CONDITION

Vitamin B12 deficiency anemia

Vitamin B12 deficiency anemia is reduced healthy red blood cell production caused by too little vitamin B12.

WHAT IT IS
Anemia caused by insufficient vitamin B12

BODY SYSTEM
Blood and nervous system

MAIN SYMPTOMS
Tiredness, breathlessness, numbness, balance problems

WHAT CAUSES IT
Poor intake, malabsorption, autoimmune gastritis, or nitrous oxide

HOW IT IS DIAGNOSED
Blood count, vitamin B12, sometimes methylmalonic acid

MAIN TREATMENT
Vitamin B12 replacement and cause management

CAN IT BE CURED?
Sometimes - reversible causes can be corrected

IS IT AN EMERGENCY?
Sometimes - with chest pain or severe breathlessness

LONG-TERM OUTLOOK
Usually good with timely, adequate replacement

Overview

Vitamin B12 deficiency anemia happens when your body does not have enough vitamin B12 to make healthy red blood cells. Red blood cells carry oxygen from your lungs to the rest of your body.

Without enough vitamin B12, developing blood cells cannot divide normally. They may become unusually large and fail to work properly. This is called megaloblastic anemia . "Megaloblastic" describes the abnormal development of blood cells in the bone marrow.

Vitamin B12 also helps maintain nerves and make DNA, the genetic material in cells. A deficiency can therefore affect the brain, spinal cord, and nerves as well as the blood. Nerve symptoms can occur before anemia develops or even when a blood count is normal.

Treatment replaces the missing vitamin. It is also important to find out why the deficiency developed. Some causes can be corrected, while others require lifelong replacement.

Symptoms

Symptoms often develop gradually. Mild deficiency may cause no obvious problems at first.

Symptoms related to anemia can include:

Vitamin B12 deficiency can also affect the mouth and digestive system. Your tongue may become red, smooth, or sore. Some people lose their appetite, experience indigestion, or lose weight without intending to.

Nerve and brain symptoms may include:

These symptoms have many possible causes and do not confirm vitamin B12 deficiency. New numbness, weakness, or balance problems should be assessed promptly because delayed treatment may make recovery less complete.

- Persistent tiredness or weakness
- Shortness of breath during ordinary activity
- A fast or noticeable heartbeat
- Pale skin, headaches, or light-headedness
- Numbness or tingling, often in the hands or feet
- Reduced awareness of touch, pain, or temperature
- Muscle weakness or difficulty walking
- Poor balance or coordination
- Problems with memory, concentration, or vision
- Mood changes, including depression or irritability

Causes and risk factors

Vitamin B12 is naturally present in animal-derived foods, including meat, fish, eggs, and dairy products. It is also added to some fortified foods. However, eating enough vitamin B12 does not guarantee that your body can absorb it.

To absorb vitamin B12, stomach acid first releases it from food. A stomach protein called intrinsic factor then helps the vitamin pass into the body through the last part of the small

intestine, called the terminal ileum.

Autoimmune gastritis is an important cause. The immune system mistakenly damages cells in the stomach that help with vitamin B12 absorption. This can reduce stomach acid and intrinsic factor. Vitamin B12 deficiency anemia caused by this process has traditionally been called pernicious anemia .

Other causes and risk factors include:

The body stores vitamin B12, often enough for several years. For this reason, deficiency caused by reduced intake may take a long time to become apparent.

Do not stop a prescribed medicine because it might affect vitamin B12. A healthcare professional can decide whether testing, monitoring, or replacement is appropriate.

- A vegan diet without adequate fortified foods or supplements
- A very restricted or nutritionally poor diet
- Surgery that removes or bypasses part of the stomach or small intestine
- Conditions affecting the small intestine, such as Crohn's disease or coeliac disease
- Long-term use of medicines that reduce stomach acid
- Metformin, a medicine commonly used for type 2 diabetes
- Repeated or heavy exposure to nitrous oxide, which inactivates vitamin B12
- Rare inherited conditions that interfere with vitamin transport or absorption

Diagnosis

Diagnosis begins with your symptoms, medical history, diet, medicines, and any previous stomach or intestinal surgery.

