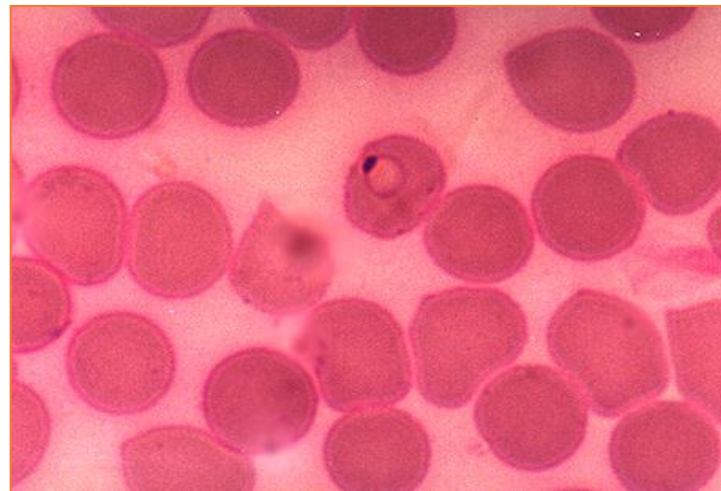
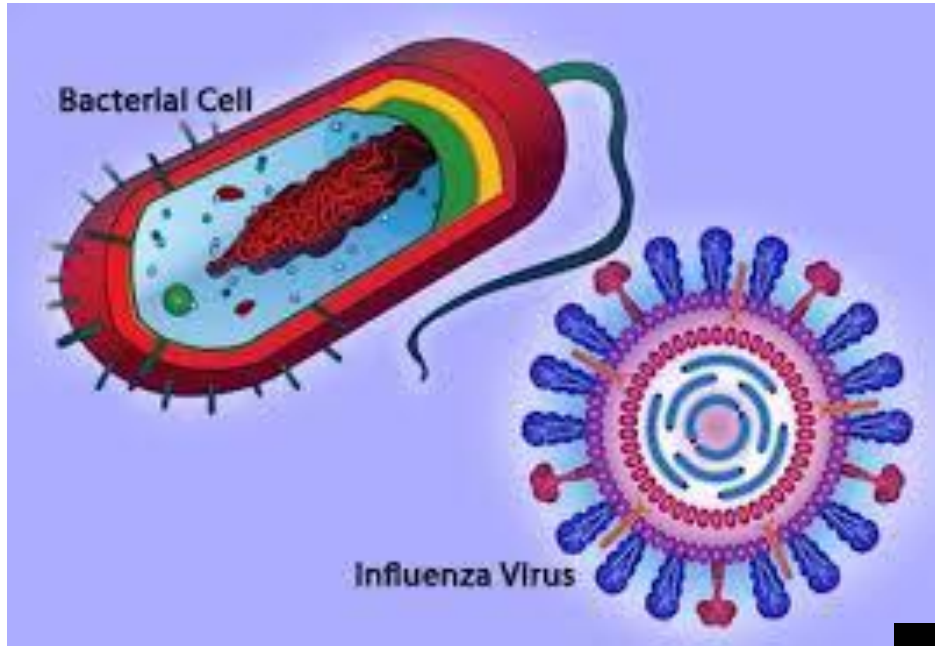


# **Antibiotics/Antimicrobial resistance**

# *What is a microorganism?*

Microbes are organisms too small for the eye to see and are found everywhere on Earth. There are many types of microbes: bacteria, viruses, fungi, and parasites.



While most microbes are harmless and even beneficial to living organisms, some can cause disease among humans, other animals, and plants.

These disease-causing microbes are called **pathogens**; sometimes they are referred to as “**germs**”.



