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Interdisciplinary Character of Biochemistry and Analytical Biochemistry

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Abstract

Biochemistry is a modern frontier science with an interdisciplinary character. Biochemistry has close links with organic chemistry, which provides support for knowing the structure and properties of biomolecules. Analytical chemistry, colloidal chemistry and chelates complexes provide biochemistry with methods of identifying, separating and characterizing biomolecules as well as kinetic and thermodynamic interpretation of biochemical reactions. Biochemical processes are carried out at cellular structures, so biochemistry interferes with molecular biology first and with morphology, which can also be approached from the aspect of structural element chemistry. Physiology raises a higher level of knowledge of the laws of life phenomena, and modern genetics has in fact become biochemical genetics, because it has created the basis for the codification of the hereditary message and has established relations between nucleic acids and protein biosynthesis as a premise of self-reproduction of living organisms.

Keywords: Biochemistry; Analytical Biochemistry; Colloidal biochemistry; Chelates complexes

Background

Biochemistry has a close relationship with life sciences such as agricultural sciences, animal husbandry and veterinary medicine because knowledge of biochemical processes taking place at the level of plant and animal organisms is indispensable for influencing plant production and for rational animal husbandry. Analytical biochemistry is the science of methods of qualitative and quantitative determination of the composition of substances or mixtures of substances, that is, science of the methods of analysing substances [1]. Analysis is the method of research science based on the study of each component. Analysis methods in general can be classified into three groups: biochemical, instrumental and biological. Biochemical analysis is the method of biochemistry as a science, which allows us to study the composition, structure, properties and processes of obtaining the substances. Biochemical analysis methods are based on the use of biochemical reactions, and the effect of the analysis is visually fixed. In particular, biochemical analysis methods: qualitative, quantitative, structural and systemic.

- Biochemical analysis of qualitative-has the task to establish what kind of elements, groups of atoms, ions or molecules is composed of the analyte or mixture of substances.
- Biochemical quantitative analysis–aims at establishing the quantitative composition of the biochemical analyzed.
- Structural analysis-aims to determine the structure of substances, i.e. how to bind the elements in the substances [2].

The biochemistry also called biological chemistry or physiological chemistry, it is the science that applies the chemical methods of investigation in the study of all manifestations of life, investigating the chemical composition of living organisms and chemical processes that take place in them. Biochemistry represents science dealing with life-long level study molecular. It is the combination of chemistry that studies interactions atomic, and molecular biology, studying the structure and interaction of the body of the body. The atoms of H and O, along with the C atom, form the first constituents elementary you living matter. The atom of N is, of also an element essentially, because next to C, H, and O it falls into the composition of the substance's proteins, that is of compounds that represent the molecular structures May important issues of living matter. Atoms of C, H, O and N are endowed with a common ownership and certain can establish covalent bonds through distribution of electrons. Elements may slightly abundant (P, S, Ca, Mg) we take part as an element construction in the composition of the molecules involved in the composition of living organisms, and Cl, Na and K or which are also indispensable to life he molecules of compounds that make up the living matter are called biomolecules They condition the biochemical structure and structure functional function specific to all living organisms.

All the biomolecules of the organism are made up of very simple, low molecular weight precursors from the environment (the great laboratory of nature!). CO_2, H_2O, NH_3. These environmental precursors, by means of metabolic mechanisms (with intermediates: piruvat, citrate, malat, glyceraldehyde-3-phosphate), are transformed by living organisms into organic compounds with a slightly higher molecular weight, also called basic biomolecules constituent units: nucleotides, amino acids, monosaccharides, fatty acids, glycerol. Biomolecules from the base bind to each other through covalent bonds resulting in macromolecules specific to the living cell: nucleic acids, proteins, polysaccharides, lipids; inorganic biomolecules: Examples of inorganic molecules: water and mineral salts; organic biomolecules: proteins, lipids, carbohydrates, enzymes, hormones, etc.

The solutions that keep almost constant the concentration of hydrogen ions at dilution and even if they are add strong acid or base are called buffers. These solutions contain two substances that are opposing environmental pH variations when small amounts of strong acid or strong base are added to it. In the analysis, separation of the ions by groups and subgroups is accomplished by precipitation bioreactions.

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The bioreactions are mostly taken place in aqueous phase, a fundamental consensus in the science community, while there are multi-folds of identification indicators and methods, such as those based on size, charge, color and heat change of molecules or reactions, not to mention numerous spectroscopic methods based on the electromagnetic properties of molecules. Some identification bioreactions are precipitation bioreactions [3]. Also, a series of dosing methods (quantitative determination) are based on a precipitation phenomenon [4]. Precipitation can be defined as the process of forming a new solid phase in a system liquid. It can be the result of both biochemical reactions and physical phenomena. For example, if alcohol is added to the solution of a salt, it may take the liquid outflow below solid form of a salt amount as a result of the physical process.

