Monday, December 15, 2025

Poster abstract submission

Approval Status Not Started

Presenting author Meshack Omwega

Presenting author's email meshacktweya2@gmail.com

Further authors (if any)

Lillian Musila
Moses Gachoya
Justin Nyasinga
Martin Georges
Erick Odoyo

Affiliation(s)

1. Microbiology Hub Kericho, Walter Reed Army Institute of Research – Africa, Kenya

Country Kenya

Type of organization Academic / research institution

Poster title

Systematic Combinatorial Optimization of Three-Phage Cocktails Against Multidrug-Resistant Pseudomonas aeruginosa

Poster abstract

Background:
Multidrug-resistant Pseudomonas aeruginosa poses a significant global health threat, necessitating alternative therapeutic strategies. Bacteriophage therapy shows promise, but single-phage use is prone to resistance. Bacteriophage cocktails can address this issue, but they are typically formulated empirically without a systematic evaluation of constituent phage interactions.
Methodology:
We employed a comprehensive combinatorial approach to optimize three-phage cocktails against clinical P. aeruginosa isolates. From 25 candidate bacteriophages, five were selected based on broad host range (≥60% of 51 MDR P. aeruginosa clinical isolates). Ten possible three-phage cocktail combinations were systematically generated and evaluated using real-time Omnilog phenotypic microarray analysis. Phage interactions were quantified using the Highest Single Agent independence model to classify synergistic ($\Delta > +5\%$), neutral ($-5\% \leq \Delta \leq +5\%$), or antagonistic ($\Delta < -5\%$) effects.
Results:
Individual phage inhibition efficiencies ranged from 35.4% to 75.4%. Cocktail performance varied dramatically (16.1–84.1% inhibition). Only one cocktail exhibited synergy, achieving 84.1% inhibition, an 8.7% improvement over the best individual phage. Four cocktails (40%) showed neutral interactions, while five (50%) demonstrated antagonistic effects. The optimal cocktail (Phages 1+3+4) demonstrated efficacy across six of eight diverse clinical isolates in biofilm inhibition assays (29–63% biomass reduction, 2.7–3.6 $\log_{10}$ CFU reduction) and achieved approximately 80% survival in Galleria mellonella infection models versus 10% in infected controls.
Conclusions
These findings demonstrate that phage cocktail optimization requires rational validation, as antagonistic interactions can occur, establishing a critical validation step before committing resources to in vivo

efficacy studies.

Research topic Phage or phage products