



# Grains of truth about FOLIC ACID and PREGNANCY

## Definition

The words folate, folacin and folic acid are often used interchangeably, but there are differences in the forms. Folate is the collective term, but also describes the nutrient found naturally in foods. Folate and folacin are generic descriptions for compounds with nutritional properties and chemical structures similar to those found in folic acid, the synthetic form, often used in fortified foods and in vitamin supplements.

## History

The need for folic acid, one of the B vitamins, was discovered in the 1930s when anemia during pregnancy was cured with a yeast extract. Further research in the 1940s isolated the cure for anemia from spinach. It was named folate after the Latin word *folium*, meaning leaf.

## Sources of Folate

Sources of folate include leafy green vegetables (spinach, broccoli, asparagus), legumes (lentils, black beans), yeast, liver and enriched grain foods such as ready-to-eat cereals, breads, and pasta, in addition to certain nuts.

About half of naturally occurring folate is absorbed, compared to 80 percent of fortified folic acid and all of supplemented folic acid. Although many foods contain folate, it is difficult for most people to consume enough from these foods, often making supplementation necessary.

## Folic Acid Needs

The current recommendation for folic acid is 400 micrograms (mcgs) per day for adult women (19+ years) and teen girls (14 to 18 years). Pregnant and lactating women require more, at levels of 600 mcg/day and 500 mcg/day, respectively. (Table 1.)

Table 1. Folate needs for adults

Age (years)	Males & Females (mcg folate/day)	Pregnancy (mcg folate/day)	Lactation (mcg folate/day)
9-13	300	--	--
14-18	400	600	500
19+	400	600	500

Institute of Medicine, National Academy of Science, 2002.

## Deficiency

A folate deficiency can occur when the need for folate by the body is increased, as in pregnancy or lactation, when dietary intake of folate is inadequate, and when the body excretes more folate than usual. Malabsorption syndromes, alcoholism and drug abuse can cause deficiency as can certain drug treatments or use of over-the-counter pain relievers like non-steroidal anti-inflammatory medications (NSAIDS) or aspirin.

Signs of folic acid deficiency are subtle and include diarrhea, loss of appetite, pale skin, nausea, and weight loss with poor absorption of other nutrients.

Women with inadequate folic acid intake are more likely to give birth to low birth weight babies (less than 5 ½ pounds) and premature infants as well as to infants with neural tube defects (NTDs). These defects may involve the brain, spinal cord, membranes and skull.



## Current Intake Levels

About 50-100 mcg folate per day must be absorbed to replenish daily amounts of folate that are used. If not enough folate is consumed, signs of deficiency may appear in four to five months.

A recent study evaluating folate intake among college-educated women showed that 36 percent of those who were pregnant and 32 percent of those lactating were not able to meet daily folate requirements (600 mcgs and 500 mcgs, respectively) from diet alone, even when consuming folate-fortified foods. Yet another study showed adult women consuming folic acid fortified foods or supplements had actual folate intakes that well-exceeded recommended intake levels per day.

## Impact on Pregnancy

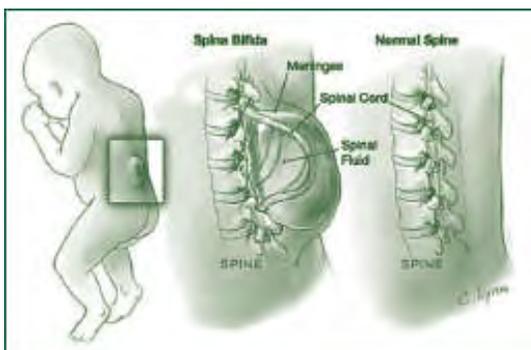
Folate, grains and the healthful benefits they provide have been in the forefront of nutrition and health. The U.S. Food and Drug Administration passed a law effective January 1998 requiring folic acid be included in enriched grain products like white bread and flour, rice, pasta, cornmeal, farina, cereal and noodles. This was implemented to reduce the number of neural tube defects (NTDs) in newborns in the U.S.

### Folic Acid and Neural Tube Defects

NTDs occur very early in pregnancy when developing fetal cells first become the brain and spinal cord, forming a tube-like structure from which the entire nervous system is created. Spina bifida, which accounts for 90 percent of NTDs, involves incomplete formation of the spine. (Figure 1.) Bones of the vertebrae that protect the spinal cord do not fuse completely, leaving an unprotected gap or bulge through the spinal cord. While these defects can sometimes be repaired, permanent nerve damage often occurs, resulting in leg and foot deformities and weakness, learning disabilities, and mental retardation.

The U.S. Public Health Services estimates that if folic acid supplements or foods with fortified folic acid were consumed daily, the incidence of NTDs may be reduced by as much as half. NTD incidence has dropped by an estimated 26 percent in the U.S. due to folic acid fortification, and by as much as 39 percent in Canada.<sup>1</sup>

Figure 1. Spina Bifida



### Impact of Folic Acid Fortification

According to data from the National Health and Nutrition Examination Survey (NHANES) during 1999-2000 and 2003-2004, folate concentrations in women aged 15-44 years showed a significant 16 percent decline since the fortification policy began, though early data suggested folate status improvement. The highest rates of NTDs in the U.S. occur among Hispanic women, yet the benefits of folic acid fortification may not be realized in this group, and perhaps other efforts need to be used.<sup>1</sup>

Better results are apparent elsewhere. Canada has shown a 39 percent increase of folate concentrations in women of reproductive age. Chile has shown a whopping 74 percent increase in folate concentrations after fortifying their wheat flour. To date, more than 40 countries now fortify grain foods with folic acid.

Despite initial rises after folic acid fortification, folate levels actually declined in the U.S. This decline is due, in part, to recent low-carbohydrate diet fads and increased consumption of whole grain products, containing less folic acid, than enriched ones. Concrete reasons for this folate status decline are yet to be determined however.



### Summary

Grain foods fortified with folic acid plus foods which naturally contain it should be consumed on a daily basis. Much research suggests that women in their child-bearing years could benefit from taking a folic acid supplement to ensure adequate intake. Diets rich in folic acid may provide numerous health benefits and help reduce birth defects.

**Resources:** <sup>1</sup>Center for Disease Control and Prevention. Morbidity and Mortality Weekly Report. 2007;55:1377-1380. See also: *Folate, Grains & Health*, 2007 Wheat Foods Council white paper. This is available at [www.wheatfoods.org](http://www.wheatfoods.org).

Additional information available from: United States Department of Agriculture, National Nutrient Database 2007; Centers for Disease Control; March of Dimes; MyPyramid; Whole Grains Council; U.S. Food and Drug Administration.

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