



## **Folic Acid Throughout the Life Cycle From Preventing Birth Defects to Healthy Aging**

From babies to boomers, folic acid offers health benefits. According to the National Council on Folic Acid (NCFA), this important nutrient plays a role in protection against birth defects, heart disease and Alzheimer's disease. Enriched grains, such as white rice, are the primary source of this important nutrient in the U.S. diet.<sup>1</sup>

### **What is Folic Acid?<sup>2</sup>**

Folic acid is a form of the water-soluble B-vitamin folate that can be found in fortified foods and supplements. It plays a crucial role in DNA and RNA synthesis, cell formation, protein metabolism, and normal growth. Several folic acid-dependent reactions are essential for normal fetal growth and development. In addition, folic acid may play a role with vitamins B6 and B12 to regulate blood homocysteine levels. As important as folic acid is, according to the CDC, most Americans fall short of recommended levels.

### **Enriched Grains in the U.S. are Fortified with Folic Acid**

The Food and Drug Administration (FDA) mandated that enriched grain products such as rice, bread, and pasta, be fortified with folic acid to reduce the risk of neural tube defects (NTD) in newborns. Fortification is the addition of a nutrient to food so that it contains more than originally present. The FDA set fortification to 0.43 milligrams to 1.4 mg per pound of food, which is an amount that is safe for all ages and genders, and keeps overall daily intakes below recommended upper limits.<sup>3</sup>

Since 1998 when the folic acid fortification mandate came into full effect, there has been a 27% reduction in pregnancies affected by NTD.<sup>4</sup> The NCFA concludes that folic acid can prevent up to 70% of NTD if taken before and during early pregnancy from fortified foods or a multi-vitamin.

### **FOLIC ACID BENEFITS THROUGHOUT THE LIFE CYCLE**

First positively linked with healthy pregnancy outcomes, a growing body of research shows that folic acid may play a role in disease protection and healthy aging. The daily folic acid recommendation for 400 micrograms is strongly supported by the health professional community, including organizations such as United States Centers for Disease Control, March of Dimes, American Dietetic Association, National Council on Folic Acid and its 62 member organizations, and the American Heart Association.

### **Healthy Mothers, Infants, and Children**

- According to the CDC, getting enough folic acid is important for preventing neural tube defects, such as spina bifida and anencephaly (failure of the spine and brain to form normally), which can be disabling or fatal for the infant. These defects occur in the first days or weeks of pregnancy, before a woman may know she is pregnant.
- The NCFA states that folic acid can help prevent other birth defects, such as cleft lip and cleft palate.
- Adequate folic acid levels may also reduce the risk of early miscarriages.<sup>5</sup>
- Pregnant women who take folic acid supplements are less likely to develop high blood pressure during pregnancy.<sup>6</sup>

### **Healthy Hearts**

- A low folic acid intake has been linked with an increased risk of coronary events.<sup>7</sup>
- According to NCFA, studies have shown that folic acid, in combination with vitamins B12 and B6, can help prevent recurrence of blocked arteries in patients who have undergone angioplasty (a procedure to unblock an artery of the heart). Adequate folic acid intake may play a role in reducing the risk of heart disease by preventing homocysteine build-up, an amino acid naturally manufactured by our bodies that is thought to damage blood vessels. Folic acid, along with B6 and B12, works by converting homocysteine into amino acids.

### Healthy Aging

- Recent research has found short-term memory, mental agility and verbal fluency to be better among adults over 50 years of age who took 800 micrograms of folic acid daily—twice the current RDA—than those who took the placebo.<sup>8</sup>
- Early research from the American College of Physicians suggests that there may be a link between age-related hearing loss and blood levels of folic acid, a B-vitamin. After three years of taking a folic acid supplement or a placebo, participants taking folic acid had less hearing loss compared to participants taking the placebo.<sup>9</sup>
- According to NCFA, folic acid may help prevent Alzheimer's disease by protecting the neurons critical for learning and memory. Emerging research suggests that folic acid deficiency can also increase the brain's susceptibility to Parkinson's disease.

### Continuously Throughout the Life Cycle

- Folic acid is necessary for the production and maintenance of new cells.<sup>10</sup>
- Both adults and children need folic acid to make normal red blood cells and prevent anemia.<sup>11</sup>
- A new study has identified a possible link between men's folic acid intake and healthier sperm with fewer chromosomal abnormalities.<sup>12</sup>

### FOLIC ACID DEFICIENCY

According to the CDC, most Americans still do not meet the daily recommended intake of 400 mcg of folic acid despite the successes of the FDA fortification program and research linking folic acid to a growing list of health benefits.

### Who is at Risk?

- Women
  - According to the CDC, studies show that most women of childbearing age in the United States are not getting enough folic acid.
  - Up to 70% of all neural tube defects can be prevented if women consume a sufficient amount of folic acid around the time of conception and early in pregnancy.
  - According to the CDC, two out of three women fall short of the recommended 400 mcg/day of folic acid.
  - CDC also report that only one out of four women knew that folic acid prevents birth defects, and even fewer knew to take it before getting pregnant. Half of pregnancies are unplanned.
  - According to the CDC data on folic acid deficiency, women obtain only 150-200 micrograms of folic acid per day from foods that naturally contain the nutrient, and an additional 140 micrograms of folic acid through fortified foods. That is a total of approximately 250 micrograms a day of dietary folic acid, far below the recommended daily 400 micrograms.<sup>13</sup>
- Hispanic and Black women
  - CDC states that more Hispanic and black women reported low folic acid consumption than white women. Fewer Hispanic and black women than white women consumed at least 400 micrograms of folic acid from supplements and fortified foods.
- Alcoholics
  - Alcoholism is associated with low dietary intake and diminished absorption of folic acid, which can lead to folic acid deficiency.<sup>14</sup>
- Pregnancy
  - Increased rates of cell division and metabolism causes an increase in the body's demand for folic acid.<sup>15</sup>
- Medications
  - Several anti-convulsant medications may also contribute to folic acid deficiency. Consult with a medical doctor about the need to take a folic acid supplement.<sup>16</sup>

