

ANTIBIOTICS



Line up

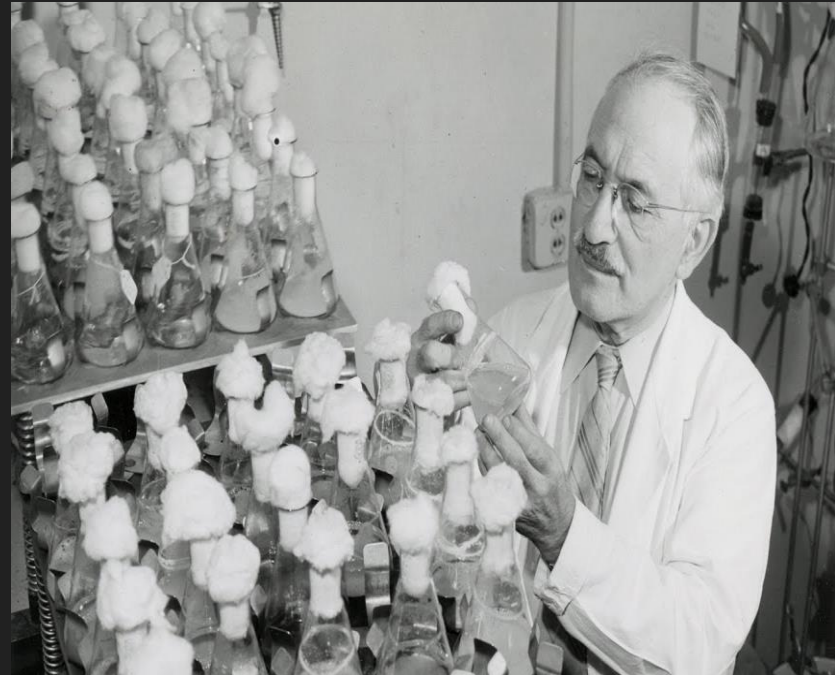
- **Introduction**
- **Definition**
- **Timeline**
- **Sources**
- **Classification**

INTRODUCTION

- Bacterial cells; grow and divide; infection
- Antimicrobial agents; interfere specific processes; growth and/or division
- Inhibitors;
 - Cell walls
 - Cytoplasmic membranes
 - Nucleic acid synthesis
 - Ribosome function

ANTIBIOTICS

- Term antibiotic was first used by in **1942 by Selman Waksman**
- Antibiotics: “against life”
- Antibacterial substances; microorganisms
- Prevent; growth, multiplication, destroy, pathogenic ation
- Differ in; spectrum of AMA, and mechanism of action
- Natural or synthetic man-made compounds

