

# Vitamin B9

## AT A GLANCE

### Introduction

Vitamin B9, also called folate, is one of the water-soluble B vitamins. The name comes from folium, which is the Latin word for leaves, because folates were first isolated from spinach.

Vitamin B9 can occur in different forms: the naturally occurring folate, and folic acid, a synthetic folate compound used in vitamin supplements and fortified food because of its increased stability.

### Health Functions

A sufficient intake of vitamin B9, occurring as folate (in foods) and folic acid (in supplements), is important as it helps the body as a coenzyme to

- utilize amino acids, the building blocks of proteins
- produce nucleic acids (e.g., DNA), the body's genetic material
- form blood cells in the bone marrow
- ensure rapid cell growth in infancy, adolescence, and pregnancy
- control (together with vitamin B6 and vitamin B12) blood levels of the amino acid homocysteine, associated with certain chronic conditions such as heart disease.

The European Food Safety Authority (EFSA), which provides scientific advice to assist policy makers, has confirmed that clear health benefits have been established for the dietary intake of folate (vitamin B9) in contributing to:

- normal blood formation;
- normal homocysteine;
- a normal metabolism of the immune system;
- normal cell division;
- normal maternal tissue growth during pregnancy.

### Disease Risk Reduction

#### **Birth defects**

Studies have found that women who take vitamin B9 (folic acid) supplements before conception and during the first four months of pregnancy (before a woman may even know she is pregnant) may reduce their risk of having children with neural tube defects by 72-100%. Folic acid may also help prevent miscarriage, although the evidence is not clear.

#### **Heart disease**

There is some evidence that getting enough vitamin B9 (folate) in diet may reduce the risk of heart disease. However, this evidence is based on population studies and not on definitive clinical trials.

In addition, because folic acid helps control levels of an amino acid called homocysteine in the body, and because homocysteine levels tend to be high in people with heart disease, some researchers theorize that lowering levels of homocysteine may help prevent heart disease, heart attack, and stroke. However, more research is needed to clarify the relationship between homocysteine, heart disease, and the potential benefits of folic acid supplements.

### **Cancer**

Vitamin B9 (folate) appears to protect against the development of some forms of cancer, particularly cancer of the colon and the breast. However, this evidence is based on population studies that show people who get enough folate in their diet have lower rates of these cancers. Presently, there is no proof that taking folic acid supplements helps prevent cancer.

### **Alzheimer's disease**

People who have Alzheimer's disease often have low levels of folic acid in their blood, but it is not clear whether this is a result of the disease or if they are simply malnourished due to their illness. There is some evidence that consuming adequate amounts of vitamin B9 - either in the diet or by supplementation - could be beneficial to the aging brain and help protect it against Alzheimer's and other forms of dementia.

## **Other Applications**

*Please note:*

*Any dietary or drug treatment with high-dosed micronutrients needs medical supervision.*

### **Depression**

Some studies show that 15-38% of people with depression have low folate levels in their bodies, and those with very low levels tend to be the most depressed. Low levels of folic acid have also been associated with a poor response to antidepressants. More research is needed to understand the link; it appears that folic acid may help enhance the effect of antidepressants, at least in some people, but folic acid itself is not a replacement for antidepressants.

## **Intake Recommendations**

While in Europe the recommended intakes for vitamin B9 (folate) varies between 200 and 400 micrograms (mcg) per day for adults in different countries, in the U.S., 400 mcg/day for adults, 600 mcg/day during pregnancy, and 500 mcg/day for breast-feeding women have been defined as adequate.

## **Supply Situation**

In most European countries, the average vitamin B9 (folate) intake is below national recommendations. In the U.S., less than half of women who become pregnant follow the recommendation, despite the effectiveness of vitamin B9 (folic acid) supplementation in preventing neural tube defects.

## **Deficiency**

Folate deficiency is one of the commonest vitamin deficiencies. It can result from inadequate intake, defective absorption, abnormal metabolism or increased requirements.

Early symptoms of folate deficiency are non-specific and may include tiredness, irritability and loss of appetite. Severe folate deficiency leads to megaloblastic anemia, a condition in which the bone marrow produces oversized immature red blood cells.

Pregnant and breast-feeding women are at a higher risk of vitamin B9 deficiency: due to rapid tissue growth during pregnancy and to losses through the milk during breast-feeding, an increased folate/folic acid intake is required. In pregnant women, vitamin B9 deficiency can result in devastating and sometimes fatal birth defects (e.g., neural tube defects).

## Sources

Folates are found in a wide variety of foods. Its richest sources are liver, dark green leafy vegetables, beans, wheat germ and yeast. Other sources are egg yolk, milk and dairy products, beets, orange juice and whole wheat bread.

## Safety

No adverse effects have been associated with the consumption of excess dietary vitamin B9 (folate).

### **Prostate cancer risk**

A study has indicated a higher incidence of prostate cancer after several years' intake of vitamin B9 (folic acid) supplements. However, experts have raised serious doubts about these conclusions because of invalid study design (see also Expert Opinion).

### **Tolerable upper intake level**

To avoid potential adverse effects health authorities in Europe and the U.S. have set a tolerable upper intake level for vitamin B9 of 1 mg per day for adults.

### **Drug interactions**

*Please note:*

*Because of the potential for interactions, dietary supplements should not be taken with medication without first talking to an experienced healthcare provider.*