

# Abstract

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## Dietary Supplementation with the Omega-3 Fatty Acid Docosahexaenoic Acid in Traumatic Brain Injury?

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**BACKGROUND:** Although various strategies for prevention of brain disease have been implemented, no substance has been found to be advantageous for prophylaxis against brain injury.

**OBJECTIVE:** While previous work has shown positive effects using the omega-3 fatty acid docosahexaenoic acid (DHA) in post-injury treatment following traumatic and ischemic insults, we wished to test its effects when given prior to injury.

**METHODS:** Five groups of sixteen adult male Sprague-Dawley rats were subjected to an impact acceleration traumatic brain after having received a prior administration of DHA in varying doses kg for 30 days prior. Serum fatty acid levels were determined from isolated plasma phospholipids at baseline and at the end of 30 days supplementation. Following sacrifice one week after injury, brainstem white matter tracts underwent fluorescent immunohistochemical processing for labeling of beta amyloid precursor protein (APP), measurements of CD68 and caspase-3 levels, and water maze behavioral assessment.

**RESULTS:** Dietary supplementation with DHA resulted in increased serum DHA levels proportionate with the escalating dosage. Using a selective measuring technique, only the highest dosage group, 40 mg/kg, showed significantly ( $p < 0.05$ ) decreased numbers of APP positive axons, at 1.15 axons per high power field versus 6.78 in unsupplemented animals. CD-68, caspase-3, and water maze testing all were significantly ( $p < 0.05$ ) improved in the high dose group.

**CONCLUSION:** Dietary supplementation with DHA increases serum levels and, if given prior to traumatic brain injury, reduces the injury response. The potential for DHA to provide prophylactic benefit to the brain against traumatic injury appears promising and requires further investigation.

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