"The application of bacteriophage and silver nanoparticles to combat Pseudomonas aeruginosa biofilms present in wound infections"

Pseudomonas aeruginosa is an opportunistic pathogen that causes >50,000 infections in hospitalized immunocompromised patients and >2,500 deaths in the United States annually. Due to its high pathogenicity and virulence, P. aeruginosa can be life-threatening causing both acute and chronic infections that can become drug resistant, thereby limiting the efficacy of traditional antibiotic therapies. Therefore, it is critical to develop new therapeutic methods to combat resistant infections. Bacteriophages are viruses that can infect bacteria. They show low toxicity to the host and are easy to isolate, which makes them highly desirable for a targeted treatment. Additionally, silver nanoparticles have shown antimicrobial activity against P. aeruginosa biofilms. Hence, this project is investigating the combined application of bacteriophage and silver nanoparticles to combat P. aeruginosa biofilms.

This project will investigate the isolation and characterization of P. aeruginosa bacteriophages that will then be incorporated into a cocktail and tested against mock wound isolate P. aeruginosa biofilms. During the enrichment and isolation procedure, 20 bacteriophages were isolated, however five show promising results of having a broad host-range which can infect multiple P. aeruginosa clinical isolates. Minimum inhibitory concentration and minimum biofilm eradication concentration assays will test the efficacy of the combined application of bacteriophage and silver nanoparticles. Finally, transmission electron microscopy and scanning electron microscopy will allow us to visualize the biofilm after application of both silver nanoparticles and bacteriophage. This novel research will give us an understanding of the synergistic effect of a new therapeutic method that could be used in combating chronic biofilm-mediated P. aeruginosa infections.