## Examples of Disease-Causing Microbes

### Strep throat



**Bacteria**  
*Group A Streptococcus*

### Food poisoning



**Bacteria**  
*Salmonella*

### Common cold



**Virus**  
Rhinovirus

### Flu



**Virus**  
Influenza virus

### Athlete's foot



**Fungi**  
Trichophyton

### Malaria



**Parasite**  
Plasmodium

- *Do you know?*

- Microbiologists determine the type of microorganism causing the disease and find a drug, usually an antibiotic, to inhibit the microorganism.
- Microbiologists continue to study the microorganisms through research to determine new antibiotics.





# *What is an antibiotic?*

**Literal definition:**  
Against (anti-) life  
(-biotic)

The more correct  
term is  
**antimicrobial  
agent**



He observed inhibition  
of staphylococci on an  
agar plate contaminated  
by a *Penicillium* mold

„One sometimes finds what  
one is not looking for“

## **Penicillin**



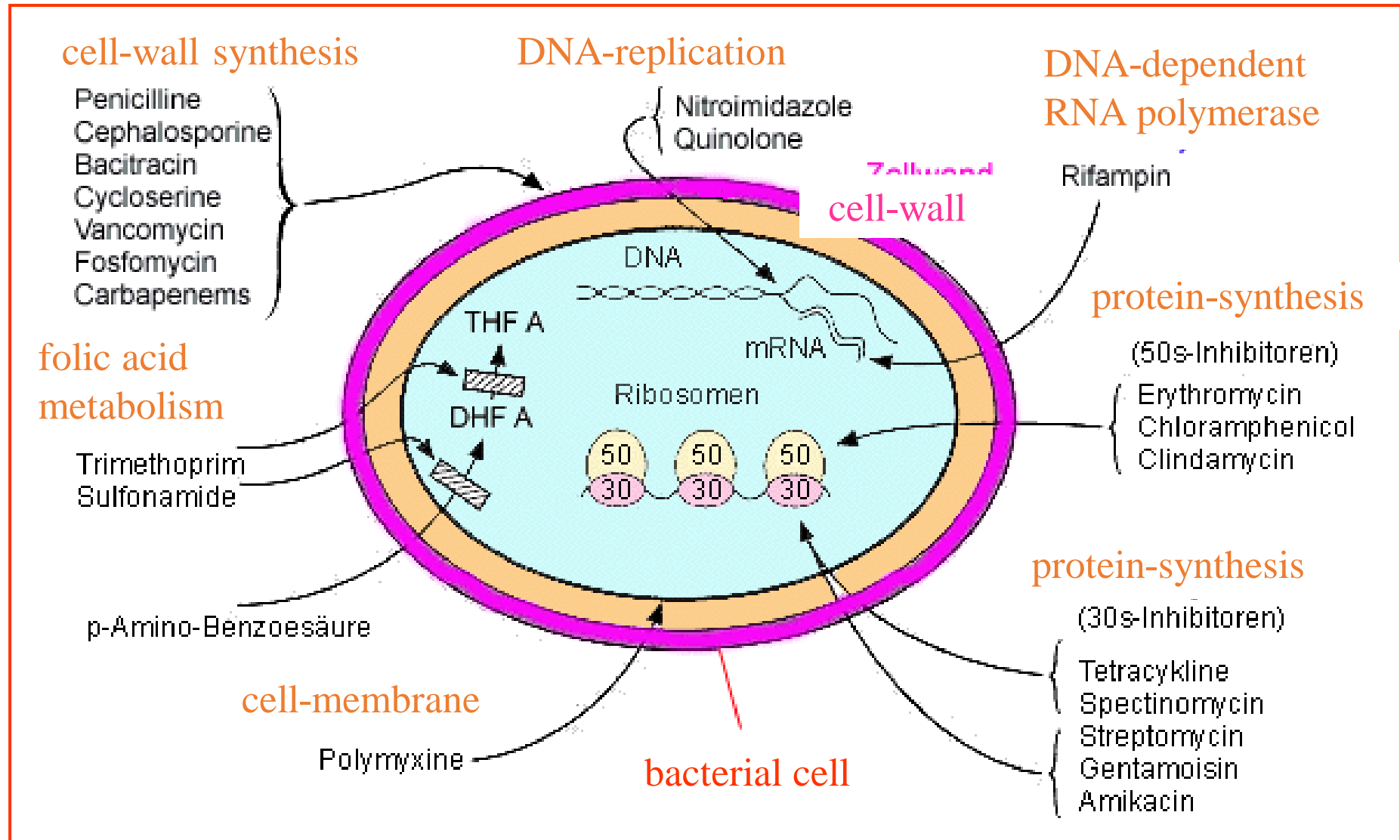
**Sir Alexander Fleming  
(1881 –1955)**

