Prevention of Neural Tube Defects: How Much Folic Acid is Enough?

The birth of a child with a neural tube defect can be devastating. Most pregnant women experience joyful pregnancies, filled with excitement and dreams for a healthy baby. When a baby is born with a birth defect, parents are shocked, overwhelmed, and find themselves searching for answers. Why did this happen? Is there something I did during the pregnancy that caused this? The answers to these questions are often not known.

Every woman has a background risk of 3-5% for some type of birth defect to occur, ranging from a serious congenital heart defect to an extra digit that can be corrected by surgery. Family history, and genetic factors play an important role in the cause of birth defects, but the underlying cause for most birth defects is unknown.

Most women try to do the best they can to stay healthy during pregnancy by eating a healthy diet, taking prenatal vitamins, and exercising regularly. Avoiding alcohol, cigarettes, or street drugs are important ways to give a baby a healthy start to life. Unfortunately, not all birth defects are preventable.

A neural tube defect (NTD) is a birth defect of the developing spine, or spinal cord that occurs in the first month of pregnancy, often before a woman even knows that she is pregnant. With this condition, the developing neural tube does not close completely. Spina bifida is the most common type of NTD where part of the spinal cord comes through a small opening in the spine. Myelomeningocele is the most serious type of spina bifida—a sac of fluid with part of the spinal cord comes through an opening in the baby’s spine damaging the nerves. In general, when the opening is lower along the spine, fewer nerves are damaged, resulting in less serious disability.
A worldwide effort to prevent recurrence and occurrence of neural tube defects began in the early 1990's. In August 1991, U.S. Public Health Service provided guidelines for women who already had a pregnancy affected with a NTD. The guidelines called for consumption of 4 milligrams (4000 micrograms) of folic acid daily beginning one month before trying to get pregnant and continuing through the first three months of pregnancy (CDC: MMWR; Aug. 2, 1991).

Folic acid is a water-soluble B vitamin. Foods that are naturally high in folic acid include leafy vegetables, fruits (such as bananas, melons, and lemons) beans, yeast, mushrooms, meat (such as beef), orange juice, and tomato juice. Most women would not consume enough folic acid by diet alone.

In order to reduce the frequency of NTDs and their resulting disability, in September, 1992, the U.S. Public Health Service recommended:

“All women of childbearing age in the United States who are capable of becoming pregnant should consume 0.4 mg (400 micrograms) of folic acid per day for the purpose of reducing their risk of having a pregnancy affected with spina bifida or other NTDs. Because the effects of higher intakes are not well known but include complicating the diagnosis of vitamin B12 deficiency, care should be taken to keep total folate consumption at less than 1 mg per day, except under the supervision of a physician. Women who have had a prior NTD-affected pregnancy are at high risk of having a subsequent affected pregnancy. When these women are planning to become pregnant, they should consult their physicians for advice (CDC MMWR: September 11, 1992).”

In 1998, the Institute of Medicine’s Food and Nutrition Board added this to the recommendation:

“To reduce their risk for an NTD-affected pregnancy, women capable of becoming pregnant should take 400 micrograms of synthetic folic acid daily, from fortified foods or supplements or
a combination of the two, in addition to consuming food with folate from a varied diet (http://books.nap.edu).”

Since 1998, folic acid has been added to cold cereals, flour, breads, pasta, bakery items, cookies, and crackers, as required by federal law. CDC reports that fortification is now mandatory practice in 57 countries and voluntary in many others. Three key results are:

- World-wide, at least 22,000 fatal or disabling birth defects such as spina bifida are prevented annually. That’s 60 babies a day.
- Countries around the world report 30% to 70% declines in NTDs after fortification begins.
- Countries save millions of dollars in healthcare cost when spina bifida is prevented.

Since one-half of U.S. pregnancies are unplanned and because these birth defects occur very early in pregnancy (3-4 weeks after conception), CDC recommends all women of childbearing age consume folic acid daily. CDC estimates that most of these birth defects could be prevented if this recommendation were followed before and during early pregnancy.

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