The U.S. Public Health Service recommendations are also supported by the Spina Bifida Association of America (SBAA), the American Academy of Pediatrics (AAP), the American College of Obstetricians and Gynecologists (ACOG), the American Society of Human Genetics (ASHG), and the National March of Dimes Birth Defects Foundation.

HOW CAN WOMEN CONSUME SUFFICIENT FOLATE?

Women in their reproductive years can increase their folate intake by:
1. Increasing dietary sources of folate-rich foods.
2. Taking vitamin supplements that contain folic acid.
3. Choosing foods that have been fortified with folic acid.

Most experts agree that all three intervention strategies complement one another and that a combined approach is the ideal overall reduction method. The advantages and disadvantages associated with each intervention strategy are described below.

1. Dietary Increase of Folate-Rich Foods

Advantages:

- Foods such as dark green vegetables, orange juice, dried beans, peas, and lentils, some fortified cereals, and organ meats such as liver are good sources of folate.
- It is possible to consume the equivalent of 0.4 mg of folic acid from diet alone.
- Folate-rich foods provide other health benefits which may help prevent heart disease, stroke, and some forms of cancer.

Disadvantages:

- Most folates in foods are only half as bioavailable as the folic acid in supplements.
- Absorption of folate varies from food to food; variations are influenced by how foods are cooked and stored. Up to 50 percent of the folate in foods may be lost during commercial processing or home cooking.[8]
- For some families, a barrier to consuming enough folate-rich foods may be the perceived high cost.
- Some families may not have easy access to wide selection of folate-rich foods.
- For many women of childbearing age, a behavior change is required to consciously consume folate-rich foods on a daily basis.

2. Vitamin Supplementation

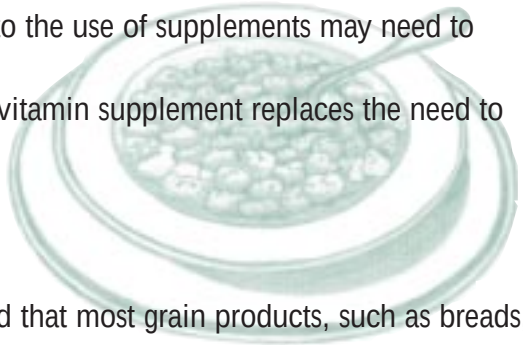
While supplementation may be the most expedient way to ensure adequate folic acid intake, vitamins are not completely harmless, particularly if women take more than one supplement daily. For example, at relatively low doses vitamin A can produce congenital defects of the heart and face in the developing fetus. Excess of vitamins C or E can increase blood clotting time, and a high intake of vitamin B-6 can cause peripheral neuropathy.

Advantages:

- Most multivitamins contain 0.4 mg folic acid. Folic acid at the 0.4 mg level is available as a single supplement for those who prefer not to take a multivitamin.
- Vitamin supplements are easy to consume and are portable.
- Supplements are relatively inexpensive. For example, a good quality generic multivitamin costs only a few cents daily.
- Folic acid in supplements is readily available for use by the body.

Disadvantages:

- The perceived cost of purchasing supplements may be a barrier for some families.
- Behavior change is required for women who are not accustomed to taking a daily supplement.
- Variations in the amount of folic acid available among different supplements or multivitamins may exist.
- A variety of educational and cultural barriers to the use of supplements may need to be overcome.
- A misconception may exist that taking a multivitamin supplement replaces the need to eat a balanced diet.

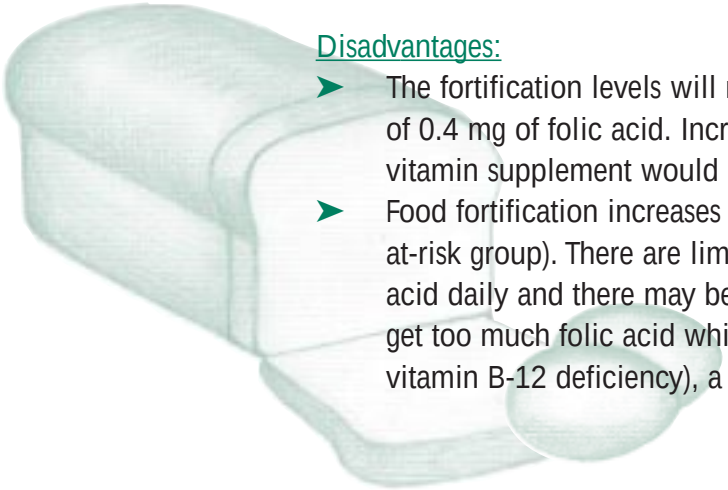


3. Food Fortification

The U.S. Food and Drug Administration has required that most grain products, such as breads, flours, cereals, rice and pasta be fortified with folic acid effective **January 1, 1998**. This level of fortification will provide 10 percent of the Daily Value for folate per serving. Based on the Daily Value level of 0.4 mg, an estimated 100 micrograms of folic acid per day will be added to the average diet.[9]

Advantages:

- Fortification will passively increase consumption of the vitamin by women of child-bearing age.
- Increased consumption of folic acid will be achieved at relatively low cost.
- Fortifying the food supply may help reduce NTDs caused by folic acid deficiency in unplanned pregnancies without involving behavior change.



