ISOLATION AND CHARACTERIZATION OF A NOVEL *STAPHYLOCOCCUS AUREUS* BACTERIOPHAGE AGAINST ANTIBIOTIC-RESISTANT *STAPHYLOCOCCUS AUREUS*

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Abstract

Staphylococcus aureus, a significant Gram-positive pathogen, is a leading cause of nosocomial infections worldwide, responsible for a wide spectrum of clinical manifestations ranging from mild skin and soft tissue infections to life-threatening conditions. The rising prevalence of methicillin-resistant *S. aureus* (MRSA) leads to an urgent need for novel antimicrobial strategies. Bacteriophage therapy has emerged as one of the most promising alternatives, as phages are viruses that specifically infect and lyse bacterial cells. In this study, a lytic bacteriophage was isolated from wastewater and characterized, designated phage J. Transmission electron microscopy (TEM) revealed that phage J possesses an icosahedral head approximately 85 nm in diameter. Phage J displayed highly stable activity between 4 °C and 37 °C of temperatures for 21 days. Furthermore, the host range determination revealed that phage J exhibited lytic activity against 88.24% (45 out of 51) of *S. aureus* strains tested, indicating its high specificity for *S. aureus*. The initial approach tested to determine the optimal multiplicity of infection (MOI) for phage J showed that an MOI of 0.01 & 0.001 with soft agar yielded the highest phage production. Phage J exhibited lytic activity against *S. aureus*, as demonstrated by a consistent and significant reduction in OD_{600} values throughout 8 hours at MOIs of 10 and 1, resulting in a marked decrease in bacterial growth compared to the non-phage-treated control. These findings suggest that phage J represents a promising candidate for the development of antimicrobial agents against antibiotic-resistant *S. aureus* infections.

Keyword: *Staphylococcus aureus*, Antibiotic-resistant bacteria, Phage