Research shows fish oil component given up to 5 hours after stroke limits brain damage

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Research led by Dr. Nicolas Bazan, Boyd Professor, Villere Chair, and Director of the Neuroscience Center of Excellence at LSU Health Sciences Center, has shown that Docosahexaenoic acid (DHA), a component of fish oil, is a powerful therapeutic agent that can protect brain tissue and promote recovery in an experimental model of acute ischemic stroke, even when treatment is delayed by up to five hours. These findings not only target a new stroke treatment approach, but also provide vital information about the length of the therapeutic window. The NIH-funded research is published in the journal *Translational Stroke Research*.

Ischemic strokes result from loss of blood flow to an area of the brain due to a blockage such as a clot or atherosclerosis. The damage includes an irreversibly injured core of tissue at the site of the blockage. The area of tissue surrounding the core, called the penumbra, is also damaged but potentially salvageable. The penumbra has a limited life span and appears to undergo irreversible damage within a few hours unless blood flow is reestablished and neuroprotective therapy is administered. A cascade of chemicals floods the tissue along with restored blood flow, including damaging free radicals and pro-inflammatory enzymes which can cause further damage and cell death.

DHA is an essential omega-3-fatty acid and is vital for proper brain function. It is also necessary for the development of the nervous system, including vision. Moreover, omega-3 fatty acids, found in cold water fatty fish, including salmon, tuna, mackerel, sardines, shellfish, and

herring, are part of a healthy diet that helps lower the risk of heart disease. DHA has potent anti-inflammatory effects. Since inflammation is at the root of many chronic diseases, DHA treatment has been widely demonstrated to have beneficial effects in patients with coronary heart disease, asthma, rheumatoid arthritis, osteoporosis, sepsis, cancer, dry eye disease, and age-related macular degeneration, but its potential benefit in stroke was not known.

"We are just now beginning to understand the significant impact of omega-3 essential fatty acids on stroke," notes Dr. Bazan. "There is no simple solution just yet, but each new discovery brings us closer to defeating stroke and other debilitating neurodegenerative diseases."

To determine how DHA might be effective in stroke treatment and recovery, the LSUHSC research team administered either DHA or saline intravenously at 3, 4, 5, and 6 hours after the onset of stroke. MRIs showed that neurological deficits were reduced by the administration of DHA. DHA treatment reduced swelling and facilitated neurobehavioral recovery. The volume of the area of destroyed tissue was reduced by an average of 40% when DHA was administered at 3 hours, 66% at 4 hours, and 59% at 5 hours. Further analysis showed it triggered production of Neuroprotectin D1 (NPD1), a naturally occurring neuroprotective molecule in the brain derived from DHA and discovered by Dr. Bazan. Not only did DHA treatment salvage brain tissue that would have died, its repair mechanisms rendered some areas indistinguishable from normal tissue by 7 days. Dr. Bazan's laboratory leads the field of medical research into understanding DHA's and NPD1's pro-survival properties.

Administering clot-busting drugs (thrombolysis) is currently the only treatment for ischemic stroke. But due to a narrow therapeutic window and complexity of administration, only 3 - 5% of patients benefit from thrombolysis.

According to the World Health Organization, 15 million people worldwide have a stroke each year, 6 million of whom die from it. Stroke is the second leading cause of death for people above the age of 60 and is the leading cause of long-term disability irrespective of age, gender, ethnicity or country. Louisiana ranks 46th in stroke deaths. It has been estimated that the direct and indirect costs of stroke in the United States total nearly $74 billion.

"We are in an unprecedented time, from a public health point of view, in regards to tackling stroke and other neurodegenerative disorders," concludes Dr. Bazan. "Stroke is an outright attack on the nervous system, and each year stroke kills over 150,000 Americans. Truly for the first time, translational research and the clinics are poised to converge in their public health efforts to combat stroke. From a therapeutic point of view, we can now see a light at the end of the tunnel. What we need now is for the political and societal views on stroke to converge in the same way that the research laboratories and hospitals are now doing. This would be a major step forward in fighting this disease."

More information: http://dx.doi.org/10.1007/s12975-010-0046-0.

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