

Vitamin B Complex

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B₁ - Thiamine

B₂ - Riboflavin

B₃ - Niacin

B₅ – Pantothenic acid

B₆ – Pyridoxine

B₇ – Biotin

B₉ – Folic acid

B₁₂ – Cobalamins (cyanocobalamin, methylcobalamin etc.)

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.

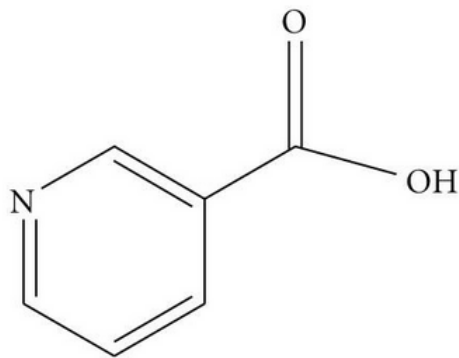
Necessary for healthy skin, nerve functions, appetite and digestion.

Vitamin B₃ (Niacin, Nicotinic Acid)

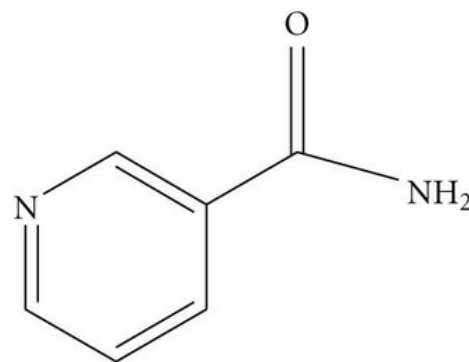
Found in two forms;

- 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.

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.

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.

Vitamin B₅ (Pantothenic Acid)

Necessary for energy metabolism (carbohydrate, fat and protein metabolism)

It is especially required for the construction of fatty acids

Necessary for the construction of red blood cells and antibodies

It plays an important role for the function and hormones of endocrine glands

Vitamin B₅ (Pantothenic Acid)

Found in all foods from herbal and animal origin (liver, kidney, egg yolk, avocado, hazelnut, walnut, unprocessed rice, soybean, lentil, broccoli, milk, brewer's yeast, tuna and eggs of codfish etc.)

It is also synthesized by bacteria in the intestines.

Not resistant to exposure to oxygen and high temperature

It is found in the form of calcium pantothenate in dietary supplements at the dose of 5-10 mg.

Pantothenic Acid Deficiency

Since it is found in several nutrients, deficiency is rarely seen.

Immunodeficiency

Headache

Insomnia

Bowel disorders

Numbness in hands and feet

Decrease in antibody production

Problems in insulin and glucose metabolism

Use of Pantothenic Acid

Pantothenic acid is transformed to CoA in the body

It provides the food we take to be converted into molecules that can be used by the body or converted into fatty acids and some proteins

Has role in the production of red blood cells

Immune function; necessary for the construction of antibodies (immune function)

Hormonal function; required for the construction of adrenaline and other stress hormones in adrenal glands

Neural function; required to transform choline into acetylcholine form

Use of Pantothenic Acid

It is reported that high doses of pantothenic acid reduce symptoms of rheumatoid and osteoarthritis.

The effect is thought to be due to the role of pantothenic acid in the production of cortisone.

In the study performed in individuals with high blood cholesterol levels, it was determined that serum cholesterol and triglyceride levels were decreased by the treatment with 900 mg pantetin which is the biologically active metabolite of the pantothenic acid.

Use of Pantothenic Acid

Although it is not clinically proven, it is known that pantothenic acid;

- prevents hair loss and whitening,
- increases athlete performance,
- provides alcohol detoxification,
- slows down the aging process.

Vitamin B₆ (Pyridoxine)

It is a vitamin that acts as a coenzyme in many metabolic functions.

Found in three different forms;

- Pyridoxine
- Pyridoxal
- Pyridoxamine

Pyridoxin is the most widely used derivative and is more resistant to degradation.

Vitamin B₆ (Pyridoxine)

Interacts with oral contraceptives and levadopa

Processing of the foods causes degradation of pyridoxine

Classical cooking methods leads to loss of ≈50% of pyridoxine content. This loss can be reduced by using less water or steaming.

Main Sources

Meat

Salmon

Nuts

Potatoe

Banana

Grains

In most vegetables, nuts, legumes and whole grain products contain varying amounts of pyridoxine.

