

Factsheet: the three main health risks associated with energy saving lamps (CFLs)

There is a trend in the European Union of promoting the widespread use of energy-saving light bulbs. Moreover, the EU and several other countries across the world have recently decided to ban conventional, incandescent lamps in the near future.

Despite this trend, concerns have been raised on the safety and health effects of energy saving light bulbs, more specifically of Compact Fluorescent Lights (CFLs), the main type of energy-saving light bulb currently on the market.

Below is a summary of the three principal health risks associated with energy saving lamps, namely electromagnetic fields, mercury and UV radiation.

1. Electromagnetic radiation and dirty electricity

Incandescent lamps emit very little electromagnetic radiation. CFLs on the contrary emit radiofrequency radiation in the frequency range of 25 to 100 kilohertz (kHz).

Measurements by the independent French research centre CRIIREM show that **CFLs generate powerful electromagnetic fields (EMF) close to the source**, up to 1 metre distance (1). At a distance of 20 centimetres, radiation levels can be as high as 180 Volts per metre (!) Measurements by the Flemish Institute for Technological Research (VITO) have confirmed these findings (2).

CRIIREM therefore advises not to use energy saving lamps at too close a distance, for example, as desk lamps or as a reading lamp beside the bed (3). A ban on incandescent lamps, however, will result in more people using CFLs as desk or bed lamps, thereby exposing them to very high levels of EMF.

It is often said that these levels of EMF stay below the international exposure limits and that they are therefore safe. However, there is widespread criticism on these limits, which are considered to be much too lenient (4).

In addition to directly emitting radiation, there are indications that the EMFs emitted by CFLs can travel along the electrical wiring thereby exposing people to so-called '**dirty electricity**' throughout the house. A study published in June 2008 in the American Journal of Industrial Medicine indicated that this dirty electricity can lead to a 5-fold increased risk of cancer (5). A harmful influence of dirty electricity has also been found in research done by the Canadian researcher Magda Havas (6).

Low voltage halogen lamps (12 V) can pose similar problems due to EMFs originating from the transformers. This is particularly the case with the pulsed radiation from "electronic transformers", which can also contaminate the mains to give dirty electricity. Mains voltage halogen lamps (220 V) do not have this effect.

All in all, there has been very little research to date into the health effects of energy saving lamps and the EMFs they emit. Therefore some groups are arguing that this research should be done before incandescent lamps are banned.

2. Mercury

Energy saving lamps contain mercury, a substance which is extremely harmful for humans, animals and the ecosystem in general. It is especially toxic to the brain, the nervous system, the liver and the kidneys. Foetuses, babies and infants are the most vulnerable, as mercury exposure negatively influences the development of the brain (e.g. lower IQ) and nervous system. Mercury can also damage the cardiovascular, immune and reproductive systems and possibly lead to tremors, emotional instability, memory loss, insomnia, neuromuscular changes, headaches, cancer and Alzheimer's (7).

It is often said that energy saving lamps contain only a very small amount of mercury, which therefore can't be harmful. Though one has to ask the question: small in comparison to what? The safe intake of mercury for a human body is only a few micrograms (8). CFL's contain three to five *thousand* micrograms.

Exposure to the mercury in CFL's normally only occurs when the lamp breaks, which can happen very easily. **Measurements show that the levels of mercury in the air after lamp breakage can well exceed the existing safety limits** (9). After the breakage, a large number of fairly complicated measures need to be taken to limit the health risks. However, very few people are aware of the needed precautionary measures. Moreover, a study by the state of Maine (United States) shows that **even when all precautionary measures are taken, the mercury concentrations in the room where the lamp broke can stay very high** (9). This is because the mercury can get absorbed into all sorts of textiles (carpet, curtains, etc.), which can then give off mercury vapours for a long time after the breakage.

