

VITAMIN B₁₂ DEFICIENCY

Vitamin B₁₂ (cobalamin), with folic acid, is necessary for the maturation of red blood cells and the synthesis of DNA (deoxyribonucleic acid), the genetic material of cells. Vitamin B₁₂ is also necessary for normal nerve function. Unlike most other vitamins, B₁₂ is stored in substantial amounts, mainly in the liver. The body's stores of this vitamin would take about 3 to 5 years to exhaust.

Vitamin B₁₂ Deficiency

Usually, vitamin B₁₂ deficiency is due to inadequate absorption. The cause may be lack of intrinsic factor, a protein produced in the stomach. Normally, vitamin B₁₂ is readily absorbed in the last part of the small intestine (ileum), which leads to the large intestine. However, to be absorbed, the vitamin must combine with intrinsic factor. Without intrinsic factor, vitamin B₁₂ remains in the intestine and is excreted in the stool. Intrinsic factor may be lacking because, for example, abnormal antibodies, produced by an overactive immune system, attack and destroy the stomach cells that produce intrinsic factor - an autoimmune reaction.

Older people may have a vitamin B₁₂ deficiency because stomach acidity is low, reducing the body's ability to remove vitamin B₁₂ from the protein in meat. Abnormal growth of bacteria in the small intestine may reduce the absorption of vitamin B₁₂. Disorders that impair the absorption of nutrients in the intestine can reduce the absorption of vitamin B₁₂. Fish tapeworm infection may also reduce the absorption of vitamin B₁₂ in the intestine. Liver disorders may interfere with the storage of vitamin B₁₂. Surgery that removes the stomach (where intrinsic factor is produced) or the part of the small intestine where vitamin B₁₂ is absorbed can result in a deficiency. A strict vegetarian diet may also cause vitamin B₁₂ deficiency because vitamin B₁₂ is available only in animal products. Infants who are breastfed by a mother who is a strict vegetarian are at risk of vitamin B₁₂ deficiency.

Symptoms

Because vitamin B₁₂ is necessary for the production of mature blood cells, deficiency of this vitamin can result in anemia, characterized by abnormally large red blood cells (macrocytes) and white blood cells with abnormal nuclei. The type of anemia that results when an autoimmune reaction destroys the stomach cells that produce intrinsic factor is called pernicious anemia. Because the liver stores a large amount of vitamin B₁₂, pernicious anemia may not develop until 3 to 5 years after the body stops absorbing vitamin B₁₂.

Vitamin B₁₂ deficiency anemia develops gradually, allowing the body to adapt somewhat. Consequently, the anemia may be more severe than the symptoms indicate. Anemia causes paleness, weakness, and fatigue. Severe anemia causes shortness of breath, dizziness, and a rapid heart rate.

Vitamin B₁₂ deficiency can also cause nerve damage (neuropathy) even when no anemia develops, particularly in people older than 60. The legs are affected earlier and more often than the arms. Tingling is felt in the feet and hands, and sensation in the legs, feet, and hands is lost. Vibration and position senses are also lost. Mild to moderate muscle weakness develops, and reflexes may be lost. Walking becomes difficult. Some people become confused, irritable, and mildly depressed. Advanced vitamin B₁₂ deficiency may lead to delirium, paranoia, and impaired mental function, including dementia.

Diagnosis

Usually, vitamin B₁₂ deficiency is suspected when routine blood tests detect large red blood cells. If this deficiency is suspected, the level of vitamin B₁₂ in the blood is measured. If a deficiency is confirmed in an older person, no other tests are performed, because the cause, such as low stomach acidity, is usually not serious. In a younger person, tests to determine the cause may be performed, usually focusing on intrinsic factor.

If the cause of vitamin B₁₂ deficiency is still unclear, a Schilling test may be performed. A tiny amount of radioactive vitamin B₁₂ is given by mouth, and the amount absorbed is measured. Then vitamin B₁₂ is given with intrinsic factor, and the amount absorbed is measured. If vitamin B₁₂ is absorbed only when given with intrinsic factor, the diagnosis of pernicious anemia is confirmed.

Treatment

Treatment of vitamin B₁₂ deficiency or pernicious anemia consists of replacing vitamin B₁₂. People who have symptoms due to nerve damage are usually given vitamin B₁₂ by injection. Injections are given daily or weekly for several weeks until the level of vitamin B₁₂ returns to normal. Then injections are given once a month indefinitely, unless the disorder causing it can be corrected. For people who have the deficiency but no symptoms, the vitamin may be taken by mouth, but blood tests are performed periodically to make sure the vitamin B₁₂ level returns to and remains normal. Severe symptoms - for example, dementia in an older person - may not resolve.