



## Practical Significance Of The Mechanism Of Metabolism In Microorganisms

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### ABSTRACT

This article highlights the biological and practical significance of metabolic processes in microorganisms. The metabolic activity of microorganisms and their important role in the food industry, agriculture, biotechnology, pharmaceuticals, and ecology were analyzed. The main stages of metabolic processes, enzymatic reactions, mechanisms of energy production, and their industrial applications were scientifically described. In addition, the practical significance of aerobic and anaerobic metabolism, biosynthesis, and biodegradation processes of microorganisms was demonstrated.

### Keywords:

Microorganisms, metabolism, metabolic processes, fermentation, aerobic respiration, anaerobic processes, biotechnology, enzymes.

**Introduction.** Nowadays, the study of the vital activity of microorganisms is considered one of the important directions of biology, microbiology, and biotechnology. Microorganisms are among the most important biological objects actively participating in the circulation of substances in nature, and their metabolic processes are widely used in industry, agriculture, and food technologies.

The vital activity of microorganisms is based on metabolic processes. Metabolism is the sum of all chemical reactions occurring in an organism and is divided into two main stages: anabolism and catabolism. During catabolism, complex organic substances are broken down to produce energy, while during anabolism, complex biological compounds are synthesized from simple substances.

The study of metabolic mechanisms in microorganisms is of great importance for the development of industrial microbiology and biotechnology. This is because antibiotics, enzymes, organic acids, vitamins, and other

biologically active substances are obtained precisely through metabolic processes.

**Metabolic Processes in Microorganisms.** Metabolic processes in microorganisms occur with the participation of enzymes. Enzymes are biological catalysts that increase the rate of chemical reactions occurring in the cell. Microorganisms absorb nutrients from the external environment and convert them into energy and cellular components. Metabolic processes are divided into two main groups: energetic metabolism and plastic metabolism. During energetic metabolism, organic substances are oxidized to produce energy. The resulting energy is stored in the form of adenosine triphosphate (ATP). In plastic metabolism, proteins, lipids, carbohydrates, and nucleic acids necessary for the cell are synthesized.

According to the method of obtaining energy, microorganisms are divided into aerobic and anaerobic groups. Aerobic microorganisms produce energy in the presence of oxygen. Anaerobic microorganisms live in oxygen-free

conditions and obtain energy through fermentation processes.

**Importance of Aerobic Metabolism.** Aerobic microorganisms develop in environments containing oxygen. As a result of their metabolic processes, organic substances are completely oxidized, forming carbon dioxide and water. This process is characterized by the release of a large amount of energy. Aerobic metabolism is of great importance in the food industry.

For example, lactic acid bacteria are actively used in the production of dairy products. These bacteria break down lactose to produce lactic acid. As a result, yogurt, kefir, sour milk, and cheese products are produced.

Aerobic microorganisms also play an important role in the decomposition of organic waste. In treatment facilities, aerobic bacteria are widely used for the biological purification of wastewater.

**Anaerobic Metabolism and Fermentation Processes.** Anaerobic microorganisms develop in oxygen-free environments. Their process of energy production is called fermentation. As a result of fermentation, alcohol, organic acids, gases, and other products are formed.

Alcoholic fermentation is carried out by yeast fungi. This process is of great importance in the bakery industry, winemaking, and beer production. In lactic acid fermentation, lactic acid bacteria convert carbohydrates into lactic acid. This process is the main technological stage in dairy product manufacturing.

Methane-producing anaerobic bacteria participate in the decomposition of organic waste and produce biogas. Nowadays, biogas production is considered one of the environmentally and economically efficient technologies.

**Importance of Microbial Metabolism in the Food Industry.** Microbial metabolism is widely used in the food industry. Many food products are produced on the basis of fermentation processes. The metabolic activity of lactic acid bacteria is of great importance in dairy production. They shape the taste, aroma, and consistency of the product.

In bread production, the release of carbon dioxide by yeast causes the dough to rise. In the

production of alcoholic beverages, yeast converts sugars into ethyl alcohol.

Organic acids such as citric acid, acetic acid, and lactic acid are produced industrially with the help of microorganisms.

**Application of Metabolic Processes in Biotechnology.** In biotechnology, microbial metabolism is used to produce antibiotics, enzymes, and vitamins. Antibiotics such as penicillin and streptomycin are products of microbial metabolism.

Enzyme preparations are widely used in the food, pharmaceutical, and textile industries. For example, amylase breaks down starch, while protease hydrolyzes proteins. As a result of the development of genetic engineering, insulin, interferon, and other biologically active substances are being produced using microorganisms.

**The Role of Microbial Metabolism in Ecology.** Microorganisms play an important role in the circulation of substances in nature. They decompose organic residues and increase soil fertility.

In bioremediation technologies, microorganisms decompose petroleum products, pesticides, and other harmful substances. This is important in reducing environmental problems.

Nitrogen-fixing bacteria convert atmospheric nitrogen into forms that plants can absorb. As a result, soil fertility increases.

**Conclusion.** The mechanisms of metabolism in microorganisms are of great biological and practical importance. The metabolic activity of microorganisms is widely used in the food industry, agriculture, pharmaceuticals, ecology, and biotechnology. Various food products, antibiotics, enzymes, and biologically active substances are obtained on the basis of aerobic and anaerobic metabolic processes. At the same time, microorganisms play an important role in solving environmental problems. In the future, an in-depth study of microbial metabolism will make it possible to create new biotechnological processes and increase industrial efficiency.

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