Folic Acid in the Prevention of NTDs
Purpose

To explain the importance of Folic Acid in the prevention of neural tube defects (NTDs)

To disseminate information regarding folic acid to females of childbearing age
Neural tube defects (NTD’s) are a group of congenital birth defects that affect the central nervous system. During embryonic development, the neural plate undergoes a change in shape to create an in-folding and closure to form the neural tube, the structure that develops into the brain, spinal cord, and spine.

Neural tube closure occurs between twenty-two and twenty-eight days after conception. When the neural tube does not completely close, a serious birth defect can develop that can result in defects of the spinal cord, brain, or both. NTD’s occur very early in pregnancy, even before most women know they are pregnant. Skin-covered or closed NTDs are caused by problems with the following stages of neuro-spinal development that occur from about twenty-eight to fifty-six days after conception. Closed NTDs can also be very serious.
The most common types of NTD are spina bifida and anencephaly.
Spina bifida results from improper development of the lower portion of the neural tube (spine) and is characterized by protrusion of a portion of the spinal cord components outside the body, usually in the lumbar or lumbosacral regions (below waist level). Complications from spina bifida include varying degrees of disability, including lower extremity paralysis, learning disabilities, variable loss of bowel or bladder control, and hydrocephalus. Approximately 90 percent of infants born with spina bifida survive into adulthood and, along with their families, must learn to manage the complications associated with this condition.

Despite surgical closure of an open NTD soon after birth, affected individuals often experience further loss of function in adulthood.
Anencephaly results from improper development of the upper portion of the neural tube (brain). It is a fatal condition characterized by severe malformation of the brain and may be accompanied by facial abnormalities and absence of the skull. Many anencephaly-affected pregnancies result in miscarriage and infants born with this condition die soon after birth.

Encephalocele accounts for about 10 percent of neural tube defects. It is a defect that allows the brain to protrude outside the skull in a sac of skin. Children born with encephalocele usually live but often suffer from mental disabilities.
Everyone capable of becoming pregnant is at risk for having a baby affected by a neural tube defect. In fact, 90 percent to 95 percent of all cases of spina bifida occur in families with no history of an NTD. The neural tube develops within the first month of pregnancy, before many women realize they are pregnant. In addition, over half of all pregnancies in the United States are unplanned or mistimed (i.e., occur earlier than desired). Although all women of reproductive age are at risk, some women may be at higher risk than others.
Statistics indicate that more than 4,000 pregnancies in the U.S. are affected by NTDs every year. In Michigan, approximately 80 babies are born with a NTD each year. Data from voluntary reporting of prenatally ascertained cases of NTD show about 50 additional cases in a 5 year period.

Costs for the care of infants affected with NTDs in Michigan is a staggering 3.7 million dollars annually, not to mention the emotional and physical stressors impacting the families involved.

The costs associated with NTDs have been estimated to be over $635,000 over the course of a lifetime, and may be well above one million dollars. These costs include ongoing medical care, surgeries for back closure and shunt placement, hospitalizations due to infection or other complications and special equipment (e.g., leg braces, wheel chairs, catheters).
As mentioned previously, 90 to 95 percent of babies born with spina bifida are born to parents with no family history of spina bifida.

Causes of NTD are thought to be many; however, a nutritional folate deficiency is correctable!
Maternal risk factors include:

- **Previous NTD-affected pregnancy**— A woman who has had a prior NTD-affected pregnancy has almost 20 times the risk of having another affected pregnancy. A history of NTDs among other family members also increases risk.

- **Poorly controlled insulin dependent diabetes**— Women with insulin-dependent diabetes may be at higher risk compared to women without insulin-dependent diabetes.

- **Use of antiseizure medications**— The anticonvulsant medications valproic acid and carbamazepine are teratogenic, and maternal use of these drugs at the time of conception may increase NTD risk two to four times that of the general population.

- **Maternal obesity**— Studies suggest that women with medically diagnosed obesity are at higher risk of having an NTD-affected pregnancy.

- **Hyperthermia in early pregnancy**— Maternal exposure to heat (e.g. hot tub, sauna, prolonged fever) during the periconceptional period has been associated with an increased risk of having a baby with an NTD.

- **Ethnicity/Race**—NTD’s are more common among women of Hispanic origin, particularly Mexican-American women born in Mexico, and among women from northern China, Northern Ireland and the United Kingdom.

