SOME COMPLEX PROTEINS AND THEIR BIOLOGICAL PROPERTIES

Qodirov Raxmatillo Shakirovich

Senior Lecturer, Department of Biological Chemistry,

Andijan State Medical Institute

Annotation: The article provides information about some complex proteins and their biological properties and importance.

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A complex protein contains two components - a simple protein and a non-protein substance. A non-protein substance is called a prosthetic group. Typically, ptorsthetic groups are strongly bound to a protein molecule.

Glycoproteins and their biological significance. Complex proteins are divided into several groups depending on the nature of the non-protein components.

Carbohydrate-protein complexes. These macromolecules are divided into two types: glycoproteins and proteoglycans or polysaccharide-protein complexes. The carbohydrate part of glycoproteins is composed of smaller, irregular heteropolysaccharides. 80-90% of the macromolecule is protein.

Depending on the location of carbohydrate-peptide bonds in the structure of glycoproteins, the following types have been identified: glycosylamide - a monosaccharide bound to the amide group of asparagine, such as immunoglobulin, glycoprotein enzymes and hormones; O-glycoside - a monosaccharide bound to the OH-group of serine or threonine, for example, mucin in saliva, blood group substances. It sometimes binds to the OH group of hydroxylysine or hydroxyproline in collagen proteins.

Although the carbohydrate component makes up a small portion of the glycoprotein, it gives the protein molecule qualitatively new properties. In particular, glycoproteins differ from proteins in their high temperature resistance (thermostability). High or low temperatures do not change their physical and chemical properties. This means that if a protein is resistant to temperature denaturation, it can be considered a glycoprotein. Unlike other proteins, glycoproteins are extremely difficult to digest in the presence of proteolytic enzymes such as trypsin and pepsin.

The carbohydrate portion of glycoproteins gives the protein a high degree of specificity. Macromolecules on the cell surface are an example of this. Most proteins consist of hormones, complex proteins in the membrane, all antibodies (immunoglobulins), blood plasma, milk proteins, ovalbumin, interferons, blood group factors, receptor proteins and other glycoproteins. They perform various functions in animal and plant organisms, microorganisms: receptors for high molecules in intercellular communication, transport of hydrophobic substances and metal ions (transcortin, serruloplasmin, haptoglobin, transferrin), coagulation (prothrombin, fibrinogen) and immunity (immunoglobulins). Enzymes such as cholinesterase, ribonuclease B and gonadotropin, corticotropin hormones are among the glycoproteins.

The cell membrane of microorganisms living in hot springs contains glycoproteins. Capsules of chemically and thermally resistant spore bacteria contain glycopeptides and glycolipoproteins. Glycoproteins act as antifreeze in Antarctic fish and prevent the formation of ice crystals in the body's internal environment.

Also, heparin, which is synthesized in the liver and is contraindicated in blood clotting, is a glycoprotein antigen of many bacteria.

A separate group of glycoproteins consists of glucosaminoglycans or acidic mucopolysaccharides. They differ from true glycoproteins mainly in that they contain repetitive, often specific disaccharide units. The main part of the proteoglycan molecule formed by the binding of glucosamine glycans to a protein

molecule belongs to polysaccharides. They are also called sour mucopolysaccharides because they were first derived from the sticky proteoglycan in saliva - mutsin. Most proteoglycans are the main gel-like substance between tissue cells. In addition, they are involved in the composition of the fluid that moisturizes the skin, joints, cornea.

\ Proteoglycans include hyaluronic acid, heparin, chondroitin sulfuric acid, and others. Mutsin, found in saliva and in the secretions of various glands, gives them a high degree of viscosity, facilitates the sliding of food into the stomach, protects the mucous membrane of the mouth from harmful mechanical, thermal and chemical effects.

Interferons. Many types of viruses are inhibitors of reproduction. There are currently several types of interferons (a, b, g). Some of them are genetically engineered. Interferons are formed in response to the introduction of viral nucleic acid into the cell, limiting the spread of the virus, which is the main protective protein in patients with cancer.

Immunoglobulins. Immunoglobulins are synthesized in plasma cells in lymphocytes. Antibodies (antibodies) enter the class of glycoproteins and perform a protective function, neutralizing foreign substances entering the body - antigens of a chemical nature. There are 5 classes of immunoglobulins: IgG, IgM, IgA, IgD and IgE. Different classes of immunoglobulins differ in molecular weight, blood concentration and biological properties.

Protein and fat complexes. Lipoproteins and proteolipids are complexes of proteins with fatty substances. Fat protein complexes are divided into free lipoproteins (milk, blood lipoproteins) and structural proteolipids contained in the membrane. Lipoproteins are water soluble. Their structure is unique, the oily component is inside the molecule, and the surface is covered with a protein layer. In proteolipids, on the other hand, the protein component is inside and the surface is covered with fat. Therefore, they are soluble in fat solvents. Lipoproteins contain neutral fats, free fatty acids, phospholipids and cholesterol.

Protein complexes of lipids differ in particle size, solubility and other

physicochemical properties. They are called alpha- and beta-lipoproteins because they move along with plasma proteins, alpha- and beta-fractions in electrophoresis. Fats are digested, absorbed from the small intestine into the lymph, and then appear in the blood chylomicrons (drops or particles with a diameter of about 1 micron) also contain a lipoprotein complex.

In the structure of lipoproteins retains a complex of non-polar triacylglycerol and cholesterol esters. The water-soluble hydrophilic parts of the polypeptide fragment are composed of phospholipids. They are trapped inside the particle. Therefore, this structure, rich in lipids, has the ability to dissolve in water and is convenient for the transport of fats from the small intestine to the fat depots and other tissues through the blood.

In addition to chylomicrons, blood lipoproteins are divided into three main groups: very low-density lipoproteins (ZJPLP) - pre-beta-lipoproteins, low-density lipoproteins (ZPLP) - beta-lipoproteins and high-density lipoproteins (ZYLP) - alpha-lipoproteins.

Chylomicrons, pre-beta-lipoproteins, and beta-lipoproteins contain less than 30% protein, while alpha-lipoproteins contain 50% protein. Proteins are assumed to be wrapped in alpha-lipoproteins, and in beta-lipoproteins in a layered configuration. The classification of lipoproteins is based on the density of the lipoprotein complex. The unit of density, in turn, depends on the ratio of protein and various lipids. The higher the amount of lipids, the lower the density of lipoproteins, and they float to the top during the centrifugation of blood plasma.

In medicine, it is important to determine the amount of lipoprotein fractions in the blood plasma. It is confirmed that the development of a serious and widespread cardiovascular disease called atherosclerosis is associated with an increase in the amount of ZPLP in the blood. This is due to the deposition of cholesterol and its esters in plasma lipids on the inner surface of blood vessels.

Structural lipoproteins are part of biological membranes. According to their physicochemical properties, they are called proteolipids because they are soluble in

non-polar solvents (chloroform-methanol 1: 1 mixture). This property of proteolipids is due to the fact that the inner part of their molecule consists of 65-85% protein, and the shell is a lipid component. Proteolipids are found in the heart, kidneys, lungs, skeletal muscle, plant cells, mostly in the myelin sheaths of nerves. The composition of proteolipids in different organs varies. They are involved in the physiological functions of nerve fibers and the transfer of substances through the membrane.

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