Abstract

*Pseudomonas aeruginosa* (P. aeruginosa) is characterized as a gram-negative, rod-shaped bacterium which has the capability to cause various infections in humans including pneumonia, UTIs, and bacteremia. In more recent years, the bacteria exhibited resistance properties to several antibiotics, causing *P. aeruginosa* infections to pose a greater risk for patients. Medical researchers have proposed using bacteria-specific phages as a way of treating multi-resistant *P. aeruginosa* infections. The reliability and effectiveness of phagotherapy must be tested and examined through extensive research prior to its use in healthcare; therefore, it is crucial to begin with an in-depth evaluation of the novel techniques involved in this form of bacterial infection treatment. This literature review will consider the effectiveness of phages on *P. aeruginosa* bacteria to investigate the efficacy of phagotherapy in combating the bacteria's antibiotic resistance. Furthermore, the review will pay special attention to any possible limitations and societal concerns associated with phagotherapy.

One study used an artificial sputum-medium (ASM) model to deduce a significant decrease (\(p,5;0_01\)) in *P. aeruginosa* bacteria formation 24-hours after phage treatment. Rodent studies were also conducted using a murine model, and the results showed a significant decrease (\(p=0_001\)) in symptoms of *P. aeruginosa* infection compared to the control group. With both the ASM and murine model, limited host range can be a potential limitation to phage effectiveness, so it is important to have a sufficient understanding of phage diversity and dynamics to counter these issues. Bacteriophage diversity, effectiveness against their target bacteria, and their growing success in the pre-clinical field are all indicators that phagotherapy can efficiently combat *P. aeruginosa* resistance.

Conclusions

- In both the murine model and the ASM model, there were significant differences in trials where phages were administered.
- These differences were further calculated with statistical testing and the low p-value numbers confirm the study's findings.

- Both studies present limited-host range against the targeted microbes to be a possible limitation within phagotherapy, so understanding phage diversity and dynamics would be helpful in creating a more effective treatment plan.
- The data presented in the figures show the efficacy of using phages as a treatment method in combating antibiotic resistance.

Further Directions

- Phages are found to have synergistic effects when in combination with another antibiotic treatments, such as chemical antibiotics or other phages (phage cocktails).
- This allows phage therapy to address the potential limitation of having a narrow-host range by providing a broader spectrum of suitable microbial targets.
- The data indicates that phagotherapy has had immense success in the pre-clinical field, and can effectively combat antibiotic resistance properties in *P. aeruginosa* bacteria.

References

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- The investigators selected the time points for sampling based on a previous study they had conducted.