Often, however, appearance a precipitate is produced by the biochemical phenomenon (double-exchange bioreactions, oxidoreduction bioreactions, complex combination formation bioreactions, etc.). Formation of precipitates, regardless of type bioreaction, involves more complex processes [5]. The precipitation equilibria, which are part of the equilibria in heterogeneous phases depend on the solubility of the substances involved in the process as well as a number of factors influencing the solubility and precipitation process respectively. Every bioreaction of precipitation, as the process of equilibrium, is characterized by the solubility product. Anything else precipitate is characterized by two values: solubility and solubility product. In the saturated solution of a heavily soluble electrolyte, two opposite processes result from each other: dissolution (passage of precipitated ions in solution), and crystallization (passage of ions from the solution to precipitate) [6].

Importance of Analytical Biochemistry for Pharmaceutical Practice. Control Service Pharmaceutical

Analytical biochemistry has the numerous applications in most areas of activity. In any branch, analytical methods are used to track the quality of raw materials, intermediate products and, in particular, final products. There is a biochemico-analytical control service for each field of activity which is regulated by that ministry [7]. This the analytical control service in the drug industry is called a pharmaceutical control service. It ensures rigorous control of the quality of raw materials, intermediate products from a production process of pharmaceuticals and finished products (i.e. pharmaceuticals) [8]. No drug can be exposed to the pharmacy for release to patients without the positive approval of the pharmaceutical control service. Detailed subject is studied at the departments and first of all at the department of pharmaceutical biochemistry [9].

The Role of Colloidal Solutions in Biochemical Analysis, Coagulation of Colloids, Peptise (*Peptide Precipitation Agents*) of Precipitates

When conducting a chemical analysis, we often face the phenomenon when precipitation of a hardly soluble electrolyte leads to the formation of a colloidal solution [10]. In most cases this phenomenon plays a negative role in qualitative and quantitative chemical analysis as it becomes difficult to performing procedures such as quantitative precipitation, centrifugation of heterogeneous "precipitated solution" systems, filtering precipitates, washing them, etc. [11-13].

To prevent the formation of colloidal systems during chemical analysis, it is necessary we know the structure, properties and conditions of forming colloidal systems. The system where a substance is dispersed as small particles into another substance is called the system dispersed. The dispersed substance-dispersed phase and the environment in which the phase is dispersed-dispersed medium. The state of aggregation of the dispersed phase and the dispersed medium, the particle size of the phase dispersion determines the properties of dispersed systems [14-16]. The stability of colloidal solutions is elucidated by the structure of colloids, which are some particles with the same task either positive or all with a negative charge. Particles of the same load cannot stick (approaching) one another and so cannot form larger aggregates that would lead to precipitation. During heating, as well as the addition of electrolytes, colloidal particles lose weight, they become and then precipitate in the form of a precipitate. This process is called coagulation (also known as clotting) [17-19].

The influence of pH is exerted on the formation of precipitates and complexes including its oxidant reductant. However, it is particularly important in proton redox bioreactions (H^+) [7,20].

Analytical biochemistry relies heavily on the ability of biomolecules to form complex bioreactions. Complex combinations are higher order compounds, characterized by their presence in molecule of a central atom around which different ions or neutral molecules are grouped. Its atom the central ion is also called complex generator. The ions or the molecules grouped (coordinated) around the central atom are called ligands. The complex combinations are characteristic of the coordinative link-a covalent bond accomplishes by a doublet of electrons coming from only one of the atoms involved in the connection [21-23].

The donor is called the atom that gives the electrons to form the bond, and the acceptor is called the atom takes part in the formation of the link without sharing any electron, that is, the atom adds the donor electron pair. The central atom (the complex generator) together with the ligands form the so-called internal sphere complex [11,24]. The ions, which are not directly connected to the complex generator, form the outer sphere of a complex. The structure of the complex combination depends on the coordination number, the nature of the central ion and its electronic configuration, and the nature of the field created by the respective ligands [25-27].

So, complexes with n=2 have linear or angular structure, those with n=4 may have tetrahedral structure, plan prosthetic or tetragonal plane; those with n=6 have octoedric structure or triangular prism, *etc.* Depending on the number of connections that a ligand with the central ion generator can form complex, ligands are classified into monodentate, bidentate and polydident ligands [28].

