Vitamin B12

Summary

Vitamin B12 (cobalamin, B12) is a water-soluble essential nutrient that can be stored in the body for many years. Absorption of B12 is relatively complex, requiring intrinsic factor from the stomach wall. People with atrophic gastritis or lacking major parts of the stomach do not absorb B12 well and have accelerated losses of the stored vitamin. Vitamin B12 deficiency causes neural degeneration with serious and often irreversible neuropsychiatric and neurological symptoms. Vegans and those over the age of 60 should use B12 supplements.

Chemical Form and Metabolism

Vitamin B12 (cobalamin, B12) is a water-soluble essential nutrient that comes as cyanocobalamin, aquacobalamin, 5-deoxyadenosylcobalamin and methylcobalamin. Absorption of B12 is relatively complex, requiring intrinsic factor from the stomach wall and several transporters including cubilin. People with atrophic gastritis or lacking major parts of the stomach do not absorb B12 well and have accelerated losses of the stored vitamin. B12 in cells has to be reduced before it can be linked to the enzymes for which it is a cofactor. Nitrous oxide (laughing gas, a still commonly used anaesthetic) oxidizes enzyme-bound B12 and inactivates it irreversibly. Some people are particularly susceptible to severe and potentially fatal harm from vitamin B12 inactivation by nitrous oxide. 1,2

Functions

Vitamin B12 deficiency 3 causes neural degeneration with serious and often irreversible neuropsychiatric and neurological symptoms, including cognitive decline,4 hallucinations 5 and dementia, paresthesia, and unstable gait. Tinnitus, tingling toes or hyperpigmentation 6 can be tell-tale symptoms. Anemia in older people with poor B12 status can be mild and is not a reliable sign.

Major Dietary Sources

B12 comes only from foods of animal origin (mostly meats, fish, dairy products, and eggs), dietary supplements and fortified foods. Neither plants nor algae contain any usable form of B12.

Clinical Uses

Vegans are most at risk of deficiency. The greatest concern is for women with low B12 intake because the risk of birth defects increases and breast-fed infants may not get enough B12 from milk alone. Vegans should always use a dietary supplement with at least 2 µg/day. The Institute of Medicine recommends that older people also use a supplement because absorption becomes less reliable with advancing age.

Potential Side Effects

None known so far.

Practical Significance

Many people, including vegans, pregnant and lactating women, and those over the age of 60,
should use B12 supplements to prevent otherwise common deficiency. Anyone getting nitrous oxide anesthesia or abusing nitrous oxide for entertainment purposes must get high-dosed B12 for a few days.

References