

A position regarding the use of Non-Ionizing Electromagnetic Radiation, including WiFi, in the workplace

OECTA Provincial
Health and Safety Committee

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Catholic
Teachers
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Introduction

There are growing health and safety concerns regarding the widespread use of technology, such as cellular phones and wireless computer networking (WiFi), which produce non-ionizing electromagnetic radiation. It is estimated that at least 3 percent of the population has an environmental sensitivity to the radiation that is emitted by these devices and, as a result, experience serious immediate physical/biological effects when exposed. As has been the case with other known societal health and safety issues, such as exposure to cigarette smoke or asbestos, the health effects of unprecedented long term exposure to this radiation may not be known for some time. Widespread use of, or exposure to, wireless communication devices and WiFi technology in Ontario schools, can be positioned as a potential workplace hazard.

This paper examines what is currently known about the impact of non-ionizing electromagnetic radiation, reviews the implications it can have for Ontario schools, including OECTA members, and makes recommendations to the Ontario English Catholic Teachers' Association on the issue.

What is Non-ionizing Electromagnetic Radiation?

Non-ionizing electromagnetic radiation is part of the low frequency/energy and longer wavelength electromagnetic spectrum. The subset of the non-ionizing electromagnetic radiation spectrum that is discussed in this paper occurs below the visible light spectrum and is created by human technological intervention and is not usually created to any major extent by natural processes. Non-ionizing radiation was traditionally thought to be of no harm because it is of low enough energy that an ionizing effect, a process known to cause immediate damage to the human tissue and DNA (cancer causing), does not occur. Familiar forms of non-ionizing electromagnetic radiation are; the visible spectrum, infrared (heat), radio/television and radar/microwave. Most of our wireless communications devices including cellular/home wireless (DECT) phones and WiFi use non-ionizing electromagnetic radiation in the microwave frequency band.

Health Canada's Position

Health Canada has deemed that the low levels of this microwave radiation, which are emitted through such vehicles as cell phones and WiFi, are safe because they are below the threshold limit values (TLV) that have been set in their standard called Safety Code 6 (SC6) Guideline of $1000 \mu\text{W}/\text{cm}^2$, (pronounced micro watts per centimetre squared) for microwave radiation. As long as exposure is below the SC6 threshold, Health Canada considers the radiation to be 'safe'.

The SC6 guideline is based on a short-term (6-minute average) exposure in an adult male. As such, it does not take into consideration longer-term exposure or effects on slighter individuals and young children. SC6 considers only thermal (heat based) tissue effects and does not consider other biological effects of this radiation to assess safety. Furthermore, SC6 Guidelines are also only intended for federal buildings and do not necessarily apply to schools.

The World Health Organization and Other Jurisdictions

On May 31, 2011, the World Health Organization's (WHO) International Agency for Research on Cancer (IARC) classified radiofrequency electromagnetic fields as a class 2b carcinogen (possibly carcinogenic or cancer causing to humans). They cited biological effects recognized in adult cellular telephone studies for their decision. This categorization by the WHO prompted Health Canada to issue an advisory calling for prudent avoidance of cellular phone use among children and youth. No long term studies have been done regarding mobile phones on children or regarding WiFi on adults or children.

Other countries have more stringent guidelines than Canada. For example in Russia, exposure to $1000 \mu\text{W}/\text{cm}^2$ (SC6 Guideline for microwave radiation, which includes WiFi) is only allowed for 15 minutes per day. In Canada, children can be exposed all day and every day to this level. The Czech guidelines for pulsed microwave radiation, which is known to be more harmful than non-pulsed radiation, allow exposure to $4 \mu\text{W}/\text{cm}^2$ for a 6-hour day (school day) which is only 0.4 percent of the SC6 Guideline.

Switzerland, China, Hungary and Poland also all have stricter guidelines than Canada. Their guidelines are stricter because they are not solely being based on heating of the body. They also include consideration of other biological, such as changes in calcium flux, changes in the permeability of the blood-brain barrier and damage to DNA.

Exposure Increases With Use

When a WiFi network is turned on, any radiation exposure would be only due to the radiation emitted from the wireless transmitter's beacon signal, with little or no use of clients on the wireless network. Each wireless device that connects to the network is a new non-ionizing radiation emitter that opens a new exposure stream over and above the beacon signal strength, which will add to the overall exposure of anyone in the nearby field. Often, testing done to measure the impact of the radiation from the wireless network is done based on the transmitter's beacon signal only, and does not take into consideration the impact of having multiple clients on the network at the same time. If the long-term goal is to encourage widespread use of the wireless network by personal electronic devices such as iPads, iPods, smartphones as well as notebooks or laptop computers, then exposure levels to this radiation will be unpredictable and higher than simple measurements would imply.

If 'safe' implementation is based on emissions being lower than Health Canada's SC6 TLV of $1000 \mu\text{W}/\text{cm}^2$ then employers must ensure that this limit is not breached through a hazard control program that should include periodic field monitoring. This type of monitoring program is the jurisdiction of the JHSC as described in the OHS S. (9)(18).

