CAMO (COMPARING ANIMAL MODELS TO ORGANOIDS) - TESTING MEDICAL COUNTERMEASURES WITH MICROPHYSIOLOGICAL SYSTEMS AND COMPARING TO TRADITIONAL ANIMAL MODELS AND CLINICAL TRAILS

Bacteriophage Therapy Rescues Caenorhabditis Elegans From Pseudomonas Aeruginosa Infection And Preserves The Gut Microbiome

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Bacteriophages are viruses that infect, replicate, and kill their specific host bacteria. Phage therapy is not an entirely new proposal, but its popularity and significance has resurged with the emergence of drug-resistant bacteria. Bacterial infections that cannot be treated by antibiotics are becoming more prevalent. During Operation Iraqi Freedom, a particular multi-drug resistant bacteria was deemed the “Iraqibacter” due to its frequent occurrence in Soldiers’ wounds. Caenorhabditis elegans, utilized as a model organism, may host a diverse gut microbiome that plays crucial roles in health and immunity, mirroring many aspects of mammalian gut microbiota. Understanding how phage therapy affects the balance of the C. elegans gut microbiome is essential to evaluating the therapeutic potential and broader implications of phage-based interventions. Phages provide a more targeted approach to infection control, and this research project aims to investigate the efficacy and potential side effects of phage therapy on the gut microbiome using C. elegans as a model organism. This study focuses on the unexplored effects on a microbiota in C. elegans amid ambiguous bacteria-phage interactions. The C. elegans gut microbiome was established on agar plates with exposure to non-pathogenic bacteria. The nematodes were infected with P. aeruginosa during the L4 larval stage by transfer to new agar plates with only P. aeruginosa; C. elegans consumed the pathogen present for various exposure periods, establishing a persistent infection in their gut. C. elegans were then washed and transferred to new plates containing a novel lytic phage against P. aeruginosa. The plates also included the previously established non-pathogenic bacteria comprising the original microbiome and were monitored for up to seven days. Our results suggest phage consumption is effective in treating P. aeruginosa infection. Treated C. elegans demonstrated significantly higher survival rates than untreated worms. Additionally, our preliminary results illustrate phage treatment preserves the non-pathogenic bacteria present in the C. elegans gut while significantly reducing the presence of P. aeruginosa. These preliminary results will be expanded as we develop more complex microbiome models, explore phage- microbiome interactions, apply this system to other phage-pathogen combinations, and compare this model system to novel gut / microbiome organoid models. All of these efforts will help better explain the complexity of the microbiome as well as the bacteriophage’s potential as both a therapeutic and supplement.

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