



**ANTIBIOTICS AND THEIR CLASSIFICATION. ANTIBACTERIAL  
CHEMOTHERAPY.**

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**Annotatsiya:** Mazkur maqolada antibiotiklar nima, kimyoviy tuzilishiga ko'ra turlari, ularni qanday ishlatish kerak va uning molekulyar ta'sir mexanizimiga ko'ra klassifikatsiyasi haqida ma'lumotlar berilgan hamda shu bilan birga zararli jihatlari haqida ham keltirib o'tilgan bo'lib, antibakterial kimyoterapiyaning samaradorligi to'g'risida yoritib berilgan.

**Kalit so'zlar:** Antibiotiklar, penitsillin, betalaktomidlar, glikopeptidlar, lipopeptidlar, aminoglikozidlar, tetrosiklin, makrolidlar, linkozamidlar, xloramfinikol, rifamitsinlar, polipeptidlar, polienlar, ftorxnolinlar, rezistentlik, kimyoterapevtik preparatlar, faollik spektri.

**Abstract:** This article provides information about what antibiotics are, their types according to their chemical structure, how to use them, and their classification according to their molecular mechanism of action, as well as their harmful aspects, and sheds light on the effectiveness of antibacterial chemotherapy.

**Keywords:** Antibiotics, penicillin, betalactomides, glycopeptides, lipopeptides, aminoglycosides, tetracycline, macrolides, lincosamides, chloramphenicol, rifamycins, polypeptides, polyenes, fluoroquinolones, resistance, chemotherapeutic drugs, spectrum of activity.

**Аннотация:** В этой статье представлена информация о том, что такое антибиотики, их типы в соответствии с их химической структурой, как их использовать и их классификация в соответствии с их молекулярным механизмом действия, а также их вредные аспекты, и проливает свет на эффективность антибактериальной химиотерапии.

**Ключевые слова:** Антибиотики, пенициллин, бета-лактомины, гликопептиды, липопептиды, аминогликозиды, тетрациклин, макролиды, линкозамиды, хлорамфеникол, рифамицины, полипептиды, полиены, фторхинолоны, резистентность, химиотерапевтические препараты, спектр активности.

**ENTRANCE**

Nowadays, studying antibiotics and their effective use is one of the most useful and urgent issues for humanity. The development of modern medicine has made it possible to prevent and effectively treat many infectious diseases, and the role of antibiotics in this regard is incomparable. Antibiotics are one of the main drugs in the treatment of various bacterial infections. Also, thanks to antibiotics, diseases that were previously dangerous are now milder. They protect the body from serious infectious complications. In some cases, especially before surgical interventions, antibiotics are prescribed as a prophylactic - this serves to prevent the introduction of infection. Antibiotics are a powerful tool in maintaining human health. However, they should be used responsibly and only on the advice of a doctor.

Antibiotics are among the drugs that have revolutionized medicine in human history. On September 3, 1928, Scottish scientist Alexander Fleming was studying staphylococcal bacteria in his London laboratory when he accidentally observed that a mold (*Penicillium notatum*) growing on them killed the bacteria. The substance produced by this mold was later called "penicillin". Fleming published his discovery in a scientific journal in 1929, but the news was not widely known. Then, in the late 1930s, Oxford University scientists Howard Florey and Ernst Chain worked on isolating and purifying penicillin. They successfully used penicillin in humans for the first time in 1941. At that time, penicillin was only available in limited quantities and was mainly used for military purposes. By 1944, penicillin had been mass-produced and was widely available to civilians.

Late 1940s - early 1950s: Antibiotics such as penicillin and streptomycin began to be produced around the world. During the time Uzbekistan was part of the former Soviet Union, these drugs were also imported into the republic and used to treat infectious diseases.<sup>1</sup>

1960s-1970s: Uzbekistan's pharmaceutical industry developed, and the production and widespread introduction of antibiotics intensified. After independence in 1991, national programs were developed for the production and use of antibiotics, and improvements were made to the healthcare system.

### **What are antibiotics?**

The word antibiotic is derived from the Greek words anti-, meaning against, and bios, meaning life. Antibiotics are organic substances produced by microorganisms (fungi, bacteria), animal tissues, and some higher plants that inhibit the growth and development of various microbes.

