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Light sets bioclock for winter babies



"We know that the biological clock regulates mood in humans. If an imprinting mechanism similar to the one that we found in mice operates in humans, then it could not only have an effect on a number of behavioral disorders but also have a more general effect on personality," says lead researcher Douglas McMahon. "It's important to emphasize that, even though this sounds a bit like astrology, it is not: it's seasonal biology!" (Credit: [iStockphoto](#))

VANDERBILT (US) — The season in which babies are born appears to have a dramatic and persistent effect on how their biological clocks function.

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A study with baby mice published in the journal [Nature Neuroscience](#) is one of the first to confirm seasonal imprinting of biological clocks in mammals. The imprinting effect may help explain the fact that people born in winter months have a higher risk of a number of neurological disorders including seasonal affective disorder (winter depression), bipolar depression, and schizophrenia.

“Our biological clocks measure the day length and change our behavior according to the seasons. We were curious to see if light signals could shape the development of the biological clock,” says Douglas McMahon, a biologist at [Vanderbilt University](#).

Study details

In the experiment, groups of mouse pups were raised from birth to weaning in artificial winter or summer light cycles. After they were weaned, they were maintained in either the same cycle or the opposite cycle for 28 days. Once they were mature, the mice were placed in constant darkness and their activity patterns were observed.

The winter-born mice showed a consistent slowing of their daily activity period, regardless of whether they had been maintained on a winter light cycle, or had been shifted to summer cycle after weaning. When the scientists examined the master biological clocks in the mouse brains, using a gene that makes the clock cells glow green when active, they found a similar pattern: slowing of the gene clocks in winter-born mice compared to those born on a summer light cycle.

“What is particularly striking about our results is the fact that the imprinting affects both the animal’s behavior and the cycling of the neurons in the master biological clock in their brains,” says graduate student Chris Ciarleglio.

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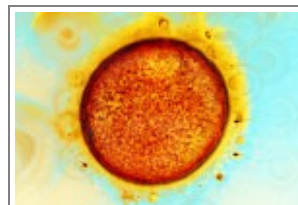


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“What is particularly striking about our results is the fact that the imprinting affects both the animal’s behavior and the cycling of the neurons in the master biological clock in their brains,” says graduate student Chris Ciarleglio (above). (Credit: Vanderbilt University)

In addition, their experiments found that the imprinting of clock gene activity near birth had dramatic effects on the reaction of the biological clock to changes in season later in life. The biological clocks and behavior of summer-born mice remain stable and aligned with the time of dusk while that of the winter-born mice varied widely when they were placed in a summer light cycle.

“The mice raised in the winter cycle show an exaggerated response to a change in season that is strikingly similar to that of human patients suffering from seasonal affective disorder,” McMahon says.

Exactly when the imprinting occurs during the three-week period leading up to weaning and whether the

effect is temporary or permanent are questions the scientists intend to address in future experiments.

Seasons get personal

The new study raises an intriguing but highly speculative possibility: seasonal variations in the day/night cycle that individuals experience as their brains are developing may affect their personality.

“We know that the biological clock regulates mood in humans. If an imprinting mechanism similar to the one that we found in mice operates in humans, then it could not only have an effect on a number of behavioral disorders but also have a more general effect on personality,” says McMahon.

“It’s important to emphasize that, even though this sounds a bit like astrology, it is not: it’s seasonal biology!” McMahon adds.

Mice in this study were raised on artificial seasonal light cycles in the laboratory and the study was repeated at different times of the year. In humans, studies conducted in the northern and southern hemispheres have confirmed that it’s the season of winter—not the birth month—that leads to increased risk of schizophrenia.

There are many possible seasonal signals that could affect brain development, including exposure to flu virus. This study shows that seasonal light cycles can affect the development of a specific brain function.

“We know from previous studies that light can affect the development of other parts of the brain, for example the visual system. Our work shows that this is also true for the biological clock,” says Ciarleglio.

The research was funded by grants from the National Institutes of Health.

More news from Vanderbilt University: www.vanderbilt.edu/News

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[Dr. O'](#)

Dec 8, 2010 14:08

This did not come as a surprise to me. I was born in July, my brother in December. Our mother could never understand the differences in our personalities. I like the comment that this finding is seasonal biology, not astrology. It seems to me that astrology may be the observation of the differences in summer and winter and an attempt at explanation of the differences.

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