

The National Library of Medicine has numerous research articles showing profound adverse effects from LED light exposure. Unlike older style bulbs, properties inherent to LEDs make this light source intensely damaging. LEDs emit short-wave, white/blue, directional, non-uniform, hyper-penetrating light which is biologically disruptive and wholly unfamiliar to natural systems. Humans and wildlife have few defenses against it.

Medical researchers conduct animal studies because medical ethics largely prohibit using human test subjects identified as high-risk. (Epilepsy, for example, precludes someone from participating in experiments involving potential seizure-inducing lights including LEDs). Animal studies are conducted on species selected for commonalities with human biology. The results and the resulting human implications are often alarming:

- A 2019 experiment with mouse embryos demonstrated how short wave LED light interferes with the embryonic implantation capacity in mice. The number of embryonic nuclei with fragmented DNA was significantly higher in embryos treated with white light.
- A 2019 study on zebra fish revealed that LED lighting affected morphology, locomotor activities, mortality and hatching rates, oxidant and anti-oxidant parameters and gene expressions related with melatonin circulation. The “blue LED-exposed zebra fish all died within 72 hours past fertilization.”
- A 2018 real world study (as opposed to lab results) found that increased skyglow in cities with LED street lights impacted yet-to-be-born babies, causing reduced birth weight, shortened gestation and pre-term birth. Boy babies are more vulnerable than girls.
- A 2018 paper entitled “Blue Light and Fruit Flies: A Warning for Humans” (Journal of Aging and Mechanisms of Disease) describes LED exposure causing reduction in lifespan, retinal damage, brain degeneration and aging due to stress. The conclusion says that these findings should lead to “more research on an urgent basis so that potentially harmful lighting may be averted.”

These references are recent, but the probability that LEDs caused harm to living organisms was recognized many years ago. Here's some background on how - despite this foreknowledge - LEDs came to be installed where they're exposing everyone and everything, just about everywhere:

The lighting industry has also known for decades that LEDs cause toxic effects. LEDs were a specialized technology, not expected to move out of the laser category and into regular use. By the mid-2000s, however, the industry turned away from promising work on super-efficient incandescent bulbs and focused on LEDs instead. Side-stepping toxic effects, emphasizing energy savings and branding LEDs as 'green,' LEDs began suddenly turning up in consumer products, offices, schools, medical facilities, outdoors and in public light fixtures without further examination. The public was mostly unaware – and the industry barely mentioned – the breadth and variety of potential damage from LED exposure to living things of all kinds.

Engineering research has different goals than medical research. The lighting industry emphasized the lack of specific laboratory evidence on LEDs' human health impacts, neglecting to mention that high-risk, human, LED-susceptibility tests *can't* be conducted because of danger to the participants. What the lighting industry *did* know was that LED exposure was capable of wreaking biological, neurological and endo-chronological havoc. They forged ahead regardless.

In 2018, still focusing on efficiency and with a motivation to ban incandescent bulbs, The European Union asked SCHEER (The Scientific Committee on Health and Environmental Emerging Risks) to review recent evidence to assess human health risks from LEDs. The transition to LEDs was already well underway, creating pressure and momentum to reach a favorable finding, one that would permit the continued proliferation of LEDs. However, that meant it became necessary to narrow SCHEER's attention to an artificially limited segment of society.

Thus their conclusion misleadingly reads:

“There is no evidence of direct adverse effects from LED emissions in normal use by the general healthy population.”

This sounds reassuring until you realize that The Committee doesn't define 'normal use.'

And when they refer to the 'general healthy population,' they're explicitly excluding babies, children, adolescents, the elderly, and people with migraines, lupus, autism, epilepsy, and other photosensitive disorders. These are the individuals who DO experience “direct adverse effects” from even brief LED exposure. As Dr. John Lincoln of Lightaware pointed out to the Committee, their conclusion about safe levels of LED use fails to account for *one third* of the global population.

