Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR)
Request for an opinion on "Light Sensitivity"

June 5, 2008

Health Concerns associated with Energy Efficient Lighting and their Electromagnetic Emissions

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I write this mini report in response to your request for information about *Light Sensitivity* as it relates to energy efficient light bulbs. It is based on research we are currently conducting that has not yet been peer-reviewed. For this reason I am able to share only a small portion of our results with you at this time.

Governments around the world are banning energy inefficient light bulbs in an attempt to reduce consumption of fossil fuels and the emission of greenhouse gases. However, the energy efficient light bulbs that are currently available may be harming both the environment (mercury content of bulbs is high) and human health (electromagnetic pollution).

The main function of light bulbs is to generate light, which is part of the electromagnetic spectrum (see Figure 1). The original incandescent light bulbs also generate *heat* (*infrared radiation*, also part of the EM[2] spectrum), which makes them *energy inefficient*. The newer compact fluorescent light bulbs generate *radio frequency radiation* as well as *ultraviolet radiation* (see Figure 1) and many still generate heat although less of it. These frequencies (RF[3] and UV[4]) have been associated with adverse health in numerous peer-reviewed scientific studies and a growing number of people are complaining that these bulbs make them ill.

Instead of promoting compact fluorescent light bulbs, governments should be insisting that manufacturers produce light bulbs that do not produce radio frequency or UV radiation and that are safe for the environment and for human health. Alternative light bulbs are available that are much more energy efficient than CFL, do not contain mercury, do not produce radio frequencies or UV radiation, and do not make people sick. Unfortunately these bulbs are still too expensive for residential use (CLED lights produced by www.realuvcorp.com).

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[1] For a biographical sketch of the author please refer to Appendix A.
[2] EM: electromagnetic
[3] RF: radio frequency
[4] UV: ultraviolet

