

FAQs for Folic Acid Fortification in Australia and New Zealand (2003)

What health benefits from flour fortification with folic acid have been documented? Folic acid fortification of flour in the United States, Canada, and Chile has resulted in the immediate and profound increases in blood folate levels. Studies in the United States and Canada show reductions in birth defects, near elimination of folate deficiency anemia, and reductions in plasma homocysteine and cases of stroke and heart attacks^{1,2,3,4}

How many countries are fortifying flour with folic acid? More than 30 countries including the United States and Canada along with most of South and Central America are now fortifying flour with folic acid.

How strong is the scientific evidence linking synthetic folic acid with prevention of birth defects? Randomized controlled trials, the strongest of epidemiological evidence, have demonstrated conclusively that daily consumption of at least 400 micrograms of the synthetic B vitamin folic acid will prevent the majority of cases of spina bifida and anencephaly, types of severe, paralyzing birth defects.^{5,6}

What is the extent of the birth defects problem in NZ and Australia? Neural tube defects (NTDs) refer to severe and/or fatal birth defects such as spina bifida that occur when the central nervous system fails to develop properly. Reporting of cases frequently undercounts the extent of the problem by two to three fold because the many pregnancies affected by NTDs are detected in the second trimester and terminated, causing much anguish to families. In Australia, an estimated 2400 pregnancies were affected between 1991 and 1995 with more recent rates reported between 16 and 20 per 10,000 live births.^{7,8} In New Zealand, at least 10 pregnancies for every 10,000 live births are reported to be affected.⁹

What is the expected impact of folic acid fortification on serious birth defects? The higher the initial NTD rate, and the higher the fortification levels, the greater the magnitude of the reduction in NTDs that can be expected to occur from adding folic acid to flour.¹⁰ For example, fortification in the US at a level of 1.4 ppm was shown to reduce neural tube defects by 20%, and in Chile where the fortification level was 2.4, birth defects have declined by 47%.¹¹ The lowest rate of neural tube defects ever demonstrated in a population of any size was 5 per 10,000 live births, during a demonstration trial of folic acid supplements in China.¹²

Why do we need mandatory fortification? Regulations that allow voluntary fortification have not persuaded staple food manufacturers to add folic acid in amounts that would protect most women against the risk of a baby affected by an NTD. Health education programs have left more than half of women unprotected from having pregnancies affected by folic acid-preventable birth defects. Mandatory fortification of flour with folic acid at levels that offer significant protection against NTDs (usually 2.4 to 4 ppm) is an inexpensive and highly effective alternative that does not require continuous educational campaigns to educate each new generation of young women about the need to take supplements prior to pregnancy.

How much do neural tube defects cost society? Each child born with severe spina bifida will require expensive medical care during the first year of life, often in excess of \$50,000, and medical, developmental, and other services throughout a lifetime will cost society on average \$532 thousand dollars per child.^{13, 14}

Are there any other bad health consequences from consuming too little folic acid?

Epidemiological studies that have followed thousands of adults over time have documented an increased risk of heart attacks, strokes, and colon cancer among older adults who do NOT take folic acid-containing-multivitamins daily for a period of 15 or more years.^{15,16,17} Alcoholic individuals are at increased risk of folate deficiency anemia.

What is the link between folic acid and heart disease? Do epidemiologists agree that this link has been proven as causal? There is quite strong evidence that increasing consumption of folic acid will prevent heart disease. Respected scientists have suggested that increasing folic acid intake reduces the risk of heart attacks by 16%, of deep vein thrombosis by 25%, and of strokes by 24%.¹⁸ Not all scientists are in agreement with this conclusion.

Why should fortification be mandatory? Won't millers just do the right thing and adopt the voluntary standards? Since the mid 1990s, voluntary fortification of white flour at 2.8 ppm has been permitted and few millers have implemented.

What was the result of the voluntary fortification standard?

Since January, 1996, the Australia New Zealand Food Standards Code has permitted folic acid fortification of wheat flour (white) at 2.85 ppm. However, adoption of voluntary fortification has resulted in only a small average increase in the average daily folic acid intake of women of

childbearing age, an amount too small to have any impact on reducing the risk of birth defects, and also too small to have any other significant health benefits.^{19,20}

[Why have some highly respected nutritionists opposed mandatory fortification with folic acid?](#)

Nutritionists have been working for many years to encourage people to eat more fruits and vegetables, thus increasing their consumption of foods rich in natural folates. They believe that fortification can be used as a marketing tactic that can fool people in to believing that they do not need to eat a balanced diet. However, folate found naturally in foods is far less easily absorbed by the body, and more than 90 percent of people fail to consume the recommended daily allowance of folate from usual diets. There is no evidence from the United States that fortification has changed dietary patterns.

