

<http://dx.doi.org/10.7124/bc.000AD8>

Isolation of bacteriophages as therapeutic agents for combating trauma-related infections in Ukraine

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Background/Aim. Antimicrobial resistance (AMR) is a huge challenge for all countries. This problem has reached particularly alarming proportions in Ukraine, which has been fighting on the battlefield for its independence for three years now. Priorities to address AMR in human health include research and development of novel antibacterial preparations. In this context due to their unique properties, bacteriophages have been perceived as promising tools in combating bacterial pathogens. The goals of our work were to investigate the microbiological profiles of wound injuries and to isolate bacteriophages capable of lysing the most relevant causative agents of soft and bone tissue infections. **Methods.** Microorganisms were isolated from clinical material through initial inoculation on differential diagnostic and specialized nutrient media. Bacteria were identified by morphological and biochemical tests. The disk diffusion method was used to evaluate antibiotic sensitivity. The Vitek system was additionally used for the identification and bacterial susceptibility testing. Bacteriophages were isolated from sewage water samples by the overlay agar method. The morphology of newly isolated bacteriophages was studied using transmission electron microscopy. **Results.** As result of our work, over 100 clinical isolates of microorganisms belonging to nine different species were isolated and identified: *Acinetobacter*

baumannii, *Enterobacter cloacae*, *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Citrobacter freundii*, *Klebsiella pneumoniae*, *Klebsiella aerogenes* and *Staphylococcus aureus*. Based on the obtained data, it can be concluded that *K. pneumoniae*, *P. aeruginosa* and *S. aureus* were the dominant pathogenic microorganisms found in wound microbiota. In this study, we have also isolated bacteriophages specific to *K. pneumoniae*, *P. aeruginosa*, *A. baumannii*, *E. coli*, *P. mirabilis* and *S. aureus*. The isolated bacteriophages differed in their host range and morphological characteristics. In general, the isolated bacteriophages belonged to the myo-like, siphon-like, and podovirus-like viruses. Due to their strong lytic activity *in vitro* and high titers, over 30 isolates of bacteriophages have been selected for further studies. **Conclusions.** This work has been funded by the National Research Foundation of Ukraine (grant No. 2022.01/0065) and represents the initial large-scale effort to develop a collection of phages targeting relevant bacteria, through the collaboration of multiple institutions. Additional research is required to establish the role of phages in modern medicine, to conduct clinical trials and to facilitate the implementation of phage therapy into clinical practice.

Keywords: Antimicrobial resistance, bacteriophages, wound microbiota, phage therapy.