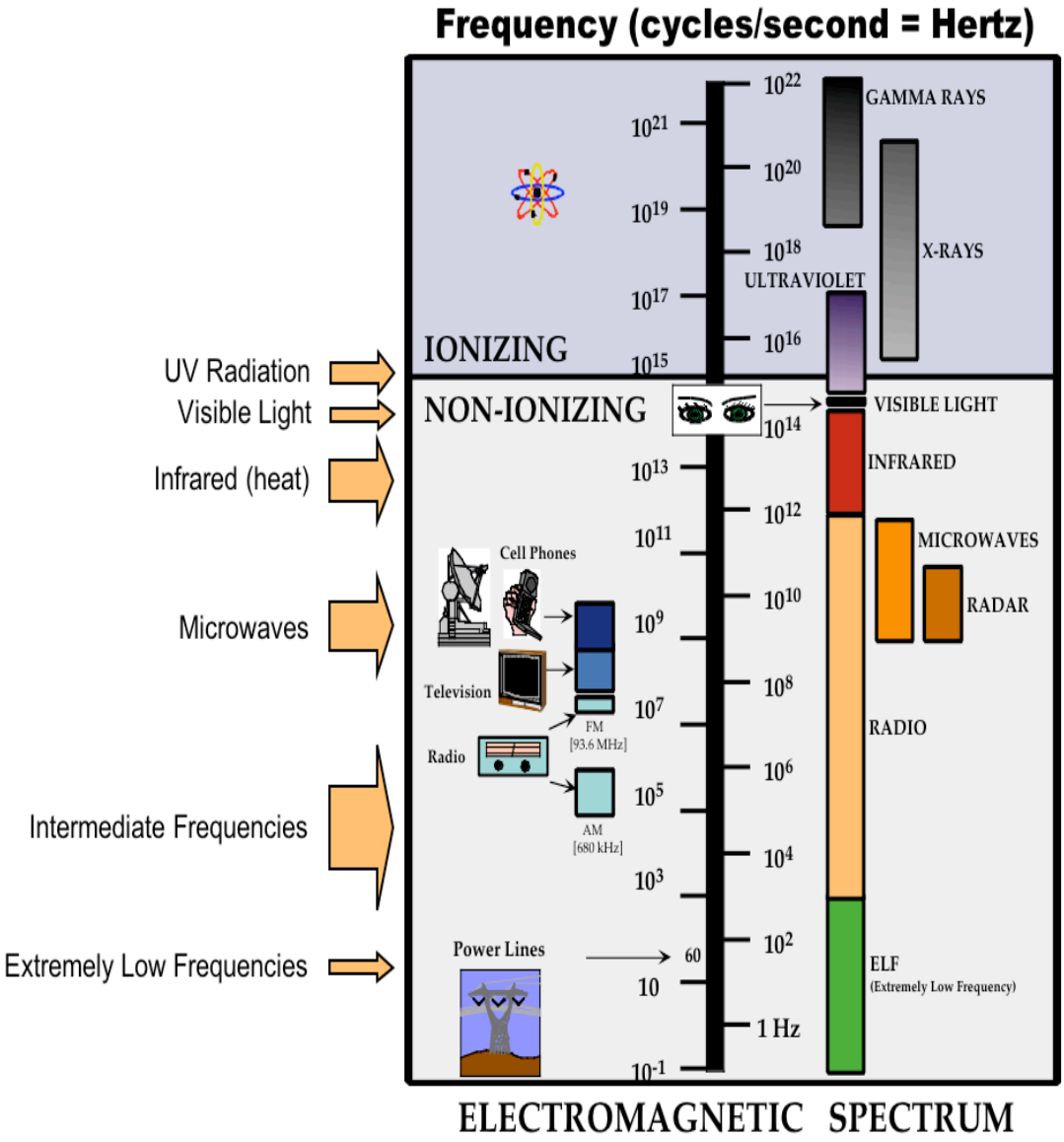


Figure 1. Electromagnetic frequencies generated by various types of light bulbs.

UV Radiation:

Fluorescent light bulbs contain mercury, which emits UV radiation when it is electrically excited. This UV radiation then interacts with the chemicals on the inside of the bulb to generate light. Tube fluorescent bulbs have diffusers that filter the UV radiation. The new compact fluorescent light bulbs do not have these diffusers and hence people using CFL are exposed to UV radiation. UV radiation has been linked to skin cancer and

various skin disorders. Those who have skin problems may be particularly sensitive to this radiation.

Global News in Canada did a Special Report in April 2008 on energy efficient light bulbs. Health Canada provided them with some information about these bulbs (see Appendix 2). According to Philippe Laroche, Media Relations Officer for Health Canada, compact fluorescent light bulbs, unlike tube fluorescent bulbs, do not have prismatic diffusers to filter UV radiation. "*Therefore, there may be skin sensitivity issues, especially in people with certain skin diseases*."

Health Canada and other government agencies responsible for ensuring that products sold have no adverse health effects need to make this information readily available to the public.

Radio Frequency Radiation:

According to General Electric (GE) their typical electronically-ballasted CFL operate in the 24-100 kHz frequency range. This range is within the radio frequency band of the electromagnetic spectrum (Figure 1) and is classified as Intermediate Frequency (IF[5]) by the World Health Organization. There is concern about electromagnetic interference (EMI) associated with IF and recently studies have shown that IF are biologically active and can have adverse health effects (1,2).

We used a Fluke Scope meter to measure the waveform generated by light bulbs through the air (at a distance of 0.5 meters) and on the wire (after it had passed through a ubiquitous filter to remove the 60 Hz cycle). We also measured power quality using a microsurge meter, which measure the frequency range between 4 and 100 kHz.

Figure 2 shows the waveform through the air (blue) and on the wire (red) for a Sylvania 60 watt incandescent light bulb and for a 15 watt CFL produced by General Electric. The GE bulb emits radio frequencies directly through the air (blue) and generates IF on wires which causes dirty electricity. Background values for power quality (dirty electricity) were between 63 and 67 GS units. The incandescent bulb did not contribute to dirty electricity but the CFL did and raised the readings to 298 GS units. This was not the "dirtiest" light bulb we tested. Several gave readings above 1000 GS units.

A recent study of cancer clusters in a school in California associated the increased risk of cancer among teachers to dirty electricity (2). Teachers who taught in classrooms where the dirty electricity was above 2000 GS units had a 5-fold increase risk of cancer (risk ratio 5.1) that was statistically significant. Teachers who never taught in those classrooms had a risk ratio of 1.8.

[5] IF: Intermediate Frequencies within the Radio Frequency band of the electromagnetic spectrum. Generally in the kHz range (thousands of cycles per second).

In a different school study in Toronto, improvement in power quality was associated with improved health among teachers and improved behaviour among their students (3). This study has been repeated at 3 Minnesota schools with similar results (4). Dirty electricity in schools contributes to ill health of teachers and behavioural problems among students.

We have conducted studies with diabetics and people who have multiple sclerosis and found that when the dirty electricity in their home is reduced their symptoms diminish. Both type 1 and type 2 diabetics have lower blood sugar and type 1 diabetics require less insulin when they are in an electromagnetically clean environment. People with MS have fewer tremors, improved balance, less fatigue, and several have been able to walk unassisted after the dirty electricity in their home was reduced (5).

