

Fat-Soluble vs. Water-Soluble Vitamins How They Differ in Absorption and Storage in the Body

By Lori Alma Updated on February 14, 2023
Medically reviewed by Sanja Jelic, MD

Fat-soluble vitamins (A, D, E, and K) are absorbed by fat, while water-soluble vitamins (everything other than these four) are dissolved in water. The difference between the two matters, since it affects if and how the vitamins are stored in the body, whether getting too much or not enough of them can cause harm, and more.

For example, thiamine, riboflavin, folic acid, niacin, biotin, and pantothenic acid examples of water-soluble B vitamins. Because they are dissolved in water, the body gets rid of anything it doesn't need in your urine. If they are not adequately replaced, nutritional deficiencies and related health problems can occur.

This article discusses the types of vitamins and their differences. It explains why your body needs them as well as the possibility that you can take too many of these vitamins.

Water-Soluble Vitamins

Water-soluble vitamins are those that are dissolved in water and readily absorbed into tissues for immediate use. Any excess is quickly passed in urine. Because they are not stored in the body, water-soluble vitamins need to be replenished regularly through your diet.

Water-soluble vitamins rarely accumulate to toxic levels. With that being said, certain types of water-soluble vitamins, such as vitamin C, can cause diarrhea if taken in excess.

The water-soluble vitamins include the B-complex group and vitamin C, each of which offers the following health benefits:

Vitamin B1 (thiamine) helps to release energy from foods and is important in maintaining nervous system function.

Vitamin B2 (riboflavin) promotes good vision and healthy skin, and it is also important in converting the amino acid tryptophan into niacin.

Vitamin B3 (niacin) aids in digestion, metabolism, and normal enzyme function as well as promoting healthy skin and nerves.

Vitamin B5 (pantothenic acid) aids in metabolism and the formation of hormones. It may help to control cholesterol and have anti-inflammatory benefits.

Vitamin B6 (pyridoxine) aids in protein metabolism and the production of red blood cells, insulin, and hemoglobin.

Vitamin B7 (biotin) helps release energy from carbohydrates and aids in the metabolism of fats, proteins, and carbohydrates from food.

Vitamin B9 (folate or folic acid) also aids in protein metabolism and red blood cell formation, and it may reduce the risk of neural tube birth defects.

Vitamin B12 (cobalamin) aids in the production of normal red blood cells as well as the maintenance of the nervous system.

Vitamin C (ascorbic acid) is central to iron absorption and collagen synthesis. It aids in wound healing and bone formation while improving overall immune function.

Water-Soluble Vitamin Food Sources

Water-soluble vitamins dissolve in water right away. Once the body has as much of one as it needs, the rest gets flushed out of the body by the kidneys. Fresh fruits, including citrus and berries, as well as tomatoes and peppers, are excellent vitamin C sources. B-complex vitamins are found in a range of foods, including meat and dairy.

Fat-Soluble Vitamins

Fat-soluble vitamins are dissolved in fats. They are absorbed by fat globules that travel through the small intestines and are distributed through the body in the bloodstream.

Unlike water-soluble vitamins, excess fat-soluble vitamins are stored in the liver and fatty (adipose) tissues for future use. They are found most abundantly in high-fat foods and are better absorbed if eaten with fat.

Fat-Soluble Vitamins and Toxicity

Fat-soluble vitamins can accumulate to toxic levels if taken in excess. Where a well-balanced diet can't cause toxicity, overdosing on fat-soluble vitamin supplements can. Symptoms and side effects of fat-soluble vitamin toxicity vary depending on the vitamin. They range from nausea and vomiting to slowed growth and birth defects.

There are four types of fat-soluble vitamins, each of which offers different benefits:

Vitamin A is integral to bone formation, tooth formation, and vision. It contributes to immune and cellular function while keeping the intestines working properly.

Vitamin D aids in the development of teeth and bone, by encouraging the absorption and metabolism of phosphorous and calcium.

Vitamin E is an antioxidant that helps fight infection and keeps red blood cells healthy.

Vitamin K is central to blood clotting and also keeps bones healthy.

The easiest way to remember which vitamins are which is to memorize the fat-soluble ones, as there are only four: vitamins A, D, E, and K. All others are water-soluble.