



VITAMINS / SUPPLEMENTS

B Vitamins Improve Memory, Prevent Brain Atrophy

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The 2010 OPTIMA [Oxford Project to Investigate Memory and Ageing] study showed that the accelerated rate of brain atrophy in elderly with mild cognitive impairment [could be slowed](#) via supplementation with homocysteine-lowering B vitamins, which included folic acid, vitamin B₁₂ and vitamin B₆. This is an important finding, as 16 percent of individuals older than age 70 have mild cognitive impairment (MCI), 50 percent of whom realize further progression to Alzheimer's disease. It is well-documented that brain atrophy is a characteristic of subjects with mild cognitive impairment who progress to Alzheimer's disease.

The Biochemistry of Brain Aging

Aging studies reveal that the brain shows progressive atrophy after the age of 60. Some atrophy occurs even in cognitively healthy subjects, but to a lesser extent than patients suffering from Alzheimer's disease. An intermediate rate of atrophy is found in people with MCI, and brain atrophy is more rapid in subjects with MCI who progress to Alzheimer's disease.

One cause of brain atrophy has been reported to be elevated concentrations of plasma total homocysteine (tHcy), as moderately elevated concentrations of tHcy have been associated with an increased risk of dementia, notably Alzheimer's disease, in many cross-sectional and prospective studies. Elevated plasma total homocysteine is also associated with both regional and whole-brain atrophy, both in patients with Alzheimer's disease and in healthy elderly individuals.



The tissue and plasma concentrations of homocysteine are largely determined by the body's status of certain B vitamins (folate, B₆ and B₁₂), which are cofactors or substrates for enzymes involved in homocysteine recycling to methionine (folic acid and B₁₂) or serine (B₆). As such, the discovery that

supplementation with folic acid, vitamin B6 and vitamin B₁₂ can reduce tHcy and slow brain atrophy has clinical significance in an aging population.¹

More Research Support for B-Vitamin Supplementation

Prior to the published results of the OPTIMA study, another B-vitamin supplementation study had shown improvement in memory function in a well-designed human clinical trial. In this study, supplementation was provided to 211 healthy younger, middle-aged and older women who took either 750 mcg of folic acid, 15 mcg of vitamin B₁₂, 75 mg of vitamin B6 or a placebo daily for 35 days. Dietary intake of these vitamins and cognition and mood were also diarized. Usual dietary intake status was estimated using a retrospective, self-reported, quantified food-frequency questionnaire.

Participants completed alternate forms of standardized tests of cognitive processing resources, memory, executive function, verbal ability and self-report mood measures before and after supplementation. Results showed that the group administered the B-vitamin supplementation protocol exhibited a significant positive effect in terms of certain measures of memory performance. Dietary intake status of the same B vitamins was associated with speed of processing, recall and recognition, and verbal ability.²

Subsequent to the OPTIMA study, a large 2011 prospective study showed that lower vitamin B₁₂ blood levels were associated with decreased brain volumes and cognitive scores. The study involved 121 older residents of the south side of Chicago who are participants in the [Chicago Health and Aging Project](#) (CHAP), a large, ongoing prospective study of 10,000 subjects over the age of 65. All participants had their blood tested to determine levels of vitamin B₁₂ and B₁₂-related markers that can indicate deficiency. The subjects also underwent tests that evaluated their memory and other cognitive skills.

After four-and-a-half years, on average, MRI scans of the participants' brains were taken to measure total brain volume and look for other signs of brain damage. Results showed that having high levels of four of five markers for vitamin B₁₂ deficiency was associated with lower scores on the cognitive tests and a smaller total brain volume. One of the markers for vitamin B₁₂-related markers included total plasma homocysteine levels. Findings from this study showed that for each increase of 1 micromole per liter of homocysteine, the cognitive scores decreased by 0.03 standardized units or points, which the researchers indicated was a significant finding.³

Clinical Considerations

In addition to keeping homocysteine in check, it should be noted that folic acid, B₆ and B₁₂ play important roles in the brain, as cofactors for the synthesis of various neurotransmitters required for normal cognition. Vitamin B₁₂ deficiency is a common finding as people age due to decreased absorption, and is secondary to declining stomach acid secretion. An acid environment enhances B₁₂ absorption by up-regulating the secretion of intrinsic factor, which is necessary for vitamin B₁₂ absorption in the small intestine.

Compounding the problem is the fact that many older subjects take antacid drugs (over-the-counter or prescription) for digestive complaints, or to reduce the intestinal irritation from nonsteroidal anti-

inflammatory drugs used to manage arthritis and/or chronic pain.

It is also noteworthy that in spite of the folic acid food-fortification program implemented by the U.S. government in 1998, epidemiological studies have repeatedly shown that the average daily intake of folic acid from food is suboptimal for certain subgroups, and that ingestion of alcohol, having a poor diet and decreased stomach acidity can compromise folic acid absorption and folate nutritional status. Many older subjects exhibit some or all of these conditions, which may increase their propensity for suboptimal folate status.

Given the emerging importance of these B vitamins on the rate of brain atrophy after age 60, memory, cognition, and risk of MCI and Alzheimer's disease, health care practitioners should consider evaluating plasma folate (more ideally using the erythrocyte folate test), plasma B₁₂ levels and total plasma homocysteine levels in patients over age 50 to identify those who would best benefit from supplementation with these three B vitamins. When warranted, a low dose of prevention may translate into many more years of normal cognitive function and preserved quality of life and dignity.^{4,5}

References

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