For children playing on the carpet this can lead to very high exposures. More generally, it can be said that: *"Babies and other small children are more vulnerable to airborne mercury exposures, because their small body sizes and more rapid respiration rates give them a larger dose of mercury than an adult gets from inhaling air with the same mercury concentration. Mercury vapour is heavier than air, and mercury concentrations in indoor air tend to be higher near the floor. Infants and toddlers who crawl, sit, walk, play and breathe on or close to the floor are thus likely to be most heavily exposed to the mercury vapour from a broken CFL."* (9, p. 7)

Lamps that are thrown in the garbage can break in the garbage can in the house or in the dump truck, from where the mercury vapours can escape and are thus transferred all over the town or city (10). Once the lamps end up on the landfill, the mercury can evaporate further, seep into the ground and contaminate water. The amount of mercury in one lamp is enough to contaminate 23.000 litres (6,000 gallons) of water (11). Even when the lamps don't break, the mercury in them constitutes a time bomb for future generations (10).

Environmental organisations, the lamp industry and government agencies often claim that energy saving lamps will ultimately reduce the amount of mercury in the environment. It is said that the production of electricity in coal-fired power plants is an important source of mercury emissions. Because CFLs use less electricity than incandescent lights, CFLs will ultimately reduce the amount of mercury in the environment, or so the argument goes. **However, several experts question the validity of this argument.** John Gilkeson, head of the Minnesota Pollution Control Agency in the United States says that less use of electricity is not directly linked to fewer mercury emissions. Using less electricity does not necessarily mean that less coal is burned. Since coal is cheap, power companies tend to keep their coal-fired plants running day and night; when demand for electricity ebbs, they cut back on more expensive natural gas, not coal (12).

Professor Ron Hui, chairman of the electronic engineering department at the City University of Hong Kong also remarks: "Talking about the amount of mercury emitted from power stations is a false argument. **With power stations, the contamination is in that area, but now we are talking about bringing that contamination into every home and every street.** We may have less mercury in the whole production process than with incandescent light bulbs but the difference with CFLs is that the mercury will be in our homes and in our streets" (10)

3. UV-radiation

Energy saving lamps emit UV-B and traces of UV-C radiation. It is generally recognised that UV-radiation is harmful for the skin (e.g. skin cancer) and the eyes (e.g. cataract). UV-C radiation, which is normally not observed in nature because it is absorbed completely in the atmosphere, is especially harmful.

Several studies have found that fluorescent lights raise the risk for skin cancer (13). A study published in The Lancet for example indicated a doubled risk for melanoma (14).

There have been numerous reports of people with skin conditions and light sensitivity who react badly to CFL's (15). But also people without existing skin conditions can develop adverse skin reactions such as redness and a hot, burning sensation in the face (16).

Organisations defending the right of people to safe lighting, such as "Right to Light" and "Spectrum Alliance", have therefore heavily criticised the plans to ban incandescent lamps. The British Association of Dermatologists has supported this criticism (17).

CFL's with a double envelope emit far less or no UV-radiation. Nevertheless, most people don't know that a double envelope is needed to shield the UV-radiation. As long as single envelope CFL's (which are cheaper than double envelope ones) are sold on the market, UV-radiation will continue to be a public health problem.

4. Other problems

- Flicker

Energy saving light bulbs, especially low quality ones, sometimes cause flickering light. This can lead to discomfort, headaches/migraine (18, 19), eye strain, diminished concentration (19), seizure-like symptoms in epileptics (20), worsened symptoms in people with Ménière's disease, etc.

- Toxic chemicals

The electronic circuit of energy saving lamps contains flame retardants (PBDE). These are chemical compounds that accumulate in the body and which studies have linked to harmful effects on the hormonal and reproductive system, the liver, the thyroid gland, to cancer and neurological effects (22).

Some energy saving lamps also have an external coating of titanium dioxide, made up of ultra small nano-particles. There still is a lot of uncertainty on the health effects of nano-

particles but there are indications that they can lead to inflammation in tissues and organs and to cardiovascular effects (23).

