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МІКРОБІОЛОГІЧНІ ТА ІМУНОЛОГІЧНІ ДОСЛІДЖЕННЯ В СУЧАСНІЙ МЕДИЦИНІ

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**МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ
КАФЕДРА
МІКРОБІОЛОГІЇ, ВІРУСОЛОГІЇ ТА ІМУНОЛОГІЇ**

**MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
DEPARTMENT OF
MICROBIOLOGY, VIROLOGY AND IMMUNOLOGY**

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**MICROBIOLOGICAL AND IMMUNOLOGICAL RESEARCH
IN MODERN MEDICINE**

**Матеріали
Науково-практичної міжнародної
дистанційної конференції**

**Materials
of the Scientific and Practical International
Distance Conference**

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Конференція внесена до реєстру з'їздів, конгресів, симпозіумів та науково-практичних конференцій, які проводитимуться у 2021 році, реєстраційне посвідчення УкрІНТЕІ № 646, від 21 жовтня 2020 року.

Мікробіологічні та імунологічні дослідження в сучасній медицині: матеріали науково-практичної міжнародної дистанційної конференції (26 березня 2021 р., м. Харків). – Електрон. дані. – Х. : НФаУ, 2021. – 198 с. – Назва з тит. екрана.

Збірка містить матеріали науково-практичної міжнародної дистанційної конференції «Мікробіологічні та імунологічні дослідження в сучасній медицині». Розглянуто актуальні питання фармацевтичної мікробіології, перспективи створення антимікробних препаратів, їх застосування в медичній практиці, вивчення антибіотикорезистентності мікроорганізмів та визначення шляхів її подолання, клінічної патофізіології та епідеміології інфекційних захворювань, клінічної імунології та алергології, досягнень вірусологічних, молекулярно-генетичних досліджень в лабораторній діагностиці, актуальні питання ветеринарної мікробіології, інформаційних технологій і автоматизації наукових досліджень з розробки антимікробних лікарських засобів, маркетингових досліджень сучасного фармацевтичного ринку хіміотерапевтичних препаратів.

Для широкого кола наукових, науково-педагогічних і практичних працівників, що займаються питаннями мікробіології, вірусології, імунології, алергології та фармації в цілому.

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The Conference has been included in the list of meetings, congresses, symposia, and scientific-practical conferences to be held in 2021, registration certificate UkrIntel № 646, dated June 21, 2020.

Microbiological and Immunological Research in Modern Medicine: Materials of Scientific and Practical International Distance Conference (26 March 2021, Kharkov). – Electron. data. – Kharkiv: National University of Pharmacy, 2021. – 198 p.

The collection contains materials of scientific and practical international distant conference "Microbiological and immunological research in modern medicine". Shows the latest issues of pharmaceutical microbiology, prospects of antimicrobial drugs, their use in medical practice, antibiotic resistance of microorganisms and ways to counteract it, clinical pathophysiology and epidemiology of infectious diseases, clinical immunology and allergology, advances in virological, molecular genetic studies in laboratory diagnostics, current issues of veterinary microbiology, information technologies and automation of scientific research into antimicrobial medicines development, marketing research of modern pharmaceutical market of chemotherapeutic preparations.

For a wide range of scientists, educators and practitioners involved in microbiology, virology, immunology, allergology and pharmacy in general.

*Materials are submitted in the original author's language.
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When considering the pharmacological characteristics of groups of antibiotics, students focus on the rules of effective therapy, knowledge of which is the initial step towards overcoming antibiotic resistance. Adherence to the principles of rational therapy by healthcare professionals is a key obstacle to the development of resistance to pathogens and the formation of new mechanisms of bacterial insensitivity to pharmacotherapy. First of all, the student should realize that the pharmaceutical specialist is a direct participant in the treatment process, whose duty is to: release antibiotics only when they are needed; explain how to take antibiotics properly in accordance with current instructions with dosage and course of treatment; to inform about possible side effects and the reasons of emergence of resistance to antibiotics, to prevent preventive use of drugs.

The key to providing qualified pharmaceutical care is the possession of modern scientific information on the effectiveness of antibiotics in certain nosologies, the benefits of protected antibiotics, the principles of combining antibiotics, the new facts of antibiotic resistance. Therefore, the importance of acquiring the skills to use the resources of medical search systems and evidence-based databases during training is emphasized.

Therefore, the education of students of the pharmaceutical faculty should be as sufficient as possible regarding the quality of antibiotic use and prevention of bacterial resistance, which is ensured by mastering the basics of rational antibiotic treatment to further take into account these principles in professional activities.

FEATURES OF DIAGNOSIS AND TREATMENT OF RECURRENT BACTERIAL VAGINOSIS

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Currently there has been an increase in clinically significant mixed infections, which are jointly involved in the pathogenesis of the disease. Such diseases include bacterial vaginosis (BV), which is the most frequent violation of the physiological microbiocenosis of the vagina in women of reproductive age (7–68%), which is characterized by the replacement of normal lactobacillary microflora with a large number of anaerobic microorganisms.

The clinical manifestation of BV is specific discharge from the genital tract resulting from the fermentation of normal vaginal mucin gel by bacteria associated with BV. The main role in the occurrence of BV is assigned to disorders of the vaginal microbiocenosis resulting from exposure to both exogenous (long-term irrational therapy with antibiotics, cytostatics, frequent use of tampons, spermicides) and endogenous (hormonal changes, disorders in the local immunity system) trigger factors. 60% of women experience recurrence of BV within 12 months after treatment. It was found that with BV, a well-structured polymicrobial film is formed, which can explain the frequent recurrences of violations of the vaginal microflora,

which is associated with an increase in antibiotic resistance of anaerobic microorganisms.

