Food for Thought: Can Intermittent Fasting and Ketosis Ameliorate Dementia by Decreasing Tau Hyperphosphorylation and Neuroinflammation in Drosophila melanogaster?

Lateef, Rania (School: Charles J. Colgan Sr. High School)

Background: Dementia is highly prevalent neuropsychiatric condition characterized by impairments in memory, reasoning, mood, and behavior; yet it has no effective treatment. This project utilized a Drosophila melanogaster (fly) model of Dementia to determine whether ketosis induced by intermittent time-restricted feeding (iTRF) can decrease mortality, improve memory, and enhance locomotion. Methods: Demented flies with the V337M Tau mutation were used. Both control and dementia flies were subjected to either: (1) 24 hours access to food (ad lib) OR (2) a Time Restricted Feeding (TRF) schedule with 10 hours of fasting and 14 hours of food access. To assess the effect on lifespan, the percent of flies surviving over time, within each group, was calculated. Impaired geotaxis, or loss of climbing motivation/ability, was evaluated for motor function. The Aversive Phototaxic Suppression assay was used to assess learning/memory; flies learn to avoid light that is paired with an aversive stimulus. Group differences were analyzed with survival curves. Chi-square tests were used for the categorical variables. Results: Survival curve analysis showed that the flies subjected to iTRF for 4 days lived longer than flies fed ad lib; the effect was more pronounced among the dementia group. Demented flies had impaired climbing ability compared with controls, but iTRF did not impact locomotion. Controls learned much better than demented flies (p-value = 0.03) but iTRF enhanced memory/learning in the dementia group (p-value = 0.04) only. Conclusion: Intermittent fasting may be a promising new intervention for Dementia. The underlying metabolic pathways and neuropathology should be further studied.

Awards Won:
Serving Society Through Science: Second Award of $500
NC State College of Engineering: Alternates (not read aloud)