The Impact of Disrupted Circadian Rhythms on Learning and Short-Term Memory on a Drosophila melanogaster Model of Alzheimer’s Disease

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Alzheimer's disease (AD) is a progressive neurodegenerative disease that causes severe memory loss and neurodegeneration in humans. Two hallmarks of AD are amyloid-beta and tau proteins both of which accumulate in the brain and directly cause neurodegeneration. Previous research has shown that these proteins are cleared from the brain during sleep, making sleep deprivation a risk factor for AD. Disrupted circadian rhythms, which are generated and regulated by an internal biological clock in the hypothalamus, are linked to sleep deprivation. Light therapy can be used to entrain circadian rhythms, thus helping to regulate them as well as sleep-wake cycles. This experiment used a Drosophila melanogaster model that expressed the wild-type and mutant human tau in the nervous system to model AD in humans. This study measured learning and short-term memory of the Drosophila through an appetitive olfactory memory assay. Groups of flies with regulated and disrupted circadian rhythms were tested in a t-maze. Following experimentation and data collection, preliminary results from this study suggest but do not confirm, that disrupted circadian rhythms do not increase memory impairment and reduce cognitive function in a Drosophila AD model. Further trials are needed to confirm the suggested results.