



Drugs and Supplements

Vitamin B12

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Background

Vitamin B12 is an essential water-soluble vitamin that is commonly found in a variety of foods, such as fish, shellfish, meat, eggs, and dairy products. Vitamin B12 is frequently used in combination with other B vitamins in a vitamin B complex formulation. Vitamin B12 is important in DNA synthesis. Vitamin B12 is bound to the protein in food. Acid in the stomach releases B12 from protein during digestion. Once released, B12 combines with a substance called intrinsic factor (IF) before it is absorbed into the bloodstream.

The human body stores several years' worth of vitamin B12 in the liver, so low levels in the body are rare. Decreases in vitamin B12 levels are more common in the elderly, HIV-infected persons, and vegetarians. Inability to absorb vitamin B12 from the intestinal tract can cause a type of anemia called pernicious anemia. Fever and symptoms of "excessive sweating" have been reported with anemia due to low levels of vitamin B12; however, these are fixed with vitamin B12 treatment.

Dosing

The below doses are based on scientific research, publications, traditional use, or expert opinion. Many herbs and supplements have not been thoroughly tested, and safety and effectiveness may not be proven. Brands may be made differently, with variable ingredients, even within the same brand. The below doses may not apply to all products. You should read product labels, and discuss doses with a qualified healthcare provider before starting therapy.

Adults (18 years and older)

Recommended dietary amounts (RDAs) are 2.4 micrograms daily for ages 14 years and older, 2.6 micrograms daily for pregnant females, and 2.8 micrograms daily for breastfeeding females. Those over 50 years of age should meet the RDA by eating foods reinforced with B12 or by taking a vitamin B12 supplement. Supplementation of 25-100 micrograms daily has been used to maintain vitamin B12 levels in older people. A doctor and a pharmacist should be consulted for use in other indications.

For canker sores, sublingual (under the tongue) vitamin B12 has been given daily for six months.

For claudication, a total daily dose of 1.5 milligrams of vitamin B12 was taken by mouth in divided doses of 0.5 milligrams three times daily for six months.

For vitamin B12 deficiency, 125-2,000 micrograms of cyanocobalamin has been taken by mouth daily for up to 2.5 years or longer. Five hundred micrograms of sublingual (under the tongue) vitamin B12 has been used daily for up to four weeks. The following doses have been given intravenously (through the veins): 1,000 micrograms of intramuscular cobalamin once daily for 10 days (after 10 days, the dose was changed to once weekly for four weeks, followed by once monthly for life); 1,000 micrograms of intramuscular cyanocobalamin given on days 1, 3, 7, 10, 14, 21, 30, 60, and 90 of treatment. For vitamin B12 deficiency caused by long-term PPI therapy, cyanocobalamin nasal spray has been used for eight weeks. The exact dosage is unclear. One study tested intranasal vitamin B12 replacement therapy (500 micrograms weekly).

For prevention of anemia, the following doses have been taken by mouth: 2-10 micrograms of vitamin B12 daily combined with iron and/or folic acid for up to 16 weeks; 100 micrograms of vitamin B12 every other week plus daily folic acid and/or iron for up to 12 weeks.

For mental performance, the following doses have been taken by mouth: 0.05-1 milligram vitamin B12 taken daily for four weeks to 5.4 years; 10 micrograms or 50 micrograms of cyanocobalamin daily for one month; and one milligram of cyanocobalamin weekly for four weeks. One 1,000 microgram vitamin B12 injection has been used daily for five days, followed by one 1,000 microgram injection monthly for five months. Additionally, 1000 microgram injections have been used weekly for four weeks or monthly for six months.

For cyanide poisoning, an intravenous (IV) infusion of five grams of hydroxocobalamin (up to 20 grams) has been used.

For depression, one milligram of cyanocobalamin, through intramuscular injections, was used weekly for four weeks.

For hereditary sideroblastic anemia, 100 micrograms of intramuscular vitamin B12 has been used monthly, with or without daily folic acid, for up to four months.

