Shaymaa Abdulghaffar Abdulmalek, J Alzheimers Dis Parkinsonism 2018, Volume 8
DOI: 10.4172/2161-0460-C7-054

Boosting brain insulin signaling to combat neurotoxicity arising in type 2 diabetes

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Background: Insulin signaling reveals to be a very promising pathway for the prevention and treatment of Alzheimer's disease (AD). Available data have indicated that brain insulin resistance may contribute to neurodegenerative diseases.

Aim: The present work aimed to study the role of combined metformin with natural oil to enhance brain insulin signaling in type 2 diabetic (T2D) rats as well as study its role on the expression profile of AD related miRNA that is possibly related to AD pathology and its impact in the early diagnosis of AD in T2D.

Methods: After intraperitoneal injection of AG538, an insulin receptor substrate inhibitor, the induced rats were orally administrated metformin and oil for 21 days.

Results: We identified significant disturbances of insulin signaling in the brain of induced rats, including the inhibition of physiological, p-IRS1, p-AKT and p-GSK3β, as well as the enhancement of tau protein phosphorylation; these effects were clearly attenuated by treatment. Remarkably, AD associated pathological proteins, such as oxidative stress, inflammation, BACE-1, APP and Aβ42 were noticeably increased and these effects were significantly revoked after treatment. Interestingly, the expression profile of AD related miRNAs in sera and brain tissues displayed its neuro protection role.

Conclusion: These findings shed light on the specific roles of insulin signaling in T2D-mediated AD like neurotoxicity. Thus, an understanding of the regulation of brain insulin signaling may provide novel insights into potential therapeutic targets for T2D-mediated AD-like neurotoxicity.

Biography

Shaymaa Abdulghaffar Abdulmalek received her PhD in Alexandria University, Egypt in 2017. Currently, she is working as a Lecturer of Biochemistry in Alexandria University, Egypt. Her research includes molecular therapy of Alzheimer's disease, neuroinflammation, cell signaling and the biochemical parameters in diseases.

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