

## Copper and Alzheimer's disease

(excerpted from *Nutritional Medicine*, Second Edition)

It has been hypothesized that excessive copper intake can increase the risk of developing Alzheimer's disease.<sup>1</sup> In rabbits, dogs, and mice, the addition of a small amount of copper (0.12 mg/L) to distilled drinking water resulted in the accumulation of amyloid beta protein in the brain.<sup>2 3</sup> Amyloid beta protein is thought to be involved in the pathogenesis of Alzheimer's disease. In contrast to these findings, copper supplementation prevented premature death in transgenic APP23 mice, which are genetically programmed to over-produce amyloid beta precursor protein.<sup>4</sup> In a double-blind trial, supplementation with 8 mg/day of copper for 12 months had no significant effect on cognitive function, compared with placebo, in patients with mild Alzheimer's disease, and there was no trend suggesting an adverse effect of copper.<sup>5</sup> Although Alzheimer's disease may be associated with an abnormality of copper metabolism in certain regions of the brain,<sup>6</sup> there is at present no convincing evidence that limiting the intake of this essential nutrient would be useful for preventing or treating Alzheimer's disease.

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<sup>1</sup> Brewer GJ. Copper excess, zinc deficiency, and cognition loss in Alzheimer's disease. *Biofactors* 2012;38:107-113.

<sup>2</sup> Sparks DL, Schreurs BG. Trace amounts of copper in water induce beta-amyloid plaques and learning deficits in a rabbit model of Alzheimer's disease. *Proc Natl Acad Sci* 2003;100:11065-11069.

<sup>3</sup> Sparks DL, Friedland R, Petanceska S, et al. Trace copper levels in the drinking water, but not zinc or aluminum influence CNS Alzheimer-like pathology. *J Nutr Health Aging* 2006;10:247-254.

<sup>4</sup> Bayer TA, Schafer S, Simons A, et al. Dietary Cu stabilizes brain superoxide dismutase 1 activity and reduces amyloid Abeta production in APP23 transgenic mice. *Proc Natl Acad Sci* 2003;100:14187-14192.

<sup>5</sup> Kessler H, Bayer TA, Bach D, et al. Intake of copper has no effect on cognition in patients with mild Alzheimer's disease: a pilot phase 2 clinical trial. *J Neural Transm* 2008;115:1181-1187.

<sup>6</sup> Faller P. Copper in Alzheimer disease: too much, too little, or misplaced? *Free Radic Biol Med* 2012;52:747-748.