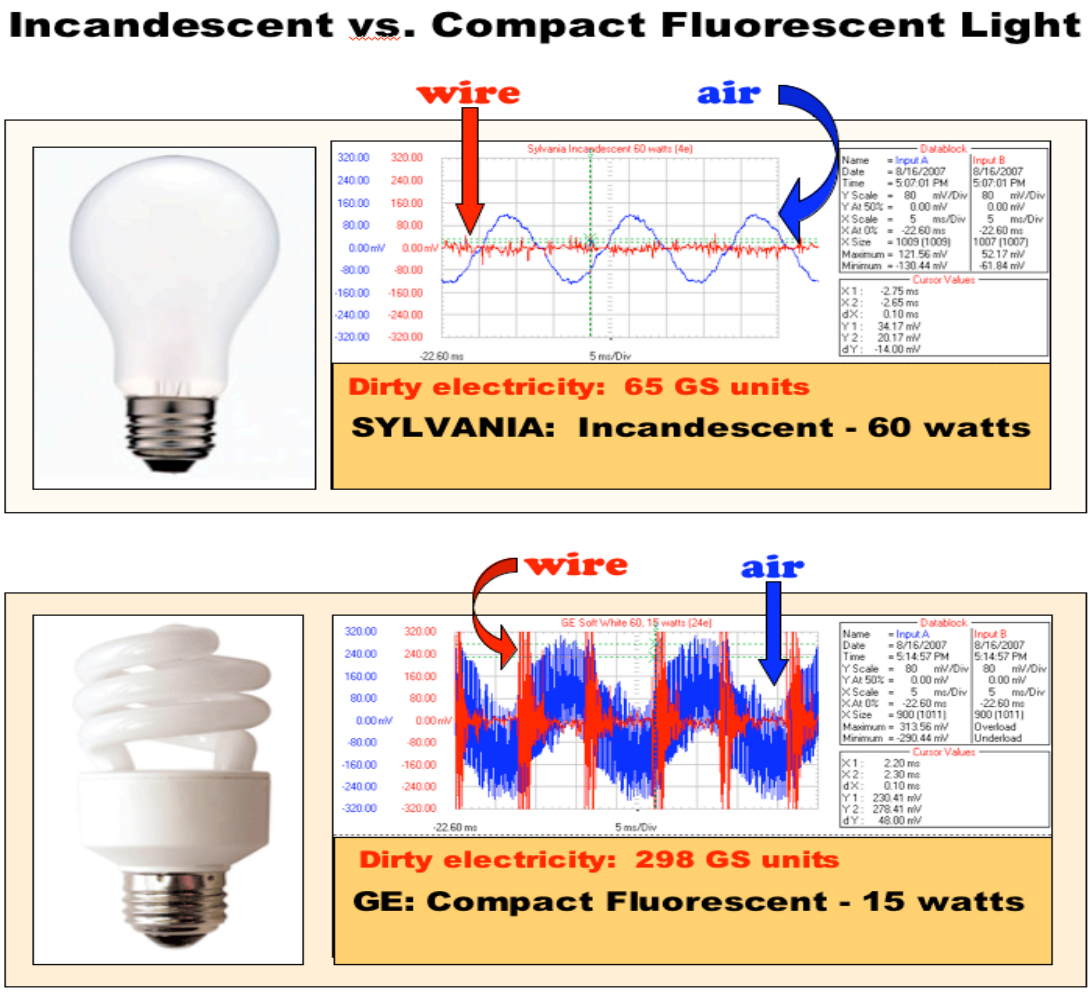


Figure 2. Intermediate frequencies generated by an incandescent light bulb and a compact fluorescent light bulb. Input A: 0.5 meters from bulb. Input B: on wire after passing through a ubiquitous filter that removes the 60-Hz cycle.

ElectroHyperSensitivity (EHS)

According to the Swedish Association for the ElectroSensitive (www.feb.se) approximately 3% of the population have severe symptoms of electrohypersensitivity. These symptoms include sleep disorders, chronic fatigue, chronic pain, cognitive dysfunction, dizziness, skin disorders, among others (see Table 1). The Swedish government recognizes EHS as a functional impairment rather than a disease (6).

Table 1. Symptoms of Electrohypersensitivity or Radio Wave Sickness (7).

Neurological: headaches, dizziness, nausea, difficulty concentrating, memory loss, irritability, depression, anxiety, insomnia, fatigue, weakness, tremors, muscle spasms, numbness, tingling, altered reflexes, muscle and joint paint, leg/foot pain, flu-like symptoms, fever. More severe reactions can include seizures, paralysis, psychosis and stroke.

