Results and its discussion. Every year, almost a million people die from bacterial infections that are not treated with conventional antibiotics due to the emergence of resistance in bacteria. At the present stage revealed some clinical strains of bacteria which are multiresistant.

Bacteria realize their resistance through various mechanisms, such as: produce new, not peculiar to them earlier, enzymes that can inactivate the active substance of drugs; change the permeability of cell membranes; form biofilms; acquire a molecular pump that pumps antibiotic molecules out of the cell; the target, to which the action of the drug is directed, is being reworked beyond recognition, or, for example, they substitute the "false targets" antibiotic.

In addition to the invention of new drugs and approaches, scientists are also engaged in the improvement of old methods. For example, with the addition of silver ions, modern antibiotics are able to destroy 1000 times more pathogenic bacteria. This mechanism is implemented by increasing the permeability of the cell membrane of bacteria for drugs and the formation of a large number of reactive oxygen species that are aggressive against bacterial cells. Another promising area is the creation of a specific treatment strategy with several antibiotics, forcing the bacteria to lose their resistance to the antibiotic, which was used to treat the patient initially.

Scientists have noticed, that when a bacterium becomes resistant to one antibiotic, it makes it more vulnerable to another antibacterial drug. At this stage, bacteriophages have again become the focus, since they can be a good alternative to antibiotics. This principle works well for intestinal bacteria, due to which dysbacteriosis develops.

Conclusions. The problem of bacterial resistance to antibiotics must be addressed internationally. Today, new antibacterial drugs are being developed and new approaches are being created in the treatment of infectious diseases. The search for new antibiotics is a time consuming, long-term and costly process. To date, combined methods of treatment are the most common way of treating patients with multidrug resistance to infectious agents.

BACTERIOPHAGES ON THE WAY TO MEDICINE OF THE FUTURE

Shkurpela O. V.
Scientific supervisor: senior researcher Gliebova K.V.
National University of Pharmacy, Kharkiv, Ukraine
microbiology@nuph.edu.ua

Introduction. According to modern science, more than 60% of pathogens are resistant to most antibiotics. This figure will be close to 100% in the next 10-20 years. The prevalence of gram-negative bacteria such as *Klebsiella spp*, *Escherichia coli* and *Proteus spp*. becomes extremely relevant for clinical practice, since their plasmid enzymes can destroy cephalosporins III and even IV generation. Especially dangerous is *Escherichia coli*, which is resistant to many antibacterial drugs such as fluoroquinols, ampicillin, co-trimoxazole, gentamicin. The synthesis of new classes of antibiotics has decreased over the past decades. The introduction of fundamentally new representatives of antibiotics into clinical practice during this period also decreased. In 2014, the World Health Organization (WHO) officially announced a crisis of antibiotic therapy. The WHO has published a report which concludes that the world has entered a post-antibiotic era. On this point, the priority tasks were: 1 –counteracting the spread of resistant microorganisms, 2 – searching for alternatives for antibiotic therapy. One of the results of such research is the possibility of using bacteriophages – specific viruses that destroy strictly defined pathogenic microorganisms.

Aim. Assessment of the ability of bacteriophages to solve the problem of antibiotic resistance.

Materials and methods. Analysis of the scientific literature and the results of the advanced research in the field of medicine and pharmacology.

Results and discussion. Bacteriophages are called such viruses that are characterized by the specific ability to selectively infect bacterial cells belonging to the same strain or antigenically homologous strains of one species or genus, followed by lysis of the host cell. Bacteriophages are natural enemies of bacteria in nature. Their ability to mutate allows us to fight the emerging varieties of bacteria.

Thus, the problem that the world community has faced in recent years can be solved. The high specificity of phages determines their ability to infect not just a specific species, but a particular strain of bacteria. Bacteriophages penetrate deep into the very source of infection. As they are characterized by self-dosing they do not need to be injected in high doses. The more target bacteria, the more actively the phage multiplies and rapidly removed from the body in the absence of bacteria. The activity of preparations in respect to clinical strains of bacteria nearly 72-98%. Bacteriophage preparations can be used in different age groups. Allowed their use in pediatrics, during pregnancy and in newborns. Thus, a special group of therapeutic and prophylactic medicines has been created on the basis of bacteriophages. Bacteriophages are produced in liquid form (solution for ingestion, local and external use) and in tablets. A whole range of valuable biotechnological products can be obtained by administering peptides with desired properties into phage surface proteins. We can create desired properties of nanovaccines, immunogens, antibodies by modifying the bacteriophage. And if you supply the bacteriophage surface protein with fluorescent or magnetic markers then orient it to the cancer cells, you will get an agent for detecting tumors. Modern bioorganic chemistry also makes it possible to attach a cytotoxic drug to the phage particle and eventually obtain a medicine that targets cancer cells. Special phages with lytic enzymes were created that are able to fight against biofilms formed on the surface of the skin, tooth enamel, implants, catheters, artificial joints and in the respiratory tract. You can use live phages, and you can also extract from them the components involved in the destruction of bacteria such as lysine. These enzymes are able to destroy the cell wall of bacteria during phage infection. Lysines usually contain two domains. The first domain recognizes the substrate and binds to it, and the second domain performs the hydrolysis of the peptidoglycan. Mammalian cells do not have a wall, therefore phage lysines do not cause them any harm. One of the main advantages of phage lysines over antibiotics is the low likelihood of the development of resistance in bacteria. Several experiments were conducted in which *Streptococcus pneumononiae* and *Staphylococcus aureus* were grown in the presence of appropriate lysines at low concentrations, but this did not lead to the development of resistance in bacteria. Phage lysines are tested as antimicrobial agents not only in medicine but also in veterinary medicine, crop production, and also in the food industry. This is necessary to prevent the spread of dangerous pathogens on food. The disadvantage of using bacteriophages is that they are ineffective against intracellular microorganisms such as, for example, the causative agents of tuberculosis and leprosy. With the joint action of antibiotics and phages, mutual enhancement of the antibacterial effect is observed, which allows reducing the doses of antibiotics to a level that does not cause pronounced side effects. In addition, bacteria practically do not produce resistance simultaneously to both components of the combined preparation at the same time.

Conclusions. For today we have two main directions of phagotherapy development. The first one is that which is advocated by the doctors. It consists in a personalized approach to the selection of therapy. A patient with a bacterial infection should go to the phagotherapy laboratory where he is selected for active phage or a combination of them after determining the causative agent of the disease. The second direction is interesting for pharmaceutical companies that offer to produce more or less universal preparations containing phages that are active against the most common infectious agents.

PROSPECTS FOR THE METHODS OF HEALING OF THE WOUND USING BACTERIA

Sklyarova A.I., Yakimova M.S.
Scientific supervisor: assist. Shakun E.A.
National University of Pharmacy, Kharkiv, Ukraine
microbiology@nuph.edu.ua

Introduction. Wounds are mechanical damage the skin, accompanied by a violation of the integrity of the epithelial tissue. They can heal for a very long time, become infected and thus be hazardous to health. Unfortunately, there are no universal drugs for treatment, but new methods and drugs are emerging to solve this problem.

Aim. The study of modern methods of wound healing using bacteria.