

# VITAMIN B<sub>12</sub>

**Other names** Cobalamin, cobalamins, cyanocobalamin, hydroxocobalamin

## Availability

Vitamin B<sub>12</sub> is available without prescription in a wide variety of preparations. Hydroxocobalamin is given only by injection under medical supervision.

## Actions on the body

Vitamin B<sub>12</sub> plays a vital role in the activities of several enzymes. It is essential for the manufacture of the genetic material of cells and thus for growth and development. The formation of red blood cells by the bone marrow is particularly dependent on this vitamin. It is also involved in the utilization of folic acid and carbohydrates in the diet, and is necessary for maintaining a healthy nervous system.

## Dietary and other natural sources

Liver is the best dietary source of vitamin B<sub>12</sub>. Almost all animal products, as well as seaweed, are also rich in the vitamin, but vegetables are not.

## Normal daily requirement

Only minute quantities of vitamin B<sub>12</sub> are required. The recommended daily amounts (RDA) are: 0.3mcg (birth–6 months); 0.4mcg (7–12 months); 0.5mcg (1–3 years); 0.8mcg (4–6 years); 1mcg (7–10 years); 1.2mcg (11–14 years); 1.5mcg (15 years and over); 2mcg (breast-feeding). Requirements of vitamin B<sub>12</sub> are unchanged in pregnancy but are increased by 0.5mcg per day during breast-feeding.

## When supplements are helpful

A balanced diet usually provides more than adequate amounts of this vitamin, and deficiency is generally due to impaired absorption from the intestine rather than low dietary intake. However, a strict vegetarian or vegan diet lacking in eggs or dairy products is likely to be deficient in vitamin B<sub>12</sub>, and supplements are usually needed. The most common cause of deficiency is pernicious anaemia, in which absorption of the vitamin is impaired due to inability of the stomach to secrete a special substance – known as intrinsic factor – that normally combines with the vitamin so that it can be taken up in the intestine. Supplements are also prescribed on medical advice in certain bowel disorders, such as coeliac disease and various other causes of malabsorption, after surgery to the stomach or intestine, and in fish tapeworm infestation.

## Symptoms of deficiency

Vitamin B<sub>12</sub> deficiency usually develops over months or years – the liver can store up to 6 years' supply. Deficiency leads to anaemia. The mouth and tongue often become sore. The brain and spinal cord may also be affected, leading to numbness and tingling of the limbs, memory loss, and depression.

## Dosage range for treating deficiency

Depends on the individual and on the type and severity of deficiency. Pernicious anaemia (due to impaired absorption of vitamin B<sub>12</sub>) is treated in adults with injections of 0.25mg–1mg (250–1,000mcg) on alternate days for 1–2 weeks, then 0.25mg per week until blood counts are normal, then 1mg every month (cobalamin) or every 2–3 months (hydroxocobalamin). Higher monthly doses of up to 1,000mcg of B<sub>12</sub> (on alternate days if there is neurological involvement), together with folic acid, may be given if the deficiency is severe. Children are treated with a total of 30–50mcg daily (cobalamin) or the same amounts as adults (hydroxocobalamin). Dietary deficiency is usually treated with oral supplements of 50–150mcg or more daily or 50–105mcg (cyanocobalamin) and 35–50mcg twice daily in infants. Deficiency that results from a genetic defect preventing use of the vitamin is treated with 250mcg every three weeks throughout life.

## Symptoms and risks of excessive intake

Harmful effects from high doses of vitamin B<sub>12</sub> are rare. Allergic reactions may, rarely, occur with preparations given by injection.

# VITAMIN C

**Other names** Ascorbic acid, calcium ascorbate, sodium ascorbate

## Availability

Vitamin C is available without prescription in a wide variety of single-ingredient and multivitamin and mineral preparations. Ascorbic acid injection is given only under specialized medical supervision.

## Actions on the body

Vitamin C plays an essential role in the activities of several enzymes. It is vital for the growth and maintenance of healthy bones, teeth, gums, ligaments, and blood vessels, and is an important component of all body organs. Vitamin C is also recognized as an important antioxidant (i.e., it protects the body against cell damage and may prevent fat deposits from building up in the blood vessels) and is important for the manufacture of certain neurotransmitters and adrenal hormones. It is required for the utilization of folic acid and absorption of iron. This vitamin is also necessary for normal immune responses to infection and for wound healing.

## Dietary and other natural sources

Vitamin C is found in most fresh fruits and vegetables. Citrus fruits, tomatoes, potatoes, and leafy green vegetables are good dietary sources. This vitamin is easily destroyed by cooking; some fresh, uncooked fruit and vegetables should be eaten daily. Adding a daily source of vitamin C, such as a glass of orange juice, is also recommended.

## Normal daily requirement

The recommended daily amounts (RDA) for vitamin C are: 25mg (birth–1 year); 30mg (1–10 years); 35mg (11–14 years); 40mg (15 years and over); 50mg (pregnancy); and 70mg (breast-feeding).

## When supplements are helpful

A healthy diet generally contains sufficient quantities of vitamin C. However, it is used up more rapidly after a serious injury, major surgery, burns, and in extremes of temperature. Supplements may be necessary to prevent or treat deficiency in the elderly and chronically sick, for smokers, and in severe alcoholism. They are recommended with other vitamins for pregnant women, children under 5 years, and nursing mothers. Women taking oestrogen-containing contraceptives may also require supplements. Although many people take larger doses (1g daily) for the prevention or treatment of colds, there is no convincing evidence that vitamin C in large doses prevents them, although it may reduce the severity of symptoms.

## Symptoms of deficiency

Mild deficiency may cause weakness and aches and pains. Severe deficiency results in scurvy, the symptoms of which include inflamed, bleeding gums, nosebleeds, excessive bruising, and internal bleeding. In adults, teeth become loose. In children, there is abnormal bone and tooth development. Wounds fail to heal and become infected. Deficiency of vitamin C often leads to anaemia (abnormally low levels of red blood cells), the symptoms of which are pallor, fatigue, shortness of breath, and palpitations. Untreated scurvy may cause seizures, coma, and death.

## Dosage range for treating deficiency

For scurvy, at least 250mg of vitamin C is given daily for several weeks.

## Symptoms and risks of excessive intake

The risk of harmful effects is low, since excess vitamin C is excreted in the urine. However, doses of over 2g daily may cause diarrhoea, nausea, and stomach cramps. Kidney stones may occasionally develop.