Treating Parkinsonian Neurodegeneration in Diabetic, Paraquat-exposed Drosophila by Increasing Caffeine Intake

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The majority of Western nations are living on unhealthy diets with high amounts of sugar and few nutrients. This diet, coupled with a lack of exercise, is associated with higher incidences of obesity, cardiovascular disease, various cancers, and diabetes. Type 2 diabetes mellitus is a condition in which the patient’s body no longer responds to insulin or produces enough to maintain healthy blood sugar levels. The hyperglycemic conditions of diabetes have been linked to the onset of Parkinson’s disease, a chronic, neurodegenerative illness that results in reduced neuromotor capabilities. Fruit flies were used to model this neurodegeneration in three assays which all measured neuromotor function: a negative geotaxis assay, a larval crawling assay, and a larval olfactory assay. Mutant flies that overproduce alpha-synuclein, a neural protein that accumulates in Parkinson’s patients’, were used as well as flies exposed to a high-sugar diet that induced a diabetic phenotype. Paraquat, a herbicide linked with Parkinson’s, was also used to induce oxidative stress. The experiment studied caffeine's ability to reduce neurodegeneration in the three assays by incorporating it into the flies’ diet along with paraquat and excessive sugar. The experiment showed in all three assays that caffeine significantly improved neuromotor function within the flies and larvae as well as reduced the long-term neurodegenerative effects of added oxidative stress. These results indicate that caffeine reduces neurological impairment from Parkinson’s and delays neurodegeneration. Further research based on these results may show that caffeine is indeed a beneficial psychostimulant that reduces neurodegeneration through an antioxidant pathway.

Awards Won:

Second Award of $2,000

American Psychological Association: Third Award of $500