Abstract

Alzheimer's disease is one of the most common forms of Dementias in the world. Alzheimer's disease is diagnosed with the accumulation and phosphorilated of TAU protein in neuron cells. Despite significant advances in the understanding of the mechanisms associated with disease progression, Alzheimer's drug is not yet effective. There is an essential need for more effective treatment of the disease. Therefore, accurate recognition of the cellular and molecular mechanisms of the disease can help in the proper diagnosis and effective treatment. In this research, using *Drosophila melanogaster* as a genetic model of tauopathies to express the *TAU* gene simultaneously in the neuronal and glial cells. Larvae olfactory learning assay was carried out to investigate the effect of *TAU* expression on memory, behavioral tests of NGA and PSA in adult flies. Catalase, superoxide dismutase (SOD), and glutathione (GSH) biochemical tests were evaluated to measure oxidative stress. The Drp1 expression levels were assessed using Real-time PCR. A bad and unhealthy memory was observed in larvae compared with the control the catalase and GSH activities were significantly in the flies than the parent ($p \leq 0.05$). In the NGA test, the samples showed a significant decrease in the level of memory and a significant reduction in the ability to climb upwards. Q-PCR showed that *Drp1* expression in all cross-sections of UAS-Tau^{R406W} and UAS-Tau^{WT} was almost significant ($p \leq 0.05$). Most probably, increased simultaneously *TAU* expressions in neurons and glial leads to an increase in ROS and premature aging due to decreased memory levels, the activity of antioxidants enzymes, *Drp1* expression and JAK / STAT pathway reduction.

Keywords: Tauopathies, Oxidative stress, Neurodegenerative diseases, *Drosophila melanogaster*, Real Time Polymerase Chain Reaction.

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