

ATR-IR Study of the Mechanism of Aluminum Chloride Induced Alzheimer Disease - Curative and Protective Effect of Lepidium sativum Water Extract on Hippocampus Rats Brain Tissue

Authors : Maha J. Balgoon, Gehan A. Raouf, Safaa Y. Qusti, Soad S. Ali

Abstract : The main cause of Alzheimer disease (AD) was believed to be mainly due to the accumulation of free radicals owing to oxidative stress (OS) in brain tissue. The mechanism of the neurotoxicity of Aluminum chloride (AlCl₃) induced AD in hippocampus Albino wister rat brain tissue, the curative & the protective effects of Lipidium sativum group (LS) water extract were assessed after 8 weeks by attenuated total reflection spectroscopy ATR-IR and histologically by light microscope. ATR-IR results revealed that the membrane phospholipid undergo free radical attacks, mediated by AlCl₃, primary affects the polyunsaturated fatty acids indicated by the increased of the olefinic -C=CH sub-band area around 3012 cm⁻¹ from the curve fitting analysis. The narrowing in the half band width(HBW) of the ν CH₂ sub-band around 2852 cm⁻¹ due to Al intoxication indicates the presence of trans form fatty acids rather than gauche rotomer. The degradation of hydrocarbon chain to shorter chain length, increasing in membrane fluidity, disorder and decreasing in lipid polarity in AlCl₃ group were indicated by the detected changes in certain calculated area ratios compared to the control. Administration of LS was greatly improved these parameters compared to the AlCl₃ group. Al influences the A β aggregation and plaque formation, which in turn interferes to and disrupts the membrane structure. The results also showed a marked increase in the β -parallel and antiparallel structure, that characterize the A β formation in Al-induced AD hippocampal brain tissue, indicated by the detected increase in both amide I sub-bands around 1674, 1692 cm⁻¹. This drastic increase in A β formation was greatly reduced in the curative and protective groups compared to the AlCl₃ group and approaches nearly the control values. These results were supported too by the light microscope. AlCl₃ group showed significant marked degenerative changes in hippocampal neurons. Most cells appeared small, shrieked and deformed. Interestingly, the administration of LS in curative and protective groups markedly decreases the amount of degenerated cells compared to the non-treated group. Also the intensity of congo red stained cells was decreased. Hippocampal neurons looked more/or less similar to those of control. This study showed a promising therapeutic effect of Lipidium sativum group (LS) on AD rat model that seriously overcome the signs of oxidative stress on membrane lipid and restore the protein misfolding.

Keywords : aluminum chloride, alzheimer disease, ATR-IR, Lipidium sativum

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020