

# The role of the environment in evolution, transmission and surveillance of antibiotic resistant bacteria

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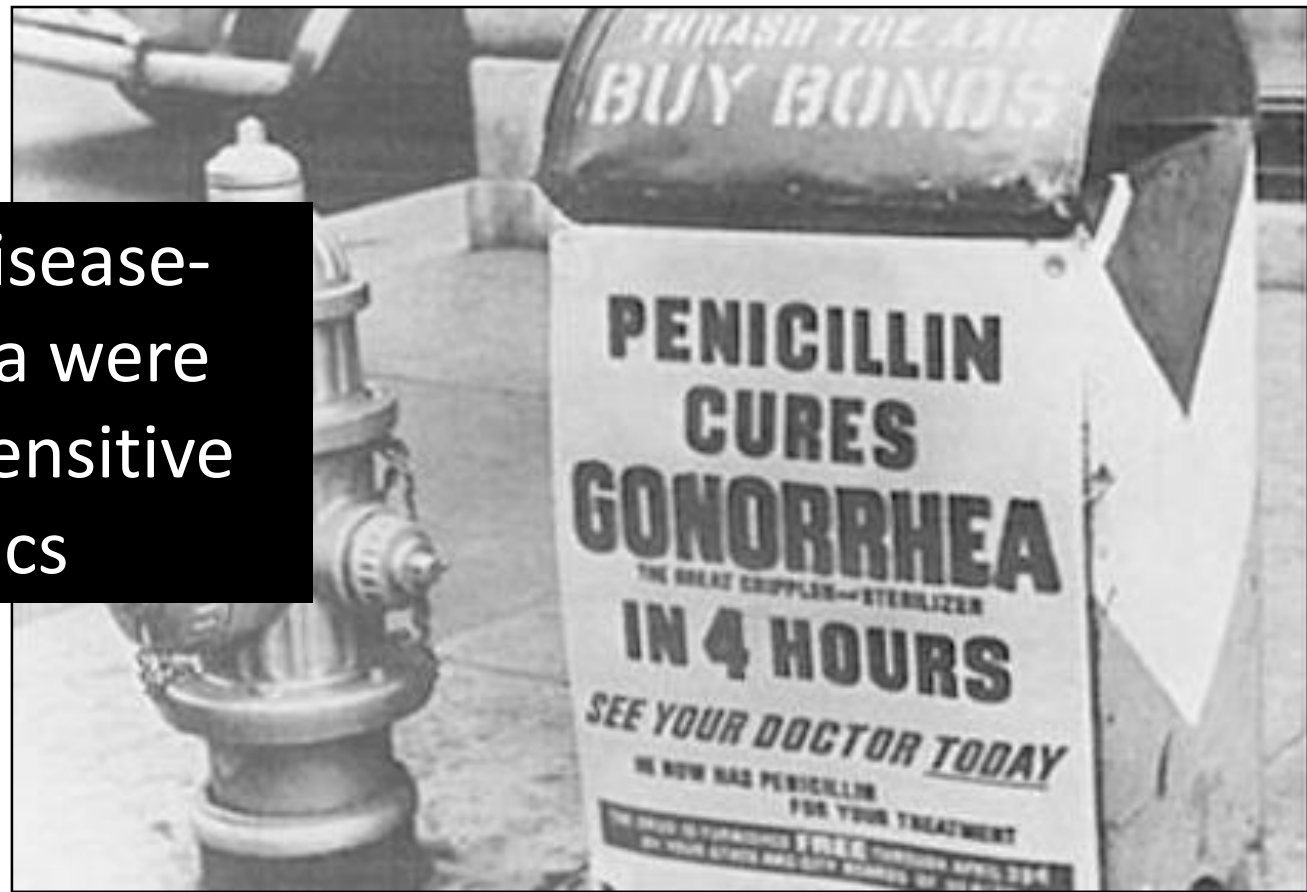
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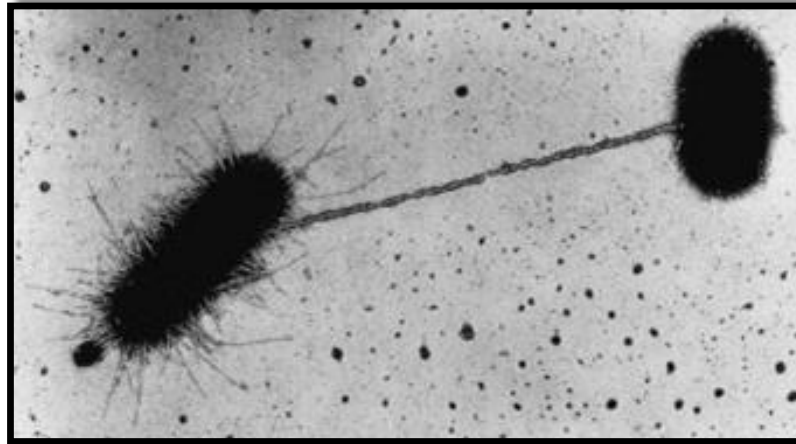
75 years ago, disease-causing bacteria were almost always sensitive to antibiotics



