

# **Pathogenic Bacteria-Antibiotic Interactions and its Consequences**

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# Content

- *Infectious Diseases and bacteria*
- *Development of chemotherapy to treat infectious disease.*
- *How antibiotic works against bacteria?*
- *Emergence and spread of MDR*
- *What next?*

# Infectious Diseases

- ▶ **Exposure to Microbes: Contamination and Infection**
- ▶ **Contamination:** The mere presence of microbes in or on the body
- ▶ **Infection:** When organism evades body's external defenses, multiplies, and become established in the body
- ▶ **Disease:** An abnormal state in which the body is not functioning normally
- ▶ **Symptom:** A change in body function that is felt by a patient as a result of disease
- ▶ **Sign:** A change in a body that can be measured or observed as a result of disease
- ▶ **Syndrome:** A specific group of signs and symptoms that accompany a disease

# Relationships Between Microbes and Their Hosts

- ▶ Pathogenic Bacteria
- ▶ Opportunistic pathogens
- ▶ Normal Microflora
  - ▶ Normal microbiota that cause disease under certain circumstances

Conditions that provide opportunities for pathogens

- ▶ Introduction of normal microbiota into unusual site in body
- ▶ Immune suppression
- ▶ Changes in the normal microbiota

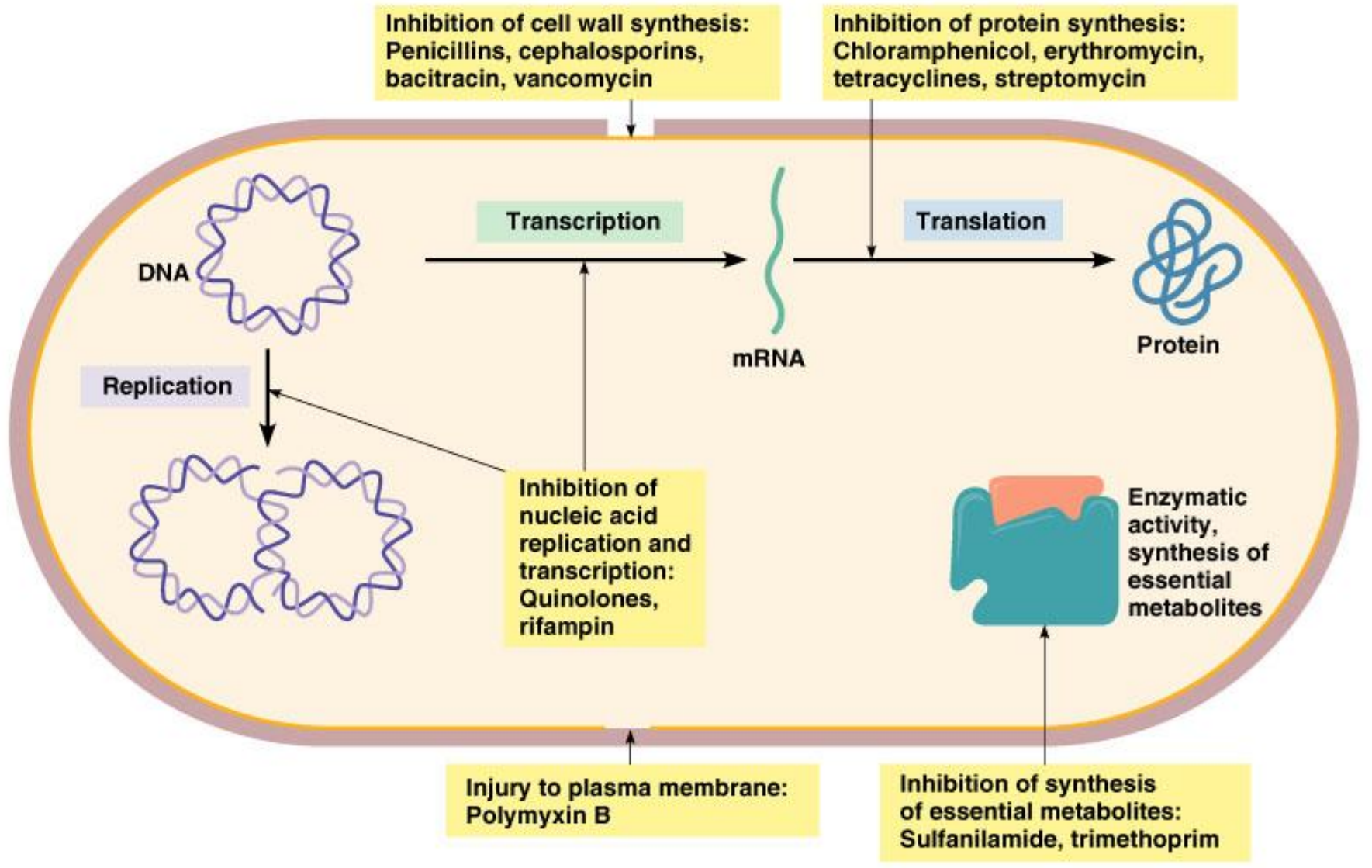
## Chemotherapy: Use of chemical agents to treat Diseases

