Request for a scientific opinion
Scientific Committee on Health, Environmental and Emerging Risks (SCHEER)

The potential risks to human health of Light Emitting Diodes (LEDs)

Background

The Light-Emitting Diode (LED) is a semiconductor light source that releases energy in the form of light when a suitable voltage is applied to it. LEDs are used in home lighting, laptop and phone screens, TV sets, traffic signals and increasingly becoming used as a light source in the automotive industry to mention a few applications.

The LEDs are energy efficient and last much longer than the conventional light sources, which makes them widely used by the general population. Hence it is important to know the implications of LED radiation on the human health.

Recently, researches have analysed potential risks of white LEDs, [1] issuing recommendations to avoid the hazards. Another group of researcher has speculated about the effects of LED radiation on retinal epithelium cells (RPE), [2]

The human visual system is exposed to high levels of natural and artificial lights of different spectra and intensities along lifetime. These lights give rise to the formation of reactive oxygen species and induce mutagenic mechanisms which lead to apoptosis and consequently to degenerative eye diseases, such as age-related macular degeneration (AMD).

There are several variables to be taken into account when referring to LEDs effects on human health: 1) spectrum of a LED light source, 2) intensity of the lighting, especially in the blue band, 3) duration of exposure, 4) health of the eye, 5) direct staring, without deviation versus active eye movement.

According to the SCENIHR opinion on the artificial light¹: "...Blue radiation directly from bright cold white light sources in proximity of the workers eyes (e.g. task lights) or strong projectors (floodlights, accentuation and scenic lighting, etc.), or reflected may represent a risk for retinal damage; the blue light component from cold white reading lights may perturb circadian rhythm of the user; a child’s crystalline lens is more transparent to short wavelengths than that of an adult, making children more sensitive to blue light effects on the retina."

Legal background

At international level, Recommendations for exposure limit values (ELVs) to protect against adverse effects of optical radiation are established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and apply both to the occupational population and the general public.

At EU level, the following legal framework exists that aims at minimising the risks posed by the LEDs.

Regarding the protection of the occupational population, the ELVs of Directive 2006/25/EC², lays down the minimum safety requirements regarding the exposure of workers to risks arising from artificial optical radiation, are based on the ICNIRP recommendations³.

¹ http://ec.europa.eu/health/scientific_committees/emerging/docs/scenihr_o_035.pdf
³
Furthermore, the safety of LEDs (unless if they are less than 50 V AC or 75 V DC) falls under the scope of the Low Voltage Directive (LVD) 2014/35/EU. LEDs must comply with the safety objectives of Annex I that include all type of risks, guaranteeing a high level of protection of health and safety of persons.

If LEDs are less than 50 V AC or 75 V DC, their safety is covered by the General Product Safety Directive 2001/95/EC.

All European standards (EN) related to LVD are voluntary, but if harmonised and published in the OJEU they would provide presumption of conformity with the safety objectives of the LVD.

EN 62471 on the “photobiological safety of lamps and lamp systems” sets up the safety limits and methods to assess the photo-biological risks of lamps including LEDs.

The specific safety requirements regarding photobiological hazards are contained within the LED modules and luminaire safety standards (EN 62031 and EN 60598-series) and in other lamp safety standards: EN 62560 and EN 62776.

**Terms of reference**

The Scientific Committee is asked to assess the safety risks associated with the use of LEDs and to provide an answer to the following questions:

1. What are the potential health hazards associated with LEDs emission in the general population with regard to wavelength, intensity, duration and viewing position?

2. If possible, identify dose response relationship associated with LEDs emission in the general population with regard to wavelength, intensity, duration and viewing position?

3. What are the potential health risks associated with LED displays (e.g., TV sets, laptops, phones, toys and car lighting) in the general population and in vulnerable and susceptible populations (e.g., children and elderly people)?

4. What are the potential health risks associated with LED lamps (e.g., toys and car lighting) in the general population and in vulnerable and susceptible populations (e.g., children and elderly people)?

**References:**


2. Chamorro E, Bonnin-Arias C, Pérez-Carrasco MJ, Muñoz de Luna J, Vázquez D, Sánchez-Ramos C., Effects of Light-emitting Diode Radiations on Human Retinal Pigment Epithelial Cells In Vitro,
Deadline.
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