

Vitamin B Complex

- B₁ - Thiamine
- B₂ - Riboflavin
- B₃ - Niacin
- B₅ – Pantothenic acid
- B₆ – Pyridoxine
- B₇ – Biotin
- B₉ – Folic acid
- B₁₂ – Cobalamins (cyanocobalamin, methylcobalamin etc.)

Vitamin B Complex

- Different chemical structures possessing similar activities –but some different activities as well
- Generally found together in the same foods
- Frequently act together to perform their functions
- Water-soluble and do not accumulate in the body
- Play role as coenzyme in cell metabolism – energy transformation and other metabolic functions

Vitamin B Complex

- Essential for healthy nerves, muscles, liver and skin.
- Riboflavin, niacin and pantothenic acid play a role in the synthesis of adrenal hormones and cholesterol and fatty acids.
- Riboflavin is important for retinal functions.
- Vitamin B₁₂ is involved in the production of red blood cells and prevents pernicious anemia.

Vitamin B Complex

- Recent studies reveals new effects of vitamin B complex.
- Intake at high doses for treatment is common but it should be considered that absorbtion of B complex vitamins can affect each other. Therefore, taking one of them at high doses may cause the lack of other.

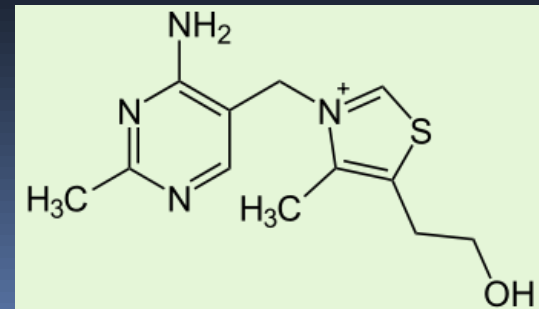


Main Sources

- Yeast
- Liver
- Cereal products
- Egg
- Meat/poultry
- Various vegetables and fruits

Vitamin B1 (Thiamine)

- It is the first isolated one among B complex vitamins.
- Plays key role in energy production from carbohydrates
- Helps digestion, supports growth, and is necessary for healthy functioning of the nervous system, heart and other muscle tissues.



Vitamin B1 (Thiamine)

- Found in grains (brown rice and whole grains)
 - but processing of grains remove most of thiamine which leads a very low content or lack of thiamine in white rice, flour and other cereal products.

Vitamin B1 (Thiamine)

- Essential nutrient for human/animals
- Bacteria, fungi and plants can produce thiamine.
- Thiamine is decomposed as a result of prolonged exposure to oxygen, exposure to high temperature, alkaline substances and sulphides used as food preservatives.

Function of Thiamine

- Cell metabolism and energy production
 - Phosphate derivatives are active forms (especially TPP)
 - Plays role in energy production from carbohydrates and storage of blood sugar as fat in the body
- Functions of nerves and muscles
 - Necessary for the function of peripheral nerves and maintenance of muscle tone

Thiamine Deficiency

- Mainly seen in cases of chronic alcoholism, HIV/AIDS, diabetes, intake of diuretics at high doses
- Depression, malaise and confusion which may be attributed to the role of thiamine in glucose metabolism
- Anorexia, digestive disorders such as constipation.

Thiamine Deficiency

- Destruction of myelin sheath, which is the protective coat of axons in neurons, leading to irritation and inflammation in neurons causing numbness, tingling and pinching and pain.
- Dysfunction of the nerves causes loss of muscle tone, weakness, weakened coordination, and difficulty in walking.
- Beriberi disease which is characterized by nerve inflammation and pain, muscle weakness and lack of coordination, edema and heart condition



Main Sources

- Whole grain
 - Unprocessed rice
 - Meat
 - Vegetables, fruits
 - Legumes
 - Seafood
 - Yeast
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Main Sources


- Dietary supplements are available as OTC products.
- Found as Thiamine-HCl or Thiamine-nitrate in dietary supplements.
- Allithiamine: lipid-soluble form of thiamine (*Allium sativum*)

Thiamine Need of the Body

Age/Period	Daily Dose (mg)
0-6 months	0.2
7-12 months	0.3
1-3 years	0.5
4-6 years	0.6
7-9 years	0.9
10-18 years (female)	1.1
10-18 years (male)	1.2
19 + years (female)	1.1
19+ years (male)	1.2
Pregnancy	1.4
Lactation	1.5



Use of Thiamine

- Physical/emotional stress quickly depletes thiamine stores.
 - Fever and other disease symptoms increase the need for thiamine and other B complex vitamins.
 - It is recommended that the daily intake of thiamine in proportion to the other B complex vitamins should be 100-500 mg in cases of stress, disease or postoperative recovery.
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Use of Thiamine

- Alcohol causes thiamine destruction. 50-100 mg of thiamine intake is needed in case of consumption of 1 to 2 alcoholic beverages daily.
- Mood disorders such as mild depression, anxiety may be induced by thiamine deficiency. In such cases, it is reported that thiamine intake of 50-100 mg daily improves the mood and increases mental alertness and energy.