Children (under 18 years old)

Recommended dietary amounts (RDAs) are lacking for all age groups; therefore,

adequate intake (AI) levels have been used instead. The RDAs and AI levels of vitamin B12 are as follows: for infants 0-6 months old, 0.4 micrograms (AI); for infants 7-12 months old, 0.5 micrograms (AI); for children 1-3 years old, 0.9 micrograms; for children 4-8 years old, 1.2 micrograms; and for children 9-13 years old, 1.8 micrograms.

Evidence

These uses have been tested in humans or animals. Safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider.

Key to grades

- A** Strong scientific evidence for this use
- B** Good scientific evidence for this use
- C** Unclear scientific evidence for this use
- D** Fair scientific evidence against this use (it may not work)
- F** Strong scientific evidence against this use (it likely does not work)

Grading rationale

A

Megaloblastic anemia (due to vitamin B12 deficiency)

Low levels of vitamin B12 are a cause of megaloblastic anemia, in which red blood cells are larger than normal. Other possible causes include folate deficiency or various metabolic disorders. Anemia should be diagnosed by a physician to address the underlying cause.

A

Vitamin B12 deficiency

Studies have shown that a deficiency of vitamin B12 can lead to abnormal mental symptoms. These symptoms may include ataxia (shaky movements and unsteady gait), muscle weakness, spasticity (stiff or rigid muscles), incontinence (lack of bladder and/or bowel control), hypotension (low blood pressure), vision problems, dementia, psychoses (abnormal condition of the mind), and mood disturbances. Giving vitamin B12 by mouth, by injection, or by nasal inhalation is effective for

preventing and treating dietary vitamin B12 deficiency.

C

Alzheimer's disease

Some people diagnosed with Alzheimer's disease have been found to have abnormally low vitamin B12 levels in their blood. The effects of vitamin B12 supplementation on the prevention or progression of Alzheimer's disease remain unclear. More studies are needed before a conclusion can be made.

C

Angioplasty (opening narrowed/blocked arteries)

Some evidence suggests that giving prescription-strength folic acid and vitamins B12 and B6 for six months following coronary angioplasty reduced the risk of overall adverse cardiac events; however, other studies have found this combination to increase restenosis (reoccurrence of narrowing of a blood vessel). Further research is needed before a conclusion can be made.

C

Breast cancer

Researchers have reported that women with breast cancer tend to have lower vitamin B12 levels in their blood serum than do women without breast cancer. However, one study found that giving a combination of folic acid, vitamin B6, and vitamin B12 failed to decrease the risk of breast cancer. Further research is needed before conclusions can be made.

C

Canker sores

Vitamin B12 and vitamin B12 injections combined with hydrocortisone were studied to treat recurrent canker sores; although treatment with sublingual vitamin B12 may have some benefit, further research is needed before a conclusion can be made.

C

Cardiovascular disease/hyperhomocysteinemia

High homocysteine levels in the blood have been suggested as being a risk factor for cardiovascular disease, blood clotting abnormalities, atherosclerosis (hardening of arteries), heart attack, and stroke (due to a blood clot). Taking vitamin B12 supplements in combination with other B vitamins (mainly folic acid) has been shown to be effective for lowering homocysteine levels. It is unclear whether lowering homocysteine levels has an effect on cardiovascular disease risk and death. More evidence is needed.

C

Cervical cancer

Some evidence suggests that vitamin B12 supplementation may have a role in preventing cervical cancer. Further research is warranted in this area.

C

Claudication (leg pain from clogged arteries)

Human research evaluated the effects of vitamin B12 and results demonstrated that although walking distance was improved, sufficient high quality evidence was lacking. Further research is needed before a conclusion can be made.

C

Depression

A combination of folic acid, vitamin B12, and vitamin B6 lacked any difference in symptoms of depression in older men as compared to placebo. Well-designed clinical trials are needed to confirm any potential benefit.

C

Diabetic neuropathy (nerve damage)

Some evidence suggests that supplementation with vitamin B12 may be helpful in people with diabetic neuropathy. More research is needed in this area.

C

Diagnostic procedure

In order to detect the presence of vitamin B12, lab tests to measure plasma and serum vitamin B12 may be used; however, many investigators believe testing is unreliable. Research has reported that diagnosis of vitamin deficiencies cannot be made by evaluating vitamin B12 levels alone.

C

Facial spasm

Research has reported that vitamin B12 lacked any benefit over acupuncture in treatment of facial spasm. Further research is needed before a conclusion can be made.

