

Early Vitamin C Deficiency Linked to Impaired Brain Development

By Stephen Daniells, NutraIngredients - Europe

Vitamin C deficiency in the first weeks and months of life may impair the development of neurones in the brain, and decrease spatial memory, says a new animal study from Denmark.

Guinea pigs subjected to moderate vitamin C deficiency were found to have 30 per cent fewer hippocampal neurons and poorer spatial memory, compared with guinea pigs given a normal diet, according to findings published in the *American Journal of Clinical Nutrition*.

The Danish researchers used guinea pigs because, like humans, the animals cannot synthesise vitamin C, and can only obtain it via the diet.

“Although a direct extrapolation of this new phenomenon to humans is not currently possible, we found that the relatively high prevalence of vitamin C deficiency in humans, including infants and toddlers, warrants future clinical studies to clarify whether a similar link to brain development exists in humans,” wrote the researchers, led by Jens Lykkesfeldt, professor of pharmacology and toxicology at the University of Copenhagen.

“We speculate that the lack of vitamin C supplementation in high-risk individuals, such as pregnant women and newborns with poor vitamin C status, could be detrimental to normal brain development and lead to neurologic disabilities later in life.”

Prof Lykkesfeldt told NutraIngredients that this was the first study to reveal a link between vitamin C deficiency and brain development.

C-ing the issue

Many consumers have a positive image of vitamin C, with public perception linking the vitamin to improved immune system health. This is translated into very impressive market figures for vitamin C supplements. According to Frost and Sullivan, the US market generated \$151.7m (€127.4m) in 2005. In Europe, revenue was calculated at \$160.3m (€134.6m) for 2005, and is expected to grow to \$192.5m (€161.6m) by 2011.

However, despite this apparent popularity, vitamin C deficiency is reportedly very common in some areas in the world. In Brazil and Mexico, for example, studies have shown that 30 to 40 per cent of the pregnant women have too low levels of vitamin C, and the low level is also found in their fetuses and new-born babies.

While current vitamin C deficiency in the Western World is not known, conservative estimates put it between 5 and 10 per cent based on the occurrence among adults.

“We may thus be witnessing that children get learning disabilities because they have not gotten enough vitamin C in their early life. This is unbearable when it would be so easy to

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prevent this deficiency by giving a vitamin supplement to high-risk pregnant women and new mothers” says Jens Lykkesfeldt

Study details

The Danish researchers took 30 new born guinea pigs and randomly assigned them to one of two groups: One group was fed a vitamin C-sufficient diet, while the other group was fed the same diet but low in vitamin C. Levels of vitamin produced deficiency, but were not extreme enough to cause scurvy.

After two months, the animals were tested in a water maze, and hippocampal neuron numbers were measured. Prof Lykkesfeldt and his co-workers report that the vitamin C deficient animals had a lower number of neurons in the hippocampus, and also performed worse in the maze tests.

Clinical implications

Commenting on the possible reasons for the effects, the researchers noted that the highest concentration of vitamin C is found in the neurons of the brain. Even at times of low vitamin C intake, the remaining vitamin is retained in the brain to secure this organ.

Studies with specially engineered mice showed that mouse foetuses that were not able to transport vitamin C developed severe brain damage, resembling damage found in premature babies and which are linked to learning and cognitive disabilities later in life.

“We speculate that this unrecognized effect of vitamin C deficiency may have clinical implications for high-risk individuals, such as in children born from vitamin C-deficient mothers,” concluded the researchers.

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“Vitamin C deficiency in early postnatal life impairs spatial memory and reduces the number of hippocampal neurons in guinea pigs”

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