Use of Thiamine

- Individuals, 60% of whose daily diet consists of carbohydrates are recommended to take 50 mg thiamine daily.
- It is reported that thiamine intake at 50 mg daily dose for 3 months in patients over 65 years has led to a moderate decrease in blood pressure, improvement in sleep quality and mood.

Use of Thiamine

- Congestive heart failure; thiamine exhibits positive inotropic effect and reduces edema.
- A strong diuretic effect was observed when 200 mg of thiamine was administered daily, and at the end of treatment for 6 weeks 22% higher recovery rate was determined compared to the patients receiving diuretics.

Adverse Effects and Cautions

- No toxic effect is reported for oral intake.
- Tolerable upto 200 mg daily dose orally.
- Anaphylaxis may be seen in case of thiamine injections.
- A daily average dose of 3 mg should not be exceeded in pregnancy and lactation periods.

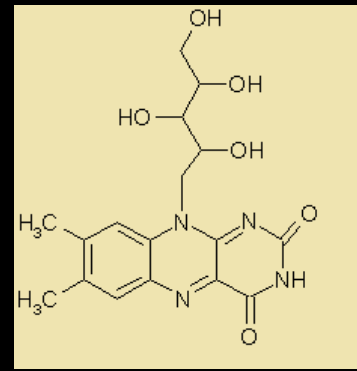
Interactions

- Long-term use of diuretic drugs such as furosemide, ethacrynic acid, bumetanide causes thiamine deficiency.
- Regular consumption of tea and coffee decreases the absorption of thiamine due to their tannin content.
- Thiamine is degraded by long-term exposure to oxygen, high temperature, sulfites used as food preservatives and alkali substances.

Interactions

- Some seafood and fish contain the enzyme thiaminase, which can be inactivated by cooking.
- Drug therapy should be administered in the treatment of clinical depression and, if thiamine is to be used in addition, it should be consulted with a doctor for possible interactions.

Vitamin B₂ (Riboflavin)



- Has important role in food metabolism along with thiamine and niacin
- A flavoprotein which acts as a coenzyme for the energy metabolism and redox reactions
- It converts all foods such as carbohydrates, proteins and fats into the form of energy that the body can use
- It activates and transforms niacin to a form which the body can utilize.

Vitamin B₂ (Riboflavin)

- Riboflavin increases the protective effect of vitamin E from free radicals (antioxidant activity).
- Partially has a role in thyroid hormone functions.
- Necessary for the production of hormones (especially cortisone) in adrenal glands
- Light-sensitive component, milk which is the richest riboflavin source loses 75% of its riboflavin content when left in the cup for 1-2 hours.

Riboflavin Need of the Body


Age/Period	Daily Dose (mg)
0-6 months	0.3
7-12 months	0.4
1-3 years	0.5
4-8 years	0.6
9-13 years	0.9
14-70 years (female)	1.1
14-70 years (male)	1.3
70 + years (female)	1.3
70 + years (male)	1.6
Pregnancy	1.4
Lactation	1.6

Riboflavin Need of the Body

- Daily requirement is 1-2 mg depending on the metabolic rate and daily caloric intake
- The need for riboflavin increases in physical and emotional stress. 100-250 mg per day induces healing and reduces the harmful effects of emotional stress.
- It is recommended that other B complex vitamins should be taken in an increased amount in case of stress.
- Especially elderly people who don't consume milk are recommended to take vitamin B complex intake.
- As the consumption of riboflavin per day increases for athletes, 50-100 mg intake is recommended.



Main Sources

- Milk
 - Yogurt
 - Cheese
 - Egg
 - Meat
 - Vegetables
 - Grains
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Riboflavin Deficiency

- Riboflavin deficiency may be seen in the patients with chronic liver disease, alcoholism as well as the ones who are fed only parenterally.
- In case of riboflavin deficiency some symptoms, such as anemia, fatigue, slow healing of cuts and wounds, mouth sores and inflammation, eye problems (such as corneal inflammation), partially oily and problematic skin (seborrheic dermatitis) etc. may be encountered.

Riboflavin Deficiency

- It was determined that antibody production decreased in case of riboflavin deficiency.
- It is necessary for the maintenance of red blood cells which carry oxygen in the body, thus deficiency leads to anemia.
- Riboflavin is a component of the retinal pigment which detects the changes in the light, therefore photosensitivity occurs in case of riboflavin deficiency.
- Vitamin B complex preparations are preferred in treatment because riboflavin avitaminosis is usually accompanied by deficiency of other B vitamins.

Use of Riboflavin

- The intake of 25-100 mg/day provides prevention from cataract formation or slows down cataract development.
- Use at daily dose of 400 mg reduces the severity and frequency of migraine headache.
- Ischemia-induced cardiac problems

Use of Riboflavin


- At the dose of 100-500 mg, it alleviates the symptoms of the carpal tunnel syndrome which is a disease characterized by pain, numbness and weakness as a result of compression of the nerve spreading to the first three fingers of the hand.
- Skin disorders; intake at 50 mg daily dose improves rosacea disease.

