1. **Coenzymes** are small molecules. They cannot by themselves catalyze a reaction but they can help enzymes to do so. In technical terms, **coenzymes** are organic nonprotein molecules that bind with the protein molecule (apoenzyme) to form the active enzyme (holoenzyme).

2.

Water-soluble vitamins are those that are dissolved in water and readily absorbed into tissues for immediate use. Because they are not stored in the body, they need to be replenished regularly in our diet. Any excess of water-soluble vitamins is quickly excreted in urine and will rarely accumulate to toxic levels. With that being said, certain types of water-soluble vitamin, such as [vitamin C](https://www.verywellhealth.com/the-benefits-of-vitamin-c-supplements-89083), 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) helps promotes good vision and healthy skin and 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 B6**(pyridoxine) aids in protein metabolism and the production of red blood cell, insulin, and hemoglobin.
* **Folate** (folic acid) also aids in protein metabolism and red blood cell formation and 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.
* **Biotin** helps release energy from carbohydrates and aids in the metabolism of fats, proteins, and carbohydrates from food.
* **Pantothenic acid** aids in metabolism and the formation of hormones.
* **Vitamin C**(ascorbic acid) is central to iron absorption and [collagen synthesis](https://www.verywellhealth.com/collagen-supplements-for-skin-89940). It aids in wound healing and bone formation while improving overall immune function.1﻿

Fat-Soluble Vitamins

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

Because fat-soluble vitamins are not readily excreted, they 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.

There are four types of fat-soluble vitamin, 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
* 3.
* niacin functions as part of a coenzyme involved in the metabolism of carbohydrates and acts to catalyze the oxidation of sugar derivatives and other substances. Niacin is a water-soluble vitamin and is found as nicotinamide (niacinamide) or nicotinic acid. It is a component of the coenzymes nicotinamide adenine dinucleotide (NAD) and its phosphorylated form (NADP), which are involved in the catabolism and/or anabolism of carbohydrates, lipids, and proteins. NADH is the predominant electron carrier and transfers electrons to the electron transport chain to make ATP. NADPH is required for the anabolic pathways of fatty acid and cholesterol synthesis. In contrast to other vitamins, niacin can be synthesized by humans from the amino acid tryptophan in an anabolic process requiring enzymes dependent on riboflavin, vitamin B6, and iron. Niacin is made from tryptophan only after tryptophan has met all of its other needs in the body. The contribution of tryptophan-derived niacin to niacin needs in the body varies widely and a few scientific studies have demonstrated that diets high in tryptophan have very little effect on niacin deficiency. Niacin deficiency is commonly known as pellagra and is characterized by diarrhea, dermatitis, dementia, and sometimes death . It is still seen in poor urban US, Africa and Asia. People at risk of developing pellagra are alcoholics, people consuming a low protein diet, and people using drugs used to treat tuberculosis and leukemia.