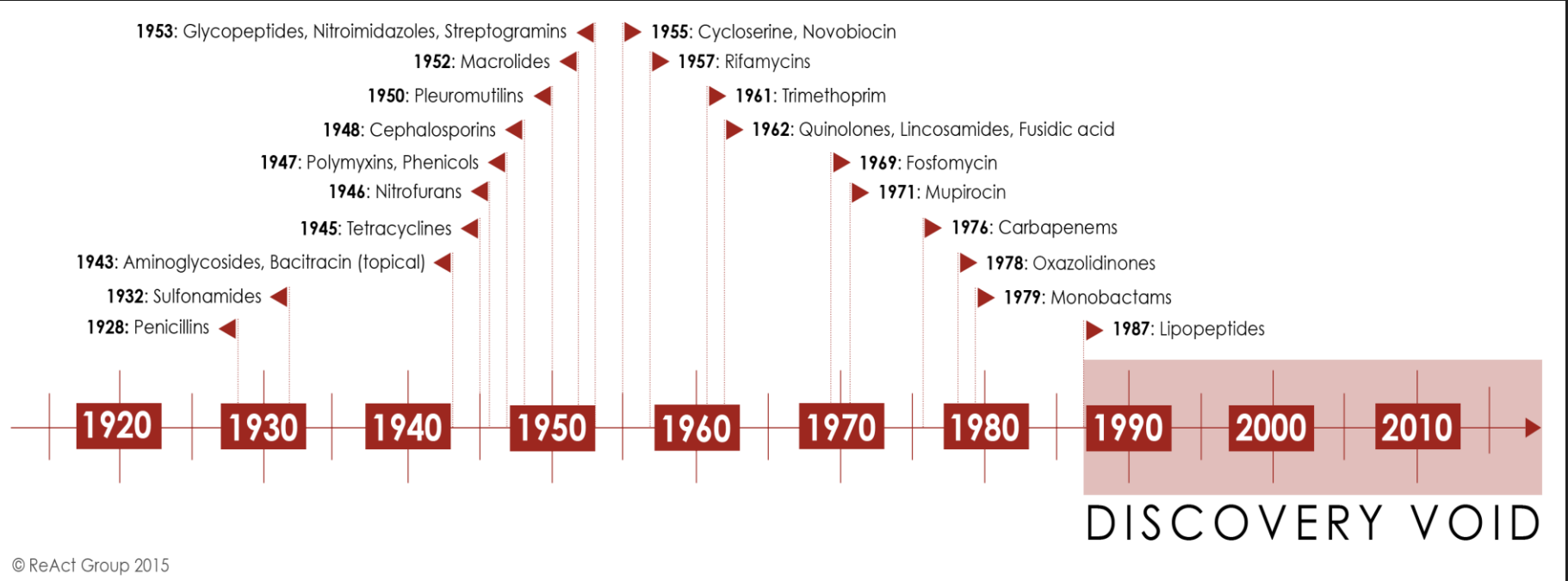


DEFINITIONS

An antibiotic is a chemical substance produced by various species of microorganisms that is capable of inhibiting growth of other microorganisms in small concentrations

An antibiotic is a product produced by a microorganism or a similar substance produced wholly or partially by chemical synthesis, which in low concentrations inhibits other microorganisms

Time-line of the discovery of different antibiotic classes



SOURCES OF ANTIBIOTICS

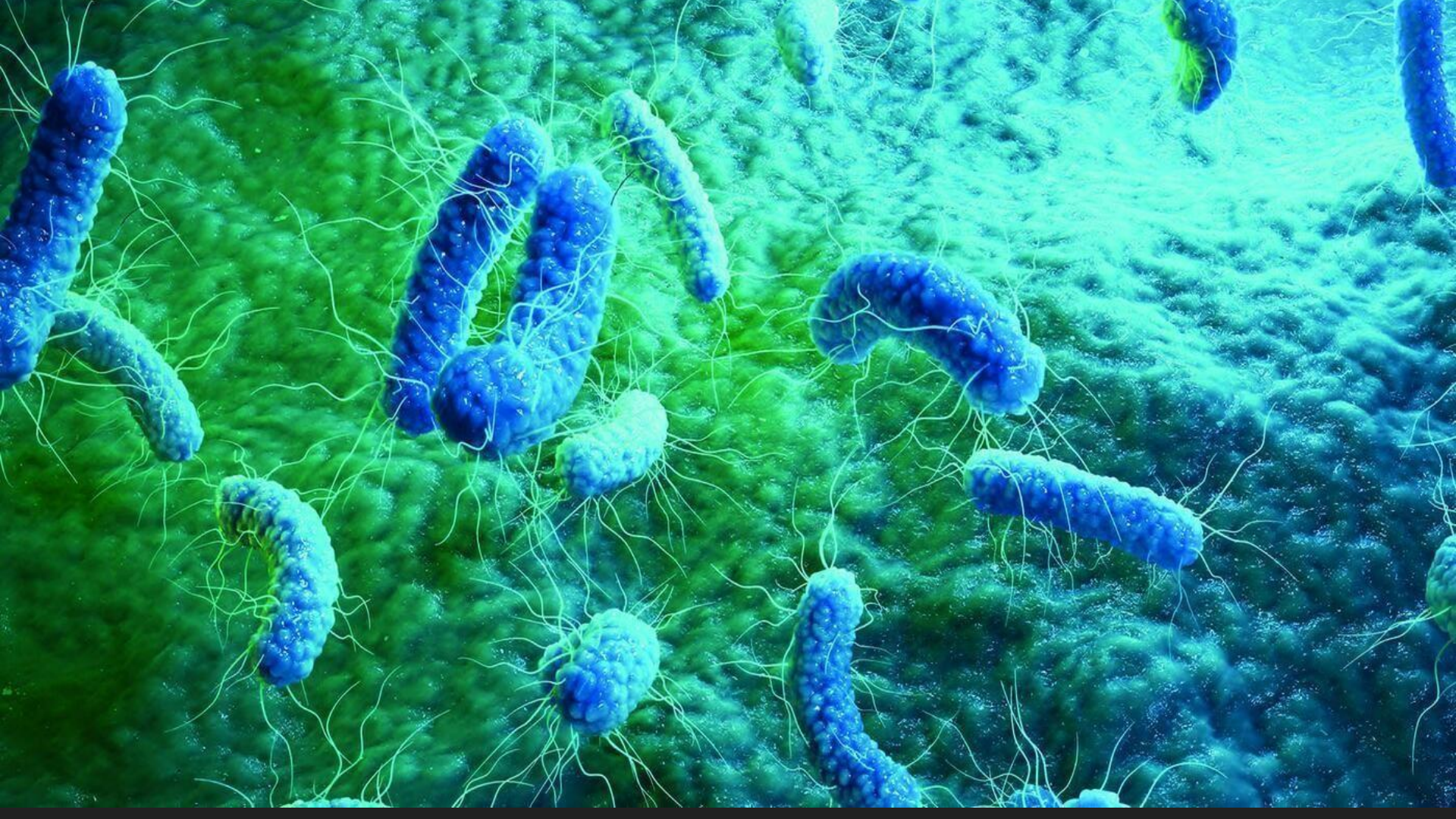
- **Fungi:** Penicillin and Cephalosporin
- **Actinomycetes;** Gram-positive filamentous bacteria; Streptomyces
- **Bacillus;** Gram-positive spore forming bacteria
- **Few from myxobacteria;** Gram-negative bacteria
- **New species explores;** plants, herbs and fish