Antibiotics disrupt the metabolism of pathogenic microbes, killing them or stopping their growth. They affect different microbes differently. For example, one antibiotic has a strong effect on a certain microbe, but has a weak effect on another or does not affect it at all. Most antibiotics destroy not only microbes, but also the human, animal and plant organism (tissues and cells). Therefore, in medical practice, only those types of them are used that kill harmful microbes, but do not destroy the human, animal and plant organism.<sup>2</sup>

Antibiotics are effective against inflammation, but they must be used with caution and when they are not effective. Doctors emphasize that uncontrolled use of antibiotics, not following the dosage, and self-medication can lead to the infection becoming chronic.<sup>3</sup>

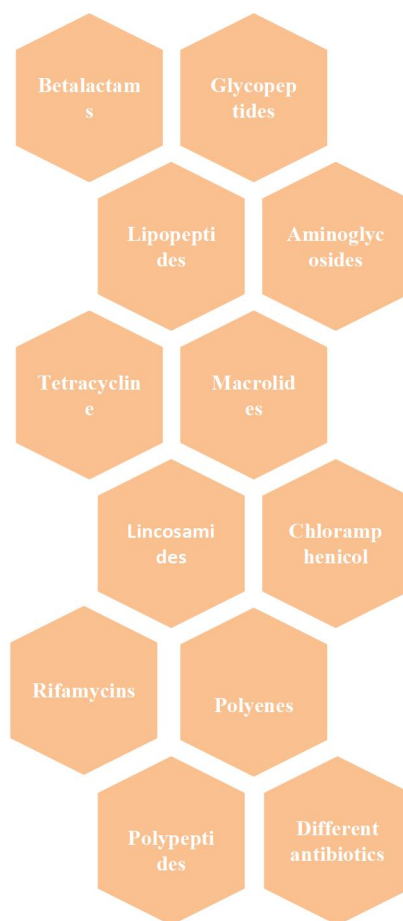
### **Types of antibiotics according to their chemical structure**

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<sup>1</sup> <https://azkurs.org/ozbekiston-respublikasi-sogliqni-saqlash-vazirligi>

<sup>2</sup> I. Muhamedov, E. Eshboyev, N. Zokirov, M. Zokirov. "Microbiology, Immunology, Virology". "New Age Generation" NM M, 2006

<sup>3</sup> <https://daryo.uz/2020/08/16/antibiotiklar-kanday-hollarda-ulnarni-abubul-qilish-yoki-kechish-kerak>



### How to use antibiotics?

1. If you are not sure how an antibiotic is used and what infections it fights, do not use it.
2. Use only the recommended antibiotic for the infection you are trying to treat.
3. Know the risks of using antibiotics and follow the precautions given in the book.
4. Use antibiotics only in the recommended doses (not too much, not too little). The amount of antibiotic depends on the disease and the age and weight of the patient.
5. If you are getting good results from taking antibiotic tablets, never take an injection. Only take an injection when absolutely necessary.
6. Do not stop taking antibiotics until all symptoms of the disease have disappeared. Continue taking the medicine for at least 2 more days after the fever or all symptoms of the disease have disappeared.
7. If an antibiotic causes a rash, itching, difficulty breathing, or other serious side effects, stop taking it and you should not use this medication again for the rest of your life.
8. Use antibiotics only when absolutely necessary. Taking too many antibiotics can reduce your body's ability to fight infection.<sup>4</sup>

### Classification of antibiotics according to molecular mechanism of action

1.	Inhibitor of bacterial cell wall synthesis	Penicillins, rincomycin, vancomycin, novobiocin, D-cycloserine
2.	Disrupts protein synthesis in bacterial cells	Antibiotics that correspond to the tetracycline structure, macrolides, levomycetin
3.	Antibiotics that inhibit protein synthesis in bacterial cells and, at the same time, disrupt the genetic code during translation.	Aminoglycosides
4.	Antibiotics that inhibit nucleotide synthesis in bacterial cells	Rifomycins, antitumor antibiotics
5.	Disrupts the integrity of the cytoplasmic membrane of the fungal cell	Polyene antibiotics for antifungal activity

### Harmful aspects of antibiotics

1. Antibiotic resistance: Overuse or misuse of antibiotics can lead to the development of antibiotic resistance in bacteria. This reduces the effectiveness of antibiotics and makes some bacteria untreatable. The rise of antibiotic resistance globally poses a major threat to public health.

2. Killing of beneficial bacteria: Antibiotics kill not only harmful bacteria but also beneficial bacteria. This can lead to disruption of the microflora and imbalance of the digestive system. The loss of beneficial bacteria can cause diarrhea, abdominal pain and other gastrointestinal problems.