- **Lower socioeconomic status**— Women in lower socioeconomic groups are more likely to have an NTD-affected pregnancy.
Risk of Recurrence

- For a **mother** who has a NTD: 
  ~ 1 in 25
- For a couple with **one affected** child/prior affected pregnancy: 
  ~ 1 in 25
- For a couple with **two affected** children/two prior affected pregnancies: 
  ~ 1 in 10

Risk of NTD Recurrence in subsequent pregnancies is as stated above.
Prevention of NTDs

50 – 70% of NTD can be prevented by consumption of 400 micrograms of synthetic folic acid per day

ALL females of childbearing age should consume 400 mcg of synthetic folic acid DAILY (from supplements or fortified foods) in addition to folate from a varied diet.

The Institute of Medicine recommends that all women of childbearing age consume 400 mcg of synthetic folic acid every day, along with eating a varied diet that includes food folate, to reduce their risk of having a baby with a neural tube defect.

Research indicates that 50-70% of NTD’s can be prevented providing that women take a multivitamin containing the recommended 400 mcg of folic acid, or a folic acid supplement containing 400 mcg, beginning at least one month prior to conception.
There is a difference between folic acid and food folate. *Folate* is a water-soluble vitamin found naturally in some foods. This form of the vitamin may be referred to as folate, food folate, or naturally occurring folate. *Folic acid* is the synthetic (man-made) form of the vitamin and is used in vitamin supplements and in fortified foods.
Folic Acid » Folate
400 micrograms (mcg) = 0.4 milligrams (mg)

*Synthetic folic acid is approximately twice as absorbable as naturally occurring food folate*

Structurally, folic acid and food folate are different. Folate is a large molecule that includes a side chain consisting of several glutamate units. In order for the body to absorb folate, all but one of the glutamate units must be cleaved from the molecule using enzymes in the small intestine.

In contrast, folic acid contains only one glutamate unit, therefore folic acid can be directly absorbed without enzyme modification.

Food folate is only about 50 percent bioavailable, whereas folic acid is approximately 100 percent bioavailable when consumed alone on an empty stomach. It is 85 percent bioavailable when consumed with other food such as breakfast cereal that is fortified with folic acid. Despite the differences in bioavailability, once absorbed, the biological function is the same. In other words, the body cannot distinguish between the two forms of the vitamin once they are absorbed.

Be aware that the term “folate” may be used to describe food folate and folic acid. The term “folate” also is used when referring to blood or tissue concentrations of the vitamin.
Folate is found naturally in oranges/juice, strawberries, dark green leafy vegetables such as spinach and other greens, broccoli, asparagus, several other fruits and dried beans and peas (pinto, kidney, black-eyed peas, lentils, peanuts, chick peas, black-eyed peas).

Foods come fresh, canned, frozen, or dried. Fresh products may not be a practical choice for all. Cooked, canned, or frozen folate-rich foods can make a significant contribution to folate intake.

*Remember, the IOM recommendation is that women of childbearing age consume 400 mcgs. of synthetic folic acid in addition to food folate from a varied diet.*
Folate is easily lost when food is heated or cooked in a lot of water. The primary loss is due to folate being leached into cooking liquid. Therefore, the way food is cooked / prepared matters.

For instance, a spinach salad is a better choice than cooked spinach. Snack-sized raw veggies and fruits are better choices than cooked and/or processed ones.

Use a small amount of cooking water to retain more folate in the cooked foods. Steaming, microwaving, roasting or grilling are good ways to cook vegetables.

Also, if vegetables are boiled, the cooking water can be reused in soups or stews, retaining the folate lost in the water to be part of the soup broth.
Effective January 1, 1998, the Food and Drug Administration (FDA) mandated that folic acid be added to enriched cereal-grain products, including bread, rolls and buns; flour (standard and self-rising); corn grits; corn meal; farina; rice; macaroni products; nonfat milk macaroni products and noodle products.

After much debate, the level of fortification chosen was 140 micrograms per 100 grams of cereal-grain product. This level represents “twice restoration,” or twice the amount of folate that is estimated to be lost during milling and processing of the cereal grain product.

