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DIAGNOSTIC CAPABILITIES OF MALDI-TOF MS IN THE IDENTIFICATION OF RARE BACTERIAL ISOLATES

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Abstract. MALDI-TOF mass spectrometry has transformed clinical microbiology by enabling rapid, highly accurate identification of microorganisms based on unique protein spectral profiles, overcoming the limitations of conventional biochemical panels when applied to atypical strains. To characterize rare bacterial isolates identified by MALDI-TOF MS and assess their clinical significance. Methods: Clinical specimens (blood, sputum, wound discharge, urine, respiratory material) collected in 2025/2026 at the Center for Microbiological Research, Danylo Halytsky Lviv National Medical University, were analyzed using a Bruker MALDI-TOF mass spectrometer with reference database comparison. Results: Six rare pathogens were identified – *Elizabethkingia meningoseptica*, *Chryseobacterium indologenes*, *Ochrobactrum anthropi*, *Myroides odoratimimus*, *Sphingomonas paucimobilis*, and *Kocuria kristinae* – many of which are difficult to distinguish from more common species by conventional culture-based methods, risking misclassification and diagnostic delay.

Keywords: MALDI-TOF, rare pathogens, microorganism identification, clinical microbiology.

Introduction. The introduction of matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) into clinical microbiology practice has opened fundamentally new possibilities for rapid and highly accurate identification of microorganisms. Unlike conventional biochemical panels, which often prove uninformative or misleading when applied to strains of pathogens with atypical properties, MALDI-TOF enables identification of microorganisms based on a unique protein spectral profile considerably faster than conventional methods.

Aim. To characterize rare isolates recovered from clinical material and identified by MALDI-TOF mass spectrometry, and to assess their clinical significance.

Materials and methods. The study was conducted at the Center for Microbiological Research of Danylo Halytsky Lviv National Medical University using a MALDI-TOF mass spectrometer (Bruker, Germany). Strain identification was performed by comparing the acquired spectral profiles with a reference database. The material comprised clinical specimens (sputum, blood, wound discharge, urine, and respiratory material) collected during 2025/2026.

Results. Among the atypical isolates examined, the study identified a number of rare pathogens, including:

- *Elizabethkingia meningoseptica* – a Gram-negative non-fermenting rod associated with nosocomial infections (meningitis in neonates, bacteremia in immunocompromised patients), characterized by intrinsic resistance to multiple antibiotic classes (isolated from a patient's blood).
- *Chryseobacterium indologenes* – an opportunistic non-fermenting microorganism causing infections in intensive care unit patients associated with catheters and mechanical ventilation (isolated from a patient's sputum).
- *Ochrobactrum anthropi* – a rare opportunistic pathogen of catheter-associated bacteremia, difficult to differentiate by conventional methods owing to phenotypic similarity to *Brucella* species (isolated from a patient's sputum).
- *Myroides odoratimimus* – a non-fermenting gram-negative rod with intrinsic multidrug resistance, causing wound and urinary tract infections predominantly in debilitated individuals (isolated from a wound in a military serviceman).
- *Sphingomonas paucimobilis* – a rare pathogen detected in catheter-associated infections and in immunosuppressed patients (isolated from a patient's sputum).
- *Kocuria kristinae* – gram-positive cocci of the family *Micrococcaceae*, with isolated cases described as a cause of bacteremia and endocarditis (isolated from a patient's urine).

Identification of the above microorganisms by conventional culture-based and biochemical methods is frequently complicated by their phenotypic similarity to more common species, which leads to misclassification or a considerable increase in the time required to establish the etiology of the pathological process. The use of MALDI-TOF enabled accurate and maximally rapid verification of all isolates listed.

Conclusions. MALDI-TOF mass spectrometry is a highly effective tool for the rapid identification of rare and atypical pathogens of infectious diseases that are verified with considerable difficulty by conventional methods. Timely and accurate identification of such microorganisms is of fundamental importance for selecting appropriate antimicrobial therapy, epidemiological surveillance, and preventing the spread of healthcare-associated infections of various profiles within clinical settings.

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EFFECT OF THE BACTERIOPHAGE PREPARATION PYOFAG ON PHAGOCYTIC ACTIVITY AND POLARIZATION-ASSOCIATED MARKER EXPRESSION IN RAW264.7 MACROPHAGES

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Abstract. This study evaluated the effects of the polyvalent bacteriophage preparation Pyofag on phagocytic activity and polarization-associated marker expression in RAW264.7 macrophages. Pyofag did not significantly alter the proportion of phagocytic cells, although bead-associated mean fluorescence intensity (MFI) showed a non-significant upward trend. The CD80-positive fraction remained