# *What is an antibiotic?*

- An antibiotic is a selective poison.
- It has been chosen so that it will kill the desired bacteria, but not the cells in your body.
- Each different type of antibiotic affects different bacteria in different ways.
- **For example**, an antibiotic might inhibit a bacteria's ability to turn glucose into energy, or the bacteria's ability to construct its cell wall. Therefore the bacteria dies instead of reproducing.

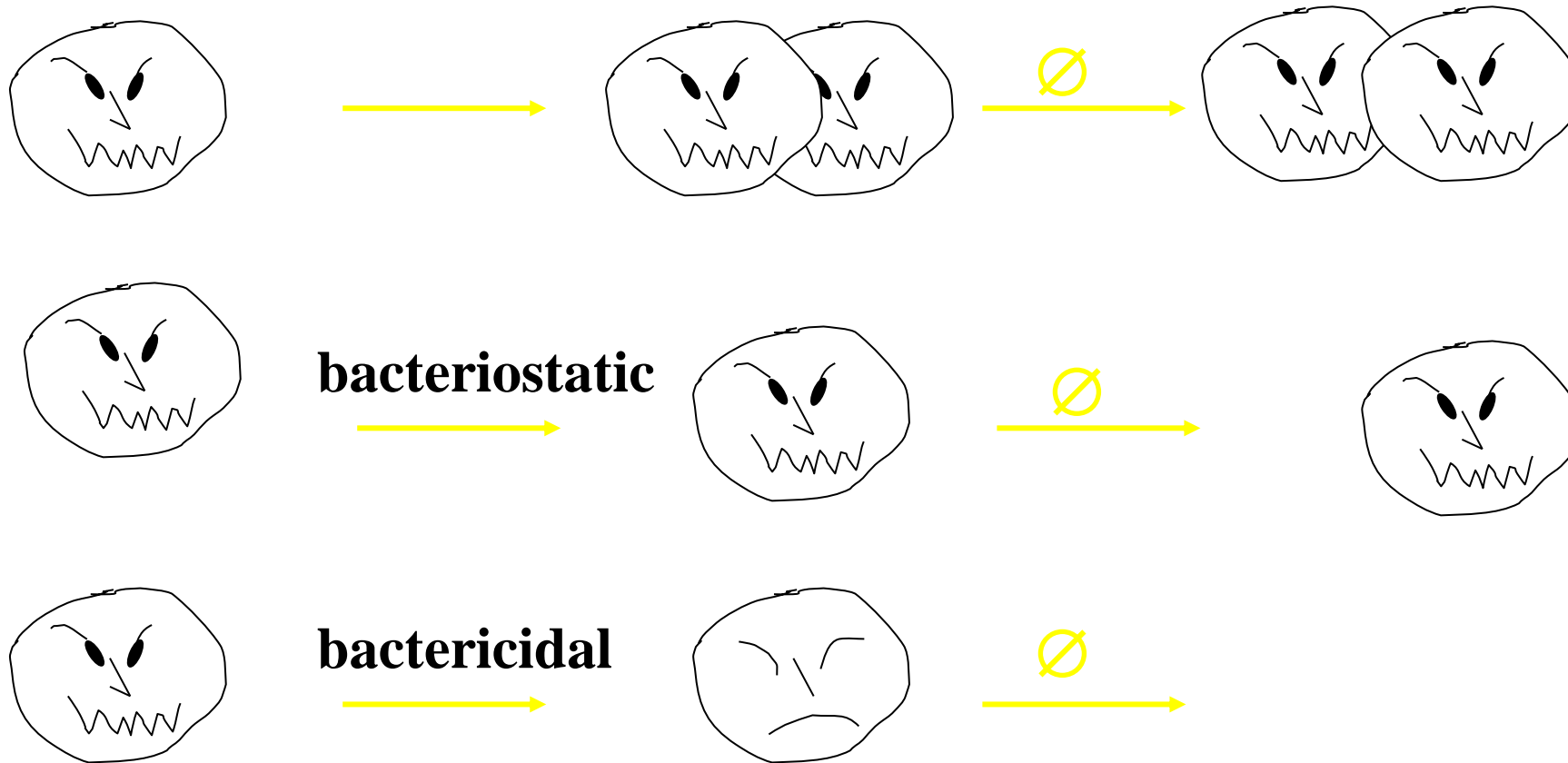
# Antibiotics and Chemotherapeutics

## Modes of Action



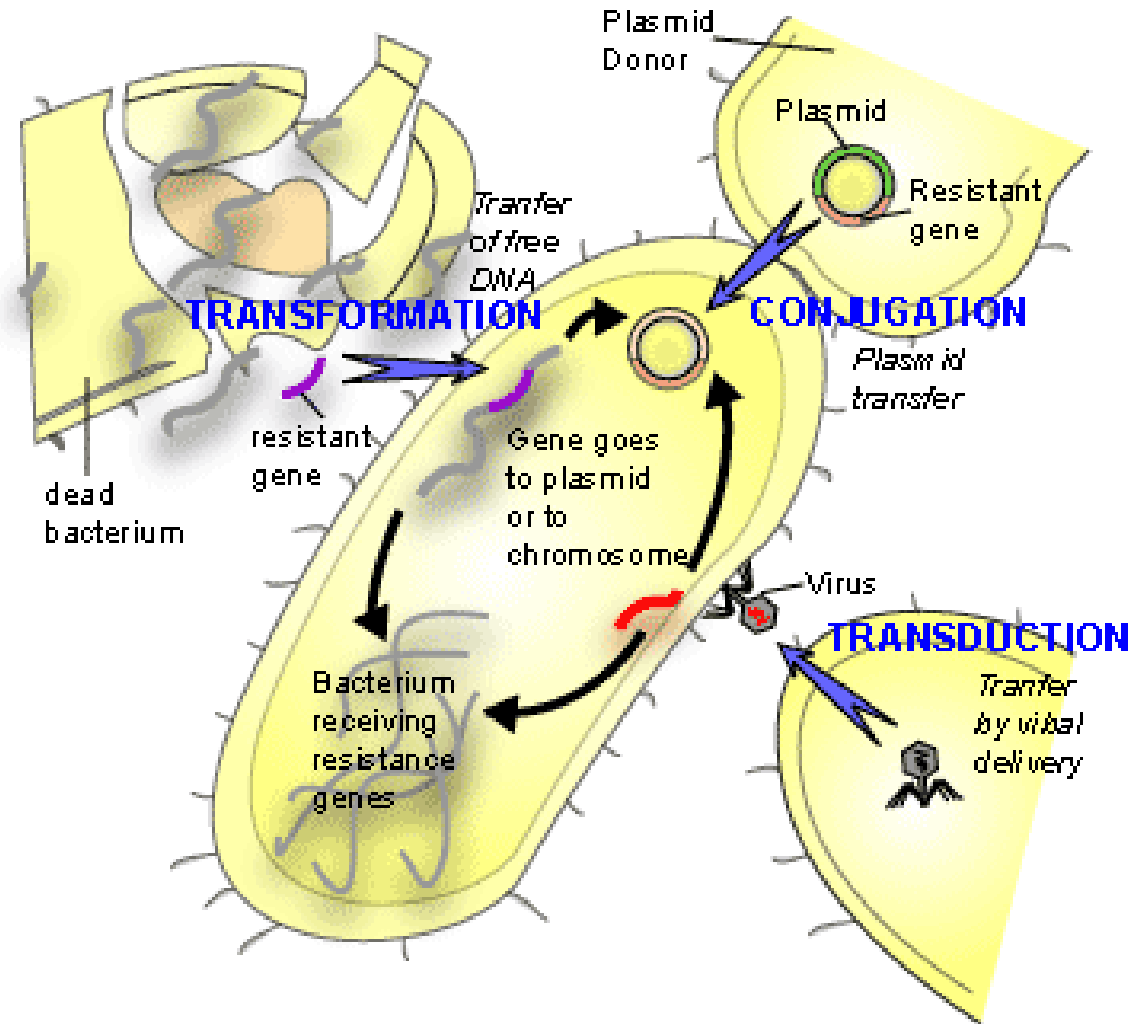


# Antibiotics – Modes of Action



# **Antibiotics Resistance**

# How Antibiotic Resistance Happens

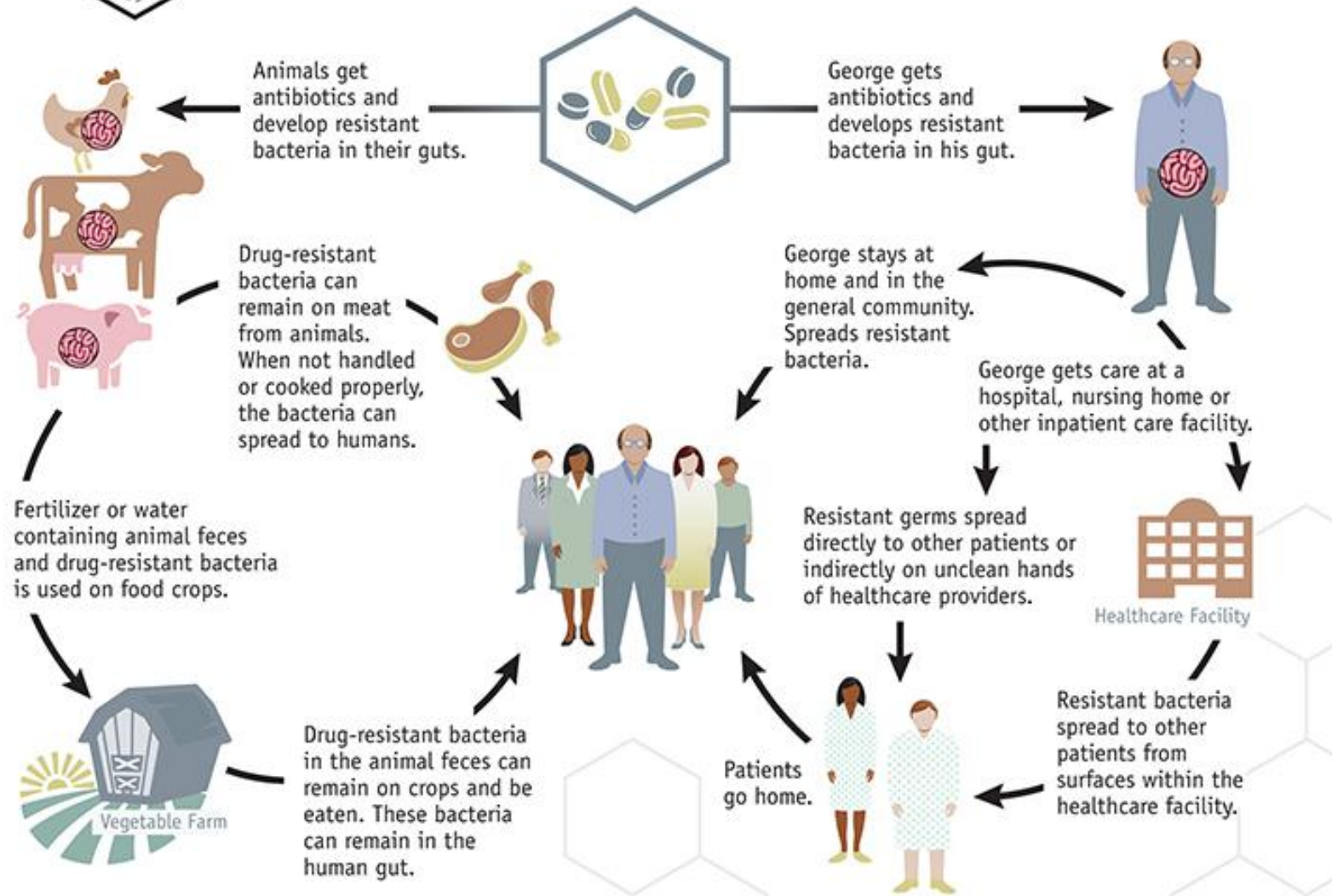


