the chromosome. Chromosomal AR develops as a result of point mutations and can combine with other AR mechanisms. The transmission of ARGs is highly effective within the resistomes of the intestinal tract or biofilms formed on wound surfaces and mucous membranes, as well as within plumbing fixtures, particularly hospital ancillary equipment throughout the evacuation stages.

The development of the infectious process involving ARGs is driven by the presence of a complex of virulence and toxigenicity factors in bacteria, the quorum sensing phenomenon, and the immunosuppressive effects of lipopolysaccharide endotoxin. Among the most dangerous pathogens of wound infections are *K. pneumoniae*, *A. baumannii*, *P. aeruginosa*, and other bacteria of the ESKAPE group (Hrytsai, 2022). Crucial factors in the diagnosis and treatment of purulent complications in combat injuries include effective microbiological diagnosis utilizing automated microbiological systems, particularly matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), methods for determining the minimum inhibitory concentration of bacterial growth, and genodiagnostics via real-time PCR.

Conclusion. The rapid dissemination of MDR and PDR ESKAPE strains in combat injuries and burns is driven by the synergistic action of chromosomal mutations and horizontal transfer of resistance genes (specifically to colistin and tigecycline) via plasmids and transposons within biofilm resistomes. Effective treatment and prevention of purulent complications necessitate the integration of methods real-time PCR and MALDI-TOF MS as a foundation for personalized last-resort antibiotic therapy.

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CURRENT SPECTRUM OF WOUND INFECTION PATHOGENS AND THEIR ANTIMICROBIAL RESISTANCE IN MILITARY PERSONNEL

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Abstract. The etiological structure of wound infections in military personnel was investigated, and the antimicrobial susceptibility profiles of the isolated microorganisms were determined. A broad spectrum of Gram-positive and Gram-negative pathogens was identified, with particular emphasis on

Pseudomonas aeruginosa, *Acinetobacter baumannii*, *Klebsiella pneumoniae*, and staphylococci. A high prevalence of multidrug-resistant and pandrug-resistant strains was observed, particularly among Gram-negative bacteria. Microorganisms isolated as components of microbial associations demonstrated less favorable antimicrobial susceptibility profiles than those recovered as monocultures. These findings highlight the challenges associated with selecting appropriate empirical antibacterial therapy for combat-related wounds. The results underscore the need for systematic local microbiological surveillance and continuous monitoring of antimicrobial resistance among wound infection pathogens.
Keywords: wound infections; combat wound microbiota; microbial associations; opportunistic microorganisms; antimicrobial resistance.

Introduction. In Ukraine, wound infections in military personnel represent a significant medical and social challenge. The development of infectious complications is associated with prolonged treatment, an increased risk of sepsis, disability, and mortality.

The situation is further aggravated by the rapid emergence and spread of antimicrobial resistance among potential wound infection pathogens. The use of antimicrobial agents without consideration of local resistance patterns, particularly inappropriate or purely empirical prescribing, exerts selective pressure and promotes the emergence and dissemination of multidrug-resistant strains. The accumulation of multiple resistance mechanisms may ultimately result in pandrug-resistant phenotypes, substantially limiting the therapeutic options available for effective antibacterial treatment.

The microbial spectrum of combat wounds is not static and may vary depending on the stage of medical evacuation, the conditions under which medical care is provided, and the characteristics of the healthcare environment. Therefore, characterization of the etiological spectrum of wound infections in military personnel and assessment of the antimicrobial susceptibility of isolated microorganisms are essential for developing evidence-based empirical treatment strategies, optimizing local antimicrobial stewardship policies, and preventing the further spread of resistant strains.

Thus, systematic investigation of the etiological structure of wound infections, combined with continuous surveillance of antimicrobial resistance among their causative agents, is an important prerequisite for improving the management of combat-related trauma and reducing infection-associated morbidity and mortality among military personnel.

Materials and Methods. Clinical specimens were collected from wound surfaces using sterile transport systems manufactured by FLmedical (Italy). Primary bacteriological examination was performed by inoculating the specimens onto appropriate culture media using the Gold sector-streaking method.

Selective and differential diagnostic media were used for the isolation and cultivation of specific groups of microorganisms. Sabouraud agar was used for the isolation of microscopic fungi. Blood agar, consisting of meat-peptone agar supplemented with 5 % blood, was used for the detection of representatives of the genera *Streptococcus* and *Neisseria*. Endo and Levine media (Farmaktiv, Ukraine) were used for the isolation of enterobacteria, while mannitol salt egg-yolk agar (Biolif-Italia) was used for the cultivation of *Staphylococcus* spp.

Species identification of the recovered isolates was based on a comprehensive assessment of their morphological, tinctorial, and biochemical characteristics using standardized test systems for microbiological identification.

Antimicrobial susceptibility testing of the isolated bacteria and microscopic fungi was performed using the disk diffusion method in accordance with the recommendations of the European Committee on Antimicrobial Susceptibility Testing (EUCAST). Standardized antimicrobial susceptibility testing disks were used.

For inoculum preparation, 24-h microbial cultures were used. Colonies were suspended in sterile physiological saline to a density equivalent to a 0.5 McFarland standard, corresponding to

approximately $1.5 \cdot 10^8$ CFU/mL. The optical density of the microbial suspension was controlled using a densitometer. A 100-µL aliquot of the prepared suspension was evenly inoculated onto Mueller–Hinton agar for bacterial cultures or Sabouraud agar for microscopic fungi.

