Viruses to the Rescue?: Using Microtiter Assays and an In-Lab Developed Simulated Anatomic Lung Model to Determine the Effectiveness of Bacteriophage Therapy as a Preventative Measure against Poly-Microbial Biofilms in Cystic Fibrosis Patients

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Bacterial infections in Cystic Fibrosis patients lead to decreased lifespan. In particular, Pseudomonas Aeruginosa infections are linked to higher mortality. This study examined the use of bacteriophages as a clinical treatment method. Notable discrepancies in bacteriophage research, such as interactions with poly-microbials biofilms and preventative feasibility, were targeted. Initially, a 96-well microtiter plate was plated with various combinations of three organisms including two Pseudomonas and a MRSA, alongside isolated phage stock, antibiotics trimethoprim/chloramphenicol, and TSB. Biofilms were encouraged to form, and then quantified. Following this, CT scans of a pediatric Cystic Fibrosis patient's lungs were converted to highly accurate 3-dimensional physical prints. The simulated anatomic models (SAMs) were submerged in combinations of the same organisms, phage and antibiotics, and biofilms were again encouraged to form, then quantified. Results from the former assay demonstrated that phage presence increased biofilm formation by upwards of 450%, while biofilm production in the SAMs with the same phage presence was practically negligible (zero). Presence of antibiotics generally increased biofilm production in both scenarios as well, showing that reliance on antibiotics may not be most advisable. The discrepancy in phage-biofilm interactions data are discussed in depth and valuable conclusions are drawn as to why lysogenic-induced-lytic phage presence can possibly act as a motivator for biofilms rather than an effective preventative measure. This study functions as one of the pioneering examinations for phage use in Cystic Fibrosis patients and highlights the almost dangerous reputation as omnipotent creatures bacteriophages are receiving in recent years.

Awards Won:

Third Award of $1,000