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**Coenzymes** is an organic non protein compound that binds with an enzyme to catalyze a reaction. Coenzymes are often broadly called cofactors , but they are chemically different. A coenzyme function alone but can be reused several times when paired with an enzyme.

Without coenzyme or cofactors enzymes cannot catalyze reactions effectively. Enzyme without a coenzymes is called an apoenzyme. They bind loosely to an enzyme at the active site to help catalyze the reactions.

**Differences between water soluble and fat soluble vitamins**

Water soluble dissolves in water while fat soluble dissolves in fat

Water soluble are absorbed into tissue while fat soluble vitamins are absorbed by fat globules that travel through the small intestines and distributed through the body in the bloodstream.

Water soluble replenish in our diet while fat soluble do not replenish in our diet.

Types of water soluble

* **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,
* Vitamin B9 (folate)
* Vitamin B12 (cobalamin)
* Vitamin C

**Types of fat soluble vitamins**

* 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

**Niacin** is a coenzyme, like thiamine and riboflavin , that is responsible for energy release from carbohydrates. A niacin deficiency can lead to ***pellagra***, a disabling disease with symptoms that may be characterized by four “Ds”: depression, diarrhea, delirium and dementia.

Niacin is found in fortified breads and cereals. Protein foods, such as eggs, fish, meat, dairy milk and poultry, are naturally rich in niacin. Niacin is converted to NAD, NADH, which serve necessary roles in oxidative respiration as electron carriers. NADP and NADPH are also niacin-dependant biomolecules which are important in synthesis of nucleic acids, fatty acids, and cholesterol. Therefore, it plays an important role in DNA repair and production of steroid hormones. Niacin could also have a major impact on decreasing the risk for cardiovascular disease as well as treatment of cancer.

Niacin has been used to lower LDL cholesterol and raise HDL cholesterol when administered as a drug under medical guidance. In heavy doses, niacin has been known to cause a ***“niacin flush”*** due to the capillaries increasing in size. This condition can lead to fatigue and even liver damage. Caution should be used if one is taking niacin or B-complex supplements.

**Sources of niacin:** eggs, fish, legumes, meats nuts, peanuts, poultry, pork

**Roles in body:** coenzyme, digestive and nervous system functions, healthy skin

**Deficiency:** appetite loss, confusion, fatigue, flaky skin, indigestion, pellagra

**Toxicity:** cramping, flushing, headaches, irregular heartbeat, irritated ulcers, liver dysfunction

Cooking Foods with Niacin

Niacin is one of the more stable water-soluble vitamins and is minimally at risk for destruction by air, heat or light.