# How do bacteria become resistant to antibiotics

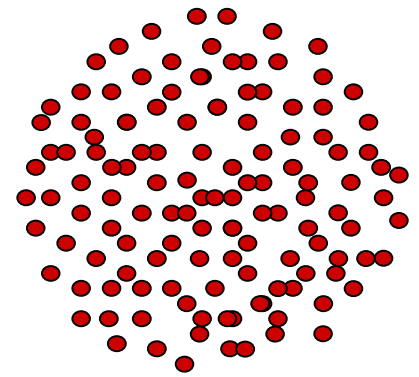
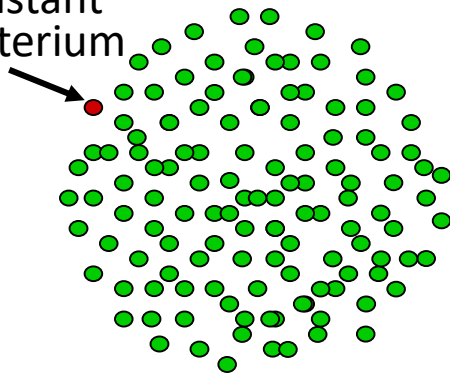
## Two main mechanisms:

- Changes in their pre-existing DNA
- Acquisition of new DNA from other bacteria in their surroundings
  - Environmental bacteria are involved in this process



# Selection of antibiotic resistant bacteria

Resistant  
bacterium



# Where and when are bacteria exposed to our antibiotics

**BEFORE**



**Production**



**DURING**



**Usage**



**AFTER**



**Sewage / Waste water treatment plant**

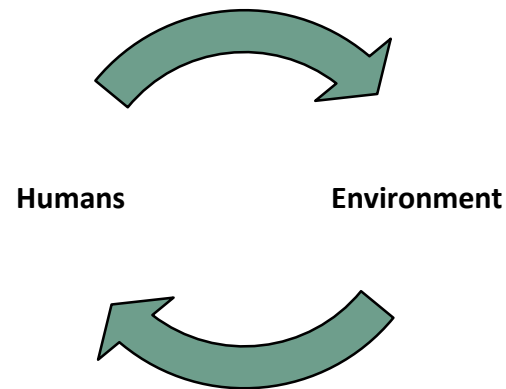
**High risk for  
evolution of  
antibiotic resistant  
bacteria**

Water environments

Water environments

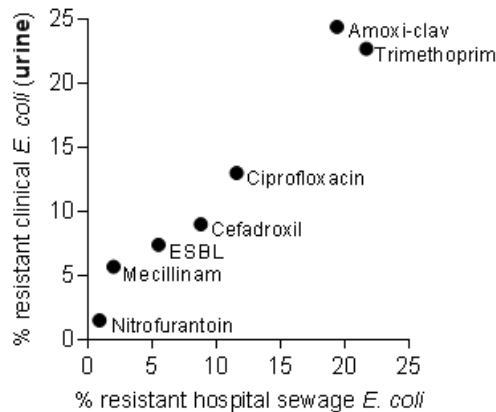
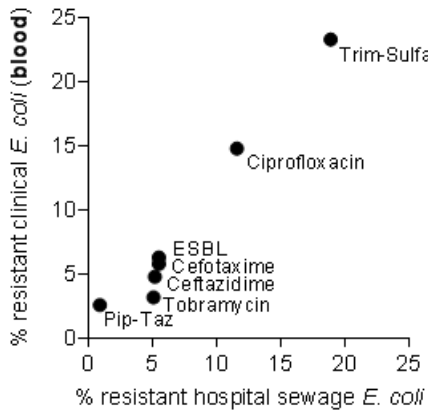


# The environment can also be a significant transmission route for antibiotic resistant bacteria



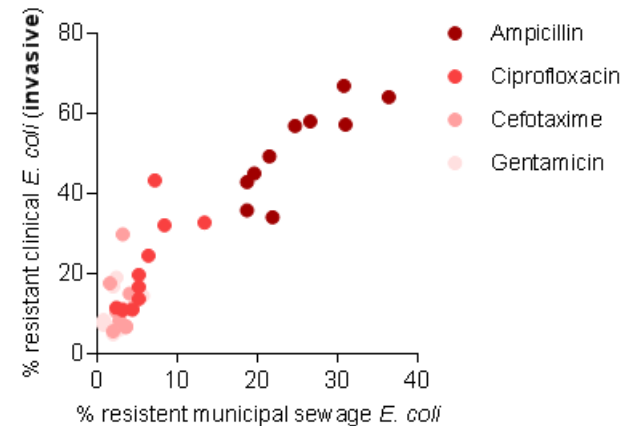
# Analyses of untreated sewage might be used to survey antibiotic resistant bacteria in human populations

## Hospital sewage vs clinical samples, Sweden




Hutinel M, Huijbers P, Fick J, Åhrén C, Larsson DGJ, Flach CF. *Correlation between antibiotic resistance rates in sewage and clinical E. coli isolates*. In prep.

## Municipal sewage vs clinical samples, 10 European countries



Huijbers P, Larsson DGJ, Flach CF. *Surveillance of antibiotic resistance in human populations through urban wastewater*. In prep.



A close-up photograph showing a hand holding a white blister pack of pills, with one pill being dispensed into an open palm. The background is a blurred blue and white, suggesting a clinical or hospital setting.

## Actions are needed

- Improved sanitation and wastewater treatment
- Incentives for greener production of antibiotics
  - Define **discharge limits** for antibiotics
  - **Transparency** throughout the production chain
  - Changes in the **procurement** of antibiotics
  - Changes in the **generic substitution systems**
  - Changes in **GMP** frameworks





# THANK YOU FOR LISTENING!



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