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Cholecalciferol (vitamin D 3) improves cognitive dysfunction and reduces inflammation in a rat fatty liver model of metabolic syndrome

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Metabolic syndrome is a physiological state characterized by an increase in abdominal obesity, insulin resistance, atherogenic dyslipidemia (a decrease in HDL with a concomitant increase in triglycerides), hypertension, and inflammation. Increased adiposity and the development of fatty liver in addition to insulin resistance or type 2 diabetes mellitus are some of the most serious health outcomes in metabolic syndrome. Much research has been dedicated to understand and explain the processes contributing to metabolic syndrome. In recent years, inflammation has been found to be a causative factor of metabolic syndrome. Specifically, it has been reported that there is increased inflammation in metabolic syndrome that facilitates the development of hepatosteatosis. Cognitive dysfunction generally refers to deficits in memory and executive function, and many diseasesmay result in cognitive dysfunction. Besides metabolic disorders, cognitive dysfunction is most often associated with advanced age such as Alzheimer's disease. The pathogenesis of Alzheimer's disease is not yet fully understood, but a complex mechanismhas been recently proposed that involves insulin resistance and an increase in inflammation. According to this theory, increased peripheral insulin resistance causes increases in serum insulin levels that trigger both peripheral and central nervous system inflammation, which induces neurotoxicity as reactive oxygen species are produced in the brain. Several other studies have examined the relationship between metabolic syndrome and cognitive dysfunction. Cholecalciferol or vitamin D3 is synthesized in the human body and is a hormone precursor. Cholecalciferol is transformed into 1, 25-dihydroxycholecalciferol which is themost biologically active form after hydroxylation in the liver and kidney. Previous studies have demonstrated that this molecule has antiinflammatory and neuroprotective characteristics. In our study, we observed that vitamin D supplementation reduced TNF- α levels in the brain and MDA levels in the plasma in rats with hepatosteatosis. Moreover, rats with fatty liver that were given vitamin D imparts cognitive benefits in rats. Interestingly, rats with fatty liver and vitamin D supplementation had no apparent differences in liver histopathology and total body weight when compared to rats with fatty liver that did not receive vitamin D. These findings suggest that vitamin D may improve systemic and brain inflammation and benefit cognition as a result.

Biography

Oytun Erbas has studied neuroprotective agents, oxytocin, metabolic syndrome and inflammation, treatment agents of diabetic complications, antipsychotic agents, fatty liver and central nervous system effect (cognition and psychiatric disorders) for 5 years, during which time he has authored 35 research papers. Dr. Erbas is a member of the Federation of European Neuroscience Societies (FENS), International Brain Research Organization (IBRO) and Society for Neuroscience (SfN).

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