3. Side effects: Antibiotics can cause allergic reactions in some patients. For example, reactions such as itching, rashes, or difficulty breathing may occur. In addition, antibiotics can have adverse effects on the liver and kidneys, which can lead to long-term negative consequences.

4. High costs: Antibiotics can sometimes be expensive. Especially when new antibiotics and specialty antibiotics are needed to treat infections that have developed antibiotic resistance, this places a significant economic burden on the healthcare system.

5. The dangers of misuse: Antibiotics are only meant to treat bacterial infections, but they are sometimes used to treat viral infections (such as the flu or colds). This misuse can lead to increased antibiotic resistance and reduce the effectiveness of the drugs.

6. Short-term effectiveness of treatment: Antibiotics are only effective in treating bacterial infections, but they do not help improve the overall health of the body. In some cases, the usefulness of antibiotics in fighting bacteria may be temporary.<sup>5</sup>

### Antibacterial chemotherapy

Chemotherapeutic drugs are chemical substances used in the etiotropic treatment of infectious diseases, selectively affecting microorganisms and harmless to macroorganisms. When using each antimicrobial drug, the principle of its physiological imitation is established, that is, the molecular configuration and components of the drug that affect the physiological control processes specific to the pathogen are determined. Currently, several tens of thousands of drugs have been obtained that can stop the vital activity of bacteria that cause infectious diseases. However, according to their pharmacological properties and requirements, several hundred antibiotics are used in practice. The effectiveness of drugs is expressed in the sum of the properties that provide the therapeutic effect. That is, when introduced into the body, it maintains

<sup>5</sup>WHO (World Health Organization), "Antimicrobial resistance: Key facts" 2020

the stability of its structure or forms active metabolites, the rate of adsorption and elimination from tissues and biological fluids, selective action, and the sensitivity of microorganisms are taken into account. The basis for the effectiveness criteria of drugs is also the spectrum of activity.

The spectrum of activity - antimicrobial drugs can only affect the vegetative form of bacteria, not their spore and cyst forms.

In order for drugs to demonstrate their antibacterial biological activity, they must have the following properties:

- ability to penetrate the microbial cell;
- to bind to and modify specific target structures;
- at the same time, it can retain its structure or be converted into metabolites.

When choosing chemotherapeutic drugs, their spectrum of activity and the sensitivity of microorganisms are taken into account. According to their specific activity, drugs can be against bacteria, fungi, protozoa and viruses. In addition, they are divided according to the spectrum of action:

- drugs with a narrow spectrum of action (active against a specific group of microorganisms);
- drugs with a broad spectrum of action (active against a large group of bacteria).

Chemotherapeutic drugs have either a bacteriostatic (stopping the growth and reproduction of bacteria) or a bacteriocidal (killing them) effect and selectively affect different structures of microorganisms.

Mechanism of action of chemotherapeutic drugs on bacterial cells:

1. To the cell wall (penicillin, cephalosporin, vancomycin).
2. To the cytoplasmic membrane (polymyxins).
3. Folic acid synthesis (sulfanilamides, trimethoprim).
4. RNA synthesis inhibitor (rifampicin).
5. DNA synthesis inhibitors (fluoroquinolones).
6. 30S ribosomal subunit inhibitors (aminoglycosides, tetracycline).
7. 50S ribosomal subunit inhibitors (erythromycin, lincomycin).
8. Paraaminobenzoic acid.<sup>6</sup>

## **Conclusion**

In summary, antibiotics are natural, semi-synthetic, and synthetic substances that inhibit the growth of microorganisms or kill them, and they are widely used in medicine. Their classification is based on their chemical structure, mechanism of action, and range of action. Antibiotics are one of the most effective agents in the treatment of bacterial infections. Antibacterial chemotherapy is a method based on the use of drugs to combat microbes, which has become an integral part of modern medicine. Its success depends on the correct selection,

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<sup>6</sup>S.Yu. KURBANOVA Microbiology and immunology - T.: "TAFAKKUR BOOSTONI" 2015.-320 p.

dosage and use of antibiotics. At the same time, the problem of antibiotic resistance requires their rational and responsible use. Thus, antibiotics and antibacterial chemotherapy are of great importance in the fight against infectious diseases, and their proper use serves to improve not only the health of the patient, but also the general health status of society.

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