To know whether a product has been fortified with folic acid, read the ingredient list. The term “folic acid” or “folate” will be listed along with the other vitamins that are part of the enrichment package.
Breakfast Cereals

**Super-fortified**
- 400 micrograms folic acid per serving
- Check the label! Look for 100% Daily Value for folic acid or folate

**Fortified**
- 100 micrograms folic acid per serving

An important category of fortified foods is ready-to-eat breakfast cereals. Many ready-to-eat cereals provide from 100 to 400 micrograms of folic acid per serving, or 25% to 100% of the Daily Value for folate. Breakfast cereal manufacturers are continually increasing the number of products containing 400 mcg. folic acid per serving.

Other food products affected by fortification include mixed dishes such as instant rice dishes and soups containing enriched noodles, and many snack foods, including crackers, cakes and cookies.
The easiest and surest way to meet the recommendation for folic acid is to take a multivitamin or supplement containing 400 mcg. of folic acid every day. However, some women cannot or will not take a pill every day. In this case, folic acid also can be obtained through the diet with enriched cereal grain products. The easiest way to get folic acid through foods is to eat one serving each day of a fortified cereal that provides 400 mcg folic acid, or 100 percent of the Daily Value. Some cereals provide 100 mcg folic acid per serving (25% of the Daily Value).

Any method used for consuming folic acid should be accompanied by the inclusion of folate rich foods as part of a varied diet.
Foods rich in folate are...

- Low in calories
- Low in fat
- Cholesterol free
- High in fiber
- Rich in other vitamins and minerals

Heart healthy foods!

Consuming food folate offers the additional benefits provided by other nutrients and compounds commonly found in folate-dense foods, such as beta-carotene, vitamin C, fiber and phytonutrients.
Diets do not have to change overnight! Begin by making small changes. For example, for breakfast, drink a glass of orange juice or eat a serving of fortified cereal (take a multivitamin as well).

For lunch, try a green salad with some bread made with enriched flour. Include strawberries as a snack.

For dinner, try adding asparagus or some dark greens to your pasta dinner. A great strategy is to combine fortified foods with folate-rich foods, such as rice and beans.
Intakes of folic acid exceeding 1,000 mcg. / day may mask a vitamin B 12 deficiency. This is because the hematologic symptoms of folate and vitamin B 12 deficiency are similar. The danger associated with increased intake of folic acid is that the folic acid may correct the hematologic indicators associated with a vitamin B 12 deficiency.

If left untreated, vitamin B 12 deficiency may lead to irreversible neurological damage.

The issue of masking a vitamin B 12 deficiency prompted the Institute of Medicine to establish an Upper Tolerable Level (UL) of intake for folic acid of 1,000 mcg/day which is the maximum intake level that has been determined not to cause adverse effects. Masking is not expected to occur at folic acid intakes below this amount. Vitamin B 12 deficiency is more prevalent in older persons and is not common among women of child bearing age.
The recommendations for folic acid are supported by the U.S. Public Health Service, the Institute of Medicine, and many other organizations including the Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN) and the American College of Obstetrics and Gynecology (ACOG).
So check the label on the multivitamin bottle to determine whether the vitamin contains the recommended 400 mcg. of synthetic folic acid. Most do.
As mentioned, a woman who has had a prior NTD-affected pregnancy has almost twenty times the risk of having another affected pregnancy.

Women who have had a NTD-affected pregnancy should consult their physician prior to planning a subsequent pregnancy. A prescription must be obtained for the 4,000 micrograms of synthetic folic acid required for NTD prevention in women who have experienced an NTD affected pregnancy, and the supplement should be started at least one month prior to pregnancy.

A multivitamin containing 400 mcg. of synthetic folic acid should be taken daily when not planning a pregnancy.
Additional Benefits of Folic Acid

*Folic acid also *may reduce the risk of:

- cardiovascular disease/stroke
- certain cancers
- other birth defects including cleft lip/palate, heart
- Alzheimer’s disease

*Investigations are ongoing. Some controversy exists.*
*The body’s metabolism is complex.*
*Much work remains to be done to understand the effects of folic acid on normal metabolism and disease processes...*

Besides reducing the risk of NTDs, folate has other potential health benefits. Folate is needed by the body on a daily basis and is essential for synthesis of DNA for proper cell division and healthy tissues. Folate also is required for amino acid metabolism; methylation reactions involving substrates such as DNA, collagen, and myelin; and remethylation of homocysteine to form methionine. Adequate folate ensures proper formation of red blood cells and folate-deficient diets can result in megaloblastic anemia.

