

Vitamin B12 (cobalamin)

Vitamin B₁₂ (cobalamin)

Chief functions

- Is important in metabolism of energy-yielding nutrients
- Acts with folate in the production of hemoglobin
- Is needed for normal fatty acid and DNA synthesis
- Functions metabolically as a coenzyme in new cell synthesis
- Protects the sheath around nerve fibers
- Helps build bone tissue
- Aids in the formation of red blood cells; needed to make all blood cells

Possible benefits

- Alzheimer's disease:
 - May play a role in prevention of onset
 - Low levels of vitamin B₁₂ are found in persons diagnosed with Alzheimer's disease
 - Research is inconsistent

Deficiency symptoms

- Pernicious anemia (macrocytic and megaloblastic anemias)
- Low levels in blood affect growth and repair of all body cells
- Fatigue of nervous system, progressing to degeneration and leading to possible paralysis
- Malfunction of nerves and muscles
- Hypersensitivity to touch—tingling or numbness
- Smooth tongue

Toxicity symptoms

- None known (tested as high as a 100-microgram dose)

Stability

- Foods may lose some B₁₂ when cooked to >100° C (212° F)
- Slowly destroyed in the presence of acid

Nutrient-nutrient reactions and absorption

- Calcium is necessary for normal absorption of B₁₂
- Deficiency of either iron or B6 decreases the absorption of B₁₂
- A high intake of folic acid can mask B₁₂ anemia
- Vitamin E deficiency might impair conversion of B₁₂ to its active form
- Efficiency of absorption decreases with age
- Some B₁₂ is stored in the liver, kidney, and other tissues:
 - Deficiency signs do not develop for up to 5 to 6 years after complete elimination from diet
- B₁₂ is recycled from bile and other intestinal secretions
- Gastric acid is required to cleave the B₁₂-intrinsic factor complex to make it bioavailable to the body

DRI	mcg
0-.5 year	0.4
.5-1 year	0.5
1-3 years	0.9
4-8 years	1.2
9-13 years	1.8
Female 14-18 years	2.4
Female 19-70 years	2.4
Male 14-18 years	2.4
Male 19-70 years	2.4
Pregnant	2.6
Lactating	2.8

DRI=Dietary Reference Intakes, mcg=microgram

Tolerable upper limits are not defined. This is because no toxicity symptoms are known with vitamin B₁₂ and no data on adverse effects exists.

Dietary sources

- Best:
 - Animal products
- Other:
 - Any fermented foods—bacteria, fungi, and algae can synthesize B₁₂

Groups at highest risk for deficiency

- Vegans
- Individuals who have had gastric bypass surgery
- Patients who have had any surgery in which most of the stomach is removed

Other facts

- The daily need for this vitamin is minimal, but essential
- Daily loss of B₁₂ is approximately 0.05% to 0.2% of the body pool, regardless of body size
- If individuals do not have most or all of their stomach and cannot produce intrinsic factor, B₁₂ supplements sometimes are required
- Typically, vitamin B₁₂ deficiency is treated with vitamin B₁₂ injections, because this method bypasses potential barriers to absorption, but high doses of oral vitamin B₁₂ may also prove effective

References and recommended readings

Dietary Reference Intakes: vitamins. Institute of Medicine of the National Academies Web site. http://www.iom.edu/Global/News%20Announcements/~/_media/474B28C39EA34C43A60A6D42CCE07427.ashx. Accessed January 6, 2014.
 Mahan LK, Escott-Stump S, Raymond JL. *Krause's Food and the Nutrition Care Process* .