

SSL Postings

As happens every so often, there've been some recent articles in the press about the possible adverse health effects of exposure to light at night, which makes it an opportune time to revisit the topic here in these *Postings*. We take such matters seriously and don't dismiss them lightly. That's why, at our [fifth annual SSL Market Introduction Workshop](#), held last year in Philadelphia, we convened a panel of experts to discuss the topic. These distinguished researchers included George Brainard of Jefferson Medical College, Mariana Figueiro of Rensselaer Polytechnic Institute, and Ronald Gibbons of Virginia Tech Transportation Institute. They pulled no punches in providing an update on what we know – and don't know – about the visual and nonvisual effects of light, focusing on the differences in spectra between available light sources. Their thought-provoking insights resulted in a U.S. Department of Energy (DOE) [white paper](#) entitled "Light at Night: The Latest Science," which is available online and complements a DOE [fact sheet](#) on the same topic.

What were their conclusions? Well, for starters, it's clear that light plays a major role in setting our biological clock – or "circadian rhythm," as scientists call it. Researchers recently discovered specialized light-sensing cells in the human eye called "intrinsically photosensitive retinal ganglion cells" ("ipRGCs" for short), which aren't directly responsible for vision but send information to parts of the brain regulating nonvisual function, such as hormone secretion. The hormone melatonin plays a key role in maintaining circadian rhythms. There's evidence that disrupting circadian rhythms can cause health problems and that short-wavelength (blue) light has

more of an effect on melatonin levels than does light in other parts of the visible spectrum.

But that's where the water starts getting murky for a number of reasons. For one thing, we don't yet know just how much nighttime light exposure it takes to affect health in a negative way. In addition, research suggests that many people would actually function *better* in life with more exposure to light in the daytime – especially exposure to blue light. One of the Philadelphia panelists made the recommendation that daytime light exposures be increased and enriched with short-wavelength (blue) visible radiation, while nighttime illumination be reduced and have less of a short-wavelength component. Although scientific consensus hasn't been reached on the relative magnitudes of the positive effects of daytime exposure and negative effects of nighttime exposure, they remain under investigation.

There's also the question of visibility, which is especially important with street and roadway lighting. One of the other Philadelphia panelists cited evidence that in low-illumination outdoor environments at night, visibility improves with broad-spectrum light sources (i.e., those that include a substantial amount of energy in the blue range) compared with narrower-spectrum light sources (such as high-pressure sodium). The most commonly used LEDs for outdoor lighting produce a relatively broad spectrum, including blue, which means they have the potential not only to save energy, but also to improve nighttime visibility and safety.

The bottom line is that more research is needed before we can truly understand the health consequences of exposure to light at night and their implications – if any – for SSL. It should also be noted that nearly all light sources – including incandescent, fluorescent, and high-intensity discharge – produce some blue light and thus could fall under the purview of this ongoing research. The improved control of distribution, intensity, and spectrum may well give LEDs an advantage in this regard, although it's too early to tell. At this

point in time, it would be premature to encourage any major changes in lighting practice, without first establishing clear cause-and-effect relationships in fields of science that are still budding and extremely complex. Although we can't afford to have preconceived notions when it comes to solid-state lighting, rushing to judgment could be just as harmful.

As always, if you have questions or comments, you can reach us at postings@lightingfacts.com.
