Mahmoud Balbaa et al., Pancreat Disord Ther 2017, 7:4(Suppl)
DOI: 10.4172/2165-7092-C1-008

ROLE OF NIGELLA SATIVA OIL AND ANTIDIABETIC DRUGS IN MODIFYING THE BRAIN INSULIN SIGNALING IN STREPTOZOTOCIN-INDUCED DIABETIC RATS

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The black seeds of Nigella sativa have different biological activities and the anti-diabetic effect is among these activities. Streptozotocin (STZ) - induced diabetic rats were treated daily with NS oil (NSO) in order to study its anti-oxidative, anti-brain insulin resistance, acetylcholinestrase (AChE) inhibition and anti-amyloidogenic activities. A significant decrease in the antioxidant status with peripheral and central production of pro-inflammatory mediators were observed. The brain insulin resistance and the reduced insulin signaling pathway (p-IRS/ p-AKT/p-GSK-3β) were accompanied by an increment of the GSK-3β level, which in turn may contribute in the extensive alterations of Tau phosphorylation along with changes in PP2A level. In addition, the brain AChE was activated and associated with diminished brain glucose level and cholinergic function Furthermore, neuronal loss and elevation in Aβ-42 plaque formation were observed due to a low IDE formation and an increased expression of p53, BACE1 and APP with diminished ADAM10, SIRT1 and BDNF levels. The treatment of diabetes-induced rats with NSO and the anti-diabetic drugs alone and/or in combination have the potential to suppress the oxidative stress, the pro-inflammatory mediators and amyloidogenic pathway. Moreover, it lowers the inhibitory effect of IOMe-AG538 for the insulin receptor and modifies the insulin-signaling pathway. Therefore, it prevents the neurotoxicity, amyloid plaque formation and Tau hyper-phosphorylation. These data suggest that NSO or its combined treatments with anti-diabetic drugs have a possible protective and modifying effect of the insulin resistance in the brain through enhancing brain insulin signaling pathway.

Biography

Mahmoud Balbaa has received his PhD in Hokkaido University, Japan during the period of 1984-1988. Currently, he is working as a professor of biochemistry in Alexandria University, Egypt. He was appointed as head of the Biochemistry Department, Alexandria University, Egypt from 2007 to 2009. His research has included the study of enzyme characterization and inhibition, cell signaling and the biochemical parameters in diseases. Based on this research and fellowship training, he has received several awards and honors, such as post-doctoral fellowship from the Medical Research Council, Canada, post-doctoral fellowship from AIEJ, Japan. He is serving as an editorial member of several reputed journals. He has authorized more than 50 research articles.

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