

What is Folic Acid?

Folic acid, a form of folate, has become a household word in recent years. Folic acid is a B vitamin that is used to fortify foods and has been shown to protect against neural tube defects such as spina bifida (a birth defect in which the spinal cord is not completely encased in bone) and anencephaly (a fatal defect in which part of the brain never develops). It may also prevent against oral and facial birth defects such as cleft palate.¹

Folate has such a large affect because it is primarily needed for cell growth and blood production. As a fetus grows, it steals folate from the mother's blood, which in turn creates a shortage in the mother. If this loss is not replenished the fetus will not have the folate needed for additional cell growth, leading to neural tube defects and other complications. To decrease these complications from a lack of folate, many foods are fortified with folic acid

Additional health benefits associated with folic acid may include reductions in cardiovascular disease and colon, cervical and breast cancers. It is through its control over homocysteine, an amino acid produced by the body, that folate is thought to protect against heart disease. High levels of homocysteine in the blood may be a risk factor for heart attacks. Studies have shown that folic acid in combination with vitamins B12 and B6 can help prevent recurrence of blocked arteries in patients who have undergone angioplasty.

Folic acid may also help prevent Alzheimer's disease by protecting the neurons critical for learning and memory. Emerging research suggests that folic acid deficiency can also increase the brains susceptibility to Parkinson's disease.²

Where do I get it?

Many foods contain small amounts folate, but the best sources are legumes, yeast, dark green leafy vegetables, some fruits, whole grains and fortified cereals and other enriched grain products are the best sources of folic acid. Effective January 1, 1998, a new fortification law required enriched grain products—white bread and flour, pasta and rice—to contain specific levels of folic acid (see fortification section) in order to help the population meet the recommended amount.

Folic acid has a higher absorption rate than natural occurring folate so it is used to fortify foods.

According to a study conducted from General Mill's Bell Institute, grain foods and breakfast cereals contributed over 62 percent of dietary folic acid.³

Dietary Folate Equivalents**(DFE) of Common Foods

FOOD	FOLATE µg/SERVING	
Ready-to-eat breakfast cereals (read labels for exact amount)	1 ounce	100-400
Enriched wheat flour tortilla	1, 8* tortilla	98
Corn flour tortilla	1, 6* tortilla	48
Enriched pasta	½ cup cooked	80
Whole wheat bread	1 slice (1 oz.)	14
Enriched white bread	1 slice (1 oz.)	37
Asparagus	½ cup cooked	121
Kidney beans	½ cup cooked	114
Lentils	½ cup cooked	179
Navy beans	½ cup cooked	127
Orange	1 medium	48
Orange juice, fresh squeezed	½ cup	37
Pinto beans	½ cup cooked	148
Spinach, raw	½ cup	29
Spinach, boiled	½ cup	131
Sunflower seeds, dry roasted	½ cup	152
Beef liver, braised	3 ounces	184

**DFE is a measure developed to account for the difference in the absorption of food folate and synthetic folic acid from dietary supplements or foods fortified with folic acid.

How much do I need?

Females of childbearing age need 400 µg (micrograms) daily. Due to spina bifida and similar birth defects occurring in the first three weeks of pregnancy, women need to build up their folate stores long before they become pregnant. Since 50 percent of pregnancies in the United States are unplanned, it is even more crucial for all women of childbearing age to continually consume adequate intakes of folic acid.

The Centers for Disease Control and Prevention (CDC) has undertaken a national prevention program through the Public Health Service for neural tube defects. They recommend that women of childbearing age increase their dietary levels of folic acid, including fortified foods, and take vitamin supplements to

ensure an intake of 400 µg daily. The CDC estimates that 70 percent of spina bifida and anencephaly could be prevented if the Public Health Service recommendations are followed. The Dietary Reference Intake (DRI) for pregnant women is 600 µg of folic acid per day.