Biofilms on mucous membranes can block the inflammatory response, reducing the activity of immunocytes, they maintain the viability of microorganisms at concentrations of hydrogen peroxide and lactic acid 4-8 times higher than required to suppress individual bacteria outside the films. Resistance due to the properties of the biofilm is explained by a decrease in the free surface due to contacts with each other and the formation of special bacteria called persisters. Persisters, due to differentiation, temporarily become resistant to almost all antibacterial drugs.

A different therapeutic strategy is used to combat biofilm infections: the use of prebiotics and probiotics, antiseptics, plant compounds, natural antimicrobial drugs, DNase, as well as acidification of the vagina. The most rational way to solve this problem at present is a combination therapy with a two-stage treatment regimen and the use of anti-virulent methods of influencing intercellular relationships in colonies of microorganisms that form biofilms. Recently, the method of application of ultrasonic cavitation with antiseptic solutions with the subsequent restoration of the vaginal flora, which is pathogenetically substantiated and affects the quorum signaling between individual bacteria, has become popular.

The aim of our study was to investigate the state of the vaginal biocenosis in women with recurrent BV, as well as to evaluate the effectiveness of the use of low-frequency ultrasonic cavitation with antiseptic solutions.

We examined 12 women with recurrent BV and the presence of biofilms. A bacterioscopic and microbiological study of the qualitative and quantitative composition of vaginal bacteria was carried out by PCR. Bacteria from the biofilm were visualized using the FISH method. For the sanitation and treatment of mucous membranes, the technique of exposure to low-frequency ultrasonic vibrations and cavitated medicinal solutions on the vagina and cervix was used. The course of exposure included ultrasonic cavitation procedures with a solution of chlorhexidine bigluconate 0.05% (aqueous) for 7-10 days, 200-250 ml for each procedure. For cavitation, an alternating electric current of ultrasonic frequency of 25 kHz was used. After eradication of opportunistic infectious agents and elimination of the associated formation of bacterial films, a drug was prescribed to stimulate reparative processes in the vaginal mucosa and cervix: a combination of bacteria that contained *Lactobacillus rhamnosus* GR-1 (10 mg) and *Lactobacillus reuteri* RC-14 (41 mg) 1 capsule orally 1 time per day with meals for 2 weeks.

We found that in all the patients, the main component of the biofilm was bacteria belonging to the *Gardnerella* cluster at a concentration of 7.8 ± 0.02 lg CFU / g. Bacteria of the *Atopobium* cluster gave positive hybridization signals in more than half of the patients and constituted 18-60% of biofilm bacteria with an average value of 6.9 ± 0.03 lg CFU / g. *Sneathia* spp. was also determined in the biofilm. at a concentration of 4.9 ± 0.02 lg CFU / g. It should be noted that in the presence of biofilm, the total number of opportunistic microorganisms increased up to 10×6 CFU / g. Bacteria clusters *Lactobacillus* and *Bacteroides* were present in insignificant amounts.

A bacteriological examination of the vaginal contents in women with BV was carried out after the complex therapy of bacterial vaginosis. The repeated bacteriological inoculation did not give rise to the growth of previously identified opportunistic microorganisms, and a tendency to the resumption of normobiocenosis due to the intensification of colonization by lactic acid bacteria, which was completely absent in most cases before the start of therapy, was observed to grow *Lactobacillus* spp. to 4 ± 0.02 lg CFU / g, the degree of colonization by fungi of the genus *Candida* decreased to 2.1 ± 0.03 g CFU / g.

Thus, recent studies show that BV not only reduces the quality of a woman's life, but is also associated with a number of inflammatory diseases of the genitourinary tract and is one of the most common causes of pregnancy complications. The disease often takes on a recurrent form due to the presence of biofilms, which may be the reason for the lack of effect of BV treatment when using various methods. Anti-virulence complex therapy by the method of low-frequency ultrasonic cavitation can be an alternative to treatment regimens for antibacterial therapy and be used in conditions of identified antibiotic resistance.

ANTIBIOTIC RESISTANCE: POSSIBLE WAYS TO OVERCOME
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The development of resistance in microorganisms is the main factor limiting the effectiveness of antibacterial drugs. In this regard, it becomes urgent to search for new ways to prevent the formation of resistance of pathogens of bacterial infections. One of the ways to overcome antibiotic resistance is the invention of combined drugs, which are called protected. Their use is justified in relation to bacteria that produce enzymes that decompose conventional antibiotics. Protection of popular antibiotics is carried out by the inclusion of special agents (for example, enzyme inhibitors) in the composition of the new drug, which block their production by bacteria or prevent the drug from being excreted from the cell by means of a membrane pump.

One of the possible ways to overcome the drug resistance of microorganisms is the chemical transformation of molecules of antimicrobial substances to obtain new drugs that are active against antibiotic-resistant microorganisms. In particular, by this transformation, semisynthetic penicillins and cephalosporins, insensitive to the action of β -lactamases, methicillin, oxacillin, dicloxacillin, cefamandol, cefuroxime, cefsulodin and a number of others were synthesized.

The bacterial metagenome contains genes that mediate resistance mechanisms and make it possible to inactivate almost any antibiotic. During some time after the start of the use of the new drug, the spread of the determinants of resistance to this compound by means of plasmids and transposons is noted. As a result, the effectiveness of the antibiotic begins to decline, which necessitates the development of new antimicrobial drugs. The use of compounds that suppress certain mechanisms

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Наукове видання

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