A complete blood count measures your red blood cells and the amount of hemoglobin, the oxygen-carrying protein in blood. Vitamin B12 deficiency may cause a low hemoglobin level and unusually large red blood cells. However, normal-sized cells do not rule it out, especially if another condition such as iron deficiency is also present.

A blood test measures either total vitamin B12 or active vitamin B12. The result must be interpreted using that laboratory's reference range. A low result supports deficiency, but an uncertain result may need further investigation.

A methylmalonic acid , or MMA, test may help confirm deficiency when the initial vitamin B12 result is unclear. MMA usually rises when cells lack vitamin B12, although kidney problems can also raise it. Homocysteine may be measured in some situations, but it is less specific because

folate deficiency and other conditions can also increase it.

Further tests may include:

A negative intrinsic factor antibody test does not completely exclude autoimmune gastritis. If significant neurological symptoms suggest vitamin B12 deficiency, treatment may begin before every test result is available.

- Folate and iron tests to look for other deficiencies
- Antibodies against intrinsic factor, which support autoimmune gastritis
- Tests for coeliac disease or other causes of poor absorption
- Investigations of stomach or intestinal disease when clinically appropriate

Treatment and management

Treatment replaces vitamin B12 and addresses the underlying cause where possible. Replacement may be given as tablets or by injection into a muscle.

The best route depends on factors such as the cause, the severity of the deficiency, neurological symptoms, and whether reliable absorption is expected. Injections are often used when deficiency is severe, nerve symptoms are present, or absorption is substantially impaired. Oral treatment can be suitable in many other situations.

If the cause is temporary and can be corrected, replacement may eventually be stopped after review. If your body cannot absorb vitamin B12 because of autoimmune gastritis or permanent changes after surgery, ongoing or lifelong replacement is usually needed.

Treatment may also involve:

Folic acid can improve the blood count while untreated vitamin B12-related nerve damage continues. For this reason, vitamin B12 deficiency should be considered before folic acid is used by itself to treat megaloblastic anemia.

Follow-up usually checks whether symptoms and the blood count are improving. Tell your healthcare professional if symptoms do not improve, return, or become worse despite treatment. This may mean the treatment route, adherence, diagnosis, or another cause needs review.

- Improving dietary vitamin B12 intake
- Managing coeliac disease, Crohn's disease, or another bowel condition
- Reviewing medicines that may contribute to deficiency

- Avoiding further nitrous oxide exposure
- Correcting accompanying iron or folate deficiency

Complications

Untreated anemia can become severe enough to place extra strain on the heart. This may cause worsening breathlessness, a rapid heartbeat, chest discomfort, or, less commonly, heart failure.

Nerve damage is the main long-term concern. Persistent deficiency can affect sensation, movement, balance, memory, or vision. Many neurological symptoms improve after treatment, but recovery may take months. Some damage can be permanent, especially when treatment has been delayed.

Vitamin B12 deficiency during pregnancy may affect the pregnant person and the developing baby. Anyone who is pregnant, planning pregnancy, or breastfeeding and at risk of deficiency should seek advice about testing and adequate intake.

Prevention

Not every case can be prevented. Autoimmune gastritis and inherited absorption disorders are not caused by lifestyle choices. Surgery or chronic intestinal disease may also make deficiency unavoidable, although planned replacement can prevent its effects.

If you eat little or no animal-derived food, use reliable vitamin B12-fortified foods or an appropriate supplement. Plant foods that are not fortified are not dependable sources of active vitamin B12.

People who have had certain stomach or intestinal operations may need scheduled monitoring or long-term replacement. Those taking metformin or long-term acid-reducing medicine like omeprazole or lansoprazole may need assessment if symptoms or other risk factors develop. Do not change prescribed treatment without medical advice.

Avoid repeated recreational nitrous oxide use. It can make vitamin B12 unavailable to the body and may cause serious nerve problems, even when a blood vitamin B12 level does not appear very low.

