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HISTORY OF DEVELOPMENT AND MODERN TRENDS IN BIOCHEMISTRY

Abstract: *This article examines the history of development and current trends in biochemistry.*

Key words: *biochemistry, biology, chemistry, cells, organism*

ИСТОРИЯ РАЗВИТИЯ И СОВРЕМЕННЫЕ ТЕНДЕНЦИИ В БИОХИМИИ

Резюме: *В статье исследуются история развития и современные тенденции в биохимии.*

Ключевые слова: *биохимия, биология, химия, клетки, организм.*

Biochemistry (biological, or physiological chemistry) is the science of the chemical composition of living cells and organisms, as well as the chemical processes underlying their vital activity. The term "biochemistry" has been used sporadically since the middle of the 19th century, in the classical sense it was proposed and introduced into the scientific community in 1903 by the German chemist Karl Neuberg.

Biochemistry is a relatively young science, which is at the intersection of biology and chemistry.

As an independent science, biochemistry was formed about 100 years ago, but people used biochemical processes in ancient times, not knowing, of course, about their true essence. In the most distant times, the technology of such industries based on biochemical processes as baking, cheese making, winemaking, and leather dressing was already known. The need to fight diseases forced us to think about the transformations of substances in the body, to look for explanations for the healing properties of medicinal plants. The use of plants

for food, for the manufacture of paints and fabrics also led to attempts to understand the properties of substances of plant origin. Ancient thinkers talked about the role of air and food in the life support of living beings, about what causes the fermentation process.

The 10th century Persian scientist and physician Avicenna, in his book "The Canon of Medicine", described in detail many medicinal substances.

In the 17th century, van Helmont coined the term enzyme to denote a chemical reagent involved in the digestion process.

The 18th century was marked by the works of M.V. Lomonosov and A.L. Lavoisier. On the basis of the law of conservation of the mass of substances discovered by them and the experimental data accumulated by the end of the century, the essence of respiration and the exclusive role of oxygen in this process were explained.

Portrait of William Prout by Henry Windham Philips

The study of the chemistry of life already in 1827 led to the still accepted division of biological molecules into proteins, fats and carbohydrates. The author of this classification was the English chemist and physician William Prout. In 1828, the German chemist F. Wöhler synthesized urea: first, from cyanic acid and ammonia (by evaporation of a solution of the resulting ammonium cyanate), and later in the same year, from carbon dioxide and ammonia. Thus, it was proved for the first time that the chemical substances of a living organism can be synthesized artificially, outside the body. Wöhler's works dealt the first blow to the theories of the representatives of the school of vitalists, who assumed the presence of a certain "vital force" in all organic compounds. Subsequent powerful impulses in this direction of chemistry were laboratory syntheses of lipids (in 1854 - M. Berthelot, France) and carbohydrates from formaldehyde (1861 - A. M. Butlerov, Russia). Butlerov also developed a theory of the structure of organic compounds.

A new impetus to the development of biological chemistry was given by the work on the study of fermentation, initiated by Louis Pasteur. In 1897, Eduard Buchner proved that sugar fermentation can take place in the presence of a cell-free yeast extract, and this process is not so much biological as it is chemical. At the turn of the 19th and 20th centuries, the German biochemist E. Fischer worked. He formulated the main provisions of the peptide theory of the structure of proteins, established the structure and properties of almost all amino acids included in their composition. But it was only in 1926 that James Sumner managed to obtain the first pure enzyme, urease, and prove that an enzyme is a protein.

Biochemistry became the first biological discipline with a developed mathematical apparatus thanks to the work of Haldane, Michaelis, Menten and other biochemists who created enzymatic kinetics, the basic law of which is the Michaelis-Menten equation.

In 1928, Frederick Griffith showed for the first time that an extract of heat-killed pathogenic bacteria can transmit pathogenicity to non-dangerous bacteria. The study of the transformation of bacteria further led to the purification of the pathogenic agent, which, contrary to expectations, turned out to be not a protein, but a nucleic acid. By itself, nucleic acid is not dangerous, it only carries genes that determine the pathogenicity and other properties of the microorganism. In 1953, the American biologist J. Watson and the English physicist F. Crick, relying on the works of M. Wilkins and R. Franklin, described the structure of DNA - the key to understanding the principles of transmission of hereditary information. This discovery meant the birth of a new direction of science - molecular biology.

In 1958, George Beadle and Edward Tatem received the Nobel Prize for their work on mushrooms, the conclusion of which was the "one gene - one enzyme" hypothesis. In 1988, Colin Pitchfork became the first person to be convicted of murder based on evidence obtained from DNA fingerprinting of

evidence, and the first offender to be caught following the massive use of fingerprinting procedures.

Among the latest milestones in the development of biochemistry, it should be noted that Andrew Fire and Craig Mello received the Nobel Prize in Physiology or Medicine for "the discovery of RNA interference - the effect of quenching the activity of certain genes".

Originating as the science of the chemistry of life at the end of the 19th century, which was preceded by the rapid development of organic chemistry, biochemistry differs from organic chemistry in that it studies only those substances and chemical reactions that take place in living organisms, primarily in a living cell. According to this definition, biochemistry also encompasses many areas of cell biology and includes molecular biology. After the separation of the latter into a special discipline, the demarcation between biochemistry and molecular biology was mainly formed as a methodological and in the subject of research. Molecular biologists predominantly work with nucleic acids, studying their structure and function, while biochemists have focused on proteins, especially enzymes that catalyze biochemical reactions. In recent years, the terms "biochemistry" and "molecular biology" are often used interchangeably.

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