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Vitamin D3 improves decline in cognitive function and cholinergic transmission in prefrontal cortex of streptozotocin-induced diabetic rats

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Complications of diabetes mellitus include cognitive impairments and functional changes in the brain. The present study aimed to investigate the possible beneficial effect of vitamin D3 on episodic memory and cholinergic transmission in the prefrontal cortex of streptozotocin-induced diabetic rats.

Methods: 30 male Wistar rats (150-200 gm) were included into control, diabetic and diabetic supplemented with vitamin D3 groups. Diabetes was induced by single intraperitoneal injection of streptozotocin (stz) 45mg/kg in citrate buffer. Vitamin D3 was administered orally in a dose of 500 IU/kg/day in corn oil for 10 weeks. Then rats were subjected to novel object recognition test to examine for episodic memory. Animals were sacrificed under diethyl ether anesthesia and prefrontal cortices were dissected to measure the activity of choline acetyl transferase (CAT) and acetyl choline esterase (ACE) enzymes to assess for cholinergic transmission.

Results: Diabetic rats spent significantly less time exploring the novel object compared to control animals. Vitamin D3 significantly attenuated the diabetes-induced impairment so that animals again spent significantly more time exploring the novel object. The CAT activity was significantly decreased in diabetic animals while the ACE activity was significantly increased compared to control non-diabetic animals. Diabetes-induced alterations in enzyme activity in the prefrontal cortex were mitigated by vitamin D3 supplementation.

Conclusion: The present findings demonstrate the potential effect of vitamin D3 supplementation on cognitive function in diabetic animals. It is possible that this effect was mediated through enhancing the prefrontal cortex cholinergic transmission.

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