[Isn't there a tolerable upper intake level for synthetic folic acid? Didn't the US IOM put it at 1000 mcg/day?](#)

The Institute of Medicine set a “tolerable upper intake level” of 1000 micrograms of synthetic folic acid for food policy based on 5000 micrograms as the “lowest observed adverse effect.” “Adverse effect” was recurrence and/or progression of neuropathy after effective vitamin B12 therapy stopped and ineffective folic acid therapy started in several studies in the 1950s. Then a 5-fold protective factor was used resulting in a tolerable upper intake level of 1000 micrograms of synthetic folic acid a day. Thus the tolerable upper intake level is based on a theoretical and a large safety margin has been used. No actual adverse effects have been shown for consuming more than 1000 micrograms a day.²¹

[Is folic acid toxic?](#) No. The CDC website states: “Folic acid has no known toxic level. If you were to eat a bowl of fully fortified cereal (400 micrograms), take a folic acid supplement (400 mcg), and eat fortified foods and foods rich in folate, . . . [you] would not have a problem with too much folic acid. Even in very high amounts folic acid is non-toxic.”²²

“Even with doses as high as 15 mg/day, there have been no substantiated reports of side effects.”²³

[Would mandatory flour fortification with folic acid pose any health risks to anyone in the population?](#)

Modeling by Green, Newton and Bourn of the University of Otago suggests that the average woman will consume about 200 micrograms of synthetic folic acid per day and only a very small percentage of the population will consume more than 1000 micrograms of synthetic folic acid with fortification of flour at the 2.85 ppm level.²⁴ Another study by Flood et al from the University of Sydney examined dietary intake of more than 2000 older people and modeled

the effect of different levels of folic acid fortification on consumption.²⁵ They concluded that universal fortification of flour with 2.85 ppm would be safe for all groups in the population; only persons who take vitamin supplements consume more than 1000 mcg/day; and these people almost certainly consume supplements with B12 and folic acid. Requiring B12 in all multivitamins could safeguard against this minimal risk.

[Are there any health risks to consumption of large amounts of synthetic folic acid?](#) Long term folic acid consumption at levels above 1000 mcg/day has never been documented to be an issue for any age group in exposed populations. Per-person daily exposure to at least 400 micrograms of synthetic folic acid has been common in the United States since the early 1970s. There have been one billion person-years' exposure, and there is no evidence of, or suggestion of any adverse effects. The only health risk hypothesized to occur with consumption of high levels of folic acid intake (>1000 mcg/day) is for older persons who have undiagnosed vitamin B12 deficiency. Because the metabolisms of folic acid and vitamin B12 are closely related, people with severe B12 deficiency may have anemia that potentially can be ameliorated with folic acid. The concern expressed by some authors was that fortification of staple foods could “mask” the anemia of older people with vitamin B12 deficiency, thus preventing its correct diagnosis and treatment with vitamin B12 supplements, and consequently increasing the likelihood that they will develop neurological problems. A recent study by Mills demonstrated that rates of vitamin B12 deficiency without anemia—an indicator of masking—did not increase in an older patient population following mandatory fortification of flour with folic acid.²⁶ Moreover, long term folic acid consumption at levels above 1000 mcg/day has never been documented to be a serious clinical issue in the diagnosis, treatment, or course of illness in severely B12 deficient individuals. Serum test of vitamin B12 concentrations are widely available to physicians who see patients with neurological symptoms suggestive of vitamin B12 deficiency. Many such tests are done and vitamin B12 deficiency is seldom found to be the cause of the signs and symptoms.

[Is there such a thing as folic acid deficiency? Why doesn't my doctor test me for it, and why don't we hear more about it?](#) Relatively few people in industrialized countries have severe enough folate deficiency to develop megaloblastic anemia. The majority of the population has plasma homocysteines that are too high because of a less severe folate deficiency. It is the less severe folate deficiency that is ironically responsible for causing most cases of folic acid-preventable neural tube defects.

