The Significance of Coenzymes

Every living organism on Earth uses coenzymes in various important enzyme-catalyzed reactions, for example, ones that are involved in the central metabolic pathways such as glycolysis and the Krebs cycle. Many species can synthesize their own coenzymes from simple precursors, which is very important in four out of five kingdoms: prokaryotes, protozoa, fungi, and plants. On the other hand, animals don't have the ability to produce some of the coenzymes, hence they have to consume it through their diet.

Depending on the interaction with apoenzymes, two types of coenzymes are

Depending on the interaction with apoenzymes, two types of coenzymes are known – cosubstrates and prosthetic groups. Cosubstrates are actually substrates in the enzyme-catalyzed reactions. They are altered throughout the biochemical reaction and dissociate from the active site. Oppositely, the prosthetic group remains bonded for the enzyme during the course of the reaction. Depending on the nature of the chemical bonds in the active site, a prosthetic group can form a strong covalent bond with its apoenzyme or it can be weakly bound to the active center by many weak interactions. Similarly to ionic amino acid residues of the active site, the prosthetic group must return to its original form by the end of the catalytic event or the holoenzyme won't be catalytically active anymore.

As mentioned earlier, animals lost their ability to synthesize some coenzymes. Mammals—including humans—have the ability to source necessary coenzymes or their direct precursors in order to survive. Herbivores obtain vitamins from plants and microorganisms, and carnivores get their vitamins from meat. Majority of consumed vitamins are enzymatically converted into their corresponding coenzymes.

Vitamins soluble in water are needed in small quantities because cell depots of their coenzymes are unstable. Therefore, the excess of these type of vitamins is excreted via urine. On the other side, lipid vitamins such as A, D, E, I and K are stored in animals' bodies and increased intake can cause hypervitaminoses, because—unlike hydrosoluble vitamins—the excess can't be excreted that easy.