

## **B Vitamins Preserve Memory and Cognitive Function**

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Deterioration of mental capacities has long been considered an aspect of the normal aging process. In recent years, however, the emerging scientific evidence has demonstrated that certain natural health products and supplements are effective in their ability to prevent, reverse, or even better manage cognitive impairment problems in older individuals. The Boston Veterans Affairs Normative Aging Study is one of many studies investigating the influence of nutrition on various aspects of age-related disorders.

In March of 1996 Drs. Riggs and associates published results from this study in *The American Journal of Clinical Nutrition*. Their findings indicated that older individuals with low blood concentrations of vitamin B12, vitamin B6, and the B vitamin known as folic acid had the poorest scores of brain function measured by a battery of cognitive tests.

In previous studies clinical deficiencies of B vitamins have been implicated in brain-related disorders, including reversible dementia (vitamin B12 and possibly folate), depression (folate), and electrophysiological dysfunction, including convulsions (vitamin B6). In healthy older adults blood levels of B vitamins usually considered to be in the normal range were associated with poorer scores on tests of delayed recall, abstract reasoning, and selective attention. There is also good evidence that deficiencies of vitamin B12, folic acid, and vitamin B6 increase with age and are common in older adults.

Thus, there is growing support for the premise that optimal B vitamin status can prevent, slow or reverse the deterioration in memory and other mental capacities important to quality of life issues in older individuals.

The Normative Aging Study involved 70 male subjects, aged 54-81 years. The results of this study revealed that blood levels of vitamin B12 and folic acid appear to be related to cognitive performance in a different manner than vitamins B6 blood levels. Low blood levels of vitamin B12 and folic acid were associated with deficits in spatial copying. Higher blood levels of vitamin B6 were associated with better performance on two tests of memory.

Another interesting finding was that nearly one half of the subjects in this study had low blood levels of vitamin B6 (<30 umol/L).

This study is extremely important because B vitamins are known to participate in brain chemistry and physiology. Vitamins B12 and folic acid are required as coenzymes in the synthesis of the neurotransmitters (important brain chemicals), serotonin, catecholamines

(adrenaline, norepinephrine). They are also required for the production of S-adenosylmethionine, which has known anti-depressant properties. Vitamin B12 deficiency may also result in de-insulation of nerve fibers (demyelination), which produces a constellation of neurological symptoms. Vitamin B6 is a cofactor in the production of other brain chemicals (neurotransmitters) including dopamine, norepinephrine, serotonin, GABA, and taurine.

As well, higher blood levels of homocysteine often results from subnormal intakes of folic acid, vitamin B12 and vitamin B6. High blood levels of homocysteine are associated with increased risk of cardiovascular, cerebrovascular (narrowed arteries in the brain), and peripheral vascular disease (narrowed blood vessels in the arms, hands, legs and feet).

Narrowed arteries in the brain (cerebrovascular disease) have been shown to be associated with decrements in psychomotor speed and on tests measuring fluid and visual abilities.

Such cognitive dysfunction, therefore, may stem from high levels of homocysteine. As previously stated, vitamins B6, B12 and especially folic acid are key nutrients that prevent and reverse high blood levels of homocysteine.

In the Normative Aging Study subjects with high levels of homocysteine performed, on average, like patients with mild Alzheimer's disease. They also exhibited difficulty in copying the most complex spatial figures. For example, few subjects in the highest 25 percent range of homocysteine concentrations completed the cube (22%) and tapered box (17%) correctly. By comparison, these figures are mastered by 50% of school children by the age of 13 years old. Subjects with the lowest blood homocysteine levels demonstrated the best results on these tests.

Taken together the body of evidence continues to support the contention that B vitamin nutritional status is crucial to the development and preservation of mental capacities throughout our lifetime. The sad reality is that many midlife and older members of society have poor dietary intake and nutritional status of various B vitamins (vitamin B6, folic acid etc.). For this reason I continue to emphasize the multitude of benefits available from the daily use of a well formulated multiple vitamin and mineral supplement that contains a B-50 complex

### **B-Vitamins and Brain Function: References**

Abou-Saleh MT, Coppen A. The biology of folate in depression: implications for nutritional hypotheses of the psychoses. *J Psychiatr Res* 1986;20:91-101

- Berg S. Psychological functioning in 70-and 75-year old people. *Acta Psychiatr Scand* 1980;Suppl 288:1-47
- Bohnen N, Jolles J, Degenaar CP. Lower blood levels of vitamin B12 are related to decreased performance of healthy subjects in the Stroop Color-Word Test. *Neurosci Res Commun* 1992;11:53-6
- Botwinick J, Storandt M. *Memory, related functions and age*. Springfield, IL: Charles C Thomas, 1974
- Dakshinamurti K, Paulose CS, Siow YL. Neurobiology of pyridoxine. In: Reynolds RD, Leklem JE, eds. *Vitamin B6: its role in health and disease*. New York: Alan R Liss, Inc, 1985;99-121.
- Goodwin JS, Goodwin JM, Garry PJ. Association between nutritional status and cognitive functioning in a healthy elderly population. *JAMA* 1983;249:2917-21
- Hertzog C, Schaie KW, Gribbin K. Cardiovascular disease and changes in intellectual functioning from middle to old age. *J Gerontol* 1978;33:872-83
- Jacques PJ, Riggs KM. B vitamins as risk factors for age-related diseases. In: Rosenberg IH, ed. *Nutritional assessment of elderly populations. Measure and function*. New York: Raven Press, 1995.
- Joosten E, van den Berg A, Riezler R, et al. Metabolic evidence that deficiencies of vitamin B12 (cobalamin), folate, and vitamin B6 occur commonly in elderly people. *Am J Clin Nutr* 1993;58:468-76
- Leklem JE. Vitamin B6. A status report. *J Nutr* 1990;120:1503-7. 1987;83(suppl 5A):104-6
- Levitt AJ, Joffe RT. Folate, vitamin B12, and life course of depressive illness. *Biol Psychiatry* 1989;25:867-72
- Lindenbaum J, Rosenberg IH, Wilson PWF, Stabler SP, Allen RH. Prevalence of cobalamin deficiency in the Framingham elderly population. *Am J Clin Nutr* 1994;60:2-11
- Martin DC. B12 and folate deficiency dementia. *Clin Geriatr Med* 1988;4:841-52
- Riggs K, et al. Relations of vitamin B12, Vitamin B6, Folate, and homocysteine to cognitive performance in the Normative Aging Study. *Am. J. Clin. Nutr.* 1996; 63:306-14
- Rinn WE. Mental decline in normal aging: A review. *J Geriatr Psychiatry Neurol* 1988;1:144-58

Sauberlich HE. Relationship of vitamin B6, vitamin B12, and folate to neurological and neuropsychiatric disorders. In: Bendich A, Butterworth CE Jr, eds. *Micronutrients in health and in disease prevention*. New York: Marcel Dekker, Inc 1991:187-218.

Selhub J, Jacques PJ, Wilson PWF, Rush D, Rosenberg IH. Vitamin status and intake as primary determinants of homocysteinemia in the elderly. *JAMA* 1993;270:2693-8.

Shane B, Stokstad ELR. Vitamin B12 folate interrelationships. *Annu Rev Nutr* 1985;5:115-41

Spieth W. Slowness of task performance and cardiovascular disease. In: Welford AT, Birren JE, eds. *Behavior, aging and the nervous system*. Springfield, IL: Charles C Thomas, 1965:366-400