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**Signs & Symptoms<sup>17</sup>**

- Early stages of folic acid deficiency may not have obvious symptoms, though blood levels of homocysteine may rise.
- Macrocytic megaloblastic anemia (fewer but larger immature red blood cells) may be evident after approximately four months (normal red blood cell lifetime)
- Macrocytic megaloblastic anemia will lead to blood that can carry less oxygen, which may result in fatigue, weakness, and shortness of breath.<sup>18</sup>

**FOLIC ACID RECOMMENDATIONS**

**RDA for Folate for Children and Adults<sup>19</sup>**

Age (years)	Males and Females (µg/day)	Pregnancy (µg/day)	Lactation (µg/day)
1-3	150	N/A	N/A
4-8	200	N/A	N/A
9-13	300	N/A	N/A
14-18	400	600	500
19+	400	600	500

**Adequate Intake for Folate for Infants<sup>20</sup>**

Age (months)	Males and Females (µg/day)
0 to 6	65
7 to 12	80

An Adequate Intake (AI) has been established that is based on the amount of folate consumed by healthy infants who are fed breast milk.

**Absorption**

**Folic acid** in enriched grains and cereal products is well-absorbed. In contrast, naturally occurring folates in foods are highly unstable and easily degraded in storage and during cooking. Foliates are poorly absorbed at 50% the rate of a **folic acid** supplement taken on an empty stomach, which is considered to be nearly 100% absorbable.<sup>21</sup>

**Food Sources\***

High amounts of folate are naturally present in liver, yeast, beans and legumes, dark leafy greens, nuts and seeds, and citrus juices. Due to fortification, enriched grains like white rice are good sources of the nutrient. Some examples are below:

- 3 ½ ounces cooked chicken liver, 770 mcg
- 2 TBSP brewer's yeast, 626 mcg
- 1 cup cooked spinach, 262 mcg
- ½ cup cooked lentils, 197 mcg
- **1 cup of enriched white rice, 92 mcg**
- ½ cup peanuts, 90 mcg
- 1 small orange, 29 mcg
- ½ cup cooked corn, 25 mcg

\*Source: USDA Food Search for Windows, version 1.0, database version SR21

**BENEFITS OF ENRICHED RICE**

A report published in the American Journal of Clinical Nutrition showed that enriched grains like white rice contribute over 200 micrograms, or over half of Americans' total daily folate intake.<sup>22</sup>

**Folic Acid**

- U.S.-grown white rice is enriched with the important nutrients niacin, thiamin and iron, and fortified with **folic acid**.
- **Folic acid** in enriched rice is one of the most easily absorbed sources of this important nutrient in the diet; plant sources are often less available to the body.<sup>23</sup>
- One cup of cooked enriched rice delivers 92 of the daily recommended 400 micrograms (mcg) of **folic acid**, which is 23% of the Daily Value (DV).\*

**Healthy Eating**

- Enriched white rice is 85% complex carbohydrate, provides about 100 calories per half-cup cooked serving, and has no saturated or trans fat, and no sodium.
- U.S.-grown rice partners well with other healthy foods like lean proteins, vegetables and beans.

## BENEFITS OF ENRICHED RICE/Healthy Eating (continued)

- According to the *U.S. Dietary Guidelines for Americans* and MyPyramid, enriched and whole grain foods, like enriched white rice and whole grain brown rice, are among the food groups that should form the basis for a healthy diet.
- *The Guidelines* recommend 3 or more servings (1 serving = 1 ounce) of whole grain products per day, with the rest coming from enriched or whole grain foods.
- Recent research studies found that Americans who eat rice – brown or white – have healthier diets than non-rice eaters and may have reduced risk for chronic diseases including heart disease and type II diabetes.<sup>24</sup>
- The diets of rice-eaters are more in line with the Dietary Guidelines for Americans than non-rice eaters. Compared to people who do not eat rice, people who eat rice:<sup>25</sup>
  - Consume less added sugar and fat;
  - Consume more nutrients, such as folic acid, potassium and iron that are contained in rice products; and
  - Are less likely to be overweight or have an increased waist circumference;
  - Have 34% reduced risk of having high blood pressure; and
  - Have a 21% reduced risk of metabolic syndrome.

## Resistant Starch

- Rice provides resistant starch, a form of dietary fiber that may play a role in delaying type 2 diabetes, satiety, physical performance, and better immunity through digestive health.

## Value For The Food Dollar

- A half-cup serving of enriched white rice or whole grain brown rice costs about 10 cents, and one pound of uncooked rice will make two pounds of cooked rice! Adding rice to burgers and meatballs, and making more rice-based main dishes

USA Rice is a proud member of the National Council on Folic Acid (NCFA). Visit [www.USARice.com](http://www.USARice.com) for recipes and more nutrition information about U.S.-grown rice. For more information about folic acid, visit NCFA at [www.FolicAcidInfo.org](http://www.FolicAcidInfo.org).

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