-
- 1 Centers for Disease Control and Prevention. Folate status in women of childbearing age--United States, 1999. *MMWR - Morbidity & Mortality Weekly Report* 2000; 49:962-5.
 - 2 Honein MA, Paulozzi LJ, Mathews TJ, Erickson JD, Wong LY. Impact of folic acid fortification of the US food supply on the occurrence of neural tube defects. *JAMA* 2001; 285:2981-6.
 - 3 Lawrence JM, Petitti DB, Watkins M, Umekubo MA. Trends in serum folate after food fortification. *Lancet*. 1999; 354:915-6.
 - 4 Jacques PF, Selhub J, Bostom AG, Wilson PW, Rosenberg IH. The effect of folic acid fortification on plasma folate and total homocysteine concentrations. *New England Journal of Medicine*. 1999; 340:1449-54.
 - 5MRC Vitamin Study Research Group. Prevention of neural tube defects: results of the Medical Research Council Vitamin Study. MRC Vitamin Study Research Group. *Lancet*. 1991; 338:131-7.
 - 6 Czeizel AE, Dudas I. Prevention of the first occurrence of neural-tube defects by periconceptional vitamin supplementation. *New England Journal of Medicine*. 1992; 327:1832-5.
 - 7 Lancaster P, Hurst T. Trends in neural tube defects in Australia. Australian Food and Nutrition Monitoring Unit, Commonwealth Department of Health and Aged Care. 2001, p. 20
 - 8 Bower C. *New Zealand Medical Journal*, 2003; 116, no. 1168, p 1-3.
 - 9 Ministry of Health, 2003. Improving folate intake in New Zealand: Policy implications. Wellington, Ministry of Health, p. 23.
 - 10 Wald NJ, Law MR, Morris JK, Wald DS. Quantifying the effect of folic acid. *Lancet*. 2001;358(9298):2069-2073.
 - 11 Hertrampf E, et al. Consumption of folic acid –fortified bread improves folate status in women of reproductive age in Chile. *Journal of Nutrition* 133: 3166-3169.
 - 12 Berry RJ, Li Z, Erickson JD, et al. Prevention of neural-tube defects with folic acid in China. China-U.S. Collaborative Project for Neural Tube Defect Prevention . *New England Journal of Medicine*. 1999;341(20):1485-1490.
 - 13 National Center on Birth Defects and Developmental Disabilities, US CDC. <http://www.cdc.gov/ncbddd/fact/folicfaqs.htm>
 - 14 Waitzman N, Romano P, Scheffler R. Estimates of the economic costs of birth defects. 1994. *Inquiry* 31: 188-205.
 - 15 Giovannucci E, Stampfer MJ, Colditz GA, et al. Multivitamin use, folate, and colon cancer in women in the Nurses' Health Study. *Annals of Internal Medicine*. 1998;129(7):517-524.
 - 16 Ma J, Stampfer MJ, Giovannucci E, et al. Methylenetetrahydrofolate reductase polymorphism, dietary interactions, and risk of colorectal cancer. *Cancer Research*. 1997;57(6):1098-1102.
 - 17 Stampfer M, Willett W. Green T, Newton R, Bourn D. Homocysteine and marginal vitamin deficiency. The importance of adequate vitamin intake. *JAMA* 1993; 270: 2726-7.
 - 18 Wald DS, Law M, Morris JK. Homocysteine and cardiovascular disease: evidence on causality from a meta-analysis. *BMJ*. 2002;325(7374):1202.
 - 19 Abraham B, Webb K. Interim evaluation of the voluntary folate fortification policy: Australian Food and Nutrition Monitoring Unit, 2000:136.
 - 20 Green T, Newton R, Bourn D. Estimated folic acid intakes from simulated fortification of the New Zealand food supply. *The New Zealand Medical Journal* 2003; 116.
 - 21 Food and Nutrition Board IOM. Dietary reference intakes for thiamin, riboflavin, niacin, folate, vitamin B12, pantothenic acid, biotin, and choline/ a report of the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes and its Panel on Folate, Other B Vitamins and Choline and subcommittee on Upper Reference Levels of Nutrients.
 - 22 National Center on Birth Defects and Developmental Disabilities, US CDC. <http://www.cdc.gov/ncbddd/fact/folicfaqs.htm>
 - 23 Hardman JG. Limbird LE. Gilman AG. (Eds) *Goodman & Gilman the Pharmacological Basis of Therapeutics*, 10th Addition: 2001McGraw-Hill, NY p. 1512.)
 - 24 Green T, Newton R, Bourn D. Estimated folic acid intakes from simulated fortification of the New Zealand food supply. *The New Zealand Medical Journal* 2003; 116.
 - 25 Flood VM, Webb KL, Smith W, et al. Folate fortification: potential impact on folate intake in an older population. *European Journal of Clinical Nutrition*. 2001;55(9):793-800.
 - 26 Mills JL, Von Kohorn I, Conley MR, et al. Low vitamin B-12 concentrations in patients without anemia: the effect of folic acid fortification of grain. *American Journal of Clinical Nutrition*. 2003;77(6):1474-1477.