Folate status is inversely associated with blood levels of homocysteine, a product of the body’s metabolism.

Although the research is inconclusive, folate deficiency may also increase the risk for certain types of cancers such as colon, breast, and cervical cancer.

Currently there are several randomized controlled trials in progress testing the effect of folic acid or B vitamin supplementation on the risk for vascular disease, as well as intervention studies evaluating the impact of folic acid supplements on colon cancer risk.
Why should every female of childbearing age take a vitamin or supplement that contains folic acid?

- We don’t always eat right
  - Healthy cells make a healthy body and all cells need folic acid every day
- To reduce the risk of birth defects

Sometimes we don’t eat right. Because only certain foods contain folic acid and naturally occurring food folate, it may be difficult to get the proper amount of folic acid every day through diet alone. Taking a supplement containing folic acid every day can ensure that a woman receives the adequate amount.
Common barriers to taking multivitamins...

- Too big
  - Folic acid supplements
  - Chewable vitamins
- Increase appetite and cause weight gain
  - No scientific evidence
- Cause upset stomach
  - Take after a meal
- Cost too much
  - Store brands
  - Folic acid supplements

Try folic acid supplements, which are much smaller than a multivitamin pill and easier to swallow. Adult chewable vitamins also are available. Dissolvable vitamins are available in some areas.

There is no evidence to suggest that taking vitamins results in weight gain. In fact, daily use of a multivitamin can provide key nutrients to help clients maintain their health and vitality.

Sometimes the iron contained in multivitamin can cause stomach upset. Suggest to your clients that they take a vitamin supplement after eating a meal or just before bedtime to reduce the chance of stomach upset. Suggest taking a multivitamin without iron unless their doctor has advised them to take a multivitamin with iron. Taking a folic acid supplement instead of a multivitamin may reduce the chance of stomach upset.

If cost is an issue, when the free vitamins are no longer available, suggest to your clients that they select store brand items, which are much less expensive than name brands. Store brand folic acid supplements can be purchased for as little as one penny per pill.

Advise your clients to put the vitamin bottle in a prominent location that is out of the reach of a child. If that is not an issue, advise placing it near something that is used every day (i.e., a toothbrush or birth control pills, or next to the coffee maker).
Medications that May Interfere with Folic Acid Absorption

- Valproic acid (antiseizure Rx)
- Metformin (oral hypoglycemic Rx)
- Trimethoprim (antimicrobial Rx)
- Methotrexate (anticancer Rx)

Certain medications may interfere with folate absorption, metabolism, or excretion. These include antiseizure medications, certain antibiotics, medications used to treat rheumatoid arthritis or cancer, and certain anti-inflammatory medications. Individuals taking these medications may have a higher folate requirement. Anticonvulsant drugs, such as phenytoin, carbamazepine, primidone, and valproic acid act as folate antagonists and work by inhibiting enzymes essential for normal folate metabolism in the body. Individuals taking anticonvulsant medications may need additional folic acid supplementation as prescribed by a physician. Methotrexate is another drug that acts as a folate antagonist and is taken by a large number of women of childbearing age for a variety of nonneoplastic diseases such as arthritis and psoriasis. Other drugs that may affect folate status include the antimalarial drug pyrimethamine; the gastrointestinal anti-inflammatory agent sulfasalazine; antacids; some antiulcer medications; and nonsteroidal anti-inflammatory drugs (e.g., large therapeutic doses of aspirin and ibuprofen). Chronic alcohol consumption increases risk for folate deficiency and folate deficiency is common among chronic alcohol users. Excessive alcohol intake may displace other nutrients from the diet, including folate, and may interfere with the way the body uses and excretes folate. Therefore, chronic alcohol users may have increased folate needs.
Who benefits from Folic Acid?

- Babies & mothers
- Women
- Men
- Families
- Communities
- Public health

Everyone needs an adequate intake of folic acid. Folate is not stored in the body in large amounts and must be eaten or taken every day so the body has enough to function properly. Folate helps to make DNA, which tells cells what they will be and how they will work. Because of its role in making DNA, folate is needed to make healthy red blood cells. Folate is important for proper growth and development and helps the body replace cells on a daily basis. Folate is needed for many reactions in the body and helps change one substance into another so the body can function properly.