Interactions

- Oral contraceptives; 100 mg/day riboflavin should be taken to eliminate deficiency
- Riboflavin absorption increases in case of hypothyroidism and vice versa.
- Colestyramine, colestipol, metoclopramide decrease riboflavin absorption.
- Chlorpromazine, doxorubicine and tricyclic antidepressants inhibit transformation of riboflavin to riboflavin monophosphate and flavin adenine dinucleotide which are coenzymes in redox reactions.



Adverse Effects

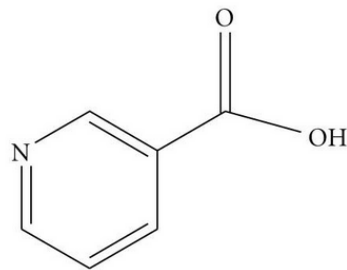
- Intake at a dose of 400 mg/day longer than 4 months causes diarrhea and diuria.
 - Paints the urine in yellow.
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Vitamin B₃ (Niacin, Nicotinic Acid)

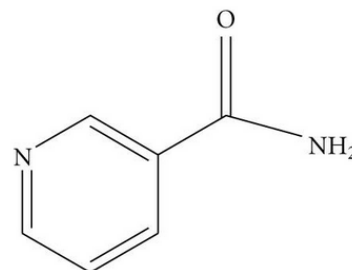
- Niacin is present in all body tissues and is essential for the use of oxygen in the cells.
- Essential for energy production in the cell along with thiamin and riboflavin.
- Necessary for healthy skin, nerve functions, appetite and digestion.

Vitamin B₃ (Niacin, Nicotinic Acid)

- Found in two forms;
 - Nicotinic acid
 - Nicotinamide
- Same vitamin activity but different pharmacological effect



Niacin (Nicotinic acid)



Niacinamide (Nicotinamide)

Vitamin B₃ (Niacin, Nicotinic Acid)

- Nicotinic acid can easily turn into nicotine amides.
- Nicotine amide plays a role in redox reactions as NAD and NADP.
- In dietary supplements, nicotine amide is preferred to nicotinic acid because it has less risk of gastric irritation.

Vitamin B₃ Need of the Body

- Niacin is used at a daily dose of
 - 2-6 mg in infants and children
 - 12-40 mg adult dose
 - 18 mg in pregnancy
- 60 mg tryptophan equivalent to 1 mg niacin activity

Main Sources

- Meat, poultry, fish
- Legumes
- Yeast
- Cereals (wheat, corn)
- It is not found in free form in corn (glycoside form), it can not be absorbed easily.
Therefore, niacin deficiency is common in societies fed with corn flour (e.g. Eastern Black Sea).

Vitamin B₃ Deficiency


- Alcoholism, malabsorption syndrome, cirrhosis, niacin incomplete parenteral nutrition, inadequate protein intake in the diet (since it is synthesized from tryptophan) can lead to deficiency.
- Weakness, discomfort, anxiety, depression
- Dementia develops in case of long-term deficiency.
- Niacin deficiency causes inflammation of the mucous membrane in the intestinal tract (mouth sores, swelling and pain in the tongue)
- Inflammation also leads to rectal irritation, diarrhea and discomfort.

Vitamin B₃ Deficiency


- Pellagra disease
 - Dermatitis
 - Inflammation
 - Diarrhea
 - Skin lesions (face, hand, foot, leg)
 - Oral lesions (redness in tongue)
 - Dementia

Use of Nicotinic acid

- Nicotinic acid improves circulation by providing dilatation of the vessels, thus requiring less pressure for blood circulation.
- To decrease the level of cholesterol and triglycerides (500-2000 mg)
 - However, this use should be controlled by the doctor.
 - Starting from the dose of 100-200 mg and then increased.
 - The use is terminated if there is no change in the result of 2 weeks of use.
 - Prolonged use can cause side effects in the liver and blood glucose level.
- To prevent atherosclerosis
- To get rid of the effects of alcohol and narcotics



Contraindications of Nicotinic Acid

- People who are allergic to niacin and niacin-containing products
 - Hepatic dysfunction
 - Peptic ulcer
 - Arterial hemorrhage
 - Intake at high doses is not recommended during pregnancy and lactation periods.
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Adverse Effect of Nicotinic Acid


- At high doses, it causes the blood to accumulate under the skin surface thus leads to flushing.
- As it can cause liver damage, those who use nicotinic acid should undergo liver function test every 3 months.
- The use of niacin in patients with peptic ulcer, diabetes, gout, glaucoma disease may worsen the disease.



Use of Nicotinamide

- Antioxidant
 - Antiinflammatory
 - Anticarcinogenic

 - In this form it does not cause flushing and bleeding but it is not as effective on blood lipid levels as nicotinic acid.
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Contraindications of Nicotinamide

- People who are allergic to niacin and niacin-containing products
 - Hepatic or renal dysfunction
 - Intake at high doses is not recommended during pregnancy and lactation periods.
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