The Lytic Bacteriophage VbϕAB-1 Against Drug-Resistant Acinetobacter Baumannii Isolated from Hospitalized Pressure Ulcers Patients

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Abstract : Bedsores are pressure ulcers that occur on the skin or tissue due to being immobile and lying in bed for extended periods. Bedsores have the potential to progress into open ulcers, increasing the possibility of a variety of bacterial infections. Acinetobacter baumannii, a pathogen of considerable clinical importance, exhibited a significant correlation with Bedsores (pressure ulcers) infections, thereby manifesting a wide spectrum of antibiotic resistance. The emergence of drug resistance has led researchers to focus on alternative methods, particularly phage therapy, for tackling bacterial infections. Phage therapy has emerged as a novel therapeutic approach to regulate the activity of these agents. The management of bacterial infections greatly benefits from the clinical utilization of bacteriophages as a valuable antimicrobial intervention. The primary objective of this investigation consisted of isolating and discerning potent bacteriophage capable of targeting multi-drug-resistant (MDR) and extensively drug-resistant (XDR) bacteria obtained from pressure ulcers. The present study analyzed and isolated A. baumannii strains obtained from a cohort of patients suffering from pressure ulcers at Taleghani Hospital in Ahvaz, Iran. An approach that included biochemical and molecular identification techniques was used to determine the taxonomic classification of bacterial isolates at the genus and species levels. The molecular identification process was facilitated by using the 16S rRNA gene in combination with universal primers 27 F and 1492 R. Bacteriophage was obtained through the isolation process conducted on treatment plant sewage located in Isfahan, Iran. The main goal of this study was to evaluate different characteristics of phage, such as their appearance, the range of hosts they can infect, how quickly they can enter a host, their stability at varying temperatures and pH levels, their effectiveness in killing bacteria, the growth pattern of a single phage stage, mapping of enzymatic digestion, and identification of proteomics patterns. The findings demonstrated that an examination was conducted on a sample of 50 specimens, wherein 15 instances of A. baumannii were identified. These microorganisms are the predominant Gram-negative agents known to cause wound infections in individuals suffering from bedsores. The study's findings indicated a high prevalence of antibiotic resistance in the strains isolated from pressure ulcers, excluding the clinical strains that exhibited responsiveness to colistin. According to the findings obtained from assessments of host range and morphological characteristics of bacteriophage VbϕAB-1, it can be concluded that this phage possesses specificity towards A. Baumannii BAH_Glau1001 was classified as a member of the Podoviridae family. The bacteriophage mentioned earlier showed the strongest antibacterial effect at a temperature of 18 °C and a pH of 6.5. Through the utilization of sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) analysis on protein fragments, it was established that the bacteriophage VbϕAB-1 exhibited a size range between 50 and 75 kilodaltons (KDa). The numerous research findings on the effectiveness of phages and the safety studies conducted suggest that the phages studied in this research can be considered as a practical solution and recommended approach for controlling and treating stubborn pathogens in burn wounds among hospitalized patients. The findings of our research indicated that isolated phages could be an effective antimicrobial and an appreciate candidate for prophylaxis against pressure ulcers.

Keywords : acinetobacter baumannii, extremely drug-resistant, phage therapy, surgery wound
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