



Protecting people
Preventing harm
Preparing for threats

Emissions from compact fluorescent lights

9 October 2008

New research by the Health Protection Agency has shown that some energy saving compact fluorescent lights can emit ultraviolet radiation at levels that, under certain conditions of use, can result in exposures higher than guideline levels. The Agency and Government Departments are calling on the European Union, relevant product standards bodies and the lighting industry to consider how product standards for lights can be tightened up.

Given its research findings, the Agency is recommending some precautionary measures for the use of certain types of compact fluorescent light bulbs (CFLs). The Agency's view is that open (single envelope) CFLs shown in Fig. 1 should not be used where people are in close proximity - closer than 30 cm or 1 ft - to the bare light bulb for over 1 hour a day. The Agency advises that for such situations open CFLs should be replaced by the encapsulated (double envelope) type shown in Fig. 2. Alternatively, the lamp should be moved so that it is at least 30 cm or 1 ft away.

The Agency's Chief Executive Justin McCracken said, "This is precautionary advice and people should not be thinking of removing these energy saving light bulbs from their homes. We are advising people to avoid using the open light bulbs for prolonged close work until the problem is sorted out and to use encapsulated bulbs instead. In other situations where people are not likely to be very close to the bulbs for any length of time, all types of compact fluorescent light bulbs are safe to use."

Not all open (single envelope) fluorescent light bulbs have significant UVR emissions but if people are in very close proximity to some of them, the exposure to bare skin is like being outside in direct sunlight. For example, Agency scientists found that when very close (2 cm, less than 1 inch) to some open CFLs, the UVR level can be equivalent to that experienced outside in the UK on a sunny day in the summer and so some precaution is warranted. When further away (over 30 cm or 1 ft), the UVR level is much lower and less than being outside on a sunny day in winter, which is not a concern.

Encapsulated (double envelope) compact fluorescent light bulbs (see Fig. 2), which look similar to traditional domestic light bulbs, do not emit significant amounts of UVR. The larger long tube "strip lighting" design fluorescent lights, commonly used in offices, workplaces and homes for many years, can also be used on ceilings without any special precautionary measures.

The precautionary advice from the Agency is interim advice. The Agency's study has stimulated research into the problem by others and the Agency may issue further advice when more information is available. As a result of the Agency's work the Government is pressing the EU to take account of the findings in future European legislation.

Exposure to UVR can cause particular problems for people suffering from some medical conditions, including Lupus. The Agency, Government and the lighting industry have met with patient groups to give advice on the use of compact fluorescent light bulbs and the availability of new technologies for low energy lighting. In addition, the Agency's work has been taken into account by an EC scientific committee looking into the issue of light sensitivity. This committee published its opinion last Friday, 3 October 2008.

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Fig. 1. Typical designs of open (single envelope) fluorescent light bulbs for which HPA precautionary advice applies. They should not be used where people are likely to be in very close proximity (less than 30 cm / 1 ft) to bulbs for prolonged periods (more than 1 hr a day).



Fig. 2. A typical design of an encapsulated (double envelope) compact fluorescent light bulb for which precautionary measures are not needed. Ultraviolet radiation is absorbed by the outer glass container. They can be used anywhere in the home.

Notes for Editors

1. The HPA research has been accepted for publication. M Khazova and J B O'Hagan, Optical Radiation Emissions from Compact Fluorescent Lamps. Radiation Protection Dosimetry (to be published). Pre-publication access at <http://rpd.oxfordjournals.org/cgi/content/abstract/ncn234v1>
2. Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). Light Sensitivity. Opinion adopted at 26th Plenary, 23 Sept 2008. DG for Health and Consumers, European Commission, Brussels. http://ec.europa.eu/health/ph_risk/committees/04_scenihr/docs/scenihr_o_019.pdf
3. Compact fluorescent light bulbs (CFLs) are an integral part of UK Government policy to encourage more efficient lighting in homes and workplaces, thereby saving energy and reducing UK carbon dioxide emissions. Fluorescent lights use much less power than incandescent lights and the UK Government has a policy to phase out these relatively inefficient lights over the next few years and to replace them with CFLs.
4. The guideline levels referred to here are those recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP <http://www.icnirp.org/>). The guideline limit is 30 J m⁻² for the eye and skin, which is equivalent to a constant irradiance of 1 mW m⁻² effective for 30,000 seconds or 8 hours, a normal working day. The CFLs are too bright for people to comfortably stare at, so the main issue here is skin exposures from CFLs when they are used for close work on desks or work benches. The exposure limit for skin is conservative for the general population and, if it is exceeded, the immediate risk is for skin reddening, similar to sunburn. There is also a small increased risk of skin cancer associated with this,

again similar to that from sunburn, but as the area of skin affected by exposure to CFLs is very small compared to sunbathing, so the risk is proportionately less.

5. HPA scientists assessed the time taken for CFLs to exceed the ICNIRP guidelines referred to above in note 4. At close proximity (2 cm or $\frac{3}{4}$ inch), the exposure limit would be exceeded in less than 10 minutes by about 20% of the CFLs tested. About half of the CFLs exceeded the exposure limit at this distance after 30 minutes. At a larger distance (20 cm or 8 inches) only 8% of those tested exceeded the ICNIRP guidelines after 8 hrs. Hence the advice given here is primarily aimed at avoiding very close exposures to CFLs.
6. Prior to publication, the Health Protection Agency provided advice on its findings to UK Government Departments, Regulators, and the European Commission. The Government has actively raised this issue with the European Commission in order to set UV emission standards. The Agency also informed UK lighting industry bodies of its early findings and they are carrying out a study to identify the cause of the UV emissions and how they might be reduced.
7. The ICNIRP guideline levels for skin take account of wide variations in sensitivity of normal skin to UVR, but they do not take account of people whose medical conditions make them abnormally photosensitive. The Health Protection Agency has been discussing these findings with the Department of Health and patient groups, in particular Lupus sufferers whose condition may make them very photosensitive.
8. HPA scientists observed that a significant proportion of the CFLs tested had a flicker at about 100 Hz. Whilst a 100 Hz flicker will not be perceptible to most people, some will be aware of it if the light bulb is in the periphery of their vision. Lighting industry bodies were informed of this finding prior to publication and further research may be needed on this.
9. HPA scientists observed that the visible spectrum emissions from the tested CFLs consisted of a series of discreet narrow peaks with low or negligible emission between peaks. Visible light from the Sun is a broad spectrum so this feature of CFLs may compromise colour perception for some people and may require an increase of brightness to perform some visual tasks.

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