

Effects of Exterior Lighting on Human Health

Research concerning non-visual human responses to optical radiation[†] has created discussion about the effects of exterior lighting on human health. As with any research concerning human health, the information is complex and difficult to place in context. This is due in part to the complexity of investigations, the lack of experimental control, the ability of results to be generalized, and finite resources that make it impractical to explore all relevant hypotheses. In 2008, the Illuminating Engineering Society of North America (IES) published *Light and Human Health: An Overview of the Impact of Optical Radiation on Visual, Circadian, Neuroendocrine, and Neurobehavioral Responses* (IES TM-18-08). **TM-18 represents the position of the IES on the known relationships between optical radiation and human health.**

TM-18 indicates that exposure to optical radiation affects human physiology and behavior, both directly (acute effects including melatonin suppression, elevated cortisol production, increased core temperature) and indirectly (resetting the internal circadian body clock). There is no confirmation that typical exposures to exterior lighting after sunset lead to cancer or other life-threatening conditions. Some of the uncertainty about the research in this area arises from the differences in spectral sensitivity between the visual and non-visual responses to optical radiation. **The position of the IES is that typical exposures to exterior lighting after sunset have not been shown to lead to cancer or other life-threatening conditions.**

Since there are differences in spectral sensitivity between the visual and non-visual responses to optical radiation, existing units of measurement based on the photopic luminous efficiency function are not adequate to characterize non-visual responses, such as melatonin suppression. **The position of the IES is that new spectral weighting functions that are appropriate for characterizing non-visual response(s) to optical radiation are needed.**

Older and more recent measurement systems have not incorporated all key aspects of the optical radiation stimuli; quantity, spectrum, duration, timing, direction and exposure history. Until such time as a new metric is available to quantify responses to these optical radiation stimuli there is uncertainty about what effects should be considered harmful to health, and for which population, because the melatonin suppression and circadian disruption are clearly variable depending on the characteristics of exposure(s) and also on the individual. Also, most of the research has occurred in laboratories; it is of interest to the IES to complement such studies with those that characterize the effect of optical radiation on circadian, neuroendocrine, and neurobehavioral responses in field applications. At present there is inadequate documentation of what constitutes typical exposures to optical radiation in exterior settings after sunset that would constitute real-world normative data.

[†] Light is defined as optical radiation entering the eye that provides visual sensation in humans. Optical radiation, however, is increasingly related to a range of ocular circadian, neuroendocrine, neurobehavioral, and therapeutic responses in humans. For the sake of clarity “optical radiation” is used in this position statement when referring to biological responses other than visual. “Light” is reserved to describe optical radiation that has been evaluated with respect to its ability to stimulate the visual system.

Optical radiation detected by the retina impacts an individual's behavior, psychology, and perception of the environment. The position of the IES is to promote and encourage a more complete understanding of human responses to optical radiation leading to improved designs for all lighted environments through additional research with specific emphasis on additional field research to document typical exposures to optical radiation in exterior settings.

About the Illuminating Engineering Society

The IES is a collegial community dedicated to improving the lighted environment. The IES is composed of a diverse membership, all with an interest in and a dedication to good lighting. 25% of the membership is involved in manufacturing (lamps, sources, luminaires, accessories); another 25% is composed of lighting designers and architects. The remaining 50% is composed of consultants, electrical and building contractors, distributors, and wholesalers, individuals working in affiliated lighting fields, those working for utilities and energy services, and people in government and education. Over one thousand of these individuals serve on committees, most serving on the Society's document development committees; these committees develop standards, design guides, technical memoranda, lighting energy management materials, guidelines and lighting measurement, testing and calculation guides.

Illuminating Engineering Society of North America
120 Wall Street, 17th Floor
New York, NY 10005-4001
Phone: 212-248-5000 Fax: 212-248-5017
www.ies.org