Partial characterization of Enterococcus faecalis Bacteriophage vB_EIS_3 and Streptococcus mitis Bacteriophage vB_SmitsM_2

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Enterococcus faecalis and Streptococcus mitis are common commensal inhabitants of the human gastrointestinal and genitourinary tracts. However, both strains can be opportunistic pathogens and cause disease in nosocomial settings. These infections can be difficult to treat because of the frequency of antibiotic resistance among these strains. Bacteriophages are often suggested as an alternative therapeutic agent against these infections. In this study, E. faecalis and S. mitis strains were isolated from female patients with urinary tract infections. Bacteriophages active against these strains were isolated from sewage water from the Mtvaria River. Two phages, designated vB_EIS_3 (Sphoviridae) and vB_SmitsM_2 (Myoviridae), were specific for E. faecalis and S. mitis respectively. Each phage’s growth patterns and adsorption rates were quantified. Sensitivity to ultraviolet light (UV) and temperature was determined. Host range, serological and neutralization assays were performed. These phages have high thermal, UV and pH stability; what made this phages very promised for application against environment contamination or treatment infections caused by these microbes. S. mitis was found to be more resistant to UV and exposure high temperatures than was E. faecalis, despite having a much greater rate of replication. While each phage was able to infect a broad range of strains of the same species as the host of isolation, they were unable to infect other host species tested. Physiological characterization of phages showed that they are very specific in lysing Enterococcus faecalis and Streptococcus mitis strains. Host range demonstrated that they didn’t infect other bacterial strains what may us suggest that this bacteriophages are virulent and have good potential for phage therapy.

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Enhanced staphylolytic activity of the Staphylococcus aureus bacteriophage vB_SauS-philPLA88 HydH5 virion associated peptidoglycan hydrolase

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Bacteriophages and phage-encoded lytic proteins are a promising approach in the biocontrol of pathogens since they act as bactericidal agents. Virion-associated peptidoglycan hydrolases have potential as antimicrobial agents due to their ability to lyse Gram positive bacteria on contact. S. aureus bacteriophage vB_SauS-philPLA88 (philPLA88) contains a virion-associated nuclease enzyme (HydH5) with two putative lytic domains: an N-terminal CHAP (cysteine, histidine-dependent amido-hydrolase/peptidase) domain and a C-terminal LYZ2 (lysozyme subfamily 2) domain. In this work, our aim was to enhance the lytic activity of HydH5. For this purpose, three different fusion proteins were created comprising HydH5 and the full-length bacteriocin lysostaphin, and HydH5 or HydH5 CHAP domain and the SH3b cell-wall binding (CWB) from the native lysostaphin. The fusion proteins showed higher staphylolytic activity than the parental enzyme (HydH5), resulting in a wider lytic spectrum which covers bovine and human S. aureus strains, S. aureus MRSA N315 strain, and human Staphylococcus epidermidis strains. However, several non-staphylococcal bacteria were not affected. HydH5 and its derivative fusions proteins displayed antimicrobial synergy with the endolysin LysH5 in vitro suggesting that they may be more efficient in combination for the elimination of staphylococcal infections.

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