Living with it and what to expect

The outlook is usually good when deficiency is recognized and treated. The anemia often begins to respond before you feel fully recovered. Tiredness, breathlessness, and other symptoms may improve over several weeks.

Numbness, weakness, or balance problems often take longer. Improvement may continue for months, and some people need rehabilitation or support with walking and daily activities. Recovery cannot be guaranteed if nerve damage was present for a long time.

Your long-term plan depends mainly on the cause. A dietary deficiency may improve with replacement and a dependable source of vitamin B12. A permanent absorption problem usually means continuing treatment even after blood results and symptoms improve.

Missing ongoing replacement can allow the deficiency to return. If you need lifelong treatment, keeping appointments and knowing how your replacement is supplied are important parts of routine care.

Routine follow-up may include discussion of symptoms, treatment adherence, diet, and the underlying condition. Blood testing is used when it will help assess the response or clarify whether another problem is present.

When to get medical help

Arrange a routine medical appointment if you have persistent tiredness, breathlessness during activity, a sore tongue, unexplained appetite or weight changes, or risk factors for vitamin B12 deficiency.

Seek prompt medical assessment for new tingling, numbness, weakness, memory changes, vision changes, or problems with balance. These symptoms are not always caused by vitamin B12 deficiency, but they should not be ignored.

Get urgent or emergency help for:

Sudden weakness on one side, facial drooping, or difficulty speaking may be a stroke rather than vitamin B12 deficiency and requires emergency help.

- Chest pain or pressure
- Severe difficulty breathing, especially at rest
- Fainting or being difficult to wake
- A very fast heartbeat with weakness or dizziness
- Rapidly worsening weakness, confusion, or inability to walk safely

Common questions

Can I have vitamin B12 deficiency if I eat meat?

Yes. Diet is only one part of the process. Autoimmune gastritis, intestinal disease, surgery, medicines, or nitrous oxide can prevent your body from absorbing or using vitamin B12 properly.

Is vitamin B12 deficiency anemia the same as folate deficiency anemia?

No. Both can cause unusually large red blood cells, but they involve different vitamins. Vitamin B12 deficiency is more strongly linked to nerve damage. Blood tests help distinguish them, and both deficiencies can occur together.

Is pernicious anemia the same condition?

Pernicious anemia is a form of vitamin B12 deficiency anemia caused by loss of intrinsic factor, usually because of autoimmune gastritis. It is not the name for every type of vitamin B12 deficiency.

Will vitamin B12 supplements cure it?

Replacement can usually correct the deficiency and anemia. Whether treatment can stop depends on the cause. Permanent absorption problems generally require ongoing replacement, while a reversible dietary cause may not.

How long does recovery take?

The blood count often starts responding relatively quickly, but feeling better may take several weeks. Nerve symptoms can take months and may not disappear completely. Your course will depend on the severity, duration, and cause of the deficiency.

Can vitamin B12 deficiency affect my nerves without causing anemia?

Yes. Neurological symptoms can occur with a normal hemoglobin level or before changes appear in the blood count. A normal blood count alone does not rule out clinically important vitamin B12 deficiency.

Sources

- National Institute for Health and Care Excellence. Vitamin B12 deficiency in over 16s: diagnosis and management, NICE guideline NG239 , 2024
- NIH Office of Dietary Supplements. Vitamin B12 Fact Sheet for Health Professionals
- NHS. Vitamin B12 or folate deficiency anaemia



- Devalia V, Hamilton MS, Molloy AM. Guidelines for the diagnosis and treatment of cobalamin and folate disorders . British Journal of Haematology . 2014;166(4):496-513
- Medicines and Healthcare products Regulatory Agency. Metformin and reduced vitamin B12 levels: new advice for monitoring patients at risk , 2022
- Wang H, Li L, Qin LL, Song Y, Vidal-Alaball J, Liu TH. Oral vitamin B12 versus intramuscular vitamin B12 for vitamin B12 deficiency . Cochrane Database of Systematic Reviews . 2018;3:CD004655