- Diminished production of melatonin

German scientists have warned that the large proportion of blue light emitted by CFL's can lead to a diminished production of the important hormone melatonin. This in turn can lead to a wide variety of diseases and conditions: sleeping disorders, cancer, cardiovascular disease, etc. (23). But the specific light emitted by CFL's could also influence the production of other hormones and neurotransmitters.

(1) <http://www.criirem.ouvaton.org/spip.php?rubrique58>

(2) <http://www.vito.be/VITO/OpenWoDocument.aspx?wovitoguid=44600D61-7547-4838-9544-1A4C1248B855>

(3) <http://www.criirem.ouvaton.org/spip.php?rubrique58>

(4) See for example:

www.bioinitiative.org

www.emfacts.com/papers/icnirp_critique.pdf

www.salzburg.qv.at/ICNIRP-Kritik1.pdf

www.hese-project.org/hese-uk/en/niemr/icnirp.php

(5) <http://www.emfacts.com/weblog/?p=903>. The entire study can be found at <http://www.beperkdestraling.org/Wetenschap/High%20frequency%20voltage%20transients%20associated%20with%20increased%20cancers%202008.pdf>

(6) Havas, M. 2006. Electromagnetic Hypersensitivity: Biological effects of dirty electricity with emphasis on diabetes and multiple sclerosis. *Electromagnetic Biology and Medicine*, 25: 259-268, 2006

(7) <http://www.zeromercury.org/>

(8) <http://edition.cnn.com/2008/TECH/07/27/eco.flourescent>

(9) http://mpp.cclean.org/wp-content/uploads/2008/08/final_shedding_light_all.pdf

(10) <http://edition.cnn.com/2008/TECH/07/27/eco.flourescent/>

(11) http://www.truthout.org/issues_06/032108EC.shtml

(12)

http://www.lakeoswegoreview.com/sustainable/story.php?story_id=122090777173654500

(13) eg. Lytle CD, Cyr WH, Beer JZ, Miller SA, James RH, Landry RJ, et al. An estimation of squamous cell carcinoma risk from ultraviolet radiation emitted by fluorescent lamps. *Photodermatol Photoimmunol Photomed* 1992/1993; 9:268-274.

(14) V. Beral, S. Evans, H. Shaw & G. Milton (1982), 'Malignant melanoma and exposure to fluorescent lighting at work', *The Lancet*, 7 August 1982, pp. 290-293.

(15) 'Low-energy bulbs worsen rashes', <http://news.bbc.co.uk/2/hi/health/7170246.stm> (4 January 2008)

Documentary 'Rays of Rash', aired on Canadian television:
http://www.youtube.com/watch?v=6CVLa_tRslY

<http://www.spectrumalliance.org.uk>

(16) eg. 'The energy-saving light bulbs that could leave you red-faced... from UV radiation', <http://www.dailymail.co.uk/health/article-1075613/The-energy-saving-light-bulbs-leave-red-faced--UV-radiation.html> (15 October 2008)

(17) <http://news.bbc.co.uk/2/hi/health/7170246.stm>
<http://www.dailymail.co.uk/health/article-1075613/The-energy-saving-light-bulbs-leave-red-faced--UV-radiation.html>
<http://www.telegraph.co.uk/earth/earthnews/3320595/Low-energy-bulbs-'could-cause-skin-cancer'.html>

(18) 'Low-energy bulbs cause migraine', <http://news.bbc.co.uk/2/hi/health/7167860.stm> (2 January 2008)

(19) 'Fluorescent lights giving pupils headaches'
<http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2007/09/06/nlights106.xml> (6 September 2007)

(20) 'Energy-saving light bulbs are threat to epileptics',
http://www.dailymail.co.uk/pages/live/articles/health/healthmain.html?in_article_id=463911&in_page_id=1774

(21) <http://edition.cnn.com/2008/TECH/07/27/eco.flourescent/>

(22) <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/pbde-eng.php#he>

(23) <http://www.irsst.qc.ca/files/documents/PubIRSST/R-589.pdf>

(24) <http://www.br-online.de/das-erste/report-muenchen/report-gluehbirne-klimaschutz-ID1230898145031.xml>