleep changed. I went from being a really great sleeper to someone who woke up not feeling so rested. I slept the whole time, but it just didn't feel like I actually slept.

Then, a few years later, in 2010, they had the 4G rollout and started putting cell towers all over the place. When the first cell tower went up behind our home I started having a host of symptoms, including MCS,

situational tinnitus (only in my apartment), nausea (only in my apartment), weight gain (60 pounds), memory loss, anomia, fatigue, involuntary muscle twitching and movements, heating sensations on my skin, and shocking.

I was focusing on chemical reactions as I had tested positive for chemical allergies. I kind of got that under control, but then they put the second cell tower up and a few weeks later I was fully electrosensitive.

I started reacting to what seemed like certain frequencies at first, then it expanded to cover a lot more frequencies and electricity. At that point I started being able to actually feel the energy coming from the devices or appliances on my skin. So if you had a cell phone on, it actually felt like a sharp pain on my body from the direction of the phone. Same with cell towers and any other electrical appliances I was using.

We moved. Eventually, I became totally disabled and had to remove myself from that line of work, ending my wonderful career.

Along the way, I saw a few different physicians, however, there was quite a variation in how they handled my illness.

Back in 2005 when I had that facial numbness from the cell phone, it had not resolved after a week so I elected to go to an emergency room. The first doctor I saw told me not to tell the specialist I was going to see after the MRI that it was associated with a cell phone. Of course, I couldn't believe he said this. Although I know he was trying to be helpful, I wasn't going to lie to the specialist and tell them something that wasn't true, or leave out a really important fact.

Microwave radiation isn't a benign substance either. There's a reason why on the after-landing checklist, we are instructed to check to see if the radar is off three times before we get to the ramp and turn the aircraft towards the guy marshaling us in.

So I ignored the warning from this doctor. The phone was obviously causing the problem and I wasn't going to lie about it. I ended up getting grounded immediately and had to stop flying until I had an MRI and EEG done. The MRI was clear. However, the MRI itself actually made me feel quite ill—I was really nauseous afterwards, then had half a day of severe vertigo which eventually resolved. Upon seeing the specialist, I remember him being exceptionally respectful, even though I told him about the phone being the problem. He actually told me I should follow up with one of his friends who was studying microwave radiation with healing of tissue, such as with people who had injured knees. I didn't at the time, and, looking back, I wish I had. I just went back to my normal life and went back to flying.

In 2010, three months after I had become electrosensitive, I saw an occupational health specialist. At this point, I already knew what I had, but I wanted to hear it from a doctor and get treatment so it wouldn't impact my career. The specialist knew exactly what the problem was. He had 12 other patients whom he had sent to every other kind of specialist for help, and nothing had worked except reducing radiation exposure and exercising. He told me that I would probably want to move out into the woods, but that I should try and maintain my social contacts. He also told me that the government was not recognizing this condition properly, and that I would probably not get work insurance if I were to go off work. He also told me that he would not advocate or testify for me if I were to go to court, but that I could come to him anytime to talk about my condition in general. The reason he had said all this was that his other colleagues had lost funding for research and been admonished by their peers. He explained he wasn't going to "stick his neck out" and risk his career until other doctors were speaking up themselves about this problem.

This is not what I wanted to hear—this is not a normal doctor’s appointment. I wanted to know how to get treatment to get better, yet there was no help there. The doctor is compassionate and has been helpful in other ways since.

My physicians at work were great. I had the same doctor for work that I had when I had the facial numbness, and he knew my history. Another doctor involved with my disability paperwork told me that he had four other electrosensitive patients in his private practice, but that he didn’t know how to help them.

For work insurance, I needed to see someone at Women’s College Hospital, the Environmental Health Clinic, and I had to do it right away. Unfortunately, there was an 18-month waiting list to get in. I was able to see Dr. Bray in her own practice, and, with her help, I was able to get permanent disability from my work for being electrosensitive.

At this point, I was suddenly left totally alone, having no idea what to do for treatment of my injury. I was so impacted, I could hardly use a computer at all, which makes it difficult to research your illness. I did meet a Professor and other electrosensitive people, who recommended trying various practitioners, which I did. Some were quite helpful and I wish I could have continued, however, unfortunately I didn’t have the finances to. I’m presently seeing a practitioner in Toronto. Because of her help, I’m now able to do more, like come and speak with you. I would never would have been able to do this a few years ago—not even close. I couldn’t even go grocery shopping. To be here is amazing for me. My condition has improved but only with a lot of avoidance.

Essentially, I had to move out of the city after a year of searching. I was injured further having to wait to find a place that was going to be low enough radiation. They were putting 4G towers all over.

