

PACO

Red LED Lighting for Patient Rooms and Vivaria



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The Use of Red LED Lighting in Patient Rooms and Vivaria



Several environmental factors influence the outcomes of hospital patients, as well as the behavior of animal subjects used in behavioral research studies. Of these factors, light is a major determinant of outcomes due to its effect on the circadian rhythm (sleep schedule) of humans and animals.

Thus, it is critical to control lighting in these areas because improper lighting can disrupt circadian rhythms, which may result in poor patient outcomes and invalidate studies. Both the intensity and color of light have been shown to affect the behavior of animals, and emerging research has suggested that red light may provide certain benefits in situations where it is important to avoid disrupting the sleep schedule of a patient or study subject.

Patient rooms

Sleep loss in hospitals has long been associated with poor patient outcomes, particularly for older adults.¹ Although healthcare workers require adequate light to perform their tasks, their use of intermittent light may wake their patients, which may exacerbate poor sleep schedules. Some research has suggested that both the intensity and color of light can influence a patient's sleep schedule, particularly blue light, which is known to disrupt the production of melatonin.

Although a lower intensity of white light can be used to decrease the amount of light, this light may not provide adequate light for

healthcare workers to complete their care tasks, and this "white" light will still contain a significant amount of blue light.

Recent research has suggested that replacing white lights with red lights can promote sleep, which may help improve patient recovery and outcomes.² This is possibly because red light contains almost no blue light, particularly red LEDs, which have an incredibly narrow emission spectrum, whose wavelengths are far from those of sleep-disrupting blue light.



Vivaria

Similar to patient rooms, vivaria lighting must provide a sufficient light intensity so that laboratory workers can perform their job while minimizing disruptions to an animal's sleep schedules—especially those of nocturnal animals. Because most vivaria do not have windows, artificial lighting is used to simulate day-night cycles. Therefore, the U.S. National Institutes of Health (NIH) has provided specific guidelines for the artificial lighting used in animal research facilities.³ This is because light has been shown to affect the production of melatonin, which can alter the results of a study by changing an animal's behavior. To ensure proper circadian rhythms in animal subjects, light is generally cycled between artificial daylight and “dark” conditions.

The spectral range of animal photoreceptors is species-dependent, so care should be taken to ensure an appropriate light spectrum is used. Although not completely blind to long-wavelength red light as previously thought, mice are still several times less-sensitive to red light than humans. Thus, by using red light in vivaria, their circadian rhythms can be minimally disrupted, helping ensure reliable research outcomes, especially in animal behavior studies.

LEDs vs other forms of lighting

As stated above, the intensity and color of light can affect animal behavior. Thus, to ensure reproducibility during animal studies, the light source must consistently emit a known spectrum of light for the duration of its lifetime. Filters can be used to eliminate undesired wavelengths, but these filters degrade over time, which can change the spectral purity of the emitted light. In contrast, LEDs emit a much purer, narrower spectrum of light and have much longer lifetimes than other forms of lighting. Due to their different light generation mechanism, they also consume less power, resulting in much lower costs compared with more traditional fluorescent bulbs.

Pa-Co Lighting Red LED Options

For more information about our Red LED Options, please visit our website, <https://www.pacolighting.com/contact/>.

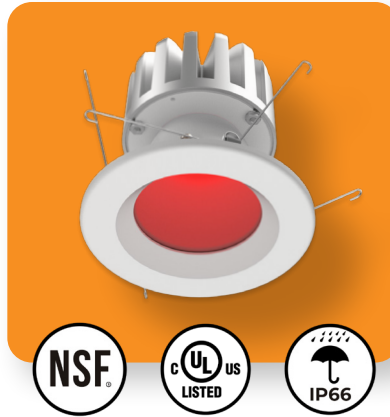
PRCL (RED)



Spec Sheets & IES Files:



MD4 (RED)



Spec Sheets & IES Files:



MD6 (RED)



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Conclusions

For patient rooms and vivaria, red light can be used to provide sufficient lighting to perform certain care tasks without disturbing the sleep schedule of a patient. Red light can also provide sufficient light for a researcher to perform their work without disrupting the diurnal sleep cycles of their animals research subject.

Pa-Co Lighting's LED series has a narrow spectral range of 625–635 nm, making it ideal in situations where red light is needed to provide adequate lighting without disrupting sleep schedules.



References

- 1) Stewart, N. H.; Arora, V. M. Sleep in Hospitalized Older Adults. *Sleep Med. Clin.* 2018, 13 (1), 127. <https://doi.org/10.1016/J.JSMC.2017.09.012>.
- 2) Trotter, B.; Gauriloff, L.; Letzkus, L.; Quatrara, B. Red Light at Night: A Feasibility Study in Hospitalized Patients. *MedSurg Nurs.* 2020, 29 (1).
- 3) National Institutes of Health. Design Requirements Manual (DRM) <https://orf.od.nih.gov/TechnicalResources/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/Pages/default.aspx> (accessed Sep 9, 2022).



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