

Folic Acid: Don't be Without it!

by

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Health starts with the individual cells of our body. If our cells are healthy so are we. Healthy cells, in turn, depend on the continued, faultless replication of our DNA. DNA can be seriously damaged through attacks by free radicals so an adequate antioxidant status is essential to cell health. It is now becoming clear though that antioxidants alone are not enough to protect our DNA; more and more research points to the B vitamin folic acid as being equally or perhaps even more important in ensuring proper DNA replication. It is not surprising that a folic acid deficiency has been implicated in a wide variety of disorders from Alzheimer's disease to atherosclerosis, heart attack, stroke, osteoporosis, cervical and colon cancer, depression, dementia, cleft lip and palate, hearing loss, and of course, neural tube defects. The list of conditions involving a folic acid deficiency is growing day-by-day as is clinical evidence that most of these conditions can be reversed by supplementation.

Folic acid (folinic acid, folacin, pteroylglutamic acid) was first isolated from spinach leaves (its name derives from the Latin *folium* meaning "leaf") in 1964 and early on was found to be essential in the prevention of anemia in animals. Later it was discovered that neural tube defects in human babies could be prevented by ensuring that mothers had adequate folic acid levels.

Folic acid is essential for the synthesis of adenine and thymine, two of the four nucleic acids which make up our genes, DNA and chromosomes. It is now also clear that folic acid is required for the proper metabolism of the essential amino acid methionine which is found primarily in animal proteins. Methionine is converted to homocysteine in the body. Homocysteine, in turn, may be converted back to methionine in a process requiring folic acid (tetrahydrofolate) and vitamin B12 (cobalamin) as a catalyst or it may be metabolized into cysteine in a process catalyzed by vitamin B6 (pyridoxine). Cysteine is a vital link in the synthesis of glutathione, one of our most

important antioxidants. A high blood level of homocysteine has been found to be highly detrimental to health and is invariably accompanied by a low level of folic acid^(1,2).

Homocysteine and heart disease

The idea that homocysteine may be a potent risk factor for coronary heart disease (CAD) was first advanced in 1986⁽³⁾. Since then numerous studies have confirmed that high homocysteine levels not only increase the risk of CAD, but also increase the risk of heart attacks, strokes, and peripheral vascular disease (eg. intermittent claudication)^(2,4-12). The average blood level of homocysteine in adults is about 10 micromol/L. Men with a level of 15 micromol/L increase their risk for CAD by 60 per cent and women by 80 per cent. The risk of a stroke at the 15 micromol/L level is two to five times higher than at the 10 micromol/L level in both men and women and the risk of peripheral vascular disease is seven times higher among people with elevated levels⁽⁵⁾. Researchers at the Harvard Medical School report that a homocysteine level of more than 11.2 micromol/L confers a five-fold increase in heart attack risk as compared to the risk at 7.2 micromol/L or less⁽⁹⁾.

There is rare, unanimous consent within the medical community that homocysteine levels in North America are too high. One study estimates that 56,000 lives could be saved every year if average levels could be lowered by just 5 micromol/L^(10,11). Fortunately, lowering your homocysteine level is simple by supplementing with folic acid and vitamins B12 and B6^(2,4,5,9-13). Although most research into the harmful effects of homocysteine has centered around heart disease there is growing evidence that high homocysteine levels (or low folate levels) are involved in many other disorders.

Folic acid protects the brain

A low or deficient blood level of folate (folic acid) has been detected in 15 to 38 per cent of adults

suffering from depression. There is now increasing evidence that supplementation with therapeutic amounts of folate can significantly improve the condition of depressed patients. In a recent trial involving 20 elderly patients with depressive disorders, treatment with 50 mg/day of methylfolate was associated with an 81 per cent response rate within six weeks. Folate supplementation (15 mg/day of methylfolate) has also been found to markedly improve the effect of treatment with standard antidepressants. Researchers at the Harvard Medical School point out that chronic diseases (eg. rheumatoid arthritis), certain cancer treatments, alcoholism, and a poor diet can all lead to a folate deficiency and the potential for depression(14,15).

