

Researchers observe disruptions of daily rhythms in Alzheimer's patients' brains

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Twenty-four hour cycles, known as circadian rhythms, are important for proper body functions, including for normal brain function and mental health. Disruptions of circadian rhythms and sleep-wake cycles have been observed in patients with Alzheimer's disease. A new study by Douglas Institute researchers unravels a possible basis for these perturbations.

First study to show function of clock genes in multiple areas of the human brain Until now, the genes contributing to this timing, known as clock genes, have only been found to be active in areas outside the brain, such as the skin and [blood cells](#). Recent findings from the Douglas Mental Health University Institute are the first to show that these genes function in multiple areas of the human brain as well, as was shown previously in animals. These findings, published in this month's issue of the *Journal of Biological Rhythms*, have implications for the numerous individuals with sleep disturbances including those with [Alzheimer's disease](#).

"To our knowledge, this is the first demonstration of circadian clock genes rhythmic expression in the human forebrain, or the front part of the brain," says senior author Nicolas Cermakian, a Douglas researcher and Director of the Laboratory of Molecular Chronobiology. "In addition, we showed that these rhythms are disrupted in the brains of Alzheimer's patients."

Shape of certain rhythms and the synchronization between brain areas

were altered in Alzheimer's patients Dr. Cermakian and his colleagues looked for the presence of the circadian clock genes, PER1, PER2, and BMAL1 in the [brain tissue](#) of 58 donors; 27 were Alzheimer patients and 31 were controls. (Brain tissue was obtained from the Brain Bank of the Douglas.) All these clock genes were detected in three brain areas in both control and Alzheimer patients. In addition, there was a significant diurnal (day/night) expression of these genes in all three structures of control samples. In samples from Alzheimer's patients, the shape of these rhythms and the synchronization between brain areas were altered.

"The abnormal clock gene coordination that we observed in the tissues of Alzheimer's patients, might explain the sleep-wake deficits that are observed in this population," says Douglas Centre for Study and Treatment of [Circadian Rhythms](#) Director, Diane B. Boivin. "The altered sleep pattern worsens with disease progression and is the most frequent reason for institutionalization. Improved understanding of the process that underlies sleep-wake disruption may lead to better treatments or therapies. "Our ultimate goal is to improve the physical and mental health of individuals by providing scientifically grounded information."

More information: The article, "Circadian clock gene expression in brain regions of Alzheimer's disease patients and control subjects", was authored by Nicolas Cermakian, Elaine Waddington-Lamont, Philippe Boudreau and Diane B. Boivin of the Douglas Mental Health University Institute and McGill University.

Provided by Douglas Mental Health University Institute

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