- ***Chemotherapeutic agent***
- ***Antibiotics***
- ***Antibacterial drugs***

- **Paul Ehrlich** and Sahachiro Hata developed **Salvarsan** (Arsphenamine) against syphilis in 1910: The concept of chemotherapy to treat microbial diseases was born.
- Sulfa drugs (**sulfanilamide**) discovered in 1932 → against Gram+ bacteria
- Alexander Fleming 1928; Penicillin
- 1943- mass production of Penicillin by Companies
- 1948 to 1970 ( Most antibiotics was discovered).
- 1980s: Fluorinated Quinolone was introduced.
- 2000: Linezolid introduced in to the Practice.

# The Action of Antimicrobial

Drugsh [https://www.google.com/search?q=mode+of+action+of+antibiotics&source=lnms&tbn=isch&sa=X&ved=0ahUKEwjY\\_fqDwKTKAhUj7nMBHfTBDMIQ\\_AUIESgB&biw=1280&bih=913](https://www.google.com/search?q=mode+of+action+of+antibiotics&source=lnms&tbn=isch&sa=X&ved=0ahUKEwjY_fqDwKTKAhUj7nMBHfTBDMIQ_AUIESgB&biw=1280&bih=913)



## Antibiotic Resistance

❑ **Natural Resistance:** Bacteria may be inherently resistant

❑ **Acquired Resistance:**

Mutations; (2) Acquisition of new genes  
Through mobile genetic (Plasmids or transposons carrying antibiotic resistance gene).

Plasmids: Autonomous ds circular DNA, self replication extra chromosomal replicon present in a bacterial cells) e.g. R-plasmids

# Genetic methods of gene Exchange and dissemination antimicrobial resistance

- Conjugation: Cell to cell contact
- Transformation: Uptake of naked DNA
- Transduction: Transfer by bacterial viruses



# Problematic Antibiotic resistance

- Worldwide problems with resistant pathogens including MRSA, VRE, Gram negative organisms, TB etc.
- Last line antibiotics (Carbapenems, fluoroquinolones, 3<sup>rd</sup>-gen cephalosporins) may no longer be effective against some common bacteria e.g. multi-resistant *E. coli* infections.
- MDR bacteria is now common in both Clinical, hospital and other environmental sources.

# Measures to prevent the spread of drug-resistant bacteria

- Better treatment strategies.
- Antibiotic resistance surveillance
- Better education of healthcare professionals
- Antibiotic use policy

## What Next?

### Combating Drug-Resistant Bacteria

- New antibiotic development
- Mobilizing host defense mechanism: defensins, Vaccine development etc.
- Use of probiotics
- Developing Antipathogenic drugs:  
Antibiofilm, Anti virulence, anti Quorum sensing
- Use of Combinational and integrated approaches.

# New and Combinational Approaches:

References: Books, Journals .E  
resources.

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## New Strategies Combating Bacterial Infection

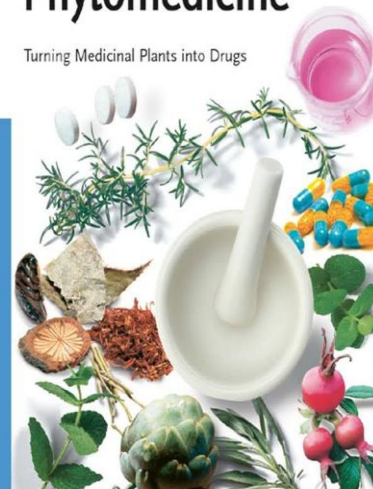


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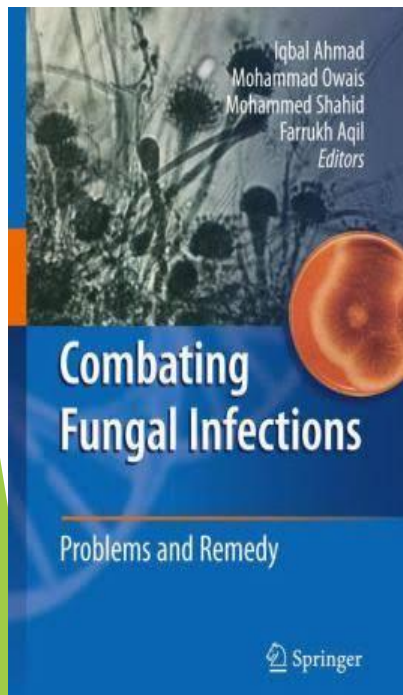
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