The committee also managed to overlook that - going forward - every person who makes it to old age, and everyone born to an LED-lit world will, inevitably, spend years in at least one high risk category (In fact, since LED exposure can cause epigenetic and gestational harm, infants are at risk *before* they are born.) The committee doesn't explain that “no evidence” just means a lack of human studies. Nor did SCHEER factor in chronic or cumulative effects, or increasing sensitization from repeated exposure over time. The Committee's report frequently refers to knowledge gaps, absence of information, unquantifiable data and of the need to monitor future adverse health effects as problems arise. Not address, not fix, only monitor. They would rather approve a product with known risks for the public than take precautions beforehand to protect the vulnerable.

The US Dept. of Energy also played a role. As mentioned, lighting industry research on LEDs goes back decades. The DOE presumably consults that research. The DOE is surely aware of the implications. In 2012, discussing the issue of flicker and dimming devices, DOE reports real world mitigation methods “can be challenging,” “little can be assumed,” and that effectiveness is “difficult to predict.” In terms of who should worry about this? The US Department of Energy website reads:

“ Sidebar: Who cares about flicker?

Anyone who is sensitive

Anyone responsible for human health, well-being and/or performance in spaces with electric lighting

At-risk populations for specific impairments

- photosensitive epilepsy: 1 in 4000

- migraine sufferers

- not all at-risk populations identified

Young people

Autistic people “

Utility companies may offer things like shields, dimmers, 'warmer' or amber bulbs, modifications meant to reduce discomfort and damage from LEDs. These measures don't actually remove the problem and none are designed to protect anyone at acute short-term or immediate risk.

Nor do these methods address the unprecedented threat to insects and wildlife from LED light pollution. Grave, photo-toxic LED impacts are still building up in the bodies of everyone exposed.

By 2015 (still discussing flicker) a DOE presenter told annual Lightfair attendees that LEDs are “acceptable for all but the most unusually sensitive individuals.”

DOE doesn't elaborate on how many people that might be, or what alternatives those people will have once their communities install lighting which they can't medically tolerate. That presentation was part of the DOE's wholesale endorsement for universal public installation of LEDs.

No-one asked, and no-one warned the public about becoming part of a vast, involuntary de-facto experiment on persistent LED exposure. Bear all of this in mind when reading the research literature cited below. Years after LEDs started eclipsing the lighting market and cropping up in homes, schools, businesses and public spaces indoors and out, the language is still that of uncertainty about just how serious, or potentially irreparable, the outcome of ubiquitous LED exposure will actually be. Based on mounting scientific evidence, the results will be catastrophic.

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"It is not yet fully understood why artificial forms of light seem to be causing such diverse health problems. Senior medical professionals are expressing concern about the effect of new forms of light on our eyes, skin, nervous system and sleep. It may be that different aspects such as the amount of blue light, glare, electro-magnetic radiation, and flicker are responsible for different symptoms....

...until this is better understood and acknowledged, new lighting is causing extreme social isolation as those who cannot tolerate it find themselves unable to access public spaces including schools and colleges, health centers and hospitals, places of worship, sports and recreation, and even the streets at night...

Elaine from Ireland had to leave her job and then her home because of severe sensitivity to LED lighting. "When the new streetlights were erected outside my home, I couldn't even step into the front garden without severe eye pain, migraine, dizziness and nausea. It hits me immediately, " she explains, "At the very same time as the streetlights, our monitors at work were changed to LED back-lit monitors. I was already struggling at work with the overhead LED lighting. I was living on painkillers and anti-sickness tablets just to get through the day. I couldn't tolerate the monitors for even a few seconds, so I had no choice but to leave my job.

Elaine is not alone. The charity LightAware, which raises awareness of the impact of artificial light on health and wellbeing, hears from people all over the world who are now struggling to light their homes and live their lives. LightAware believes it is unjust to ban a safe form of lighting with no provision for those who cannot tolerate the alternatives."

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