

Vitamin E protects critical nutrient, prevents neurologic damage and death in embryos – OREGON STATE UNIVERSITY (USA)

Researchers have discovered that a dietary deficiency of vitamin E in laboratory animals can cause significant neurological impairment in developing embryos, as well as physical abnormalities and embryonic death.

The study suggests that one mechanism leading to this damage may be loss of the role vitamin E plays in protecting levels of DHA, one of the most important of the omega-3 fatty acids that plays a crucial role in brain and cellular development.

The work, by scientists in the Linus Pauling Institute at Oregon State University, was done with zebrafish, a vertebrate that has neurologic development very similar to humans. They also have dietary needs that are more similar to humans than some other animal models.

In these fish, vitamin E-deficient embryos did not respond correctly to visual cues, had severe physical abnormalities as early as two days after fertilization, and many died before the end of five days.

The findings were published in *Redox Biology*, in work supported by the National Institutes of Health and the National Science Foundation.

They take on special significance, researchers say, because more than 90 percent of the adults in the United States who do not take supplements have diets deficient in vitamin E.

"DHA in a developing embryo is very important for cell signaling and membrane development," said Melissa McDougall, an OSU graduate research assistant in the Linus Pauling Institute and the College of Public Health and Human Sciences, and lead author on this publication.

"Our research showed that adequate levels of vitamin E are important in preventing depletion of DHA in the embryo.

"Without enough DHA, there was also evidence for disruption of the structural integrity of cell membranes as a whole. It appears that vitamin E protects these critical lipids, such as DHA, from excessive depletion that can cause physical and behavioral damage."

The study showed loss of locomotor activity in vitamin E-deficient embryos as a measure of impaired behavior. Vitamin E-deficient embryos were 82 percent less responsive to a light/dark stimulus.

Past research done elsewhere with rodents, McDougall said, has correlated low DHA levels with less memory and intelligence, and one study in Bangladesh with vitamin E-deficient pregnant women showed a higher level of miscarriage.

The recommended daily allowance of vitamin E for human adults is 15 milligrams a day, and the typical American diet rarely provides that. Vitamin E is most common in nuts, seeds, some leafy greens like spinach, and a few varieties of vegetable oils like sunflower and canola. Low-fat diets also present a special challenge in getting enough vitamin E.

Not all pre-natal vitamins even include vitamin E, McDougall said, although some of the better ones are now including not only vitamin E but also supplements of DHA, a nutrient most common in fatty fish. It's worth noting, she said, that vitamin E cannot serve its role in protecting DHA if there is inadequate dietary DHA to begin with.

Most human brain development occurs during pregnancy, and some of the most important neurologic development happens during the first trimester.

The corresponding author on this publication was Maret Traber, the Helen P. Rumbel Professor for Micronutrient Research in the Linus Pauling Institute. Other collaborators were from the OSU College of Pharmacy, the Sinnhuber Aquatic Research Laboratory, the OSU Department of Environmental and Molecular Toxicology, and the OSU Environmental Health Sciences Center.