

# Effectiveness of bacteriophages in treating antibiotic resistant bacterial infections

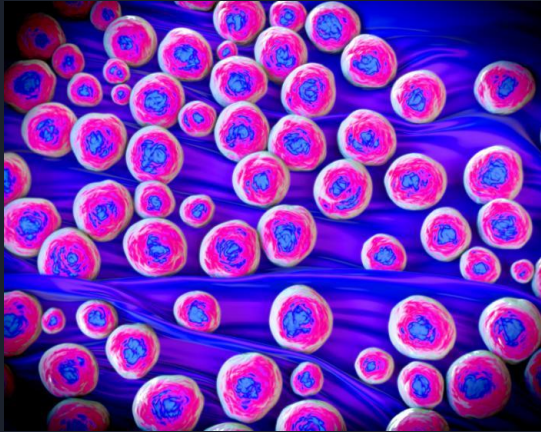
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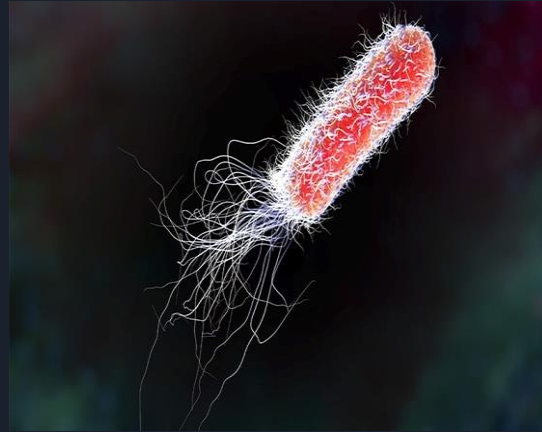
# Introduction

- Antibiotic-resistant infections: bacteria have immunity genes and do not respond to antibiotic treatment
- Results in 2 million illnesses and 23,000 deaths per year
- Developing novel antibiotics is expensive and challenging, and resistance builds quickly

