Redox enzymes

Most of the energy in the animal organism comes from redox processes. The oxidation products of the reaction have a lower energy content than the starting reactants and the energy is released as heat or is transformed into other types of usable energy, e.g. chemical bond energy. Numerous oxidations are associated with the formation of "macroergic" phosphate esters of anhydride nature (ATP , ADP), which are of particular importance in the conservation and transfer of energy. They are created from the energy released in the cell during oxidation reactions. Oxidoreductions can take place anaerobically, e.g. in glycolysis , or aerobically, e.g. in the oxidation of substrates of the citrate (Krebs) cycle or β-oxidation of fatty acids in mitochondria.

Sugars, lipids and proteins are energy sources in the body, but oxidation usually does not take place directly with molecular oxygen, even during aerobic oxidation-reductions (with the exception of so-called oxygenases).

During oxidation-reduction processes in the mitochondria, electrons are transferred from substrates to oxygen by a series of transporters that create a precisely linked system of enzymes. This chain of oxidation-reduction processes (cellular respiration) takes place in two stages:

1. 1. Transfer of hydrogen atoms by the action of dehydrogenases, which contain pyridine and flavin nucleotides as coenzymes .
   2. Electron transfer mainly through cytochromes (in mitochondria). The last step is significant, where autooxidable cytochrome oxidase reacts directly with molecular oxygen to form water molecules

The redox sequence of reactions takes place in the inner mitochondrial membrane in the so-called respiratory (respiratory) chain , which is very schematically expressed as a two-electron transfer, since electrons are removed in pairs from molecules of organic substrates via dehydrogenase coenzymes during biological oxidations. At the level of cytochromes, however, the transfer is one-electron, and at the level of cytochrome oxidase, during the reduction of the O 2 molecule, it is four-electron .

During the two-electron transfer from substrates (most often) of the citrate cycle to molecular oxygen, ATP molecules are simultaneously created - the so-called aerobic (oxidative) phosphorylation .

However, the electron acceptor does not always have to be oxygen. Some dehydrogenases also donate electrons to other acceptors, e.g. pyruvate (lactate dehydrogenase) or *in vitro* to artificial acceptors, such as methylene blue (flavin dehydrogenases). This is about anaerobic oxidation reduction.

In addition to dehydrogenases and cytochromes, oxidoreductases (among others) also include peroxidase (EC 1.11.1.7) and catalase (EC 1.11.1.6), which decompose H 2 O 2 in such a way that the peroxidase catalyzes the oxidation of a suitable substrate

AH 2 + H 2 O 2 → 2 H 2 O + A, whereas catalase releases molecular oxygen during the reaction 2 H 2 O 2 → 2 H 2 O + O 2 Category :

- Chemistry
- Biochemistry

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