

Abstract

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Docosahexaenoic acid (DHA) Reduces Traumatic Axonal Injury in a Rodent Head Injury Model.

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BACKGROUND: Traumatic brain injury (TBI) remains the most common cause of death in persons under age 45 in the Western world. Recent evidence from animal studies suggests that supplementation with omega-3 fatty acids (O3FA) improves functional outcomes following focal neural injury.

OBJECTIVE: The purpose of this study is to determine the benefits of DHA supplementation following diffuse axonal injury in rats.

METHODS: Four groups of ten (n=40) adult male Sprague-Dawley rats were subjected to an impact acceleration injury and then received 30 days supplementation with either 10mg/kg/day or 40mg/kg/day of docosahexaenoic acid (DHA). Serum fatty acid levels were determined from the isolated plasma phospholipids prior to the injury and at the end of the 30 days of DHA supplementation. Following sacrifice, brainstem white matter tracts underwent fluorescent immunohistochemical processing for labeling of beta amyloid precursor protein, a marker of axonal injury.

RESULTS: Dietary supplementation with either 10mg/kg/day or 40mg/kg/day of DHA for 30 days results in significantly ($p < 0.05$) increased DHA serum levels of 123 and 175% over baseline, respectively. Immunohistochemical analysis reveals significantly ($p < 0.05$) decreased numbers of amyloid precursor protein positive axons in animals receiving dietary supplementation with DHA, 26.1 (S.D. 5.3) and 19.6 (S.D.4.7) axons per mm² respectively; versus 147.7 (S.D. 7.1) axons in unsupplemented animals. Sham injured animals had 6.4 (S.D. 13.9) APP positive axons per mm².

CONCLUSIONS: Dietary supplementation with DHA increases serum levels in a dose response effect. DHA supplementation significantly reduces the number of APP positive axons at 30 days postinjury to levels similar to uninjured animals. DHA is safe, affordable, and readily available worldwide to potentially reduce the burden of traumatic brain injury.

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