# Antibiotic-Resistant Bacteria



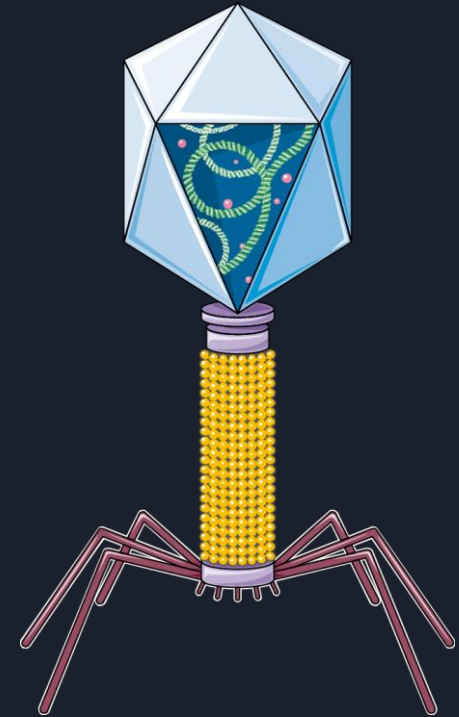
*Staphylococcus aureus*



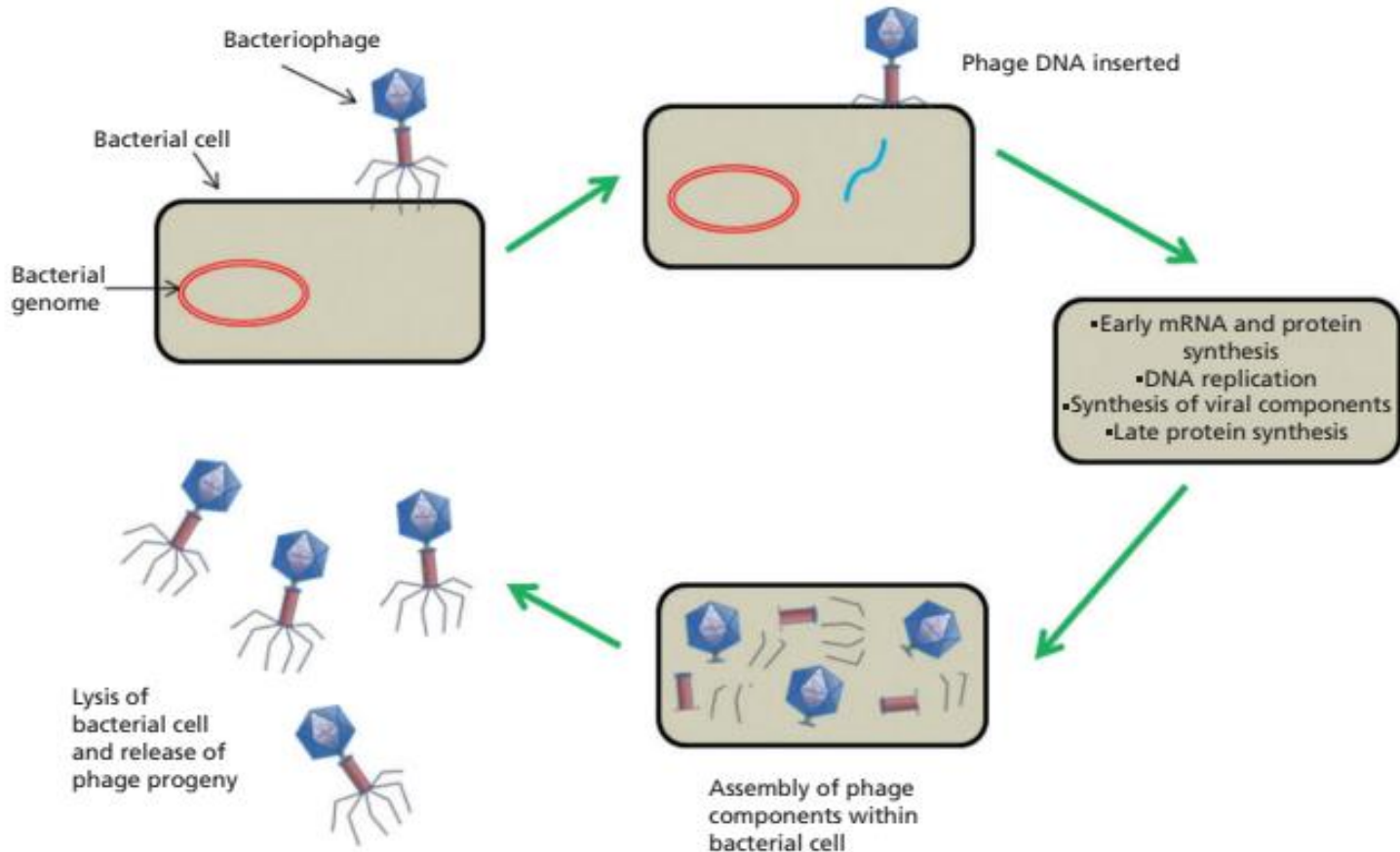
*Escherichia coli*

# Bacteriophage Therapy

- Bacteriophage- virus that infects and kills a target bacterium
- Discovered by Felix d'Herelle (1917)



Bacteriophage Model





## Advantages:

- Host-specific
- Concentrate at the site of infection
- Easily found and isolated in the environment
- Disrupt bacterial biofilms

## Disadvantages:

- Phage Resistance can develop



# Purpose

To investigate if bacteriophage therapy is an effective method of treating antibiotic-resistant bacterial infections.



# Research Question

How effective is the administration of bacteriophages in the inhibition of antibiotic resistant bacterial infections?





## *Alternative Hypothesis*

The treatment of specific phages will result in significant difference in bacterial inhibition of the treated infection compared to the control groups.

## *Null Hypothesis*

There will be minimal to no difference in bacterial inhibition after the treatment of specific phages compared to the control groups.



# Methods

- Systematic Literature Review
- Scientific papers from several databases (Ebscohost, Google Scholar, CSUCI)
- Data collection and analysis: Excel



