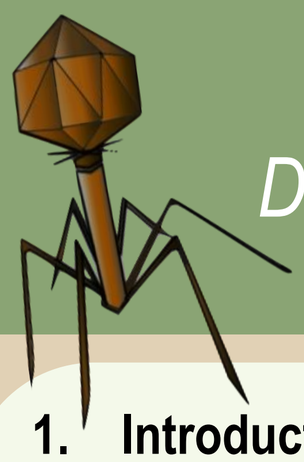


# Beyond Antibiotics

## *Does phage resistance lead to changes in antibiotic resistance?*

*Karen Erstad, Lotta A. I. Landor, Selina Våge*

## 1. Introduction

Antibiotic resistance is an increasing threat to human health. It is predicted that antibiotic resistance will cause 10 million deaths worldwide by 2050 [2]. Phage therapy, which makes use of naturally occurring phages to lyse bacteria at the site of infection, is thus being explored as an alternative for antibiotics [1]. However, a difficulty with phage therapy is that bacteria can develop a resistance to phages as well.

There is much unknown about phage biology and phage resistance, preventing phage therapy from being a common treatment method. Studies show that phage resistance comes at a cost to the host bacteria, potentially leading to decreased antibiotic resistance. They also suggests that phages and antibiotics can work synergistically to kill bacteria. Concerns have, however, been raised about the interaction of some antibiotics with phages may promote antibiotic resistance while delaying phage development. [2] In this project, we explored whether higher phage resistance causes increased or decreased antibiotic resistance.

