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Environmental Effects on Mycobacteriophage Cepens - Host Interactions

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Bacteriophage (phage) are viruses that infect and use bacterial hosts for viral replication. Study of these bacterial viruses has led to such discoveries as knowing DNA is the molecule of inheritance. Study of phage has also led to discovery and implementation of novel therapeutic treatment of infections. Known as “phage therapy”, phage have been utilized in curing a patient of the highly virulent infection known as MRSA. Tuberculosis, caused by Mycobacterium tuberculosis, is a growing concern as more antibiotic-resistant strains become more prevalent in the population. Cepens is a lytic phage that infects members of the Mycobacterium genus. This study analyzes Cepens and its interactions with its host bacteria, Mycobacterium smegmatis, in an effort to understand how environmental conditions impact infection and replication efficiency. First, replication benchmarks were established by conducting a serial dilution and plaque assay under standard conditions. Baseline titer calculations were used for comparison after alteration of incubation temperature and pH of phage, both prior to and during infection. To determine the ability to withstand thermal exposure during infection, plated samples were incubated between 25°C-50°C. To test the effects of pH on infection, samples were titered on plates ranging from pH of 5.0-8.1. Thermal stability of phage lysate was determined after exposure to 37°C-65°C. Lastly, pH stability of phage lysate was also tested by exposing sample to a pH range of 1.0-10.0. Extreme temperatures and pH are expected to lead to a decrease in infectivity as well as potential degradation of the phage itself. The effect of variation in environmental conditions was shown through analysis of plaque presence, size, and number. Analysis of this data provides optimal conditions for maximum host infectivity and further contributes to the understanding of virus-host interactions.