

We know that exposure to light at night from a variety of sources affects circadian rhythms in general. This is one of the reasons Takoma Park wants to replace old light-pollution emitting streetlights with International Dark Sky Certified streetlights. The certified streetlights are specifically designed to limit exposure to streetlight. Human and animal exposure to the streetlight is limited to the street and sidewalk. The proposed streetlight fixtures can be controlled for the appropriate level of lighting to manage the needs of drivers and pedestrians. The needs of drivers and pedestrians are based on the International Engineering Society (IES) guidelines for streetlighting (link on the project page).

There is no credible evidence that LED streetlight at 3,000K and appropriate wattage is any more disruptive to human and animal health than any other type of streetlight.

The study that Jim Dougherty of the International Dark Sky Association has been using in his presentation and as evidence of the detrimental human health effects of LED Streetlighting is this one:

<https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP1837>

This study claims that high exposure to outdoor artificial light at night in the blue-enriched light spectrum was associated with breast and prostate cancer.

- This study relies entirely on subjective, anecdotal interviews for data collection.
- The researchers at no time conducted medical or sleep studies of the participants to rule out pre-existing sleep disorders or other conditions.
- Researchers did not monitor sleep with any device.
- Researchers did not measure light levels inside the participant's homes.
- Researchers did not measure light exposure from electronic devices participants used inside or outside their homes.
- Researchers did not measure light levels on the ground. They relied entirely on satellite images of light being emitted or reflected upward.
- Blue light is not defined anywhere in the paper.
- LED blue light spectrum is not defined or described, the paper does not specify useful numbers. There is zero information about the Kelvin readings of any of the lights, CRI, etc.
- Control factors did not include participant's proximity to any sources of pollution such as industrial areas, traffic exposure, exposure to known cancer causing substances, etc.

We cannot draw any conclusion whatsoever from this research paper. It is entirely anecdotal, and does not contain useful information in the context of an ordinary streetlight replacement project.

There are also some studies done on rats. Here are three:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5854379/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5566984/>

https://hal.sorbonne-universite.fr/hal-01383394/file/Krigel_Light-induced.pdf

In these rat studies rats were exposed to an incredible amount of constant, direct light. Rats eyes were often dilated for the exposure.

- 200 lux continuously for 8 days
- 500 lux for 30 days, cyclic exposure
- 5,000 lux continuously for 7 days
- 6,000 lux continuously (with 6,300K LEDs) for 24 hours

These studies only prove that extreme exposure to extreme levels of light is bad for rat eyes. The studies **do not:**

- Relate in any way to exposure to streetlighting
- Relate to the type of fixture proposed

Your exposure to streetlights equates to an exposure of about 3 – 10 lux. Your direct exposure to the proposed Internarial Dark Sky Certified streetlights means that people and animals will have to be standing within the footprint of the streetlight to receive exposure to the light, again, 3 – 10 lux maximum. Even if you stood directly under a streetlight, staring directly up at it for 12 hours a night, the exposure is still a fraction of a fraction of what these studies did to the rats.

The studies do not indicate what Kelvin temperature their lights were, except in one case. Using the wavelength charts and description, we can guess they used 5,000K and above. There is more than double the blue light in a 5,000K LED than in a 3,000K LED.

More discussion on your typical exposure to light:

- Daylight is around 10,000 lux (around 100,000 lux if staring directly at the sun)
- Overcast daylight around 1,000 lux
- Office lighting is around 300-500 lux
- Streetlighting is around 3 – 10 lux

Blue content of lighting:

- Blue sky is around 10,000K
- Daylight is around 5,000K
- Overcast day is around 7,000K
- Most offices are 3,000K-4,000K
- Sunset is around 4,000K
- Restaurants, homes, hotels 2,700K – 3,000K
- Proposed streetlight 3,000K
- Existing HPS streetlight 2,200K
- Soft White Incandescent bulbs 2,700K – 3,000K
- Daylight Incandescent bulbs 4,000K – 6,500K

The difference in blue light between 2,700K and 3,000K in streetlights is so small it is imperceptible. 3,000K is considered warm white, the same as 2,700K. There is no credible evidence 3,000K has any greater health or environmental impact than 2,700K. Exposure to streetlight, especially IDA Certified streetlights, is minimal.