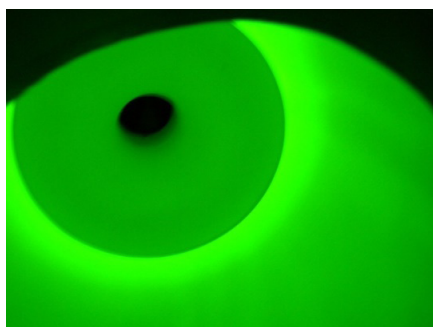


APPLICATION NOTE: LIGHT EFFECTS ON THE BIOLOGICAL CLOCK



Most organisms have a circadian clock which has evolved as a consequence of the rotation of the earth around its axis. The circadian clock resides in the suprachiasmatic nucleus and generates rhythms of about 24 hours. The suprachiasmatic nucleus adapts to daily changes in its environment. Light is the main synchronizer of the biological clock to the external light-dark cycle and is detected by ocular photoreceptors in the retina. Light information is then sent to the suprachiasmatic nucleus via the optic tract. In the suprachiasmatic nucleus light information leads to an enhancement in electrical activity of the neurons.

Experimental conditions

To determine the effects of light on the circadian clock in mice, in vivo electrophysiological recordings of neurons of the circadian clock were performed. Mice were exposed to three different wavelengths of light using monochromatic LEDs. The wavelengths of light used were UV (λ max 365 nm), blue (λ max 467 nm) and green (λ max 505 nm). During light exposure the extracellular activity of a group of neurons of the suprachiasmatic nucleus were recorded.

The spectrometer used in these experiments is an AvaSpec-2048. This spectrometer was used to determine the exact wavelength of light, including the bandwidth and to determine the light

intensity and amount of photons per wavelength light.

Results

Exposure to all three wavelengths of light led to an enhancement in electrical activity of neurons of the suprachiasmatic nucleus. The effects of light on electrical activity of the neurons were dependent on the wavelength, duration and intensity of light. Similar to behavioural effects of light, the effects of light on electrical activity of the neurons were time-dependent. Light exposure during the night led to a large enhancement in neuronal activity, while light exposure during the day resulted in a minimal increase.

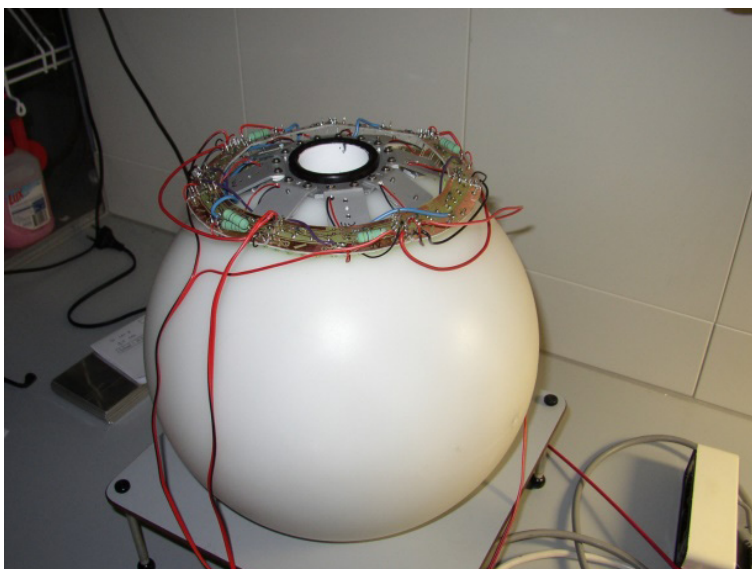


Figure: Light setup, the AvaSpec-2048 was positioned below the light source to measure the wavelength and intensity of light.



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