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Sulfonamide drugs. Anti-tuberculosis and anti-viral drugs.

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Abstract

Sulfanilamides are synthetic antimicrobial agents that inhibit the growth of bacteria. Antituberculosis agents are a group of potent drugs that kill mycobacteria, while antiviral agents prevent viruses from entering or multiplying in cells. These drugs inhibit the growth and reproduction of bacteria (bacteriostatic effect). They work by disrupting the synthesis of folic acid by microbes. Tuberculosis (tuberculosis) is a complex and long-term disease, usually requiring the use of several drugs in combination. Sulfanilamide drugs are a group of antibacterial chemotherapeutic agents and are important in the treatment of infectious diseases. This article provides a scientific analysis of the pharmacological properties, mechanism of action, pharmacokinetics, and clinical application of sulfanilamide drugs. Sulfanilamides disrupt the synthesis of folic acid in microorganisms through competitive antagonism with paraaminobenzoic acid, and as a result, they inhibit the growth and reproduction of bacteria. The results of the study indicate the importance of sulfonamides in pharmaceutical and clinical practice.

Keywords: Sulfanilamides, drugs

Antibacterial drugs are one of the most important areas of modern medicine. The widespread spread of infectious diseases and the increasing resistance of microorganisms to various drugs require the search for new treatment methods. Sulfonamide drugs are one of the first representatives of chemotherapeutic agents against microorganisms, which were introduced into practical medicine in the first half of the 20th century. Sulfonamides are derivatives of sulfanilic acid, which act by disrupting the metabolic processes necessary for the vital activity of bacteria. These drugs have a bacteriostatic effect, not completely destroying bacteria, but rather stopping their growth and reproduction. Therefore, sulfonamides play an important role in the complex treatment of infectious diseases.

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Sulfonamide drugs play an important role in antibacterial chemotherapy. Their bacteriostatic effect effectively inhibits the growth and reproduction of microorganisms. The results of the study show that sulfonamides are one of the effective antibacterial agents that can be widely used in pharmaceutical and clinical practice. In future studies, the study of new combinations of these drugs, the problem of resistance, and methods of safe use remain one of the urgent issues.

According to the World Health Organization, approximately 2.1 billion people on earth are infected with tuberculosis. 10% of these people may develop tuberculosis during their lifetime, with AIDS playing a significant role in this.

The pathogenesis of tuberculosis is divided into two main periods - primary and secondary. The primary period includes the period from the moment the tuberculosis pathogen enters the body until the complete disappearance of the tubercle bacilli. The secondary stage begins some time after the clinical symptoms have subsided and is considered to be the endogenous re-development of old foci of the disease. Chemotherapeutic agents are used in the treatment of tuberculosis. These drugs include the following:

A. Synthetic substances - derivatives of hydrozide isonicotinic acid - isoniazid, ftivazit. Sodium paraaminosalicylate derivatives - lycilate, bepask and chemical compounds - ethionamide, thioacetazone.

B. Antibiotics - rifampicin, cycloserine, streptomycin sulfate, dehydrostreptomycin, calcium chloride complex of streptomycin, kanamycin sulfate, florimycin sulfate.

Most of these substances have a bacteriostatic effect, some have a bactericidal effect. However, some drugs (isoniazid, rifampicin, streptomycin) have a bactericidal effect at certain concentrations. According to their use, anti-tuberculosis drugs are divided into 3 groups:

The first group - the most effective drugs: isoniazid and rifampicin.

The second group - drugs with moderate effectiveness: ethambutal, streptomycin, ethionamide, prazinamide, kanamycin, cycloserine, fluoromycin.

The third group - drugs with less effectiveness: PASK, thioacetazone. The first group of drugs has a strong effect against tuberculosis bacteria and is less toxic.

Treatment of the disease begins and continues with the first group of drugs. The second and third groups of drugs are less effective and more harmful than the first group of drugs. If tuberculosis mycobacteria become resistant to the first group of drugs, the second and third groups of drugs are used. With prolonged use of tuberculosis chemotherapy drugs, mycobacteria can get used to them and become resistant. However, mycobacteria develop resistance to some substances, including GINK products and PASK, more slowly. Several substances are used together to reduce the resistance of tuberculosis mycobacteria.

