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Light-Emitting Diodes (LEDS): Implications for Safety.

International Commission on Non-Ionizing Radiation Protection (ICNIRP)1.

Since the original ICNIRP Statement was published in 2000, there have been significant improvements in the efficiency and radiance (i.e., optical radiation emission) of LEDs. The most important improvement is the development of 'white' LEDs that can be used as general lighting sources, which are more efficient than traditional lighting sources. LEDs emitting in the ultraviolet wavelength region have also become available and have made their way into consumer products. All these changes have led to a rise in concern for the safety of the optical radiation emissions from LEDs. Several in vitro and animal studies have been conducted, which indicate that blue and white LEDs can potentially cause retinal cell damage under high irradiance and lengthy exposure conditions. However, these studies cannot be directly extrapolated to normal exposure conditions for humans, and equivalent effects can also be caused by the optical radiation from other light sources under extreme exposure conditions. Acute damage to the human retina from typical exposure to blue or white LEDs has not been demonstrated. Concern for potential long-term effects, e.g. age-related macular degeneration (AMD), remains based on epidemiological studies indicating a link between high levels of exposure to sunlight and AMD. When evaluating the optical radiation safety of LEDs, it has now been established that published safety standards for lamps, not lasers, should be applied. Thus far, the only clear, acute adverse health effects from LEDs are those due to temporal light modulation (including flicker). Glare can also create visual disturbances when LED light fixtures are not properly designed. Further research is needed on potential health effects from short- and long-term exposure to new and emerging lighting technologies.

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