The Inception of Infection II: The Antimicrobial and Synergistic Efficiency of Antibiotic Ethambutol and Isoniazid and Bacteriophage D29 in Treating a Model Organism for Tuberculosis

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Mycobacterium smegmatis mc2155 is a commonly used model organism for Mycobacterium tuberculosis, which is one of the most serious bacterial infections in the world and has become increasingly difficult to treat due to its rising rate of antibiotic resistance. This second year study continued exploring bacteriophage therapy, and it was proposed that due to each agents' distinct mechanisms of action, the synergy of both antibiotic (isoniazid and ethambutol, tested separately) and bacteriophage would provide for more effective treatment than either agent alone in treating Mycobacterium smegmatis over a period of time. Increasing concentrations of antibiotic were separately diluted with varying concentrations of lytic mycobacteriophage D29 (i.e. high concentration of antibiotic diluted with low concentration of phage) and compared to the activity of the same varying concentrations of antibiotic and phage D29 on Mycobacterium smegmatis. At each time interval of 4.5 hours, absorbency values were calculated using a spectrophotometer and compared. All treatments significantly decreased initial bacterial concentrations, but bacteriophage in combination with ethambutol was significantly more effective than either agent alone in treating Mycobacterium smegmatis, having treated all bacteria by 18 hours. Bacteriophage in combination with ethambutol demonstrated significantly greater efficiency than bacteriophage alone or in combination with isoniazid, suggesting that the use of phage alone and in combination with specific antibiotics should be explored further, especially for treating multi-drug resistant tuberculosis. Further applications include the use of antibiotic and phage to treat other antibiotic-resistant infections or contaminants in dairy and agriculture.

Awards Won:
Third Award of $1,000