C

Fatigue

There is some evidence that vitamin B12 injections given twice weekly may improve the general well-being and happiness of people complaining of tiredness or fatigue. Further studies are needed before a conclusion can be made.

C

Fractures (prevention)

Some evidence suggests that a combination of vitamins including vitamin B12 may help prevent fractures. More research is needed.

C

High cholesterol

Some evidence suggests that vitamin B12 in combination with fish oil may be better than fish oil alone when used daily to reduce cholesterol and triglyceride levels. More studies are needed before a conclusion can be made.

C

Imerslund-Grasbeck disease

Vitamin B12 injections may be effective for treating a hereditary form of vitamin B12 malabsorption (Imerslund-Grasbeck disease). Further research is needed to confirm these results.

C

Joint pain (elbow)

Preliminary research suggests that vitamin B12 may be effective for elbow pain, but evidence is lacking. Further research is needed.

C

Mental performance

Increased homocysteine levels have been associated with lower mental testing scores. However, there was a lack of association between low vitamin B12 blood levels and mental decline, Alzheimer's disease, or dementia. More research is needed before a conclusion can be made.

C

Poisoning (cyanide)

Hydroxocobalamin (a chemical form of vitamin B12) has been approved by the United States Food and Drug Administration (FDA) since 2006 as a potential antidote for treatment in people with suspected smoke inhalation cyanide toxicity, and although research is lacking on the use of hydroxocobalamin in pregnant women, it did gain FDA approval in pregnant women in 2010. In addition, according to the Australian Resuscitation Council, serious adverse effects with hydroxocobalamin were lacking, and many people with fatal cyanide poisoning had survived.

C

Shaky-leg syndrome

Clinical reports show that shaky-leg syndrome may be due to vitamin B12 deficiency. Further research is needed to confirm these results.

C

Sickle cell disease

Early study suggests that a daily combination including folic acid, vitamin B12, and vitamin B6 may reduce endothelial (cells lining vascular walls) damage in people with sickle cell disease. Further research is needed to confirm these results.

C

Sleep disorders (circadian rhythm)

Taking vitamin B12 by mouth lacked any effectiveness for treating delayed sleep phase syndrome. Giving vitamin B12 with bright light therapy may be helpful for adolescents with circadian rhythm sleep disorders. More research is needed in this area.

D

Lung cancer

One study found an increase in lung cancer in people with heart disease in Norway whom were taking vitamin B12 and folic acid. More research is needed to better understand this relationship.

D

Stroke

In people with a history of stroke, neither high-dose nor low-dose vitamin B12 combinations containing vitamin B6, vitamin B12, and folic acid seem to affect risk of recurring stroke.

Uses based on tradition or theory

The below uses are based on tradition or scientific theories. They often have not been thoroughly tested in humans, and safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider.

Aging, AIDS, allergies, amyotrophic lateral sclerosis, asthma, autism, bleeding, blood clots, chemotherapy side effects, chronic fatigue syndrome, diabetes, energy level enhancement, growth disorders (failure to thrive), immunosuppression (decrease in immune function), improving concentration, inflammatory bowel disease, kidney disease, Leber's disease, liver disease, male infertility, malignant tumors, memory loss, mood (elevate), mouth and throat inflammation (atrophic glossitis), mental disorders, movement disorders (tremor), multiple sclerosis, myoclonic disorders (spinal myoclonus), neural tube defects, periodontal disease (dental and mouth disorders), prevention of pregnancy complications, protection from tobacco smoke,

ringing in the ears (tinnitus), skin disorders (seborrheic dermatitis), skin pigmentation disorders (vitiligo), seizure disorders (West syndrome), tennis elbow (tendonitis), thyroid disorders (increased thyroid hormone).

Interactions

Interactions with Drugs

Vitamin B12 may interact with agents for bone loss, cancer, gout (colchicine), high blood pressure (angiotensin-converting enzyme inhibitors), and for stomach and intestine disorders (H2 blockers, proton pump inhibitors), agents that affect blood products, agents that affect the nervous system, alcohol, Alzheimer's agents, antibiotics (neomycin), anti-seizure agents, aspirin, bile acid sequestrants, birth control pills, cardiovascular agents, chloramphenicol, metformin, nicotine, nitrous oxide, para-aminosalicylic acid, stimulants, and zidovudine.