Disadvantages:

- The fortification levels will not increase average consumption to the recommended level of 0.4 mg of folic acid. Increased consumption of folate-rich foods or the addition of a vitamin supplement would be needed.
- Food fortification increases folic acid consumption for the entire population (not just the at-risk group). There are limited data on the safety of consuming more than 1 mg of folic acid daily and there may be a risk for some people. For example, older individuals may get too much folic acid which may cause difficulty diagnosing pernicious anemia (a vitamin B-12 deficiency), a condition common in older people.

WHAT ARE THE OTHER HEALTH BENEFITS OF FOLIC ACID ?

Folic acid has possible benefits for helping to prevent heart disease, stroke and some forms of cancer.

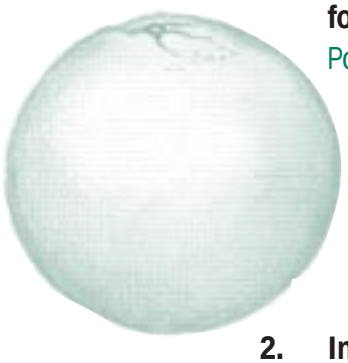
- High plasma levels of the metabolite homocysteine are independently associated with an increased risk of heart disease and stroke. It has been shown that adequate levels of serum folate reduces plasma homocysteine in both men and women, but it is not yet known whether folic acid supplementation also lowers the risk of heart disease and stroke.
- Low serum folate levels have been associated with cervical and colon cancer. Women with moderate and low serum folate levels have a greater risk of developing precancerous lesions of the cervix than women with high serum folate levels.

WHAT ARE SOME APPROACHES IN OHIO TO NTD REDUCTION?

Since the levels of folic acid in fortified foods will not meet NTD-reduction levels as recommended by the CDC, ODH recommends the following strategies to address the reduction of NTDs in Ohio.

Possible Strategies for State-Level Partners

In order for women to make the long-term behavior changes necessary to achieve an optimal folate intake, they must hear the folic acid and NTD-reduction message from different channels, using different methods.



1. **Promote educational efforts encouraging females of reproductive age to consume foods high in folate.**

   Possible Activities:

   a. Provide information to the print and electronic media, health insurance consumer newsletters, employee wellness programs and health care providers on ways to increase consumption of foods high in folate.

   b. Develop and publish culturally-appropriate materials for consumers and clinic settings.

2. **In addition to maintaining a diet high in folate, encourage females of childbearing age to augment their diets with a vitamin supplement which contains 0.4 mg of folic acid per day at least 1 month prior to and during their entire pregnancy. For those who have had a pregnancy affected with an NTD, encourage supplementation at 4.0 mg folic acid per day under medical supervision at least one month prior to, and during their pregnancy.**

   Possible Activities:

   a. Disseminate public health “advisories” to physicians, nurse midwives and health practitioners.

   b. Publish articles/alerts in state medical, nursing and nutrition journals and newsletters.

   c. Distribute desk “reference cards” on periconceptional health.

d. Provide educational resources and counseling guidelines to public health clinics such as WIC, Prenatal, Child Health, and Family Planning on the role of folate in NTD reduction.
e. Provide alerts to faculty in schools of medicine, pharmacy, nursing, nutrition, public health, social work, and teaching (particularly in health and home economics programs) for education of students in these professions.
f. Prepare articles for health professional journals.
g. Prepare a program and poster board presentation on the reduction of NTDs to take to all key state health professional meetings and conferences.
h. Provide educational resources to teachers of health and home economics about folate and its importance in NTD reduction.
i. Develop or assist in developing educational materials for clients about the reduction of NTDs that are culturally appropriate and easy to read.
j. Prepare and distribute radio and TV public service announcements to local media.

3. Promote education and genetic counseling for individuals who have a family history of an NTD.

Possible Activities:

a. Encourage clinic and hospital practitioners who identify NTD-affected pregnancies to educate patients about folic acid/NTDs and planning future pregnancies.
b. Assure that genetic clinics incorporate folic acid/NTD information and CDC recommendations regarding planning future pregnancies whenever a NTD is identified by prenatal testing.
c. Develop recommendations for identifying and tracking the occurrence of NTDs in Ohio to facilitate follow up and referral services.

4. Assess changing behavior patterns related to folate intake before and after a statewide educational campaign is in place.

Possible activities:

a. Collect and analyze data from the 1997 CDC Behavioral Risk Factor Surveillance Survey (BRFSS) folate module conducted by ODH to gather baseline data on folic acid intake of Ohio adults.
b. Disseminate results of the 1997 BRFSS folic acid information to relevant groups in Ohio and other states.

Possible Strategies for Local Agencies and Partners

The success of any educational intervention is dependent upon many partners. ODH will work with partner health provider associations on information dissemination. Ultimately, the success of this statewide educational effort relies upon support from many direct service providers. This section of recommendations from the ODH and suggested activities for NTD reduction offers ways direct service providers can contribute to the education, increased awareness and potential behavior modifications of the general population. An extensive list of strategies and message delivery channels can be found in the accompanying document, "Ideas on Educating Ohioans About the Importance of Folic Acid."