Adult men and older women also need 400 µg to meet the RDA for folic acid. Folic acid has been linked with reducing the risk of heart disease, stroke and some forms of cancer. A CDC study, estimates that fortified flour used in grain foods may be resulting in a reduction of 31,000 stroke-associated deaths and 17,000 ischemic heart disease deaths per year.

About the only way anyone can obtain 400 µg per day through diet is by eating folic acid-fortified grains and breakfast cereals. For individuals unable to get enough folic acid in the diet, a folic acid supplement may be recommended by your physician.

Cigarette smoking and alcohol intake can also affect folate status.⁴ A study showed that smokers require an average folate intake of 658 µg /day to have the same blood plasma level as a non-smoker consuming only 200 µg daily.

Folic Acid fortification

Enrichment and fortification has been an effective way to prevent diseases in the past. Enrichment of niacin, thiamin and riboflavin in refined grain products in the 1940s eradicated the occurrence of beri beri and pellagra.

In 1996, the Food and Drug Administration (FDA) established a regulation that required manufacturers to add folic acid to enriched flours, breads, rolls, buns, corn grits, cornmeal, farina, rice, pasta and noodle products. The regulation became effective January 1, 1998 and the effects were seen shortly after. In 2005, CDC reported that neural tube birth defects have decreased by 36 percent following folic acid fortification, resulting in an additional 1,000 healthy babies each year.⁵ A Nova Scotia study showed a 50 percent decrease in neural tube birth defects due to fortification between 1998 and 2000.⁶ In 2010, CDC named folic acid fortification as one of the top 10 great public health achievements in the last 10 years.

Over-consumption of folic acid can mask vitamin B12 deficiency; however, FDA concluded this is unlikely to happen if total intakes of folate are below 1,000 µg/day.⁷

The fortification level is 0.7 mg folic acid per pound of flour. At this level, a slice of enriched bread will contain 37 µg and a half-cup of cooked pasta will have 60 µg. If consumers ate at least six ounces from the bread and grains group daily, this would allow them to reach the DRI of 400 µg. For example, three ounces of bread (bagels, tortillas, English muffins, etc.) would total 81 µg; a cup of pasta, 120 µg and a fortified breakfast cereal with at least 200 µg would fulfill the requirement for women of childbearing age.

Foods qualifying for a folic acid health claim must meet or exceed at least 10 percent of the Daily Value (DV) (40 µg) of folic acid. This amount meets requirements for a —good□ source claim. Possible health claims could read: —Healthful diets with adequate folate may reduce women’s risk of having a child with a brain or spinal cord birth defect□ or —Adequate folate in healthful diets may reduce a woman’s risk of having a child with a brain or spinal cord defect.□ The terms folate, folacin or folic acid are all acceptable on the claims, as are neural tube defects, birth defects, spina bifida or anencephaly. If the food/supplement contains more than 100 percent of the DV (400 µg), they must identify the upper limit of 1,000 µg /day.

References:

- 1) University of California at Berkeley Wellness Letter. Vol. 12 (8) 1996.
- 2) National Council on Folic Acid, <http://www.folicacidinfo.org>
Folic Acid Now – About Folic Acid. 2005
- 3) The Bell Institute of Health & Nutrition Dietary Intake Study, 2000-2002. General Mills, Inc., Minneapolis, MN. Unpublished data.
- 4) Piyathilake CJ, Macaluso M, Hine RJ, Richards EW, Krumdieck CL. Local Systemic effects of cigarette smoking on folate and vitamin B12. *AJ Clin. Nutr.* 60, 559-566, 1994.
- 5) Mathews TJ, Honein MA, Erickson JD. Spina Bifida and Anencephaly Prevalence-United States, 1991—2001. CDC website, Sept. 2005
- 6) Persad VL, Vanden Hof MC, Dube JM, Zimmer, P. Incidence of open neural tube defects in Nova Scotia after folic acid fortification. *CMAJ* 167 (3) 241-245, 2002.
- 7) *Journal of the American Dietetic Association*. Commentary. 96 (5) 451-452, 1996.