Following placement of the antimicrobial disks, bacterial cultures were incubated at 37 ± 2 °C for 24 h, whereas cultures of microscopic fungi were incubated at 35 ± 2 °C for up to 48 hours. Antimicrobial activity was assessed by measuring the diameters of growth inhibition zones around the disks in millimeters. The results were subsequently interpreted according to the applicable EUCAST criteria.

The susceptibility of the isolates to representatives of the cephalosporin, macrolide, fluoroquinolone, carbapenem, sulfonamide, and lincosamide classes was assessed. For microscopic fungi, susceptibility to antifungal agents was additionally determined.

Results. The study demonstrated substantial variability in antimicrobial susceptibility profiles depending on the taxonomic identity of the microorganisms and whether they were isolated as monocultures or as components of microbial associations. Overall, microorganisms recovered from microbial associations tended to exhibit higher levels of resistance than corresponding isolates recovered as monocultures.

Among Gram-positive cocci, *Staphylococcus aureus* isolates generally retained susceptibility to fluoroquinolones and reserve agents, including glycopeptides and oxazolidinones. At the same time, reduced susceptibility was observed to certain cephalosporins. *Staphylococcus epidermidis* exhibited a considerably less favorable susceptibility profile: most isolates demonstrated multidrug resistance, while strains recovered as components of microbial associations showed characteristics consistent with pandrug resistance.

Enterococcus faecalis isolates recovered as monocultures generally retained susceptibility to penicillins and reserve agents, although resistance to several other antibacterial classes was observed. When isolated as components of microbial associations, susceptibility to the principal β-lactam agents remained predominantly high, whereas carbapenems demonstrated limited activity.

A substantial proportion of pandrug-resistant strains was identified among *Streptococcus pyogenes* isolates. This finding indicates the emergence of unfavorable resistance patterns even among microorganisms traditionally regarded as highly susceptible to antibacterial therapy.

The most pronounced multidrug resistance was observed among Gram-negative bacteria. *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolates demonstrated high levels of resistance to the majority of the antibacterial agents tested, with susceptibility retained only to selected agents. Similar patterns were observed among members of the family Enterobacterales, particularly *Klebsiella pneumoniae* and *Enterobacter xiangfangensis*. The reduction in antimicrobial susceptibility was particularly pronounced when these microorganisms were isolated as components of microbial associations.

In contrast, *Escherichia coli* isolates demonstrated a relatively more favorable susceptibility profile toward selected antibacterial agents. Carbapenems and aminoglycosides retained comparatively higher activity. Nevertheless, *E. coli* isolates demonstrated resistance to cephalosporins and some fluoroquinolones.

Overall, the findings demonstrate a substantial prevalence of multidrug-resistant and pandrug-resistant microorganisms among wound infection pathogens in military personnel. The least favorable antimicrobial susceptibility profiles were observed among microorganisms isolated as components of microbial associations. This finding complicates the selection of appropriate empirical antibacterial therapy and emphasizes the importance of regular local microbiological surveillance.

Conclusions. The findings confirm the presence of a broad spectrum of microorganisms associated with wound infections in military personnel, with a substantial proportion of

multidrug-resistant and pandrug-resistant strains. The high prevalence of antimicrobial resistance among Gram-negative bacteria and microorganisms recovered from polymicrobial associations is of particular concern. The observed variability in antimicrobial susceptibility profiles highlights the limitations of an exclusively empirical approach to antibacterial therapy in the absence of local microbiological data.

Regular and systematic surveillance of the etiological structure of wound infections and the antimicrobial susceptibility of their causative agents is therefore essential. Further research should focus on monitoring temporal changes in resistance patterns and developing optimized approaches to antimicrobial treatment. Expansion of such investigations is an important prerequisite for establishing an effective antimicrobial stewardship strategy, improving the management of combat-related wounds, and limiting the further spread of antimicrobial resistance in military healthcare.

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ORAL MICROBIOME IN INFLAMMATORY PERIODONTAL DISEASES AND DEVELOPMENT OF PLANT-BASED CORRECTIVE ORAL CARE PRODUCTS

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Abstract. The study investigated the characteristics of the oral microbiota under various pathological conditions and evaluated the antimicrobial and antibiofilm activity of plant-derived essential oils. Complex aerobic–anaerobic microbial associations dominated by periodontal pathogens and opportunistic microorganisms were identified. Species-specific differences in the activity of essential oils against the studied microorganisms were established. The highest antimicrobial and antibiofilm activity was demonstrated by essential oils of *Thymus vulgaris* and *Origanum vulgare*. *Achillea millefolium* essential oil exhibited broad-spectrum antimicrobial activity against Gram-positive and Gram-negative microorganisms, as well as fungi of the genus *Candida*. The highest activity against anaerobic periodontal pathogens was observed for essential oils of *Pinus sylvestris*, *Eucalyptus globulus*, and *Anethum graveolens*. The findings support the potential use of essential oils as natural components of oral care products aimed at modulating the oral microbiota.
Keywords: oral microbiome, microbiome-associated markers, antimicrobial activity, essential oils.

The study of the oral microbiome is one of the promising areas of modern microbiology and dentistry, as it provides an opportunity not only to deepen our understanding of the mechanisms underlying various diseases of infectious and non-infectious origin but also to establish a scientific basis for the development of effective approaches to the correction of inflammatory diseases of the oral mucosa and periodontal tissues.

During 2016–2026, we investigated the composition and structure of the oral microbiota under various pathological conditions at the clinical departments of the Educational and Scientific Institute of Dentistry and Laboratory Medicine of Uzhhorod National University and at the University Dental Clinic. Microbiome-associated markers of the course of inflammatory periodontal diseases were identified using both conventional culture-based methods, including isolation and identification of anaerobic periodontal pathogens, and metagenomic analysis.