Healthy bodies = healthy communities
To assess women’s knowledge and behavior related to the use of vitamins and folic acid in pre-pregnancy care, the March of Dimes, with funding from the Centers for Disease Control and Prevention (CDC) commissioned Gallup Polls from 1995 – 2005, directed at women aged 18 to 45 years.
One step toward our goal of reducing the occurrence of neural tube defects is to improve women’s awareness of folic acid. In 2005, 84% of women responded “YES” to the question “Have you ever heard or read anything about folic acid?” This is an increase from 52% in 1995, but has remained fairly constant since 2001.

The March of Dimes, together with the Centers for Disease Control and Prevention and the National Council on Folic Acid, worked to increase awareness through mass media placements to raise awareness among the general public -- women of childbearing age, in particular -- about the importance of folic acid for preventing birth defects. Media efforts were comprised of national and local advertising campaigns, as well as publicity and promotion strategies and activities.

Since 2005, fighting prematurity has become the major focus of the March of Dimes' efforts to improve the health of babies, in Michigan and nationally. Promoting folic acid remains one of many strategies, part of good general preconceptional health, supported by the MOD to improve reproductive outcomes.
To better understand what women surveyed knew about folic acid, a few more questions were asked. Women who said they had heard, read or seen something about folic acid were asked what they recalled about folic acid through an open-ended question, which asked: “What have you heard, read or seen about folic acid?”

In 2005, 19% of those surveyed mentioned that folic acid helps prevent birth defects. This figure has increased since 1995 when 4% of women mentioned that folic acid helps prevent birth defects.

In the 2005 survey, only 7% of women mentioned that folic acid should be taken before pregnancy. This response has improved from 2% in 1995.

Although women’s knowledge of the benefits of folic acid has increased since 1995, the percentages remain low, and may be decreasing. In 2005, more than 9 of every 10 women did not know that folic acid should be taken before pregnancy.
This slide summarizes women’s actions regarding vitamin use. In 2005, although 84% of women surveyed were aware of folic acid:

• Only 33% of all women consumed a vitamin containing folic acid daily.
• 31% of non-pregnant women consumed a vitamin containing folic acid on a daily basis.

There has been only a slight increase in vitamin consumption rates since 1995.
Among the women of childbearing age surveyed, there are differences in daily vitamin use by age, education and income.

• Women 25 and older are more likely to take a daily vitamin compared to women between the ages of 18 and 24. In 2001, nearly one-third of live births in the United States were to women in this younger age group.

• Women who have completed any college are most likely to take a vitamin containing folic acid daily.

• Women with annual household incomes of $25,000 and over are more likely than those with incomes less than $25,000 to consume a vitamin containing folic acid daily.
Women who said they were aware of folic acid were also asked, “Where did you learn about folic acid?”

In 2005:

- More than one in four women (26%) mentioned magazines or newspapers. Rates for magazines and newspapers decreased between 1995 and 2005.
- More than 1 in 6 women (18%) mentioned radio or television as their source of information on folic acid. Between 1995 and 1998, the rate of women reporting radio and television as a source doubled, but has remained stable since 1998.

In 2005, 26% of women mentioned their health care provider as a source of information on folic acid. This response shows an increase from 13% in 1995.

While the majority of women report the media as a source of folic acid information, results from focus groups of women of childbearing age indicate that the advice of a health care provider is most frequently accepted over health-related information obtained from the media.
Reasons Why Women Do Not Take a Multivitamin Daily
March of Dimes Folic Acid Survey, 2005

Women who did not take a vitamin or mineral supplement on a daily basis were asked why they did not take a daily multivitamin. In 2005, more than one in four (28%) women reported they “forget to take them”, 16% said there was no particular reason, and 16% felt they did not need them.
In 2005, women who did not take a vitamin containing folic acid daily were asked what, if anything, would make them more likely to do so. Unprompted, one third of women (26%) said they would be more likely to take folic acid daily if their health care provider recommended they take it. This is a substantial increase from 20% in 2001 (data not shown). Thus, health care providers have a real opportunity to convey the importance of folic acid to a receptive audience of women of childbearing age.