- Horizontal Gene Transfer

# **Macrolides mode of action and resistance**



## Examples of How Antibiotic Resistance Spreads

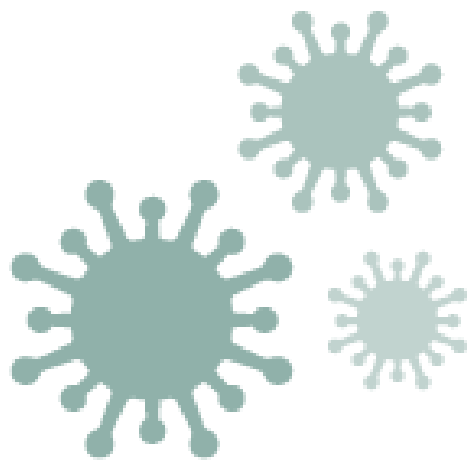


Simply using antibiotics creates resistance. These drugs should only be used to treat infections.



# **Four Core Actions to Fight Resistance**

# 1 PREVENTING INFECTIONS, PREVENTING THE SPREAD OF RESISTANCE



Avoiding infections in the first place reduces the amount of antibiotics that have to be used and reduces the likelihood that resistance will develop during therapy. There are many ways that drug-resistant infections can be prevented: immunization, safe food preparation, handwashing, and using antibiotics as directed and only when necessary. In addition, preventing infections also prevents the spread of resistant bacteria.

# 2

## TRACKING



CDC gathers data on antibiotic-resistant infections, causes of infections and whether there are particular reasons (risk factors) that caused some people to get a resistant infection. With that information, experts can develop specific strategies to prevent those infections and prevent the resistant bacteria from spreading.

# 3

## IMPROVING ANTIBIOTIC PRESCRIBING/STEWARDSHIP



Perhaps the single most important action needed to greatly slow down the development and spread of antibiotic-resistant infections is to change the way antibiotics are used. Up to half of antibiotic use in humans and much of antibiotic use in animals is unnecessary and inappropriate and makes everyone less safe. Stopping even some of the inappropriate and unnecessary use of antibiotics in people and animals would help greatly in slowing down the spread of resistant bacteria. This commitment to always use antibiotics appropriately and safely—only when they are needed to treat disease, and to choose the right antibiotics and to administer them in the right way in every case—is known as antibiotic stewardship.