The group of isonicotinic acid hydroxysides (GINK) selectively acts against tuberculosis mycobacteria, tuberculostatically, tuberculocitally, and intracellularly. Resistance of tuberculosis mycobacteria to isoniazid develops more slowly than to streptomycin and rifampicin. Isoniazid is well absorbed in the gastrointestinal tract. It easily passes through tissue barriers, passes well through the hematoencephalic and placental barriers, and penetrates in large quantities into the pleural, pericardial, joint cavities, and cerebrospinal fluid. This group of substances accumulates in the lungs and liver and is excreted from the body through the kidneys. Isoniazid is used against all types of tuberculosis and in the treatment of various stages. These drugs are administered orally, rectally, in some cases intravenously, intramuscularly, into the cavities. During the treatment period, when using isoniazid, headaches, dizziness, sometimes insomnia, allergies, anemia, and dyspeptic processes may occur. To reduce the negative effects, isoniazid is prescribed together with vitamins - pyridoxine, ascorbic, thiamine, pantothenic acids. Ftivazit, a combination of isoniazid with vanillin, is widely used from GINK products. Ftivazit is used in the treatment of tuberculosis in children and in infants living with sick parents, in the initial stages of tuberculosis in adolescents.

Of the paraaminosalicylic acid products, sodium paraaminosalicylate and Bepask, which have a bacteriostatic effect, are used. PASK is used in all types of tuberculosis. The effect of PASK is more pronounced in cases of exacerbation of tuberculosis. PASK is often used together with more powerful anti-tuberculosis agents. Adverse effects: nausea, stomach pain, allergies, fever, eosinophilia can be observed. These conditions are more common in children. PASK, when administered in large quantities, suppresses the activity of the thyroid gland. To reduce its harmful effects, it is used together with B vitamins.

Antibiotics - streptomycins, which belong to the group of simple aminoglycosides, have a bactericidal effect on mycobacteria of tuberculosis. Streptomycins prevent the formation of proteins in the cells of microorganisms at the level of ribosomes. Streptomycin is mainly administered parenterally, intramuscularly, and after 1-2 hours is absorbed into the blood, passes into the tissues of organs, abdominal, pleural cavities. However, it cannot pass through the blood-brain barrier, therefore, in tuberculous meningitis, the chlorine-calcium salt of streptomycin is administered into the spinal canal. Streptomycin is a rather toxic antibiotic, mainly damages the nervous system and causes allergic processes. When streptomycin is used in large quantities, it easily passes into the middle ear fluid and accumulates, as a result of which the patient may completely lose hearing. Streptomycin, when used in pregnant women, can cause damage to the baby and cause congenital deafness, and therefore its use in pregnant women is prohibited. Dehydrostreptomycin, which is part of the streptomycin

group, is also used. Dehydrostreptomycin has a less allergic effect, but its ototoxic effect is stronger than streptomycin.

Cycloserine is effective against gram-positive and gram-negative microorganisms, especially mycobacterium tuberculosis, which is located outside and inside the cells. Cycloserine has a bacteriostatic effect by inhibiting the formation of the mycobacterial shell. Cycloserine is often used in combination with other anti-tuberculosis agents. It is well absorbed through the gastrointestinal tract, does not bind to proteins in the blood, and penetrates well into the cerebrospinal fluid. In some cases, adverse effects occur - dizziness, headache, and mental changes are possible. To reduce the harmful effects, pyridoxine, glutamine, ATP are used together.

Rifampicin is a semi-synthetic antibiotic that inhibits the formation of RNA in mycobacteria and has a bacteriostatic, bactericidal effect. This substance is well absorbed from the gastrointestinal tract into the blood and easily crosses the blood-brain barrier. Rifampicin is used to treat all types of tuberculosis and more pulmonary tuberculosis, and is effective against primary tuberculosis in children and adolescents. Rifampicin is administered intramuscularly and sometimes intravenously. In some cases, treatment with rifampicin can cause adverse effects such as dyspeptic conditions and damage to the liver and pancreas.

Ethambutol is effective against mycobacteria resistant to streptomycin, isoniazid, and PASK. It is well absorbed from the stomach and intestines and excreted in the urine. The effect of ethambutol is even more pronounced when used with rifampicin. Ethambutol can cause increased sputum production, cough, dizziness, and blurred vision. It is forbidden to use ethambutol during pregnancy and in cases of eye diseases.

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