Cardiac: palpitations, arrhythmias, pain or pressure in the chest, low or high blood pressure, slow or fast heart rate, shortness of breath

Respiratory: sinusitis, bronchitis, pneumonia, and asthma

Dermatological: skin rash, itching, burning, and facial flushing

Ophthalmologic: pain or burning in the eyes, pressure in/behind the eyes, deteriorating vision, floaters, and cataracts

Others: digestive problems; abdominal pain; enlarged thyroid, testicular/ovarian pain; dryness of lips, tongue, mouth, eyes; great thirst; dehydration; nosebleeds; internal bleeding; altered sugar metabolism; immune abnormalities; redistribution of metals within the body; hair loss; pain in the teeth; deteriorating fillings; impaired sense of smell; ringing in the ears.

We conducted a survey on line to determine how electrically sensitive people respond to different types of lighting. This survey was circulated among different groups include those with electrohypersensitivity, migraines, lupus and other health concerns. Since migraine sufferers respond to bright light we eliminated them from this part of the analysis.

We asked participants to identify their degree of electrohypersensitivity and to identify their symptoms when they were exposed to various types of lighting. Figure 3 shows their results for headaches. The highest percentage of headaches was reported for exposure to both tube and compact fluorescent light bulbs among those who classify themselves as either moderate sensitive to extremely sensitive. Results for other symptoms were similar.

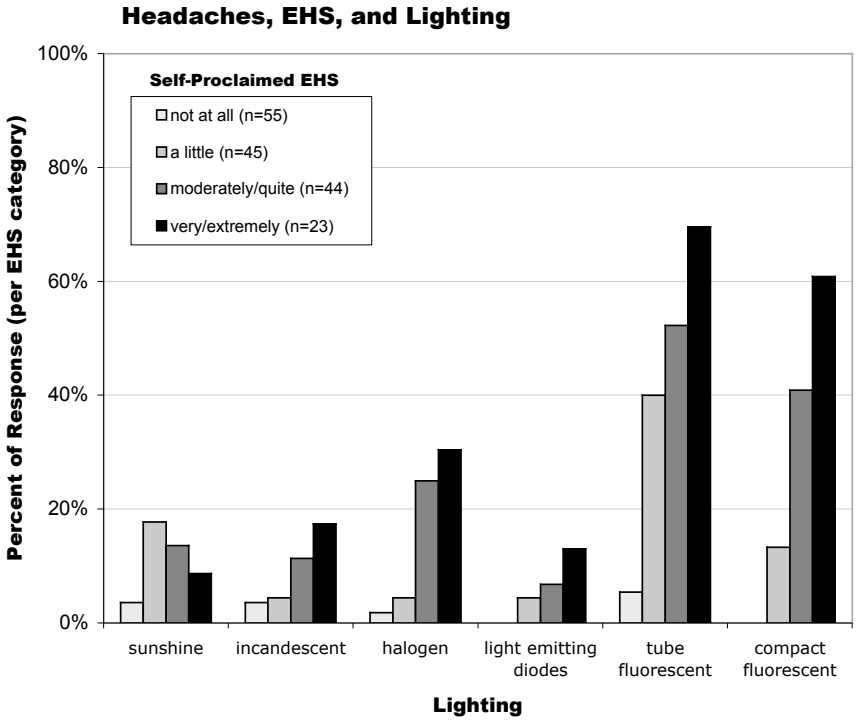


Figure 3. Responses to an electronic survey on self-proclaimed electrohypersensitivity and to various types of lighting n=168.

The World Health Organization held an international seminar on EHS in Prague, October 25-27, 2004 and at that seminar they defined EHS as follows:

> *". . . a phenomenon where individuals experience adverse health effects while using or being in the vicinity of devices emanating electric, magnetic, or electromagnetic fields (EMFs). . . . Whatever its cause, EHS is a real and sometimes a debilitating problem for the affected persons . . . Their exposures are generally several orders of magnitude under the limits in internationally accepted standards*."

Medical doctors and scientists around the world are asking governments to establish stricter guidelines for electromagnetic exposure. These guidelines are for both extremely low frequency (ELF) electromagnetic fields and for radio frequency radiation (RFR) (8). We also need stricter guidelines for Intermediate Frequencies.

These appeals include:

2002: Freiburger Appeal: German Physicians request tougher guidelines for radio frequency exposure, endorsed by 6,500 practioners.

2004: World Health Organization, EHS Workshop, Czech Republic, Oct 2004.

2005: Irish Doctors' Environmental Association (IDEA): EHS increasing.

2005: Helsinki Appeal: Finland, call for new safety standards, reject ICNIRP, apply Precautionary Principle to EMFs.

