University of Zabol

Management of graduate education

Faculty of Basic Sciences

Department of Biology

Dissertation for obtaining a master's degree in the field of genetics

Title:

Investigation of changes in the transcription level of genes encoding some enzymes involved in cardiolipin biosynthesis in the central nervous system of transgenic fruit flies expressing human amyloid beta

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Summer 2024

Abstract

This research focuses on the transcriptional changes of certain genes involved in cardiolipin biosynthesis within the central nervous system of transgenic Drosophila expressing human amyloid beta (Aβ). Cardiolipin is a crucial lipid for maintaining mitochondrial membrane integrity and is vital for mitochondrial function. In this study, we examined the expression levels of four key genes *CLS*, *MINO, PGS1*, and *OYS* that play a role in cardiolipin synthesis. Dysregulation of these genes may contribute to neurological damage associated with Alzheimer's disease (AD) by disrupting mitochondrial function and affecting the biosynthesis of this lipid. Utilizing the Gal4-UAS genetic system, the human gene coding for Aβ42 was expressed in the neuronal cells of the Drosophila central nervous system through the Elav-Gal4 stock. Subsequently, quantitative reverse transcription polymerase chain reaction (qRT-PCR) was employed to analyze the expression of these genes in comparison to the *eEF1α* gene, which served as the house control. The results indicate significant changes in gene expression in transgenic flies relative to the control group, revealing a decrease in the expression of the *MINO, PGS1*, and *OYS* genes, alongside an increase in the expression of the *CLS* gene. At the transcriptional level, the findings underscore the relationship between amyloid-beta accumulation and impaired cardiolipin biosynthesis, while confirming and emphasizing the role of cardiolipin metabolism in AD pathogenesis. This highlights Drosophila as a valuable model for investigating the underlying molecular mechanisms of neurodegenerative diseases. The research enhances our understanding of how lipid homeostasis impacts neurological health and suggests potential therapeutic strategies aimed at restoring cardiolipin levels in Alzheimer's disease.

Key words: cardiolipin, Alzheimer's disease, Drosophila, Gal4/UAS system