Chronic Jet-Lag Conditions Hasten Death in Aged Mice

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Researchers at the University of Virginia have found that aged mice undergoing weekly light-cycle shifts—similar to those that humans experience with jet lag or rotating shift work—experienced significantly higher death rates than did old mice kept on a normal daylight schedule over the same eight-week period.

The findings may not come as a great surprise to exhausted globetrotting business travellers, but the research nonetheless provides, in rather stark terms, new insight into how the disruption of circadian rhythms can impact well-being and physiology, and how those impacts might change with age.

The mouse study is reported by a group at U.Va. led by Gene Block, professor of biology, and Alec Davidson, research scientist, and appears in the November 7th issue of the journal *Current Biology*, published by Cell Press.

The researchers were led to examine a possible link between jet lag and mortality by something they had noticed in an earlier, unrelated study: A surprising fraction of old (but genetically altered) rats exposed to a six-hour advance in their light cycle died after the shift in schedule.

In the new work, the researchers examined the mortality link in earnest by looking at how young mice and old mice fared when subjected to two different types of light-cycle shifts. In one regimen, mice experienced a six-hour forward shift once a week, while in the other, mice experienced

a six-hour backward shift. A “control” group of young and old mice did not experience any schedule shifts.

The researchers found that the young mice generally survived well under the various conditions. In contrast, the light-cycle shifts had a marked effect on the survivorship of the old mice. While 83% of old mice survived under the normal schedule, 68% survived under the backward-shift regimen and 47% survived under the forward-shift regimen.

Past work has also linked changes in light schedule with death in other animals and under different experimental circumstances, but the findings here indicate that there may be a differential effect of mortality depending on the direction of the schedule shift—forward or backward. Schedule “advancers” did more poorly in the present experiment than did “delayers.”

Notably, the researchers found that chronic stress—as measured by daily corticosterone levels—did not increase in the old mice experiencing the light-cycle shifts. The underlying cause of the increased mortality is not yet clear, but could involve sleep deprivation or immune-system disruption.

The body’s physiological reaction to time change may be complex. Past research has indicated that circadian clocks govern physiological rhythms in a great variety of tissues in the body, and that different aspects of the physiological clock can adjust to schedule changes at different rates. The researchers speculate that the internal lack of synchrony among different physiological oscillations may have serious health consequences that are exacerbated in aged animals.

Source: University of Virginia

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