

USANA Technical Bulletin

Disclaimer: The information provided in this Technical Bulletin is strictly educational. It may not be used to promote USANA products, nor is it intended as medical advice. For diagnosis and treatment of medical disorders, consult your health care professional. When there are references to third party websites, addresses, and/or phone numbers, USANA, Inc. makes no claim, actual or implied, regarding the content or validity of the information obtained from such sources. This Technical Bulletin may be copied and freely distributed only if all text remains intact and unchanged.

Folic Acid (Folate)

Technical Background

- Folic acid is a water-soluble B vitamin. Its derivatives act as coenzymes responsible for regulating several aspects of cellular metabolism and cell division.¹
- Folic acid is absorbed from foods in the gut and transported across cell membranes in its monoglutamate (folic acid) form. However, once inside the cell, it is converted to tetrahydro-polyglutamate forms, which are metabolically active as coenzymes.²
- Folic acid and its derivatives are termed ‘folates.’ Folates act as coenzymes for two sets of cellular reactions.³ The first involves methylation reactions central to amino acid metabolism (and consequently central to the survival of both cells and organisms). The second involves the synthesis of nucleic acids (like DNA and RNA), making folates equally important in ensuring normal cell replication and embryonic development.⁴
- In the 1930’s, folic acid was found to play a role in preventing and treating certain anemias, particularly during pregnancy. High folate intake during pregnancy is now strongly recommended because of its essential role in brain development. Multiple clinical trials have shown that folate supplementation can markedly reduce the occurrence of spina bifida and anencephaly in babies,^{5,6} as well as helping prevent many other birth defects.⁷
- Epidemiological studies have shown a strong relationship between folic acid nutrition and cancer risk, particularly for cervical, breast, and colorectal cancers.^{8,9} Other studies are presently exploring the role of increased folate intake or supplementation in reducing the risk of stomach and colon cancers.
- There is strong evidence that folic acid supplementation lowers blood homocysteine levels, consequently lowering the risk of cardiovascular disease and stroke.^{10,11,12} It may also help with insulin and lipid metabolism, both of which are important cardioprotective elements.⁹
- Folic acid deficiencies have been linked to a number of diseases, most of which can be avoided or reversed through proper diet and/or folic acid supplementation.

Sources and Recommended Intake

- The Recommended Dietary Allowance (RDA) for folic acid has been set at 150 mcg/day for children age 1-3, 200 mcg/day for ages 4-8, 300 mcg/day for ages 9-13, and 400 mcg/day for everyone 14 and older. Pregnant women should get at least 600 mcg/day, and 500 mcg/day during lactation.¹³
- Many obstetricians recommend that pregnant women and women planning to become pregnant take 800-1,000 mcg/day to decrease the risk of neural tube defects in their infants.

- An upper limit of 1,000 mcg per day has been set for folic acid because supplementation at higher levels can mask vitamin B₁₂ deficiencies and lead to imbalances.¹⁴
- The best food sources for folic acid include dark green leafy vegetables (e.g. spinach), broccoli, Brussels sprouts, legumes, orange juice, whole grains, organ meats, and some seafoods.¹⁴ Most cereals and grain products are now fortified with folate.

Abstracts

Larsson SC, Giovannucci E, Wolk A. A prospective study of dietary folate intake and risk of colorectal cancer: modification by caffeine intake and cigarette smoking. *Cancer Epidemiol Biomarkers Prev.* 2005 Mar;14(3):740-3. Epidemiologic evidence indicates an inverse association of folate intake with risk of colorectal cancer, but whether this association is modified by intake of caffeine (in coffee and tea) or cigarette smoking--factors that possibly interfere with folate--has not been studied. Thus, we examined whether the association between dietary folate intake and incidence of colorectal cancer is modified by caffeine intake and smoking. Cox proportional hazards modeling was used to estimate rate ratios relating dietary folate intake to colorectal cancer incidence among 61,433 women ages 40 to 75 years at recruitment into the Swedish Mammography Cohort in 1987 to 1990. From March 1987 through June 2004, a total of 805 incident cases of colorectal cancer were diagnosed. After controlling for age and other potential confounders, we observed an inverse association between dietary folate intake and risk of colon cancer (rate ratio for the highest versus the lowest quintile, 0.61; 95% confidence interval, 0.41-0.91; P(trend) = 0.02), but not of rectal cancer (rate ratio, 0.93; 95% confidence interval, 0.55-1.56; P(trend) = 0.97). The inverse association between dietary folate intake and colon cancer risk was most pronounced among smokers (P(interaction) = 0.03). We found no apparent modification of risk by caffeine intake. Findings from this population-based cohort study support an inverse association between dietary folate intake and risk of colon cancer and suggest that smokers might benefit most from a high dietary folate intake.

References

- ¹ Selhub J and Rosenberg IH. 1996. Folic acid. Pp 206-219. In E.E. Ziegler and L.J. Filer (eds). Present Knowledge in Nutrition. ILSI Press, Washington, D.C.
- ² Shane B. 1995. Folate chemistry and metabolism. Pp 1-22. In. L.B. Bailey (ed). Folate in Health and Disease. Marcel Dekker, Inc. New York.
- ³ Wagner C. 1995. Biochemical role of folate in cellular metabolism. Pp 23-42. In. L. B. Bailey (ed). Folate in Health and Disease. Marcel Dekker, Inc. New York.
- ⁴ Duthie SJ. Folic acid deficiency and cancer: mechanisms of DNA instability. Brit Med Bull. 1999(55):578-592.
- ⁵ Scott JM, et al. 1995. Folate and Neural Tube Defects. Pp329-360. In. L. B. Bailey (ed). Folate in Health and Disease. Marcel Dekker, Inc. New York.
- ⁶ Czeizel AE. 1995. Folic acid in the prevention of neural tube defects. J. Pediatr. Gastroenterol. Nutr., 2: 4-16.
- ⁷ Czeizel AE. The primary prevention of birth defects: Multivitamins or folic acid? Int J Med Sci. 2004;1(1):50-61.
- ⁸ Mason JB. 1995. Folate status: effects on carcinogenesis. Pp 361-378. In. L. B. Bailey (ed). Folate in Health and Disease. Marcel Dekker, Inc. New York.
- ⁹ Kim YI. Folate, colorectal carcinogenesis, and DNA methylation: lessons from animal studies. Environ Mol Mutagen. 2004;44(1):10-25.
- ¹⁰ Selhub J, et al. 1995. Association between plasma homocysteine and extracranial carotid artery stenosis. N. Engl. J. Med., 332: 286-291.
- ¹¹ Villa P, Perri C, Suriano R, et al. L-Folic acid supplementation in healthy postmenopausal women: effect on homocysteine and glycol-lipid metabolism. J Clin Endocrinol Metab. 2005 May 17
- ¹² Wang X, et al. Efficacy of folic acid supplementation in stroke prevention: a meta-analysis. Lancet. 2007; 369(9576):1876-82
- ¹³ Institute of Medicine. Food and Nutrition Board. Dietary Reference Intakes: Thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline. National Academy Press. Washington, DC, 1998.
- ¹⁴ Baily, L.B. 1995. Folate requirements and dietary recommendations. Pp. 123-151. In. L. B. Bailey (ed). Folate in Health and Disease. Marcel Dekker, Inc. New York.