Research has also shown that many drugs such as methotrexate, levopoda, niacin, phenytoin (Dilantin), carbamazepine, and theophylline can markedly reduce folate levels(2,10,11). Researchers at Oxford University recently reported that Alzheimer's patients have substantially lower levels of folic acid and vitamin B12 than do normal people of the same age. They also found that a high homocysteine level is a potent risk factor for AD; study participants with a level above 14 micromol/L had an almost five times higher risk than participants with levels below 11 micromol/L. Participants with low folate and vitamin B12 levels had a three to four times higher risk of AD than did people with normal levels(16).

Folic acid is especially important for women

It is now firmly established that women can reduce their risk of giving birth to a baby with neural tube defects (eg. spina bifida) by supplementing with folic acid prior to conception and during pregnancy(10,11,17). Perhaps less well known is the finding that women can also markedly reduce their risk of giving birth to a child with a cleft lip or palate by supplementing daily with a multivitamin containing 0.4 to 0.8 mg of folic acid(18). These findings are particularly important in view of the fact that oral contraceptives reduce folate levels significantly. Women who have been "on the pill" need to boost their folate status if they are planning a pregnancy(19-21).

Low folate levels are also heavily implicated in the development of cervical cancer. Cervical

dysplasia is the precursor of cervical cancer and is usually first detected through a routine Pap smear. Fortunately, folate supplementation (0.8-3.0 mg/day) is very effective in reversing cervical dysplasia and preventing the cancer(22-24). Researchers at the Harvard Medical School recently reported that women who supplemented with folic acid (0.4 mg/day or more for at least 15 years) had a four times lower risk of developing colon cancer than did women with a daily intake of 0.2 mg/day or less (the daily contribution of a typical North American diet)(25-27). Many postmenopausal women have increased homocysteine levels which are believed to contribute to the risk of osteoporosis; folate supplementation can reverse these high levels(28).

And the list goes on

There is no question that folic acid is extremely important to health and wellbeing. Not only is it important for heart health, mental health and women's health, but it is now also clear that it affects many other facets of health and disease. Researchers at the Cleveland Clinic Foundation have found that patients with end-stage renal disease have extremely high homocysteine levels and can be protected from cardiovascular events by supplementing with folic acid, vitamins B6 and B12(29). Diabetes patients tend to have high homocysteine levels and folate is especially important for them(30). Recent research has also shown that low folate levels (high homocysteine levels) are implicated in age-related hearing loss, psoriasis, and restless leg syndrome(31-33).

It is indeed astounding that one single vitamin, folic acid, can have such a profound effect on our health and yet perhaps it is not so surprising when one considers its vital role in DNA synthesis and homocysteine metabolism.

So how much is enough

It is estimated that 88 per cent of all North Americans suffer from a folate deficiency(5,8). Obviously, the standard diet is not supplying what we need. This has led to the fortification of cereals and other food stuffs with folic acid to try to ensure a minimum daily intake of 0.4 mg/day. Although beans and green vegetables like spinach and kale are good sources of folates, relatively few people eat lots of vegetables and cooking destroys most of the folate anyway(8).

Realizing the poor availability from the diet many medical researchers now advocate daily supplementation with folic acid. Because folic acid needs the catalysts vitamins B12 and B6 to carry out its functions effectively it is usual to supplement with a combination of the three. Dosage recommendations for folic acid vary between 0.4 mg/day and 10 mg/day or more depending on the severity of the deficiency and the health problem to be overcome. The RDA for adults is now 0.4 mg/day and 0.6 mg/day for pregnant women. Recommendations for vitamin B12 generally range from 0.5 to 1.0 mg/day and for vitamin B6 from 10 to 250 mg/day(2,4,5,9,10,11,13,34-36).

Supplementation with folic acid and vitamins B6 and B12 costs only pennies a day and yet it is indeed hard to imagine a better investment in protecting your health.

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