

The salutary effects of DHA dietary supplementation on cognition, neuroplasticity, and membrane homeostasis after brain trauma

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KEY POINTS FROM THIS ARTICLE:

- 1) "Traumatic brain injury (TBI) is one of the most common causes of death and disability in United States: 220,000 hospitalizations, 52,000 deaths from head trauma, and 80,000-90,000 patients suffering from permanent disability each year."
- 2) "Even though over 30 major clinical trials have been made, no efficient treatment for TBI has been found to date."
- 3) TBI results in long lasting consequences on the cognitive ability of patients.
- 4) The pathology of traumatic brain injury is characterized by membrane damage, oxidative stress, failure in the capacity of neurons to metabolize energy, sustain synaptic function, and likely resulting in cognitive and emotional disorders.
- 5) These authors assessed the potential of the omega-3 fatty acid docosahexaenoic acid (DHA) to counteract the effects of concussive injury on important aspects of neuronal function and cognition.
- 6) Fluid percussion injury (FPI) or sham injury was performed on rats which were then maintained on a diet high in DHA (1.2% DHA) for 12 days.
- 7) DHA supplementation improves learning ability in FPI rats.
- 8) Given the involvement of SOD [superoxide dismutase endogenous antioxidant] and Sir2 [a longevity gene] in promoting metabolic homeostasis, DHA may help the TBI brain by providing resistance to oxidative stress.
- 9) The overall results emphasize the potential of dietary DHA to counteract broad and fundamental aspects of the TBI pathology that can translate in preserved cognitive capacity.
- 10) Dietary supplementation of fish oil before brain injury can protect the brain from the deleterious effects of TBI on cognition and plasticity.

- 11) DHA is a crucial omega-3 fatty acid abundant in the brain, is important for brain development and plasticity, and has been shown to support learning and memory neurodegenerative disorders such as Alzheimer's.
- 12) This study investigated the healing capacity of DHA dietary supplementation when provided immediately after a concussive injury in rats.
- 13) There is a homeostatic effect of DHA dietary supplementation when provided immediately after TBI.
- 14) A short period of DHA supplementation "significantly counteracted the negative effects of the injury on cognitive function, neuronal signaling, and membrane homeostasis."
- 15) "These results indicate that DHA supplementation can provide the type of broad protection important for counteracting the effects of TBI."
- 16) "Given the role of DHA in membrane homeostasis and neuronal signaling, these findings implicate dietary DHA as a potential candidate for counteracting the adverse effects of TBI on synaptic plasticity and cognition."
- 17) "Short time feeding of DHA significantly unregulated molecules with recognized antioxidant capacity such as SOD and Sir2." "DHA upregulates SOD and Sir2, which may contribute to counteracting oxidative damage to plasma membrane after TBI."
- 18) "The increase in DHA content may help maintain membrane fluidity, thereby preserving cognitive function in TBI animals."
- 19) It is known that TBI causes degradation of membrane phospholipids. Synaptic membranes phospholipids are preferentially enriched in omega-3 fatty acid DHA. Increased DHA content helps prevent the loss of DHA from membrane lipids.
- 20) "Our findings suggest that supplementation of DHA may help the TBI brain preserve synaptic membrane integrity and fluidity, thereby enhancing membrane related cellular function and subsequent cognitive improvement."
- 21) "Our results demonstrate that DHA dietary supplementation applied immediately after TBI counteracts the related cognitive decay."

COMMENTS FROM DAN MURPHY

As noted, traumatic brain injury often leaves the patient with serious long-term cognitive and functional consequences. This article suggests that an important therapeutic intervention to markedly improve the clinical outcome is to immediately supplement the patient with fish oil (as it is high in DHA).