

Abstract

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Omega-3 Polyunsaturated Fatty Acid Supplementation Confers Long-Term Neuroprotection Against Neonatal Hypoxic-Ischemic Brain Injury Through Anti-Inflammatory Actions.

Zhang W, Hu X, Yang W, Gao Y, Chen J.

From the State Key Laboratory of Medical Neurobiology and Institute of Brain Science, Fudan University, Shanghai, China; the Department of Neurology and Center of Cerebrovascular Disease Research, University of Pittsburgh School of Medicine, Pittsburgh, Pa; and the Geriatric Research, Educational and Clinical Center, Veterans Affairs Pittsburgh Health Care System, Pittsburgh, Pa.

BACKGROUND AND PURPOSE: Current available therapies for neonatal hypoxia/ischemia (H/I) brain injury are rather limited. Here, we investigated the effect of omega-3 polyunsaturated fatty acids on brain damage and long-term neurological function after H/I in neonates.

METHODS: Female rats were treated with or without an omega-3 polyunsaturated fatty acids-enriched diet from the second day of pregnancy until 14 days after parturition. Seven-day-old neonates were subjected to H/I and euthanized 5 weeks later for evaluation of tissue loss. Neurological impairment was assessed progressively for 5 weeks after H/I by grid walking, foot fault, and Morris water maze. Activation of microglia and production of inflammatory mediators were examined up to 7 days after H/I.

RESULTS: Omega-3 polyunsaturated fatty acid supplementation significantly reduced brain damage and improved long-term neurological outcomes up to 5 weeks after neonatal H/I injury. Omega-3 polyunsaturated fatty acids exerted an anti-inflammatory effect in microglia both in an in vivo model of H/I and in in vitro microglial cultures subjected to inflammatory stimuli by inhibiting NF-kappaB activation and subsequent release of inflammatory mediators.

CONCLUSIONS: Our results suggest that omega-3 polyunsaturated fatty acids confer potent neuroprotection against neonatal H/I brain injury through, at least partially, suppressing a microglial-mediated inflammatory response.

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