Stroke-like brain damage is reduced in mice injected with omega-3s

August 22 2016

Credit: martha sexton/public domain

Researchers from Columbia University Medical Center (CUMC) found that omega-3 fatty acids reduced brain damage in a neonatal mouse

model of stroke.

Findings from the study were published recently in *PLOS ONE*.

The researchers treated 10-day-old mice that had incurred hypoxic-ischemic brain injury (caused by a decrease in blood flow and oxygen to the brain, as occurs during a stroke) with a fat emulsion containing either DHA or EPA—omega-3 fatty acids that are found in certain foods and in supplements. The researchers evaluated the mice's neurological function 24 hours and 8 to 9 weeks after the brain injury.

EPA and DHA are bioactive omega-3 fatty acids that are found in oils extracted from cold-water fish. The CUMC researchers and other scientists have shown that these fish-oil fatty acids protect organs and cells in numerous ways after oxygen deprivation, reducing inflammation and cell death.

At 24 hours, mice treated with DHA, but not EPA, had a significant reduction in brain injury. In the following weeks, the DHA group also had significantly better results in multiple brain functions compared to the EPA-treated mice and untreated (control) mice.

The researchers also discovered that these mice had increased concentrations of DHA in their brain mitochondria, energy-producing structures in cells that can be injured by free radicals when blood flow is restored to the brain after a stroke. This process, known as reperfusion injury, is a common cause of brain damage following the oxygen and nutrient deprivation that occurs after a stroke.

"Our findings suggest that injecting the omega-3 fatty acid DHA after a stroke-like event has the ability to protect brain mitochondria against the damaging effects of free radicals," said senior co-author, Vadim S. Ten, MD, PhD, associate professor of pediatrics at CUMC.

Interruption of blood flow and oxygen supply to the brain during or shortly after birth is a major cause of brain damage in newborns, causing life-long neurological impairments in more than 25 percent of those affected. Many of the pathways involved in this type of brain damage are similar to those in an adult stroke.

"Clinical trials are needed to determine if administering lipid emulsions containing DHA shortly after a stroke-like brain injury offers the same neuroprotective effects in babies and adults, as seen in mice. If successful, such trials could lead to the development of a novel therapy for stroke in newborns, children, and adults, addressing a major medical need," said senior co-author Richard J. Deckelbaum, MD, CM, the Robert R. Williams Professor of Nutrition (in Pediatrics) and Professor of Epidemiology and director of the Institute of Nutrition at CUMC.

The study is titled, "DHA but Not EPA Emulsions Preserve Neurological and Mitochondrial Function after Brain Hypoxia-Ischemia in Neonatal Mice."

Provided by Columbia University Medical Center