Other responses for things that would encourage a woman to take a multivitamin included if they experienced a change in health (9%), needed vitamins (6%), had more information about the benefits (4%), could remember to take them (4%), had someone to remind them (3%) or if they were not in pill form (3%).
Between 1995 and 2005, survey results indicate that improvements have been made in folic acid awareness and knowledge. Despite these improvements folic acid intake still remains low, with less than 1 in 3 women reporting taking a vitamin containing folic acid daily.
Approximately 62% of all births are to women less than 30 years of age. It is essential that we reach this population with the folic acid message.
The Michigan Pregnancy Risk Assessment Monitoring System is a population-based survey of a random sample of women who have given birth to a live-born infant. Results indicated that the majority of women knew about the sources and benefits of folic acid, but were not acting upon the message for a variety of reasons. Continued education about the benefits of folic acid consumption is still needed, particularly in the preconceptional period, to encourage females of childbearing age to take a multivitamin with folic acid daily.
PRAMS suggests that community-based programs may be most effective in reaching these at-risk women with low awareness.

These women may have limited access to information through computers, pamphlets or other specific forms of media.

Results suggest that women are best reached through community based programs—hence the vitamin project.
One question in the PRAMS questionnaire asked about the participant’s awareness of the benefits of folic acid prior to pregnancy.

About 80% of women had heard or read about folic acid and its benefits before pregnancy.

About 60% of women were both aware and instructed by a health care provider about the benefits of folic acid.

Q-

“Before you became pregnant with your new baby did either of the following things happen? – You heard or read that taking the vitamin folic acid or foods that contain it…could prevent some birth defects. – Your doctor or nurse instructed you on how to get enough folic acid.”
Concerning daily folic acid consumption, Michigan PRAMS results (29%) are very near the National March of Dimes - Gallup Poll findings (31%). There is a disconnect - folic acid awareness (80%) does not match folic acid consumption.
Again, the recommendation of a health professional appears to make a difference. Daily multivitamin consumption was highest among women who reported to be both aware and instructed by a healthcare professional about the benefits of folic acid.
Folic Acid Outreach and Multivitamin Distribution in Selected Michigan Counties

Funded 2005-2007

- To distribute 30,000 bottles of free multivitamins to low-income females of childbearing age
- To instill a healthy habit that will continue after project completion
- To reinforce the critical role of the health professional in the delivery of prevention messages

Funded by a Community Awards Grant from the March of Dimes, Michigan Chapter. The initial proposal was funded in 2005, with two additional years of continuation funding received. Bottles of multivitamins with folic acid were purchased wholesale by MDCH and delivered to partnering agencies e.g., WIC, Planned Parenthood and Family Planning, for distribution to non-pregnant female clients of childbearing age.
The Folic Acid - Free Vitamin Project initially targeted geographic regions with the highest NTD rates based on data from the Michigan Birth Defects Registry. Now in its third year, it has spread into areas with high risk populations, i.e., serving a high proportion of Hispanic clients.

The participating agencies –WIC and Planned Parenthood—educate women via agency staff.

Women are given an initial 3 month supply of free vitamins containing 400 mcg synthetic folic acid.

Those consenting to participate in a follow up phone call survey will be contacted after the initial 3 month period. MDCH staff complete 200 surveys for project evaluation.
YOUR Role

- Raise awareness of need for preconceptional counseling and folic acid intake
- Educate patients, families, and others in the community/neighborhood
- Participate in state-wide outreach efforts
- Obtain educational materials from MDCH, other sources (e.g., MOD, CDC)

Every health professional serving females of childbearing age has an important role in delivering prevention messages, including the benefits of folic acid. Working toward optimal health in a woman before pregnancy is the best way to protect the health of future babies.
For more information, visit Folicacid.net, or contact the other resources listed above.
Thank You,
Together, we can make a difference!

Contact:
Joan Ehrhardt, MS, CGC
Birth Defects Program Coordinator
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For birth defects prevention information and educational materials

Contact:
Carol Wilson, RNC, MSN
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For information about the multivitamin distribution project and folic acid training
Acknowledgements & Disclaimer

This presentation is intended for information purposes only and does not constitute medical advice.

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Folic Acid in the Prevention of NTDs

Independent Study

Instructions:
1. Read entire Power point presentation in the “notes” version
2. Go to www.michigan.gov/healthwatch and complete the post-test Folic Acid Outreach in the Prevention of NTDs (password: folicacid)
3. Complete evaluation, including time taken to complete both reading and test, and send with test to Carol Wilson at: Wilson60@centurytel.net or 14366 Park Dr., Mecosta, MI 49332

Be sure to include your return address or e-mail address Carol will review your test and if you have scored 80% or better you will receive a certificate for 1 contact hour by return mail or e-mail.