We moved into a great new neighbourhood over on Lake Huron, but unfortunately they put another 4G tower up and any improvement in my health suddenly dissipated. I was left highly non-functional, having severe migraines six to seven days a week. Most of my symptoms came back except for the ones where I was being heated up, as well as the involuntary movements I previously experienced.

Another electrosensitive airline pilot from the United States called and said, “You need to try this place in the States called Green Bank, West Virginia. It’s a radio-free zone where they have eight telescopes that listen to the universe, and because of that there’s no cell towers and Wi-Fi there.” It took her a long time to get me to do it. I would have to drive 11 hours to get down there, and you have to think about things like, what if you get stopped at the border, and am I going to be able to drive the car that long? But I was so desperate I actually went.

Although Green Bank is not a place that sets out to protect people, it’s the only legally protected place in the world that reduces radiation, making it a haven for electrosensitive people. People from all over the world come there and just show up in their cars. Sometimes they sleep in their cars, or in tents with their pets. They sometimes stay in a cabin—I was able to get a cabin for a little while, and some people have bought property there. I’ve even seen people show up who did not speak English. They show up at the library and hope someone can help them; the place is just better than from wherever they came from. The media has labeled them all “wireless refugees,” which is a very appropriate description. Media from all over the world come there to interview these people, whoever happens to be there at the time.

Most people with electrosensitivity never actually make it to Green Bank. It is just really impossible to get there, there is nowhere to stay, and everyone is afraid to try. We need places like this in Canada, but we don’t have them right now.

I drove down myself, through the Appalachian Mountains, getting lost on the way. I came down into this valley and wasn’t sure where I was. It was late and I’d been in the car for almost eleven hours at this point, but suddenly I knew I’d found the place, because all of the muscles in my body at the very same

time relaxed. It was absolutely astonishing. I could not remember the last time I felt that relaxed in my whole life.

Within two days all my symptoms subsided. The tinnitus took the longest to resolve, taking two days. Everything else basically stopped almost immediately. The best part was I was not being “electrocuted” anymore by anyone’s devices or wireless. The experience was so profound that I spent two weeks each month there for the next year. That was able to stop my decline, and I was able to improve a little bit and spend a little more time at home.

In the meantime, a house was built beside us in what was formerly a woodlot. The owners moved in and put Wi-Fi in on the third floor, which came in through the roof of my house. I couldn’t even be in the basement because it was all the way through the house. So now, I became a wireless refugee and ended up spending the next year in Green Bank. I spent five months in a cabin and the rest of the time sleeping in a tent. I can tell you sleep sleeping in a tent isn’t safe when your car is parked a kilometer away and there are bears that actually squash your tent. That was the longest run to my car, when this bear was harassing me. I was all by myself. It is absolutely ridiculous because I had a perfectly great house in Grand Bend where I could be living, yet meanwhile I had to live in a tent in another country.

Back in 2012, Frank Clegg and I went to speak to Industry Canada together. There was a hamlet over on Lake Huron that wanted to be Canada’s first white zone, or Radio-Free Zone. It was a perfect place to set up in a radio-free area in Canada. Industry Canada told us they would legally block all attempts to do this anywhere in Canada, that there would be no areas in Canada without cell service. Canada is a very large country, and there are a lot of people with electrosensitivity who need a place to live and try to recover. It seems pretty inhumane to deprive people of this chance to live a normal life or even attempt to help themselves.

There are a lot of burdens with this illness. Having electrosensitivity not only means you suffer physical disability with no control over protecting yourself from further injury, it almost always means you are not able to work anymore. You’re going to suffer economic poverty, which means you and your entire family’s future is going to be affected.

It also often means that you are going to suffer social poverty. It becomes impossible to be in public spaces. It can be difficult to see family and friends, and it all depends on whether they are okay with turning off devices to accommodate you. A lot of these important connections are lost when they don’t understand the illness, are prejudiced, or are just too addicted to alter their technology use to accommodate their supposed loved one.

Lastly, you are going to suffer medical poverty, because even though in Canada we have socialized health care, people with electrosensitivity are unable to even go to the hospital they pay for with their taxes because of the wireless systems and devices installed there. What are people with electrosensitivity going to do if, say, they need to get an education, or be in a nursing home, or even go to a women’s shelter?

If you have a child with electrosensitivity, and there are many—and I’m so glad I’ve not had to deal with many of them, because it’s just too sad—those kids are not able to go to public school, play at their friends’ houses, go to University someday, or get a job. What future are they going to have? At least for me, when I got sick, I was 42. I got disability insurance, which is really lucky, and had a great life before that; and all those kids aren’t going to have that. They aren’t going to have that, and they won’t have disability insurance in the future.

