## INTERDEPENDENCE OF NOSOCOMIAL INFECTIONS AND ANTIBIOTIC RESISTANCE

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**Introduction.** The problem of hospital-acquired infections (HAI) is inextricably linked with antibiotic resistance. HAI in most cases is caused by the formation and spread of hospital strains that are resistant to antibacterial drugs (ABP). HAI caused by multi-resistant microorganisms increase health care costs, increase the duration of hospitalization and determine an extremely unfavorable outcome for the patient. The continuous epidemic process of HAI is due to the fact that bacterial pathogens in medical institutions can be acquired through direct or indirect contact between patients, health workers, visitors, and through objects in the medical institution's environment. The intensive development and widespread use of high-tech methods of providing medical care expand the routes and factors of infection transmission, causing the emergence of new risks associated with HAI. According to estimates by the World Health Organization (WHO), out of 100 hospitalized patients, at least one form of HAI will be identified in 7 patients in developed countries and in 10 patients in developing countries.

According to statistics from the World Health Organization, the prevalence of HAI in high-income countries varies from 3.5 to 12%, and in low- and middle-income countries – from 5.7 to 19.1%. In European emergency hospitals, 3.8 million cases of HAI are registered annually, with the prevalence reaching 6.5%. In the USA, HAI are detected annually in 1.7 million patients, and the number of fatal cases reaches 98 thousand.

Aim. To analyze the problem of the relationship and interdependence of the development of nosocomial infections and antibiotic resistance of microorganisms.

**Materials and methods.** Analytical and statistical materials on antibiotic resistance of the Public Health Center of the Ministry of Health of Ukraine, World Health Organization. Analysis of modern scientific research and literary sources in the field of bacteriology, clinical microbiology, pathophysiology and infectious diseases.

**Results and their discussion.** In recent years, there has been a trend towards an increase in cases of HAI caused by multidrug-resistant (MDR) microorganisms. Treatment of such infections requires the use of expensive antibacterial therapy (ABT) regimens. A number of studies have demonstrated that the highest costs are associated

with the treatment of patients with infections caused by vancomycin-resistant Enterococcus (VRE), carbapenem-resistant Acinetobacter baumannii (A. baumannii), Klebsiella pneumoniae (K. pneumoniae) and Pseudomonas aeruginosa (P. *aeruginosa*). In addition, nosocomial infections caused by MDR microorganisms are characterized by high mortality rates. Thus, according to the study by H. Zhang et al., the in-hospital mortality of patients with infections associated with carbapenemresistant Klebsiella pneumoniae (CR-KP) was 28.9%, while in the group of carbapenem-sensitive Klebsiella pneumoniae (CS-KP) it was 14.1%. At the same time, multivariate analysis showed that taking antibiotics in the last 3 months, in particular carbapenems, and the presence of a nasogastric tube were the leading risk factors for infections associated with CR-KP. X.J. Lee et al. Conducted a multicenter study, establishing a three-fold increase in the odds of in-hospital mortality in patients with HAI of the bloodstream associated with Enterococcus faecium (E.faecium), K.pneumoniae and Escherichia coli (E.coli) compared with patients in the control group. It was also noted that the risk of death in patients with urinary tract infection (UTI) caused by E. faecium increased by 1.4 times, and in patients with lower respiratory tract infection (LRTI) associated with P.aeruginosa - by 2.4 times. In this study, bloodstream infections (BSI), UTI caused by *Staphylococcus aureus* (S. aureus), as well as LRTI associated with P.aeruginosa showed the highest cost of hospitalization.

HAI is usually caused by the formation of a hospital strain that exhibits resistance to drugs, disinfectants and antiseptics. Currently, the microorganisms that cause the greatest clinical concern include pathogens of the "ESKAPE" group. The term "ESKAPE" includes six pathogens that exhibit drug resistance: *E.faecium, S. aureus, K. pneumoniae, A. baumannii, P. Aeruginosa* and *Enterobacter spp.* Interest in these microorganisms is due to their widespread distribution in the MO, as well as the presence of various mechanisms of antibiotic resistance, which significantly complicates the choice of ABT.

In the context of growing antibiotic resistance, one should remember the phenomenon of "parallel damage". It consists of the selection of resistance not only among the strains of pathogens that were targeted by antibiotic therapy, but also among microorganisms that were not etiologically significant. First of all, we are talking about the intestinal microflora. Antibiotics cause profound changes in the intestinal microbiota, including, in addition to increased antibiotic resistance, a decrease in bacterial diversity and a change in the number of key beneficial commensals. The use of cephalosporins is accompanied by pronounced parallel damage associated with the

risk of colonization or infection caused by bacteria of the *Enterobacterales* family that produce extended-spectrum beta-lactamases. When using carbapenems, the risk of colonization or infection caused by *Stenotrophomonas maltophilia* may increase. In the study by W. Wangchinda et al. Intensive use of colistin in hospitalized patients has been reported to result in collateral damage associated with an increased risk of colonization with colistin-resistant *E. coli* and *K. pneumoniae*.

**Conclusions.** Despite the fact that great efforts are being made to combat nosocomial infections, this area requires continuous study due to the changing conditions of patients' stay in medical institutions, the emergence of new medical technologies, the increase in the number of patients with weakened immunity, the variability of nosocomial pathogens themselves and the diversity of clinical manifestations of nosocomial infections.

Today, it is extremely important to correctly assess the growing significance of the problem of antibiotic resistance and to seek new and urgent measures to contain it, since the situation with infections caused by multi-resistant strains is becoming unmanageable.

## EVALUATION OF THE ANTIBACTERIAL ACTIVITY OF *BEGONIA SOLI-MUTATA* L.B.SM. & WASSH. LEAF EXTRACT AGAINST *PSEUDOMONAS AERUGINOSA* STRAINS

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**Introduction.** Begonia soli-mutata L.B.Sm. & Wassh., a member of the Begoniaceae family, is a tropical plant known for its rich phytochemical composition and potential medicinal properties. Over the years, numerous studies have highlighted the antimicrobial and antiviral activity of various Begonia species against a wide range of pathogens, demonstrating their therapeutic potential [Ramesh et al., 2002; Zubair et al., 2021; Prasad et al., 2023]. Pseudomonas aeruginosa, a Gram-negative bacterium, is a common opportunistic pathogen that causes infections in immunocompromised