Priority Populations

One of the most significant roles in NTD reduction that local providers can undertake is to assure that public health staff serving women provide periconceptional assessment, counseling, education and/or referrals related to folate and reduction of NTDs. This staff should incorporate the following activities into their public health program policies and/or agency protocols when working with women who are in any of the following priority populations.[10]

- Non-Pregnant Women of Childbearing Age
  - Teach women about healthy behaviors before and during pregnancy, including need for folate. Refer to dietitian for in-depth nutrition counseling as needed.
  - Screen women for risk factors such as overweight, the use of oral contraceptives, family history, and NTDs in previous pregnancies.
  - Discuss the predisposing factors identified at screening with clients.
  - Refer women for genetic counseling, if indicated.

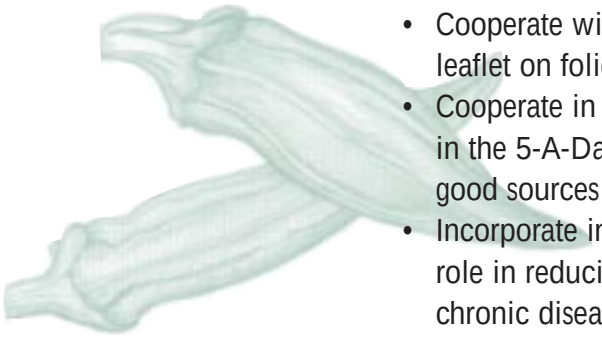
- Women Planning Pregnancy
  - Teach women about healthy behaviors before and during pregnancy, including need for folate. Refer to dietitian for nutrition counseling as needed.
  - Screen women for risk factors such as overweight, the use of oral contraceptives, family history, and NTDs in previous pregnancies.
  - Discuss the predisposing factors identified at screening with clients.
  - Refer women for genetic counseling, if indicated.
  - Discuss the need for folic acid supplementation and provide the prescription, if indicated.
  - Be vigilant in monitoring for vitamin B-12 deficiency with absence of megaloblastic anemia when women have high folate intakes.

- Female Teenagers
  - Discuss healthy behaviors with emphasis on their effects on pregnancy. Include the need for a healthy diet with an adequate folic acid intake for healthy pregnancy outcomes.
  - Review the importance of planning each pregnancy for the benefit of the woman, her partner, and the infant.
  - Provide information on family planning methods as indicated.

- Any Pregnant, Breastfeeding, or Postpartum Woman
  - Screen for NTD risk factors and folate intake.
  - If indicated, refer women for genetic counseling, and discuss need for medical supervision and folic acid prescription if planning a pregnancy.
  - Teach women about healthy behaviors before and during pregnancy, including physical health, need for folate, sources of folate, and possible effects of folate deficiency on pregnancy.
  - Provide dietary counseling and educational materials on ways to increase consumption of foods high in folate.
  - Stress the preventive benefits of folate throughout the childbearing years.

- Women with History of Previous Neural Tube Defect
  - Review importance of planning each pregnancy for the benefit of the woman, her partner, and the infant.
  - Review family planning goals and needs.
  - Teach healthy behaviors before and during pregnancy.
  - Support appropriate dietary folate and supplemental folic acid intake beginning before pregnancy.
  - Discuss the need for medical supervision and folic acid prescription when planning a pregnancy.
  - Assess for early symptoms of pernicious anemia if client is taking a supplement which contains 4.0 mg folic acid.

- Parents of Children With Special Health Care Needs Related to Spina Bifida
  - Assess for history of NTDs through locally-based services and provide information on the importance of adequate folic acid in the reduction of NTDs.
  - Develop a system to identify families with a child affected by an NTD and to ensure enrollment in Myelodysplasia Clinics/BCMH, Early Intervention Programs, etc. Refer appropriate family members for genetic counseling, if necessary.
  - Encourage genetic counseling and ways to reduce risk of recurrence through referral to maternal-fetal medicine physicians, regional genetics centers and outreach sites.
  - Provide information on reducing risk of occurrence and recurrence to hospital staff as part of newborn screening hospital site visits.
  - Provide information about the reduction of recurrence of NTDs to families of children with NTDs followed in Myelodysplasia, genetics clinics and other centers.
  - Assure that families who have children with NTDs are aware of services available through the ODH Bureau for Children with Medical Handicaps.
  - Support families and reinforce that not all NTDs are caused by inadequate intake of folic acid.

- Adults with Spina Bifida
  - Provide pre-pregnancy genetic counseling for adults of childbearing age who have spina bifida.

- General Population
  - Cooperate in public education initiatives that address the role of folate in the reduction of neural tube defects.
  - Cooperate with other health partners in the development of a consumer education leaflet on folic acid and neural tube defects.
  - Cooperate in the development of materials for use by grocers and others participating in the 5-A-Day for Better Health program to showcase fruits and vegetables that are good sources of folate.
  - Incorporate information about the importance of adequate folic acid intake and its role in reducing the risk of cardiovascular disease and some forms of cancer into chronic disease risk reduction strategies.