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1) Coenzyme: A substance that enhances the action of an enzyme. (An enzyme is a protein that functions as a catalyst to mediate and speed a chemical reaction).

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).

A number of the water-soluble [vitamins](#) such as [vitamins](#) B1, B2 and B6 serve as coenzymes.

2) Water-Soluble Vitamins

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](#), 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 promote 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 cells, 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. It aids in wound healing and bone formation while improving overall immune function.

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.²

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.²

3) Niacin assists functions of the nervous and digestive system. It plays a role in food metabolism and in the formation of red blood cells and skin. NAD and NADP are coenzymes that are part of the energy production system of the body. This system works by means of oxidation and reduction (redox) reactions. Niacin deficiency occurrence causes many symptoms, such as fatigue, headaches, dry skin, loss of appetite, ulcers and emotional instability. On rare occasions (mainly in developing countries) people may experience severe deficiency, which leads to a condition known as pellagra. This condition is commonly characterized by the 4 D's: dermatitis, diarrhoea, dementia and death. Pellagra literally means raw skin. The condition was named this because the skin of a patient develops a dark pigmented rash on areas exposed to bright sunlight.

Vitamin B₃ in food

Niacin is part of a range of foods, for example meat, fish, bread, yeast, nuts, seeds, soy beans, potatoes, dried fruit, tomatoes and peas. Milk, green-leaved vegetables and coffee and tea also provide some niacin. Cereals may be fortified with niacin. Some foods, such as corn, may release niacin upon cooking. Before cooking corn only contains bound, unavailable niacin.

Vitamin B₃ as a supplement

Niacin is recommended for dizziness, Post Menstrual Syndrome (PMS) and arthritis. It is a useful preparation for burn treatment. Niacin can also be useful for alcohol addicts and people with high cholesterol, mental problems, severe stress problems or hyperthyroid, for athletes and for elderly people. Niacin is suspected to decrease the possibility of introduction of certain types of cancer such as leukaemia, as a result of increase levels of DNA-repairing coenzymes (NAD). People suffering from HIV may be given extra niacin to postpone symptoms and elongate their life.