Interactions with Herbs and Dietary Supplements

Vitamin B12 may interact with herbs and supplements for bone loss, cancer, cholesterol, gout, high blood pressure, and for stomach and intestine disorders, herbs and supplements that affect blood products and that affect the nervous system, Alzheimer's herbs and supplements, antibacterials, anti-seizure herbs and supplements, birth control, cardiovascular herbs and supplements, folic acid, omega-3 fatty acids, potassium, salicylates, stimulants, tobacco, and vitamin C.

Methodology

This information is based on a systematic review of scientific literature and was peer-reviewed and edited by contributors to the Natural Standard Research Collaboration (www.naturalstandard.com).

[Monograph methodology](#)

Related terms

Adenosylcobalamin, AdoB12, B complex, B complex vitamin, B-12, bedumil, cobalamin, cobalamins, cobamin, cyanocobalamin, cyanocobalamine, cyanocobalaminum, cycobemin, hydroxocobalamin, hydroxocobalaminum, hydroxocobemine, idrossocobalamina, mecobalamin, methylcobalamin, vitadurin, vitamin B-12, vitamina B12 (Spanish), vitamine B12 (French).

Safety

The U.S. Food and Drug Administration does not strictly regulate herbs and supplements. There is no guarantee of strength, purity or safety of products, and effects may vary. You should always read product

labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy. Consult a healthcare provider immediately if you experience side effects.

Allergies

Vitamin B12 supplements should be avoided in people sensitive or allergic to vitamin B12, cobalt, or any other product ingredient.

Side Effects and Warnings

Vitamin B12 is likely safe when taken according to the recommended dietary amounts (RDA) or less.

Use cautiously in people with heart concerns, due to an increase in rates of restenosis (reoccurrence of narrowing of a blood vessel) after stent placement and vitamin B12 supplementation.

Use cautiously in people with high blood pressure, as high blood pressure following intravenous (IV) administration of hydrocobalamin has been reported.

Use cautiously in people with a history of cancer.

Use cautiously in people with skin disorders, as rash, itching, and burning have been reported. Pink or red skin discoloration and facial flushing have also been reported.

Use cautiously in people with genitourinary concerns, as urine discoloration has been reported.

Use cautiously in people with gastrointestinal concerns, as nausea, difficulty swallowing, and diarrhea have been reported.

Use cautiously in people with blood disorders, as it has been reported that treatment of vitamin B12 deficiency may lead to an increase in blood volume and the number of red blood cells.

Use cautiously in people with low serum levels of potassium, as the correction of megaloblastic anemia with vitamin B12 may result in fatally low potassium levels.

Use cautiously in people with a history of gout, or elevated uric acid levels, as the correction of megaloblastic anemia with vitamin B12 may start a gout attack.

Use cautiously in people taking the following agents, as they have been associated with reduced absorption or reduced serum levels of vitamin B12: ACE inhibitors, acetylsalicylic acid (aspirin), alcohol, antibiotics, anti-seizure agents, bile acid sequestrants, chloramphenicol, colchicine, H2 blockers, metformin, neomycin, nicotine, nitrous oxide, oral contraceptives, para-aminosalicylic acid, potassium chloride, proton pump inhibitors (PPIs), tobacco, vitamin C, and zidovudine (AZT, Combivir®, Retrovir®).

Avoid in people sensitive or allergic to vitamin B12, cobalt, or any other product ingredient.

Pregnancy and Breastfeeding

Vitamin B12 is likely safe when taken according to the recommended dietary amounts (RDA) or less. There is insufficient reliable information available about the safety of larger amounts of vitamin B12 during pregnancy.

Infants, when breastfed by a vitamin B12-deficient mother, are at risk for many health issues such as severe developmental disorders, growth failure, and anemia. Some research has reported that vitamin B12 levels during pregnancy have effects on mental function in infants.

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Portions of this document last updated: Nov. 01, 2013

Original article: <http://www.mayoclinic.org/drugs-supplements/vitamin-b12/evidence/hrb-20060243>

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