Effects from Exposure

There are reports of a number of immediate biological effects that are experienced with exposure, such as; headaches, nausea, dizziness, difficulty concentrating, weakness, pressure in the head, and a racing or fluttering heart (tachycardia). Moreover, students are considered to be more susceptible to microwave radiation because of their age and their earlier stages of development.

Implementation of WiFi technology in schools will produce unprecedented exposure to microwave radiation of approximately 6 hours each school day, 5 days a week, for 40 weeks each year. This will be without any studies being done to determine the effects of either the short-term or long-term effects of this microwave exposure on adults as well as children.

Electromagnetic Hypersensitivity

A portion of the population are estimated to be affected in some way by an environmental sensitivity called electro-hypersensitivity, which is an increased sensitivity to non-ionizing radiation, and may become ill when WiFi is initialized.

"Approximately 3 percent of the population (over 1 million Canadians) has been diagnosed with environmental sensitivities (ES) which include multiple chemical sensitivities (MCS) and electromagnetic sensitivity."¹

¹ Park J and Knudson S. *Medically Unexplained Physical Symptoms*. Statistics Canada. 12-1-2007.

Some studies show that adults who are electrically sensitive react to this frequency (2.4 GHz) at levels 0.3 percent of SC6 Guidelines.²

The reactions include heart irregularities, a rapid heart rate and changes to the regulation of both the sympathetic and parasympathetic nervous system. These are biological effects and do not involve microwave heating to the body.

Unlike with other forms of hypersensitivity, peanuts for example, the general public may not yet associate any of these symptoms with exposure to non-ionizing radiation such as WiFi. Sufferers feel unwell and attribute their state to some other cause. Currently our workplaces are smoke-free and nut-free regardless of the minority of the population being affected.

Environmental Sensitivity is a Disability

Environmental Sensitivity, including electro-hypersensitivity, is recognized as a disability under the Canadian Human Rights Code. As such, all workplaces, including educational institutions (schools) have a duty to accommodate students and staff diagnosed with environmental sensitivities.^{3,4}

Employers have a duty to accommodate persons with environmental sensitivities under the Canadian Human Rights Code as well as the Accessibility for Ontarians with Disabilities Act (AODA).⁵

Role of the Joint Health and Safety Committee

Any potential hazard in the workplace falls under the power and the jurisdiction of the Joint Health and Safety Committee(s) (JHSC), as established in S. 9(18) of the Occupational Health and Safety Act (OHSA) – see appendix A. It is within the powers of the Joint Health and Safety committee for each workplace to identify potential hazards and make recommendations for the establishment of hazard control programs to address hazards in the workplace.

Joint Health and Safety Committees have the ability to include all potential hazards, such as non-ionizing electromagnetic radiation, in a hazard control program developed for the workplace. These hazard control programs are developed locally to oversee the application and monitoring of appropriate control measures to minimize worker injury.

Hazards are required to be eliminated where possible or at least have the risk of injury reduced by the application of controls. A hazard control program can be established to address the potential for injury from non-ionizing radiation, including WiFi.

Hazard Control and Prudent Avoidance

² Havas et al, "Provocation Study Using Heart Rate Variability Show Microwave Radiation from 2.4 GHz Cordless Phone affects autonomic nervous system," Eur. J. Oncol. Library Vol. 5.

³ Canadian Human Rights Commission. *Legislation and Policies: Policy on Environmental Sensitivities*. June 15, 2007. www.chrc-ccdp.ca/legislation_policies/policy_enviro_npolitique-en.asp

⁴ Ontario Human Rights Commission (OHR): *Guidelines on Accessible Education* at www.ohrc.on.ca/en/resources/Guides/AccessibleEducation?page=AccessibleEducation-CREATING.html#Heading262 (see "Accounting for Non-Evident Disabilities").

⁵ Wilkie, C. & Baker, D., "Accommodation for Environmental Sensitivities: Legal perspective," Canadian Human Rights Commission, May 2007

Administrative and physical controls are most effective when applied at the source of the hazard. Controls gradually decrease in effectiveness as you move along the path of the hazard, with the least effective being at the worker level (wearing personal protective equipment). Controls for WiFi would best be guided by the ALARA principle (As Low As Reasonably Achievable), as well as by applying the concept of prudent avoidance (of non-ionizing radiation). Section 25 (2)(h), of the OHSA states "An employer shall take every precaution reasonable in the circumstances for the protection of a worker".

Examples of prudent avoidance control measures may include, but need not be limited to:

- The continued use of wired technology as most existing buildings are currently wired with Ethernet.
- Ensuring new buildings/construction includes a fully wired Ethernet infrastructure.
- Where new network connections are required, add to the existing wired network by running new wiring to that location. It is still less expensive to add the odd Ethernet drop each year than to add a completely redundant wireless system to the entire facility.
- Where new wired locations are not practical, consider using a PowerLine HD Ethernet Adapter (or similar technology) to pass a network signal through existing electrical lines.

D-Link® is just one manufacturer that offers PowerLine Ethernet Adapters that allow the use of existing electrical wiring to act as Ethernet wires to create or extend a network by turning every power outlet in to a potential ethernet port.



