

Vitamin D Deficiency a Brain Disruptor

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Vitamin D deficiency disrupts structural brain connectivity and harms learning and memory by destabilizing perineuronal nets (PNNs) that provide scaffolding for neurons, new research suggests.

PNNs are made of proteins and sugar molecules that form a strong, supportive mesh around certain neurons. In so doing, they stabilize the contacts these cells make with other neurons.

Thomas Burne, PhD, and colleagues from the University of Queensland, Brisbane, Australia, removed vitamin D from the diet of a group of healthy young adult mice, while a control group continued to receive vitamin D.

After 20 weeks, the vitamin D–deficient group showed a significant decline in the ability to remember and learn, compared with the control group.

The brains of the vitamin D–deficient mice showed a pronounced reduction in PNNs in the hippocampus, a brain region crucial to memory and learning. There was also a pronounced reduction in both the number and strength of connections between neurons in the hippocampus. Vitamin D deficiency had no apparent impact on hippocampal volume.

The study was [published online](#) February 2 in *Brain Structure and Function*.

Bad Connection

"Intriguingly, the right side of the hippocampus was more affected by vitamin D deficiency than the left side," Burne said in a [news release](#).

Loss of function in this area may contribute to severe memory deficits and a distorted perception of reality, hallmarks of [schizophrenia](#), he noted. About 70% of people with schizophrenia have insufficient vitamin D, and schizophrenia patients also tend to have more disruption in the right side of their hippocampus, he added.

In a second paper, [published online](#) February 19 in *Trends in Neuroscience*, Burne and colleagues propose that adequate (normal) vitamin D levels prevent certain enzymes from breaking down PNNs, but when vitamin D levels drop, these enzymes become unchecked and begin to degrade PNNs.

"As neurons in the hippocampus lose their supportive perineuronal nets, they may have trouble maintaining connections, and this ultimately leads to a loss of cognitive function," said Burne.

The new findings support "converging evidence" from human and animal studies that show an association between vitamin D deficiency and cognitive impairment, the researchers conclude.

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Brain Struct Funct. Published online February 2, 2019. [Abstract](#)

Trends Neurosci. Published online February 19, 2019. [Abstract](#)

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