Enzyme Nomenclature (FBLT)

Trivial Nomenclature

The originally used term *ferments*, which was based on the fact that enzymes are involved in fermentation, is no longer used. Enzymes discovered among the first were usually named after their **source' *or the* *method* *by which they were discovered. Thus, their names tend to be unrelated to the mechanism of the reaction they catalyze. Many end with the suffix* -*in* -** see pepsin found in the digestive juices of the stomach *(Greek pepsis - digestion)* or ptyalin found in saliva *(Greek ptyalon – saliva)*.

Recommended Terminology

It introduces a system into the nomenclature and is at the same time simpler than systematic nomenclature, which is why we often use it in everyday practice. We create the name by combining:

1. **Substrate + -ase (-asa)** - for example amylase (catalyzing the hydrolysis of amylose);
2. **Type of reaction + -ase** - for example dehydrogenase.

Systematic nomenclature

Systematic nomenclature was introduced by IUB (*International Union of Biochemistry*). Each enzyme has its own **EC' *(Enzyme Commission)* *number*** consisting of four digits - x.x.x.x. The first indicates one of the six main enzyme classes, the other two a subgroup and a subsubgroup. The last one indicates the order of the enzyme in the subgroup (and thus completely characterizes the given enzyme). We recognize these **seven major classes of enzymes'**:

1. oxidoreductases,
2. transferases,
3. hydrolases,
4. lyases (synthases),
5. isomerases,
6. ligases (synthetases),
7. translocases.

Oxidoreductases

Oxidoreductases catalyze reactions in which there is oxidation of one component and reduction of another component. They often use cofactors – e.g. NAD^+, $NADP^+$, FAD or heme. Oxidoreductases include:

- oxidases, peroxidases,
- oxygenases – introduce oxygen into the substrate molecule, either in the form of -OH (monooxygenases or hydroxylases) or as O_2 (dioxygenases),
- dehydrogenases – oxidize the substrate by removing H-atoms, their name is abbreviated as DH (e.g. lactate dehydrogenase – LDH, alcohol dehydrogenase – ADH),
- desaturases.

Transferases

Transferases are involved in the transfer of various groups (amino-, acyl-, methyl-, glycosyl-, phosphoryl-, ...). Examples of transferases are:

- transaminases (aminotransferases) – transfer the $-NH_2$ group,
- kinases (phosphotransferases) – transfer the phosphate group from ATP or other nucleoside triphosphates,
- transaldolase, transketolase.

Hydrolases

They catalyze hydrolytic reactions (the splitting of bonds in molecules by means of a water molecule). Hydrolases include:

- lipases, phospholipases,
- disaccharidases (sucrase, maltase, lactase),
- proteases, peptidases (pepsin, trypsin),
- esterases,

- phosphatases.

Lyases (synthases)

They catalyze the removal of a certain group from the substrate without hydrolysis (non-hydrolytic cleavage of e.g. bonds between C-C, C-N) as well as addition reactions to double bonds and syntheses without consumption of ATP. Examples of lyases are:

- decarboxylase,
- aldolase,
- dehydratases, hydratases.

Isomerases

They catalyze changes within one substrate molecule (intramolecular changes). The resulting product is an isomer of the starting substrate. Isomerases include:

- epimerase – changes the position of the -OH group in the molecule,
- mutases – change the position of the phosphate group in the molecule.

Ligases (synthetases)

They catalyze synthetic reactions associated with ATP hydrolysis (coupling exergonic and endergonic reactions). Examples of ligases are:

- carboxylase,
- DNA-ligase.

Translocases

They ensure the movement of substances across the biological membrane. They enable a specific transfer of atoms and molecules. E.g.:

- TOM complex - ensures the transition of the outer mitochondrial membrane (translocase of the outer mitochondrial membrane)
- ADP-ATP-translocase – catalyzes the antiport of ATP behind ADP on the inner mitochondrial membrane