- Where a wireless connection is required, use single application wireless routers (similar to home use wireless routers) which can be temporarily connected to an existing Ethernet port within the room/area, eliminating the need to permanently wire a router. A classroom or conference room can be made wireless for only the class/conference time period.
- Pre-plan the deployment of permanently installed wireless routers such that they can be easily recognized and turned on or off, either manually or electronically, to provide access only when necessary.
- Consider placing wireless routers to service smaller zones so that use in one area does not produce undue exposure in others. Create 'WiFi enabled areas' (and therefore 'WiFi disabled areas') such as in libraries or cafeterias that provide limited scheduled access to the network if necessary.

Other components of a control program may include but need not be limited to:

- Labelling of all transmitter locations - Workers have the right to know about potential hazards.
- A maintenance/monitoring program for the wireless access points to ensure no over powering or excessive emissions occur. The JHSC has a duty to monitor exposure of existing WiFi installations because exposure during peak use, with most clients connected, should not exceed the SC6 TLV of 1000 $\mu\text{W}/\text{cm}^2$.

Summary

1. We do not know what the long-term effects of low-level non-ionizing radiation are on those who are exposed (workers and students). No form of radiation can be deemed 'safe' as it depends on the constitution of the individual exposed, the amount of exposure as well as a sufficient amount of time to pass to observe any health effects that have a long latency period (i.e. cancer).
2. The WHO has classified low-level non-ionizing radiation in the microwave band associated with cellular phones as a class 2b carcinogen (possible carcinogen) and Health Canada has warned about limiting the use of handheld personal electronic equipment such as cellular phones among youth. Initializing WiFi for personal electronic equipment will result in an unpredictable exposure as use varies.
3. A segment of the population are environmentally sensitive (a disability according to the Canadian Human Rights Commission) to low level non-ionizing radiation and may experience immediate physical/biological reactions when exposed.
4. Employers including School Boards have the duty to accommodate persons with disabilities including that of electro-hypersensitivity. A widespread investment in a redundant WiFi network may limit the ability to reduce WiFi exposure thereby accommodating workers with an electro-hypersensitivity disability.
5. The safety of this technology has not thoroughly been researched and therefore the precautionary principle and prudent avoidance of exposure should be practiced.
6. The purposeful introduction of non-ionizing radiation transmitters, such as WiFi, into the work place is considered to be the introduction of new equipment that presents a potential health and safety hazard for workers. As such, it is the duty of the Joint Health and Safety Committee to develop a hazard control program to; assess the risk of injury from the potential hazard, recommend controls to be applied to address the hazards, and to monitor the effectiveness of the applied controls.
7. Administrative and physical control methods to address the hazards of non-ionizing radiation, such as WiFi, in the workplace are readily available and relatively easy to apply. Application of controls would be completely consistent with the ALARA (As Low As Reasonably Achievable) approach and the precautionary principles as well as the general duty clause, Section 25 (2)(h) of the *Occupational Health and Safety Act*.

Recommendations

- I. OECTA recognizes that there is a growing concern regarding the potential adverse health effects of the use of wireless technology which requires the broadcasting of non-ionizing electromagnetic radiation, typically in the radio/microwave frequency band.
- II. OECTA recognizes that the installation of WiFi microwave transmitters and the expanded use of wireless devices in Catholic schools and educational facilities across the Province of Ontario may present a potential Health and Safety risk or hazard in the workplace.
- III. OECTA recognizes the need to provide information to the Joint Health and Safety Committee(s) at the local Unit level regarding the potential hazards and prudent avoidance control measures regarding the presence of non-ionizing radiation (WiFi) in the workplace such that they may exercise their powers as established under S. 9(18) the Occupational Health and Safety Act (OHSA).
- IV. OECTA post this position paper on the OECTA website.

Appendix

***Occupational Health and Safety Act* [R.S.O. 1990, c. O.1, s. 9 (18)]**

Powers of committee S (9)(18)

(18) It is the function of a committee and it has power to,

- (a) identify situations that may be a source of danger or hazard to workers;
- (b) make recommendations to the constructor or employer and the workers for the improvement of the health and safety of workers;
- (c) recommend to the constructor or employer and the workers the establishment, maintenance and monitoring of programs, measures and procedures respecting the health or safety of workers;
- (d) obtain information from the constructor or employer respecting,
 - (i) the identification of potential or existing hazards of materials, processes or equipment, and
 - (ii) health and safety experience and work practices and standards in similar or other industries of which the constructor or employer has knowledge;
- (e) obtain information from the constructor or employer concerning the conducting or taking of tests of any equipment, machine, device, article, thing, material or biological, chemical or physical agent in or about a workplace for the purpose of occupational health and safety; and
- (f) be consulted about, and have a designated member representing workers be present at the beginning of, testing referred to in clause (e) conducted in or about the workplace if the designated member believes his or her presence is required to ensure that valid testing procedures are used or to ensure that the test results are valid. R.S.O. 1990, c. O.1, s. 9 (18).