

Different processes govern sight, light detection

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A Johns Hopkins University biologist, in research with implications for people suffering from seasonal affective disorder and insomnia, has determined that the eye uses light to reset the biological clock through a mechanism separate from the ability to see.

The findings suggest that patients with trouble sleeping or seasonal depression -- disorders that can be linked to lack of exposure to daylight -- could benefit from development of easier, more available tests to determine if they are able to detect light properly for functions distinct from normal sight, said Samer Hattar, assistant professor of biology in the university's Zanvyl Krieger School of Arts and Sciences.

“It seems that even if individuals have normal sight, they might be having a malfunction that is contributing to their inability to detect light, which can adversely affect their biological clocks,” Hattar said.

Writing in the Advance Online issue of *Nature* and in the May 1 print issue, Hattar and colleagues reported that they genetically modified mice so that a particular set of retinal ganglion cells – cells that receive input from the rods and cones of the animals’ eyes and send information to the brain – no longer functioned.

The mice were still able to use light to see normally, but had great difficulty synchronizing their circadian rhythms to light/dark cycles, the constant lengthening or shortening of daylight hours that occurs depending on the time of year.

Prior research in the field leads the researchers to believe that because the rodents' internal, biological "clocks" are out of sync with the solar day, the rodents would have difficulty learning and sleeping on a regular, 24-hour cycle. The team has not yet tested that hypothesis.

"This research illustrates that there are two distinct pathways for the two different aspects of light detection: image-forming and non-image-forming," Hattar said.

The team's next step will be working toward a broad understanding of the functions of light for animals and to differentiate between those which are associated with image formation and those which are associated with simple light detection.

Even without that additional research, however, Hattar and his team are convinced, on the basis of a long line of work by other researchers, that daily exposure to natural light enhances memory, mood and learning.

"Our tips are simple: Get out in the sun for at least a little while each day," Hattar said. "There's a reason why we seek the sun and the beach and we feel better when we can sit in the sun and bask.

"Also, avoid very bright lights during the night, as exposure to them can cause a malfunction in your biological clock," he said. "The idea is to keep your internal rhythm in sync with the cycle of the sun: exposure during the day when the sun is out, less exposure at night, when the sun is down, so to speak. I am convinced that this will help improve your memory and your learning."

Source: Johns Hopkins University

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