

Introduction to protein and amino acid metabolism

Proteins are among the most important and at the same time the most represented biomolecules of the human body. The sum of all amino acids in the body is called the **amino acid pool**.

The body of a man with an average weight of 70 kg contains approximately 14 kg of protein.

Creation and use

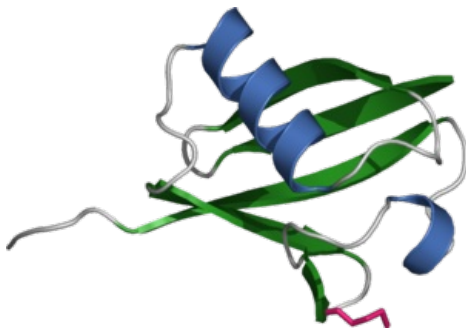
About 300-500 g of proteins are degraded into amino acids per day in a healthy adult. We are talking about the so-called **proteolysis**. Another **source of amino acids is dietary protein**, which represents approximately 70-100 g per day. The last source of amino acids is the **biosynthesis of non-essential amino acids**, from which the body obtains 30-40 g of amino acids per day.

Approximately the same amount of amino acids as released by proteolysis is re-incorporated into proteins. This is the process of so-called **proteosynthesis**.

We degrade around 120 g of amino acids per day – the amino acid chain is split into an amino group (and other nitrogen atoms) and a carbon chain – each of which has a completely different fate.

Amino acids can also serve as **precursors of** important substances – e.g. biogenic amines, heme or purines and pyrimidines.

The half-life of proteins varies greatly from protein to protein, so no average value can be given. In general, however, it can be said that structural proteins are more permanent - they have a longer half-life. The molecules of many enzymes, on the other hand, only exist for a very short time - just a few tens of minutes or hours.



Ubiquitin

Proteolysis is the complete degradation of proteins into **free amino acids**. In the course of proteolysis, protease and peptidase enzymes are used, which are found both in the digestive tract and in every cell - lysosomes .

The basic division of peptidases distinguishes:

- **Exopeptidases** – amino- and carboxypeptidases – cleaving proteins / peptides at the ends of their chains;
- **Endopeptidases** - trypsin, chymotrypsin or pepsin - cleaving internal bonds of proteins / peptides.

The ubiquitin-proteasome system

Ubiquitin is a small cellular protein found in all eukaryotic cells. It serves as a tag that predisposes the protein to its **degradation** in proteasomes. We call this process ubiquitination (or polyubiquitination - if more ubiquitin molecules are attached).

Historical correlation:

For the discovery of ubiquitin-mediated protein degradation, Aaron Ciechanover, Avram Hershko and Irwin Rose were awarded a Nobel prize in Chemistry in 2004.