Complex formation bioreactions are equilibrium bioreactions (as well as most of the bioreactions chemical ones), and the shift of balance in one sense or another is evidence of greater stability or greater small complexes [29-31]. The stability of the complexes depends on the nature of the complex generating ion, or some its properties (electronic structure, charge, ionic radius, etc.), the nature of the ligand and the properties its (basics, task, etc.), the formation of cross-linking π-donor, chelation cycles, etc. The constant of equilibrium in the formation of the complex called constant formation or constant of stability serves to quantify the stability of the complexes [32-34]. Formation of the complexes, especially with inorganic ligands, proceeds step by step through the successive substitution of water molecules (or other solvent) with ions or ligand molecules [35,36]. Therefore, every stage of complex formation is characterized by the partial constant of equilibrium, thus of stability, and the general constant (global) stability is calculated by multiplying the partial constants. The constants for the formation of the complexes (or those of their instability) are used for calculating the conditions for the application of complex formation bioreactions to determine the direction for their calculation of the concentrations of the central ions (complex generators) and the ligands, etc. [37-39].

Chelates complexes are generated by the action of organic reagents on cation generators complexes. These ligands, however, are coordinated to the central metal ion by several atoms with donor properties (a polyidated ligand) to form a heterocycle [40,41]. Such the cycle has taken place the particular chelating cycle name, and the molecule or ion that generates this chelating agent cycle. The stability of the chelates complexes increases significantly compared to the usual complexes (the effect of chelating). Cycle size and number also influence the stability of the chelate complexes [17,42]. The most stable and more frequent cycles occurring in chelated combinations are those containing 5 and 6 atoms. The higher the number of cycles, the greater the stability of these complexes. If complex combinations accomplish cycles through both coordination and linkages ionic complexes are called internal complex combinations. Chelates encompass both complex combinations and complex chelated combinations where all links are coordinating [43].

Conditions for the Biochemical Reactions and Sensitivity of Biochemical Reactions

Any the biochemical reaction may occur under certain conditions, namely: environmental conditions (acid, basic, neutral), temperature conditions (some reactions must be cold and some hot) in the presence of reagents favoring the bioreaction in the desired direction, etc. The bioreactions used in the analysis must be sensitive. The lower the amount of an analyte substance that can be identified with the reagent given, the more sensitive the bioreaction is concerned [44]. Quantitatively, the sensitivity of an analytical bioreaction is characterized by several notions: the limit of recognition (or identification) Lr, μg; the limit concentration C_{lim}, g/mL; the limit dilution W, mL; sensitivity index pD. The limit of recognition is the minimum mass of the substance (ion), which can also be identified by the reagent given under conditions determined by the nature of the bioreaction [45]. The limit concentration is the lowest concentration; of the analyte component to which the bioreaction is given can have a positive result and the ratio of a mass unit (1 g) of the substance analyzed and the mass, g, or volume, mL, of the solvent. Limit dilution is the volume of aqueous solution containing 1 g of the analyte. The sensitivity index is related to the limit concentration and the limit dilution [27,40].

Conclusions and Remarks

The profound and extensive study of the biochemical processes that determine the maintenance of homeostasis, thanks to the adaptation mechanisms, is a current problem of functional biochemistry.

These investigations determine the essence of the biochemical processes that underlie physiological functions and can specify the regulatory mechanisms that delineate homeostasis in extreme states. This is a matter of both theoretical and practical interest. In the last 30-40 years, radical changes have occurred in biochemical studies due to the use of modern research methods.

The sensitivity and accuracy of quantitative assessments of different metabolites in biological structures has increased considerably.

Due to the infrared spectroscopy we can study the structural character of the molecule, it is possible to determine different foreign compounds in microcapsules. Improving the chromatographic method-in thin layers-allowed the extraction of individual metabolites from the tissue even when they are in minimal quantities. A the particular feature is immunochemical methods that favored and justified the identification of individual proteins, the sequence of amino acids in the chain. A the special role belongs to the radioactive detection method, which facilitates the study of the plastic and energetic metabolism under suitable conditions of the intact organism. A wide spread is the method of isotope recording (scintigraphy) that allows for perfect examination of metabolic processes at all levels of living systems.

At its core lies the process of transforming the energy of the primary radioactive particles into the electromagnetic radiation energy with a wavelength of 430 nm. The energy transformation is performed by the scintillator (liquid-for s-particles and crystal-for Y-particles). Absorbing the energy of the radioactive particles, the scintillator removes the photons that are recorded on the photoelectronic amplifier. Undoubtedly, the success of biochemistry depends on the obvious achievements in related sciences such as bio-organic, inorganic, analytical chemistry, physics and colloid, biology, physics and even mathematics.

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