## Data collection

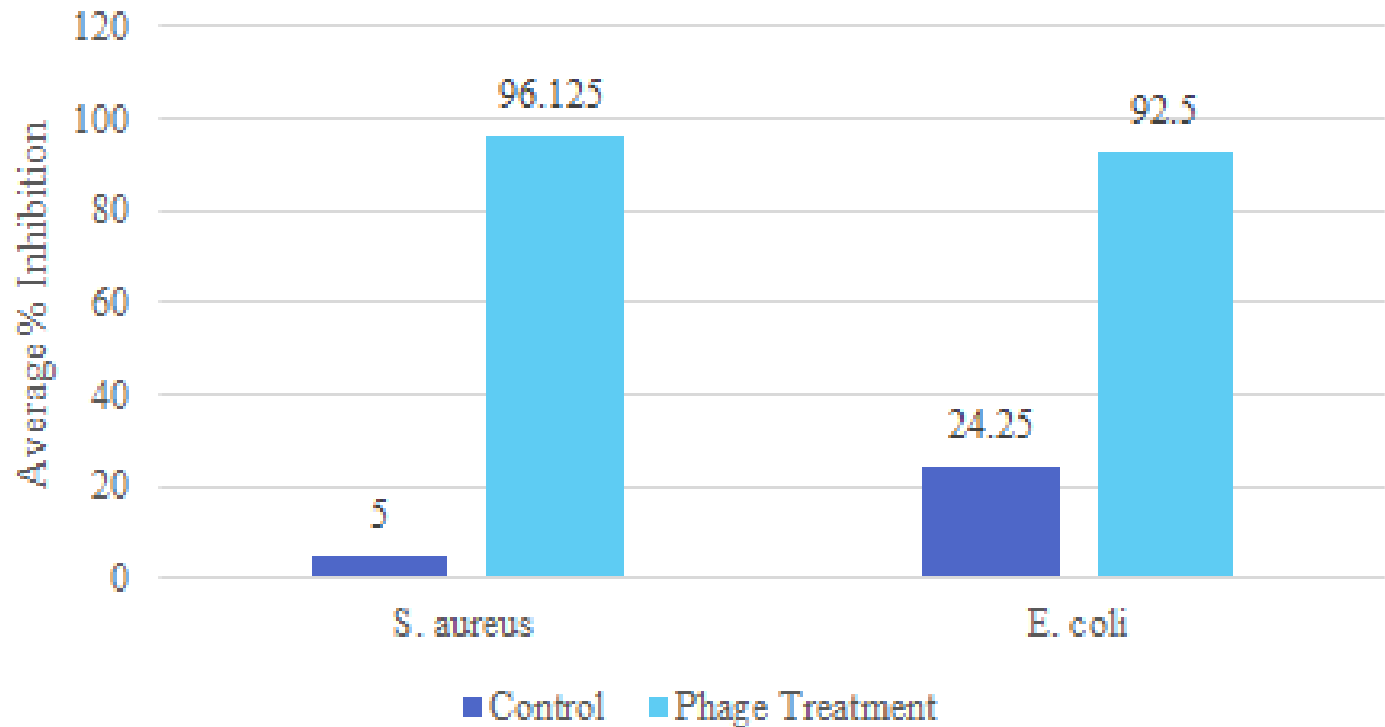
- Antibiotic-resistant *E. coli* and *S. aureus* in mice, rabbits, and chickens
- Bacterial inhibition of infection was compared between treated groups and untreated control groups
- Significance determined using two-tailed t-test



## Results

- *S. aureus*: 96.125% bacterial inhibition through phage treatment
- 5% inhibition in control groups
- *E. coli*: 92.5% bacterial inhibition through phage treatment
- 24.25% inhibition in control groups

## Effectiveness of phage therapy on bacterial inhibition





## Discussion

- Phage therapy is effective in treating drug resistant *S. aureus* and *E. coli*
- T-test score:  $p=0.0019$  for *S. aureus* and  $p=0.032$  for *E. coli*
- Null hypothesis should be rejected



## Delivery routes

- Delivering bacteriophages to the site of infection
- Key to the success of phage therapy
- Encapsulation



## Phage resistance

- Monitored in trials: frequency of appearance was found to be  $1.3 \times 10^{-8}$  in a culture of  $10^8$  CFU of *S. aureus*.
- Phage resistance is an uncommon event
- New lytic phages can be isolated easily





# Conclusion

- Available literature shows promise for phage therapy
- Effective against antibiotic-resistant infections
- Potential for being a potent method of treating infections



## Further Work

- Experimentation against other bacterial strains
- Testing new delivery routes (encapsulation)
- Toxicity testing
- Clinical trials to determine effectiveness




# Acknowledgements

- Dr. Nikki Malhotra
- Dr. Robert Sandrock



# References

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