



## Vitamin B12

### AT A GLANCE

#### Introduction

Vitamin B12 is the largest and most complex of all the vitamins. Vitamin B12 comprises the only cobalt-containing molecules (so-called cobalamins), with biological activity in humans. The cobalt gives this water-soluble vitamin its red color.

#### Health Functions

A sufficient intake of vitamin B12, also known as cobalamin, is important as it helps the body to

- convert food into glucose, which is used to produce energy
- maintain healthy nerve cells
- produce nucleic acids (e.g., DNA), the body's genetic material
- regulate, together with vitamin B9 (folate), the formation of red blood cells
- control, together with vitamin B6 and vitamin B9, blood levels of the amino acid homocysteine, a potential marker for heart disease risk.

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 vitamin B12 in contributing to:

- normal red blood cell formation;
- normal cell division;
- normal energy metabolism;
- a normal function of the immune system.

#### Disease Risk Reduction

##### Heart disease

High levels of the amino acid homocysteine in the blood are associated with heart disease. However, researchers are not sure whether homocysteine is a cause of heart disease or merely a marker that indicates someone may have heart disease. Although increased intake of vitamin B12 and vitamin B9 (folic acid) has been found to decrease homocysteine levels, it is not presently known whether increasing intake of these vitamins will translate to reductions in risk for heart disease.

##### Breast cancer

Although there is no evidence that vitamin B12 alone reduces the risk of breast cancer, some population studies have shown that women who get more vitamin B9 (folate) in their diet have lower incidence of breast cancer. As vitamin B12 acts together with folate in the body, it may help contribute to a lesser risk.

### **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.

As vitamin B12 interacts with folate in the body, it may help contribute to a lesser risk of birth defects.

### **Alzheimer's disease**

Individuals with Alzheimer's disease often have low blood levels of vitamin B12. However, daily supplementation with vitamin B12, vitamin B9, and vitamin B6 did not affect symptoms.

### **Depression**

Studies have shown that 30% of patients hospitalized for depression are deficient in vitamin B12. However, because few studies have examined the relationship between vitamin B12 status and the development of depression over time, it cannot yet be determined if vitamin B12 deficiency plays a causal role in depression.

## **Other Applications**

*Please note:*

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

### **Pernicious anemia**

Pernicious anemia occurs when stomach cells are not able to make a certain protein the body needs to absorb vitamin B12. Pernicious anemia can be a dangerous condition, which has been treated successfully with vitamin B12 supplements in high doses.

### **Hyperhomocysteinemia**

Studies indicate that high levels of homocysteine in the blood appear to promote mortality and cardiovascular disease. Some evidence exists that keeping homocysteine at levels associated with lower rates of disease requires adequate vitamin B12, vitamin B9 (folic acid) and vitamin B6 intake.

### **Weariness**

Small studies have suggested that people in a state of physical and mental weariness (fatigue) who are not deficient in vitamin B12 might gain more energy from vitamin B12 injections.

### **Male infertility**

Studies have suggested that vitamin B12 supplements may improve sperm counts and sperm mobility. However, the evidence is weak.

## **Intake Recommendations**

Intake recommendations for vitamin B12 in adults vary between 1.4 micrograms (mcg) per day in the European Union and 2.4 mcg/day in the U.S. During pregnancy an additional 0.2 mcg/day, and during breast-feeding an additional 0.4 mcg/day have been defined as adequate.

## **Supply Situation**

For many countries average intakes between 3.0 and 4.5 micrograms (mcg) vitamin B12 per day were reported for adult men and women.

## Deficiency

Mild deficiencies of vitamin B12 are not uncommon in elderly people (10-15% of individuals over the age of 60), either because of poor diet or because they have less stomach acid, which the body needs to absorb vitamin B12.

Low levels of B12 can cause a range of symptoms including fatigue, shortness of breath, diarrhea, nervousness, numbness, or a tingling sensation in the fingers and toes. Severe deficiency of B12 causes neurological damage.

## Sources

Vitamin B12 is produced exclusively by microbial synthesis in the digestive tract of animals. Therefore, animal protein products, in particular organ meats (e.g., liver, kidney), are the source of vitamin B12 in the human diet. Other good sources are fish, eggs and dairy products.

## Safety

Vitamin B12 is considered safe and non-toxic.

### **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.*