## 2. Methods

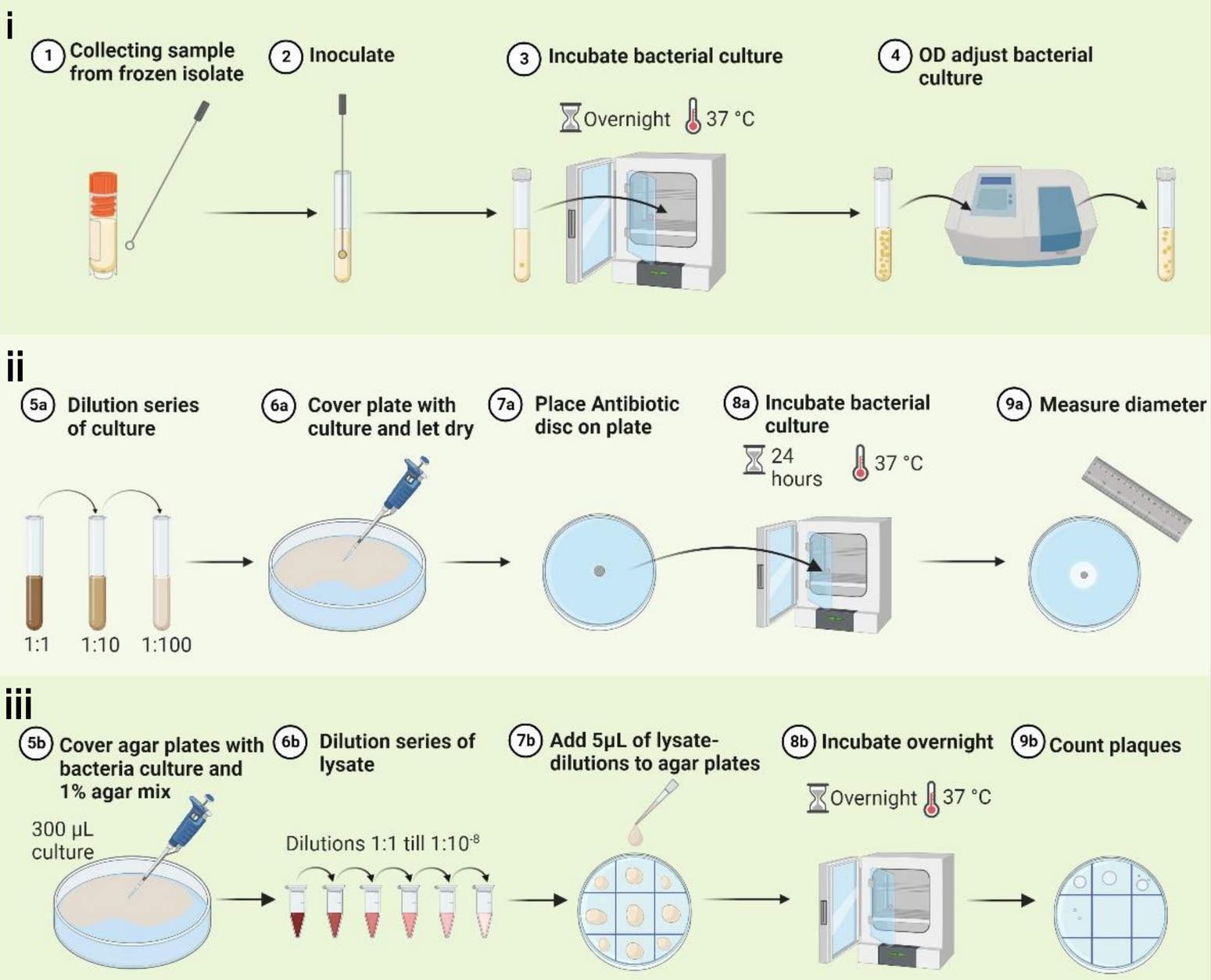
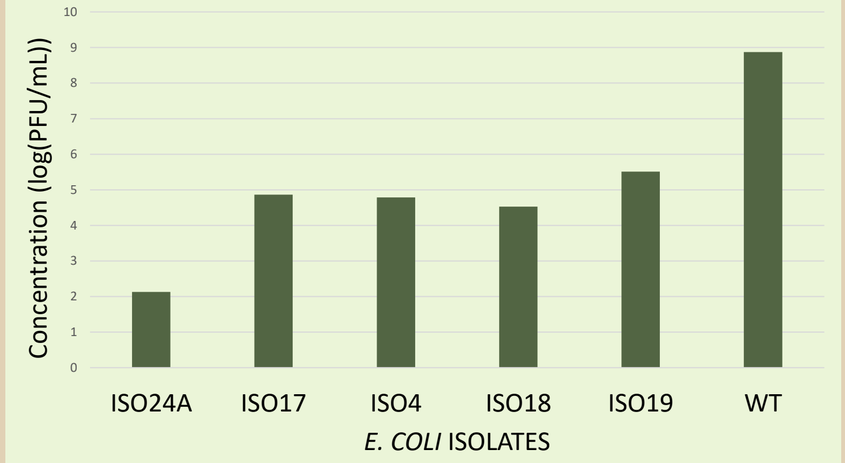
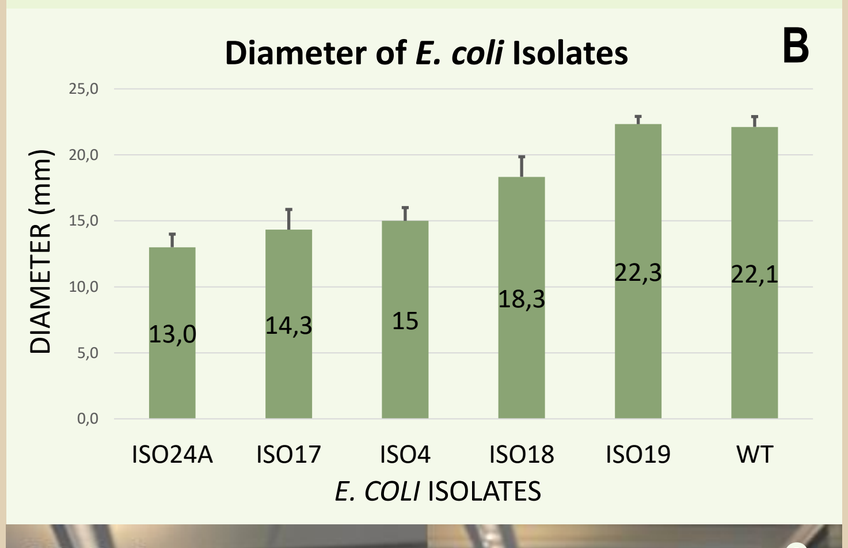



*Figure 1*: **i**; Production of *Escherichia coli* (*E. coli*) culture, **ii**; Agar Diffusion test, **iii**; Plaque Assays. [3]

## 3. Key Findings

The results indicate that phage resistance and antibiotic resistance correlates in a positive manner. The isolates with the highest phage resistance also seem to have increased antibiotic resistance as indicated by figures A, B, and C.