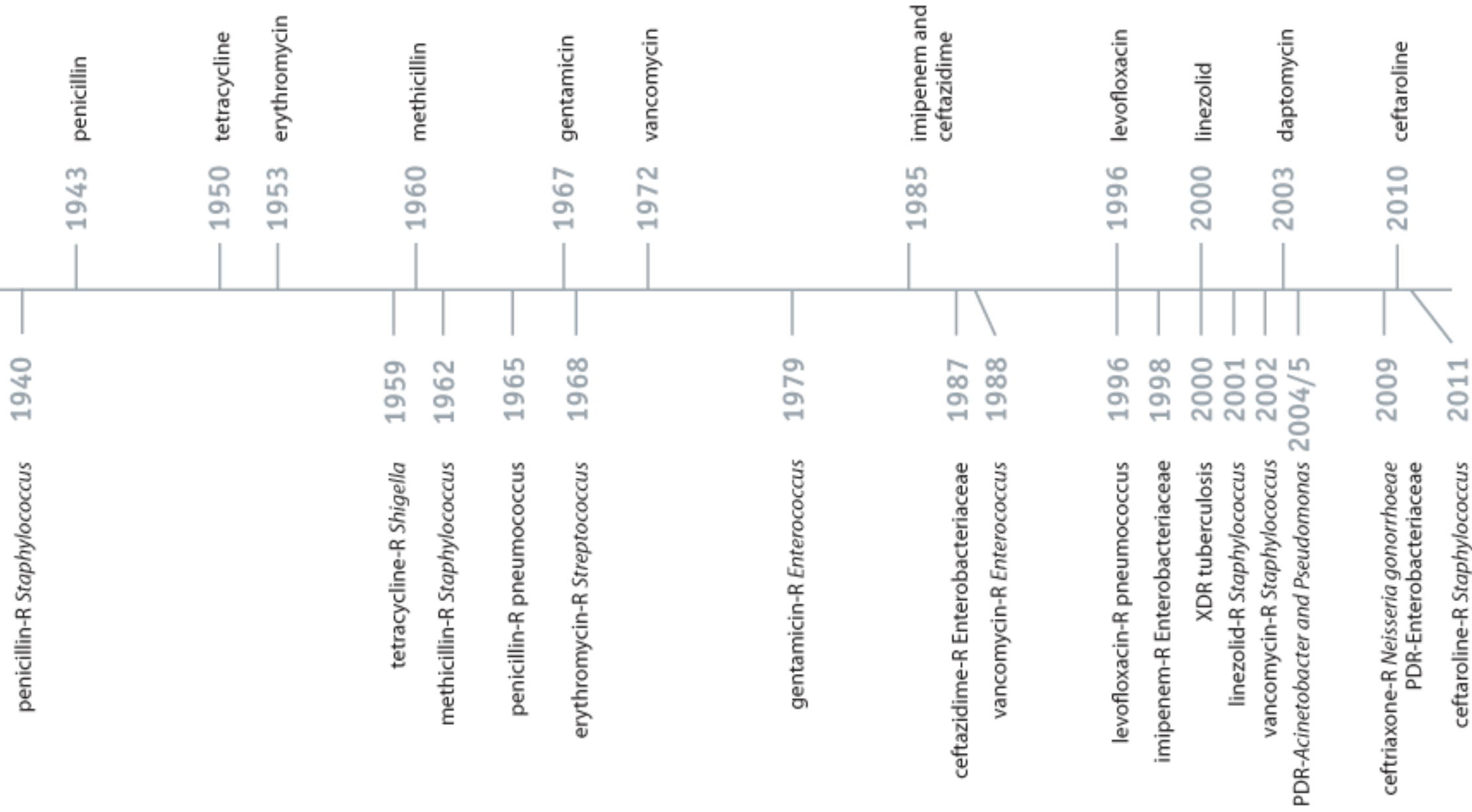
# 4

## DEVELOPING NEW DRUGS AND DIAGNOSTIC TESTS



Because antibiotic resistance occurs as part of a natural process in which bacteria evolve, it can be slowed but not stopped. Therefore, we will always need new antibiotics to keep up with resistant bacteria as well as new diagnostic tests to track the development of resistance.



**ANTIBIOTIC RESISTANCE IDENTIFIED****ANTIBIOTIC INTRODUCED**

**Thank you!**