BACTERIA AND THEIR IMPACT ON HUMAN HEALTH

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Annotation. Bacteria can have both positive and negative effects on human health. This article analyzes bacteria and their effects on the human body, the microbiome, and diseases caused by pathogenic bacteria. The role of bacteria in the natural microbiome, their interaction with the immune system, and their role in causing infectious diseases are considered. The impact of bacteria on health is discussed using statistical data and scientific research.
Keywords: bacteria, microbiome, pathogenic bacteria, human health, infection, immune system, antibiotics, probiotics, the impact of the microbiome on health.

Introduction. Bacteria are among the oldest and most widespread organisms on Earth, and they play a significant role in the human body. Their abundance, ability to live in various ecosystems, and diverse effects on the organism can have a serious impact on human health. Bacteria are divided into two main groups: beneficial bacteria and pathogenic bacteria. Beneficial bacteria live within the microbiome of the body and contribute to various important processes, while pathogenic bacteria cause diseases. This article explores how bacteria and the microbiome affect human health, the role of bacteria in infectious diseases, and recent research on new treatment methods.

The microbiome and its role. The human microbiome is the collection of bacteria, viruses, and other microorganisms that live in the human body. Most of the microbiome is located in the intestinal system and carries out processes essential for the functioning of the body. Metabolites produced by microbiome bacteria help protect the body and aid in the digestion of nutrients. According to research, the microbiome has a broad impact on health, being associated with diseases such as cardiovascular disorders, diabetes, obesity, and mental illnesses. A balanced microbiome supports proper immune function and helps defend the body against various diseases.

Interaction between the microbiome and the immune system. The relationship between the microbiome and the immune system is complex and biologically significant. Through its bacterial composition, the microbiome ensures the normal functioning of the immune system. Disruption of the microbiome can lead to improper immune responses and the development of various diseases. For example, negative changes in gut bacteria may contribute to the onset of autoimmune diseases.

Pathogenic bacteria and their effects. When pathogenic bacteria enter the body, they can cause various infectious diseases. Bacterial infections typically result from the bacteria entering the body, multiplying, and producing harmful substances. For instance, *Streptococcus pneumoniae* causes pneumonia, while Escherichia coli can lead to urinary tract infections. These bacteria trigger inflammatory processes in the bloodstream and can lead to serious illnesses. Entry of bacteria into the body, production of bacterial toxins, or release of inflammatory compounds can weaken the immune system. In 2020, 2–3 million people worldwide died from bacterial infections, illustrating the significant impact of bacteria on human health (World Health Organization, 2020**).**

Antibiotics and bacteria. Antibiotics are the most effective treatment for bacterial infections. However, improper and excessive use of antibiotics increases bacterial resistance. This contributes to global antibiotic resistance. Incorrect use of antibiotics leads to the emergence of new bacterial strains, making treatment more difficult. Studies show that new antibiotic-resistant bacterial strains are increasing annually.

The health impact of the microbiome. There are many studies on the impact of the microbiome on human health. In recent years, new knowledge has been gathered about the quality of the microbiome and its vital role in the body. Changes in the microbiome affect not only the gastrointestinal system but also the functioning of the immune system. For example, negative effects of the microbiome are observed in various inflammatory diseases. When the microflora is imbalanced, this can lead to metabolic disorders, obesity, and diabetes. A healthy microbiome also affects mental health, making its maintenance very important.

Treatment of diseases and bacterial infections. Although antibiotics are the most widely used means of treating bacterial infections, their overuse increases bacterial resistance. Therefore, new treatment methods must be sought. One of the new methods is restoring and improving the microbiome using probiotics and antimicrobial peptides. Probiotics help restore the microbiome by adding beneficial bacteria and play an important role in preventing infectious diseases.

Conclusion. Bacteria are crucial to human health as they form a beneficial microbiome in the body. However, some bacteria act as pathogens and cause various diseases. A balanced and healthy microbiome plays a key role in protecting the body from illnesses. Misuse of antibiotics can increase bacterial resistance, necessitating the development of new treatment approaches. In the future, research on microbiome-based therapies and effective management of bacterial infections will continue.

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