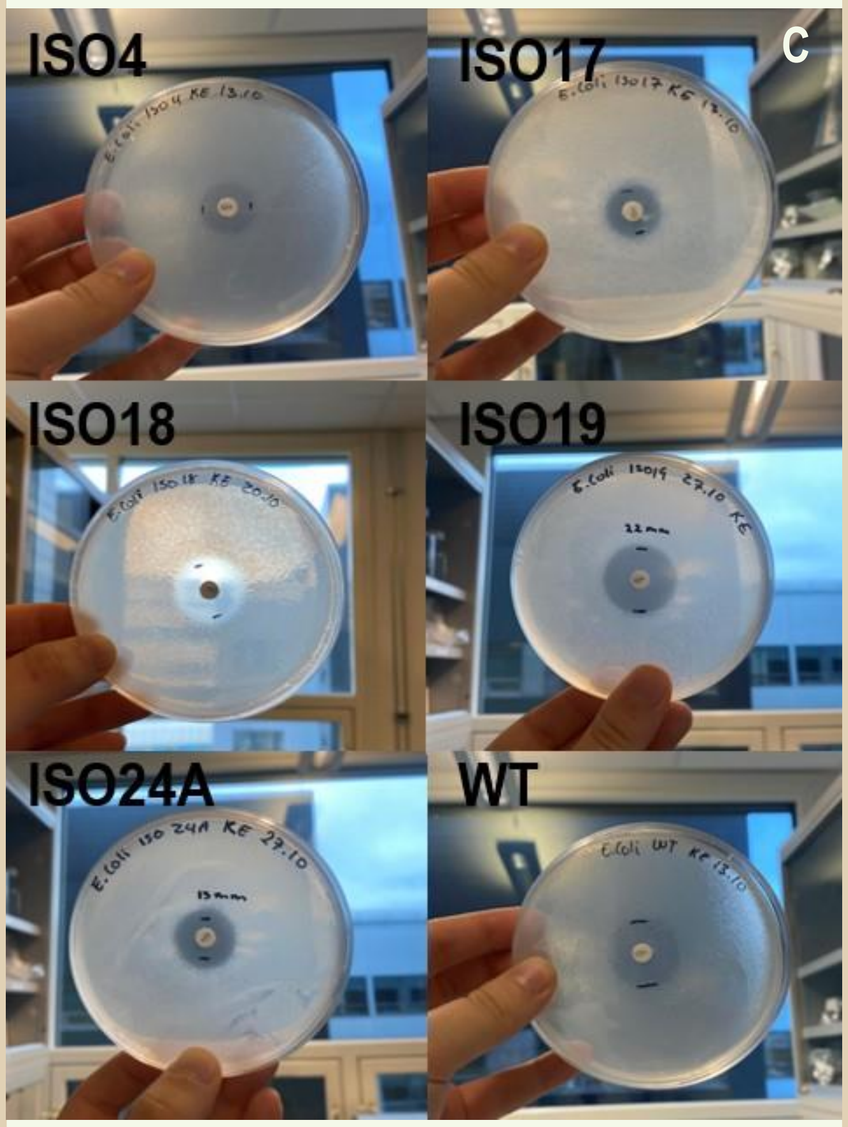




*Figure 2*: **A**; Graph with concentration of phage able to infect the phage-resistant isolate and phage susceptible wildtype (WT). Calculated from plaque assays. **B**; Graph showing average diameters of bacteria-free zone from agar diffusion test of each phage-resistant isolate and WT, **C**; Pictures of agar diffusion test of each phage-resistant isolate and WT, outer edges of each bacteria-free zone is marked.

## 4. Further investigations

- Growth curves with several concentrations of antibiotics
- Test different bacteria-phage systems
- Clinical trails

*References*

1. Lin, D.M., B. Koskella, and H.C. Lin, *Phage therapy: An alternative to antibiotics in the age of multi-drug resistance.* World J Gastrointest Pharmacol Ther, 2017. **8**(3): p. 162-173.
2. Chen, Q., et al., *Bacteriophage and Bacterial Susceptibility, Resistance, and Tolerance to Antibiotics.* Pharmaceutics, 2022. **14**(7): p. 1425.
3. Method animations created with BioRender.com.
4. Landor, L., *Phage animation*

UNIVERSITY OF BERGEN

Karen Erstad
ker029@uib.no
Department of Biological Sciences
University of Bergen
Bachelor in Molecular Biology
Posternumber: 299_9