Meat, fish, poultry and other animal foods contain pridoxal and pyridoxamine.

Pyridoxine Deficiency

Pyridoxine intake is generally enough in a normal daily diet, therefore deficiency is especially seen in case of malabsorption syndrome.

Pyridoxine deficiency is more common among women.

Deficiency symptoms are;

- lesions in the eye, mouth and nose,
- neurological disorders.

Use of Pyridoxine

Has an active role in protein metabolism; necessary for growth and development, health and repair of tissues.

Important for carbohydrate and fat metabolism as well as including energy production

Immune system functions; necessary for the construction of antibodies. It is reported that use of vitamin B₆ supplement strengthens the immune system in the elderly people and slows down the tumor growth in animal trials.

Use of Pyridoxine

Neural functions; necessary for the production of serotonin and other neurotransmitters, thus used for the treatment of anxiety and mild depression

Necessary for the production of red blood cells

When homocysteine, which is a product of protein metabolism, is found in blood vessels at high levels, the vessels become more sensitive to damage and the risk of arteriosclerosis increases. Pyridoxine support balances the level of homocysteine in the blood.

Vitamin B₉ (Folic Acid)

Cooking causes loss of 90% of folic acid content

Production of genetic material and red blood cells

Wound healing

Formation of muscle tissue

Metabolic functions

Regulates the blood homocysteine level and protects against heart disease

Vitamin B₉ (Folic Acid)

Required for the development of fetus, therefore folic acid need increases in pregnancy period

Folic acid deficiency during early pregnancy causes some abnormalities especially on the the brain and nerves of the baby (neural tube defect).

Besides, it may cause some other serious pregnancy problems such as miscarriage, blood poisoning and placenta abnormalities

Deficiency causes megaloblastic anemia (defects in DNA synthesis, large and immature erythrocytes in blood)

Main Sources

Meat

Green leafy vegetables

Orange and orange juice

Whole wheat bread

Cereals

Folic Acid Need of the Body

Age/Period	Daily Dose (μg)
0-12 months	65-80
1-3 years	150
4-8 years	200
9-18 years	300-400
19 + years (female)	400
Pregnancy	600
Lactation	500

Use of Folic Acid

For the treatment of megaloblastic anemia (alone or with vitamin B₁₂)

Used for the treatment of heart diseases, along with vitamin B₆ and B₁₂

Inflammation of intestines (intestines can not absorb some necessary nutrients); at high doses of folic acid and vitamin B₁₂

For the prevention of neural tube defect

Interactions

Alcohol

Oral contraceptives

Too much tea/coffee consumption

Some drugs, such as corticosteroids, barbiturates, some antibiotics and anticancer drugs, aspirin (at high doses)

can affect folic acid absorption and may lead to deficiency.

Vitamin B₁₂ (Cobalamin)

Found in intestinal flora

Accumulated in the liver

Required for carbohydrate, protein and fat metabolism

Necessary for the production of red blood cells and choline, the maintenance of the health of neural tissue and homocysteine metabolism

5 µg/day intake is recommended

The level of vitamin B 12 decreases in smokers.

Not resistant to heat and light

Main Sources

Animal sources

- Liver extract
- Meat
- Sea products

Cobalamin Deficiency

Deficiency can cause pernicious anemia which is a fatal disease.

Deficiency can be seen in patients with stomach disease or vegetarians who don't take vitamin B₁₂ as dietary supplement.

Fatigue

Loss of appetite

Pernicious anemia is treated with cobalamin at the dose of 15-30 μg

Vitamin H (Biotin)

Essential for energy production using blood sugar

It has similar functions to pantothenic acid

Necessary for the construction of fatty acids

Involved in many metabolic events

Synthesized by intestinal bacteria

Biotin is resistant to heat, exposure to oxygen, UV light, strong acids or alkali cause degradation of biotin.

Powdering process of cereals causes loss of most of the biotin content

30-60 µg daily dose is recommended.

Biotin Deficiency

Rarely seen

Consumption of large amounts of raw eggs deficiency can be seen due to avidin content of raw egg. Avidin in raw eggs is bound with biotin and inhibits absorption (when egg is cooked, avidin becomes inactive)

Neurological abnormalities

Depression

Hallucinations

Paralysis of the extremities

Blushing of eye, nose, mouth and ears