

HARMFUL SIDE EFFECTS OF BROAD-SPECIFIC ANTIBIOTICS

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**Abstract:** This article provides an in-depth analysis of the problems associated with the use of broad-spectrum antibiotics in clinical practice and their negative effects on the human body. The mechanisms of antibiotic resistance, imbalance of normal microbiota (dysbacteriosis), allergic reactions, toxic effects (hepatotoxicity, nephrotoxicity, ototoxicity), and the pathophysiological basis for the development of superinfection resulting from uncontrolled and unreasonable use of antibiotics are highlighted.

The drug-drug interactions of broad-spectrum antibiotics and complications arising in polypharmacy are also considered. The article scientifically substantiates the need for rational use of antibiotics, i.e. an individual approach, therapy based on microbiological tests, and giving preference to narrow-spectrum drugs.

This work serves to highlight the current problems aimed at improving the culture of antibiotic use in modern medicine, preventing the development of resistance, and ensuring patient safety.

**Keywords:** broad-spectrum antibiotics, antibiotic resistance, dysbacteriosis, allergic reaction, toxicity, superinfection, polypharmacy

**Relevance of the topic:** In recent years, the widespread and often uncontrolled use of antibiotics has become one of the most pressing problems of the global health system. In particular, the unreasonable use of broad-spectrum antibiotics sharply increases the resistance of microorganisms to them (antibiotic resistance). As a result, previously easily treatable infections become complicated, take on a long-lasting and recurrent form. In addition, broad-spectrum antibiotics have a negative effect on the normal microbiota of the human body, leading to dysbacteriosis, weakened immunity and the development of opportunistic infections. In particular, disruption of the intestinal microflora also negatively affects metabolic and immunological processes. Inappropriate use of antibiotics in clinical practice increases the risk of allergic reactions, toxic complications (liver, kidney, hearing system damage) and superinfections. At the same time, in conditions of polypharmacy, drug interactions increase and treatment effectiveness decreases.

Although the global increase in antibiotic resistance creates the need to create new, more powerful antibiotics, this process is complex and economically expensive. Therefore, the rational use of existing antibiotics is of great strategic importance. The above factors determine the relevance of this topic.

**Purpose of the topic:** The main purpose of this study is to comprehensively study the negative effects of broad-spectrum antibiotics on the human body and analyze their pathophysiological mechanisms on a scientific basis.

*At the same time, the following tasks are also set:*

- ✓ identify the main mechanisms of antibiotic resistance development;
- ✓ assess the effect of broad-spectrum antibiotics on normal microbiota;
- ✓ analyze the mechanisms of allergic and toxic reactions;
- ✓ shed light on the problems of superinfection and drug interactions;
- ✓ substantiate the principles of rational use of antibiotics (rational therapy).

Through these goals, it is intended to develop scientifically based recommendations for the correct selection, effective and safe use of antibiotics in clinical practice.

**Main part:** Broad-spectrum antibiotics are widely used in clinical practice due to their high effectiveness against various gram-positive and gram-negative microorganisms, but their uncontrolled and unjustified use leads to a number of negative pathophysiological changes in the body. One of the most important problems is the development of antibiotic resistance. Antibiotics exert selective pressure on the bacterial population, eliminating sensitive strains, and as a result, resistant microorganisms survive and multiply. This process occurs through mechanisms such as enzymatic inactivation, changes in target structures, activation of efflux pumps, and decreased cell membrane permeability. As a result, multidrug-resistant bacteria are formed, which significantly complicates the treatment of infectious diseases. In addition, broad-spectrum antibiotics also have a negative effect on the normal microbiota in the body. Disruption of the intestinal microflora leads to dysbacteriosis, the synthesis of short-chain fatty acids decreases, the protective function of the intestinal epithelium weakens, and the regulation of the immune system is disrupted. This causes diarrhea, flatulence, malabsorption, and opportunistic infections. Antibiotics can also cause allergic reactions. They bind to body proteins and become antigenic and activate the immune system, resulting in reactions ranging from IgE-mediated immediate reactions to delayed-type hypersensitivity reactions. Clinically, this is manifested by rash, itching, bronchospasm, or in severe cases, anaphylactic shock. Another important negative aspect of broad-spectrum antibiotics is their toxic effects. They can damage the liver, kidneys, and hearing system. Hepatotoxicity is associated with impaired metabolic processes in hepatocytes, nephrotoxicity occurs at the level of the renal tubules, and ototoxicity is associated with damage to the receptor cells of the inner ear. These complications are often associated with high doses or prolonged use of the drug. The development of superinfection as a result of suppression of normal microflora is also an important problem. In this case, antibiotic-resistant microorganisms actively multiply, causing new and often severe infections. Cases such as pseudomembranous colitis are of particular clinical importance.

Broad-spectrum antibiotics can also interact with other drugs and change their metabolism. This leads to a decrease in the effectiveness of drugs or, conversely, an increase in their toxic effects. This problem is especially acute in cases where several drugs are used simultaneously, that is, in polypharmacy. As a result of all the above factors, the effectiveness of treatment decreases, the course of the disease worsens, the duration of hospitalization increases, and economic costs increase. Therefore, the rational use of broad-spectrum antibiotics is one of the important tasks of modern medicine.

**Conclusion:** Despite the important role of broad-spectrum antibiotics in clinical practice, their uncontrolled and unreasonable use poses a serious threat to the health of the human body and society. These drugs accelerate the development of antibiotic resistance, complicate the treatment of common infections, and are a major problem for modern medicine. In addition, they disrupt the normal microbiota, leading to dysbacteriosis, decreased immunity, and the development of

opportunistic infections. Allergic reactions and toxic effects of varying degrees can pose a direct threat to the patient's life. Also, when using broad-spectrum antibiotics, the likelihood of developing superinfection increases, and due to drug interactions, the effectiveness of treatment decreases or side effects increase. Therefore, antibiotics should be used only on the basis of clear indications, based on the results of microbiological examination and with an individual approach. It is important to give preference to drugs with a narrow spectrum of action whenever possible, to complete the course of treatment completely and correctly, and to adhere to the principles of rational use of antibiotics. As a result, the rational use of antibiotics is a decisive factor not only in protecting the health of individual patients, but also in preventing the global spread of antibiotic resistance.

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