Intense light boosts the circadian function of cardiac vessels which protects from heart attacks

Humans are daily exposed to intense light in the form of sunlight which is crucial for the circadian rhythms in our bodies to properly function. This is important as circadian rhythms regulate all physiological processes in the human body. However, modern society has generated an environment that allows humans to fully escape the natural light cycles of the sun. This can ultimately lead to a dysfunctional circadian system which leads to cardiovascular diseases, such as heart attacks. However, if consistent exposure to intense light during the natural light periods can improve the function of circadian rhythms remains a highly investigated area.

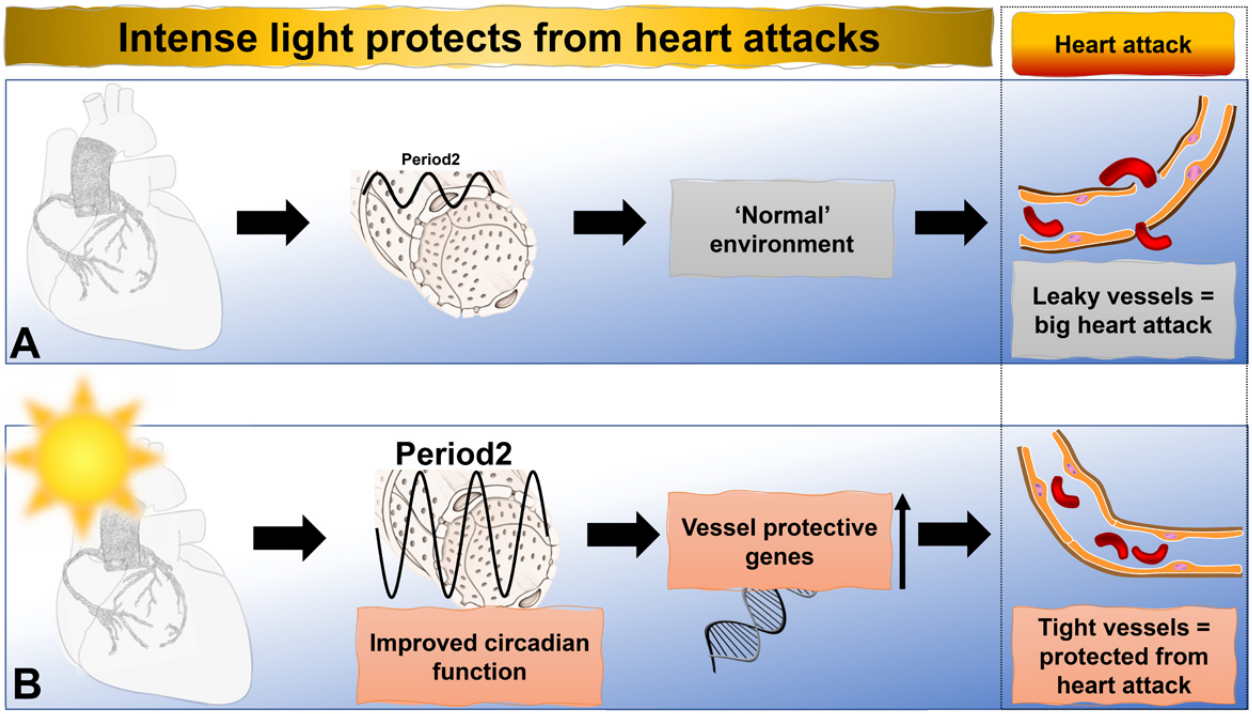

Fig. 1. Intense light protects from a heart attack. **A**. A heart attack causes leaky blood vessels which further damages the tissue. **B**. Intense light treatment improves the circadian function of vessels which turns on vessel protective genes, resulting in non-leaky vessels and protection from a heart attack.

In studies on 'Intense Light-Mediated Circadian Cardioprotection via Transcriptional Reprogramming of the Endothelium', it was found that housing mice under intense light instead of ambient light conditions resulted in improved circadian rhythm's function which protected from heart attacks. Specifically, it was found that intense light improved the function of the circadian

rhythm protein Period2. Following this observation, the study discovered that intense light elicited Period2 protected the vessels from becoming leaky during a heart attack. A heart attack occurs when blood vessels are occluded, and blood flow stops. During no blood flow, the vessels are damaged and become leaky. This further damage the surrounding heart tissue, making a heart attack worse. In the study on intense light mediated cardioprotection, Period2 was found to protect the vessels through genetic reprograming. Genetic reprograming means that genes that are normally not active, are turned on. Indeed, intense light elicited Period2 turned on genes that made the vessels tighter and therefore less leaky which protected the heart from being damaged during the time of no blood flow. This study was further able to demonstrate, that genetically manipulated mice with no Period2 in the vessels, were not protected from a heart attack via intense light. As such, intense light can bolster the cardiac vessels via increased circadian function of Period2 which ultimately protects from a heart attack.

As these detailed mechanistic studies were done in mice, the effects of intense light in healthy human subjects were also explored. Here, the study team demonstrated that intense light also increases the function of the circadian rhythm protein Period2 in humans. Thus, these data suggested intense light could be a promising novel strategy to protect from heart attacks in patients. E.g., after certain surgeries, patients with many underlying diseases are at a high risk of having a heart attack. Based on the study results, these patients might benefit from intense light therapy prior to surgery. However, future studies in this exciting research area will be necessary to fully understand the impact of intense light on human health and its potential to protect from heart attacks.

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