2006: Benevento Resolution: International Commission for Electromagnetic Safety (ICEMS), Italy, Precautionary Approach.

2007: Bioinitiatives Report: reviewed 2000 studies, calling for biologically based exposure guidelines. www.bioinitiative.org

While 3% of the population may be severely affected by EHS, another 35% of the population in developed countries has many of the symptoms of EHS (5). With continued exposure this number is likely to increase.

If we extend these percentages to the population of Europe (728 million as of 2005), then approximately 21.8 million people in the EU are severely affect by EHS and another 254 million have moderate symptoms of EHS. Even if these values are in error by more than 50% we have a serious emerging and newly identified health risk that requires immediate attention.

Conclusion

The energy efficient compact fluorescent lights that are commercial available generate radio frequency radiation and ultraviolet radiation, they contain mercury-a known neurotoxin, and they are making some people ill. Instead of promoting these light bulbs governments around the world should be insisting that manufactures produces light bulbs that are electromagnetically clean and contain no toxic chemicals. Some of these are already available (CLED) but are too expensive for regular use. With a growing number of people developing electrohypersensitivity we have a serious emerging and newly identified health risk that is likely to get worse until regulations restricting our exposure to electromagnetic pollutants are enforced. Since everyone uses light bulbs and since the incandescent light bulbs are being phased out this is an area that requires immediate attention.

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Appendix A: Biographical Sketch of Author

Magda Havas is Associate Professor of Environmental and Resource Studies at Trent University where she teaches and does research on the biological effects of electromagnetic fields, dirty electricity, ground current, radio frequency radiation and electrical hypersensitivity. She is working with diabetics and those with multiple sclerosis who are responding adversely to power quality issues in their homes. Dr. Havas received her B.Sc. and Ph.D. from the University of Toronto and did Post-Doctoral Research at Cornell University before returning to Canada. She has co-edited 3 books and has more than 100 publications.

Dr. Havas provides advice to the public and expert testimony on radio frequency radiation from wireless telecommunication antennas and electromagnetic fields from power lines in the United States and Canada. She helped draft Resolution 15 for the International Association of Fire Fighters (IAFF) cell phone antennas on fire halls. She also helped draft the Private Member's Bill on Ground Current Pollution in Ontario that received unanimous approval at its Second Reading in the House. The Ontario Energy Board is currently reviewing that Bill.

Magda Havas is science advisor on EMF-related issues to non-profit organizations including: WEEP Initiative in Canada; the Council on Wireless Technology Impacts and the EMR Policy Institute in the US; HESE and the EM Radiation Trust in the UK; and the Nationaal Platform Stralingscrisico's in the Netherlands.

Appendix 2: Health Canada and UV Radiation

Here are Health Canada's answers given to Allison Vuchnich (avuchnich@globaltv.com) of Global TV:

What enquiries has Health Canada received regarding the bulbs?

On 08-04-11, at 15:10, Philippe Laroche philippe_laroche@hc-sc.gc.ca wrote:

Since 2002, the Department has received 31 consumer complaints surrounding CFLs. The majority of these complaints are with regards to the bulbs' end-of-life failure, which can include flickering, a bright orange or red glow, popping sounds, an odour or browning of the ballast enclosure.

The following Web sites include additional information on this process:

http://www.esainspection.net/pdf/Safety_Alerts/07-03-AL.pdf
http://www.esainspection.net/pdf/Safety_Alerts/06-03-AL.pdf

As well, Health Canada's Consumer and Clinical Radiation Protection Bureau has received questions about increased UV and colour rendering from CFLs use in the Canadian household environment. Contrary to ordinary fluorescent tubes used in luminaires, the CFLs are not provided with a prismatic diffuser that filters ultraviolet radiation out. Therefore, there may be skin sensitivity issues, especially in people with certain skin diseases.

According to the Canadian Electrical Code, CFLs are required to be certified by testing and certification organizations such as Underwriters' Laboratories Canada (ULC) or the Canadian Standards Association (CSA) to ensure they meet their requirements for safety. If consumers have a safety-related concern with a CFL, that is marked by a certification body such as ULC or CSA, they can report the details directly to these bodies by contacting them at the following:

Underwriters' Laboratories of Canada: Tel: 1-866-937-3852
Email: customerservice@ulc.ca
Canadian Standards Association: Tel: 1-800-463-6727

The Canadian Advisory Council on Electrical Safety also notes that Regional Electrical Safety Associations are able to follow up on any incidents where there is no information on the certifying body.

Je vais recommuniquer sous peu avec vous concernant votre requête pour une entrevue avec un expert.

Merci.

Philippe Laroche
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