Synthesis of Biological Polymers

Biopolymers

Polymers are natural or synthetic substances in whose macromolecules the basic monomeric unit is repeated many times.

- Divided into elastomers and plastics.
- They are prepared by **polymerization** - a chemical reaction in which the molecules of a low-molecular compound (monomer) combine and create a macromolecular substance (polymer) by repeating it many times.

The use of polymers has also found application in medicine (e.g. soft tissue transplantation, replacement of blood vessels, heart valves or panchytic organs, after reinforcement with metal or ceramic fibers they can be used in the construction of artificial bones and joints).
Biological polymers include proteins, nucleic acids and polysaccharides. The synthesis of biological polymers requires an input of energy.

Protein synthesis

Proteins or proteins are biomacromolecular substances - biopolymers.

- Animals and humans take them in food,
- plants are able to create them from inorganic substances from nitrates.

In the digestive system, they are further broken down into amino acids, from which the organism subsequently creates its specific proteins. They have a large relative molecular weight.
Amino acids are the building blocks of proteins, 20 of them participate in their construction (proteinogenic AMK). The incorporation of amino acids into protein molecules is precisely controlled, there is a genetic code for them. These amino acids are referred to as coded amino acids. Amino acids that cannot be synthesized by humans are called essential, or indispensable. Amino acids that humans create themselves and therefore do not need to take in are called non-essential, or dispensable.
Protein synthesis takes place by **proteosynthesis**. It is divided into transcription and translation, and post-translational modifications also occur. Transcription is the event in which genetic information is transcribed from DNA to RNA, followed by splicing of introns and mRNA is produced. Next, synthesis continues with translation, when the genetic information from mRNA is translated into the primary structure of the protein.
Proteins can also be synthesized by **condensation**, which produces peptides to proteins, depending on the length of the chain. Condensation is the joining of amino acids into peptides, during which a water molecule is released.

- **Polypeptides** are formed by combining more than 10 amino acids, and **proteins** are formed by combining more than 100 residues of amino acid molecules.

Synthesis of Polysaccharides

Polysaccharides are organic molecules, referred to as biomacromolecules or biopolymers.

- They are created by joining the so-called **monosaccharide** units into long chains.

They mostly do not have a regular structure (they are amorphous), they are not soluble in water and, unlike carbohydrates, they do not have a sweet taste.

- We divide them into **homopolysaccharides** and **heteropolysaccharides** - depending on whether they are made up of one or more types of monosaccharides.

Polysaccharides are a very important source of energy and also the building block of cells of various organisms. For humans it is polysaccharide glycogen, for plants starch and cellulose, for fungi chitin.
Glycogen is found as a storage substance in humans mainly in the cytoplasm of liver cells, in the form of granules, and also in muscles. The energy source works in such a way that when glycemia drops, glycogen begins to be broken down into glucose, which is released into the blood. The actual process of glycogen splitting is referred to as glycogenolysis.

Glycogen Synthesis

Glycogen synthesis (and polysaccharides in general) takes place in the **cytosol** of the cell and, like all biomacromolecule synthesis, requires an energy supply.
The process by which glycogen is formed from glucose (α-D-glucose) is called glycogenesis. The protein glycogenin is the core and the beginning of the formation of glycogen. Glucose is converted by enzymes into glucose-6-phosphate, then into glucose-1-phosphate, and finally into the activated form of glucose, UDP-glucose. These molecules are then bound to the glycogenin core, around which complex branched structures of glucose molecules are gradually created with the help of enzymes. The so-called glycosidic bond is used here (i.e. the bond of a saccharide with the hydroxyl group of another molecule).

Links

Related Articles

- Glycogenesis
- Translation
- Transcription
- Carbohydrates

External links

https://www.scientificpsychic.com/fitness/carbohydrates1.html http://lekarske.slovniky.cz/lexikon-pojem/glykogenin-1 https://cs.wikipedia.org/wiki/Glykogensynt%C3%A1za https://en.wikipedia.org/wiki/Glycogenesis https://cs.wikipedia.org/wiki/Glykosidov%C3%A1_vazba https://cs.wikipedia.org/wiki/Polysaccharides http://oldweb.izip.cz/ds3/hypertext/AJDOG.htm http://www.studentske.cz/2007/09/syntza-blkovin-proteosyntza-transkripce.html

References

References

- OTOVÁ, Berta – MIHALOVÁ, Romana. *Fundamentals of human biology and genetics.* 11. edition. Karolinum, 2014. ISBN 9788024621098.

Recommended reading