I knew an elderly EHS woman who was severely beaten by her husband with a cane in the middle of the night while she was sleeping, and he really hurt her head and neck severely. She went by taxi to three different abuse shelters, as she couldn’t drive her car. They were all in different cities, and it was a long time in the taxi. Yet none of them were okay for her to stay in, and so she had to go back home.

In my own case, I couldn't visit my father in a nursing home because of the Wi-Fi installed throughout the whole facility. Initially it was just at the nursing station, but then the Province had it put it through the entire facility, outside every few rooms. He started declining the next day after they activated that system. The nursing home eventually decided to turn the router off located outside his room so I could visit him, but he ended up dying the day before they were scheduled to do that. I lost so much time with my dad, because of this stupid, stupid technology. I know it's not stupid, it's just that there's something wrong with it. We need to fix the problem.

Things like grocery stores, going to the dentist, or even living in your own house are no longer an option for you. If you're needing social housing, you can forget about it. Apartments are not an option for someone with electrosensitivity because of neighbours' wireless devices. Very often these apartment buildings have cell antennas on top to try and cover some of their own costs. Social housing assistance, something like \$350 a month, is not transferable if you find a basement apartment somewhere else. And God forbid you're not able to drive your car, because that means you can't even flee, because public transit is no longer on the table for you. There is bluetooth, Wi-Fi, and radar on vehicles now. I'm going to say this: self-driving cars will **never** be an option for electrosensitive people.

These things that people in our Canadian society should be able to do, are no longer an option. It is unethical for society and the government to not do anything about this, especially when it's being reported all the time by people who are injured and are suffering.

I've been very public about my illness and have done advocacy when I can, and because of that I am inundated with people calling needing help. It's really too much for sick people to have to keep helping sick people.

Anybody can become electrosensitive. It's not just computer people who use too much wireless. It's teachers and students, physicians, nurses, yoga teachers, scientists, rock stars, models, politicians, and yes, even telecom executives. I've had them all call me. I've met hundreds of people with electrosensitivity in person and have had many more call me on the phone.

Most people who have called me got sick after I did. I wish I didn't have to say this, but, from my perspective, if Health Canada had been doing its job when my family reported my illness to them and they had investigated any of this and taken proper measures to protect the public, these men, women, and children would not have had their lives ruined. If Health Canada had taken proper action back when people were reporting these illnesses years ago, I would not have had my life ruined.

The problem with electrosensitivity is not going away. In fact, it's getting much worse. When 5G hits, you are going to see a health catastrophe—not just for us but for the natural world. It's already happening.

Telecom and Industry Canada all point to Health Canada being responsible for any change. Health Canada is not investigating any reported illnesses from wireless. Nothing is being done. Health Canada mentions there is a group of people sick with something, with real symptoms, but that Health Canada doesn't think it's from wireless. Yet to say that you have to actually investigate the illnesses being reported to you, firsthand; you have to do something, like having a tracking system, and implementing the HESA recommendations so people can report this.

The key to fixing this problem is through the medical community. We need the medical community to help so people don't have to self-diagnose and self-treat. We need health care providers to take their patients complaining of these illnesses seriously, and to be kind and considerate. Their symptoms are real. They need to be listened to, and they need to be helped.

As doctors, nurses, practitioners, and others here helping in the medical field, we need you to not be afraid to speak the truth. Look into the common connections this illness has with other neurological conditions and cancers. Once you are able to advise patients, you need to advocate for us by insisting

patients get proper insurance coverage and government assistance; and especially, to report the illnesses to Health Canada, the Canadian Medical Association, Provincial Medical Associations, unions, hospital administration, and even the media if necessary. It is in the best interest of your patients, your own family, and all of society to do this.

I don't want to say this, but, realistically, my future is not that promising. I am a positive person with a genuine love for life. I will continue to do everything I can to improve my health, so I can attempt to withstand the unnatural human-made environment my society is building at a rapidly alarming rate. I will make the best of every day I can, while having to wait for enough people to get sick for Health Canada to finally act. However, it would be so much better if, instead of waiting for people to get sick, society takes a deep breath, listens, and reevaluates its decisions.

For a long time, humans didn't have cell phones and Wi-Fi and computers. It's an impossibly small fraction of our existence on this planet we've had these things. We lived without it and we lived well. The future is always evolving, and people will always be creative and invent new amazing things for the world. But in this case, there are obvious problems that rightfully need to be addressed.

We don't have to rush things. We have time. And we should take that time to get it right.

We have the right to radiation-free spaces, clean air, clean water, adequate nutritious food, shelter, to be heard, seen, and known, to be represented as a living entity, as all life on this planet deserves to be, no matter how small and insignificant.