Sources of some common antibiotics

S/n	Microorganism	Antibiotic
1.	<i>Bacillus subtilis</i>	Bacitracin
2.	<i>Bacillus polymyxa</i>	Polymyxin
3.	<i>Streptomyces nodosus</i>	Amphotericin B
4.	<i>Streptomyces venezuelae</i>	Chloramphenicol
5.	<i>Streptomyces aureofaciens</i>	Tetracycline/chlortetracycline
6.	<i>Streptomyces erythraeus</i>	Erythromycin
7.	<i>Streptomyces griseus</i>	Streptomycin
8.	<i>Micromonospora purpureae</i>	Gentamicin
9.	<i>Cephalosporium species</i>	Cephalothin
10.	<i>Penicillium griseofulvum</i>	Griseofulvin
11.	<i>Penicillium notatum</i>	Penicillin

Microorganism	Antimicrobial
Fungi	
<i>Penicillium chrysogenum</i>	Penicillin
<i>Penicillium griseofulvin</i>	Griseofulvin
<i>Cephalosporium spp.</i>	Cephalothin
Bacteria	
<i>Bacillus licheniformis</i>	Bacitracin
<i>Bacillus polymyxa</i>	Polymyxin
<i>Micromonospora purpurea</i>	Gentamicin
<i>Streptomyces griseus</i>	Streptomycin
<i>Streptomyces fradiae</i>	Neomycin
<i>Streptomyces aureofaciens</i>	Tetracycline
<i>Streptomyces orientalis</i>	Vancomycin
<i>Streptomyces venezuelae</i>	Chloramphenicol
<i>Streptomyces erythraeus</i>	Erythromycin





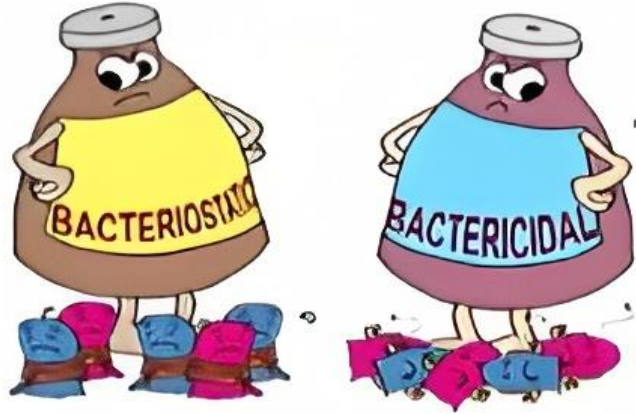
CLASSIFICATION OF ANTIBIOTICS

Classification of Antibiotics

Based on mode of Action

Bacteriostatic

Bactericidal



Based on their spectrum of action

Broad-spectrum

Narrow Spectrum

Antibiotic Classes

Mnemonic



**“Antibiotics Can Terminate Protein
Synthesis For Microbial Cells Like Germs”**

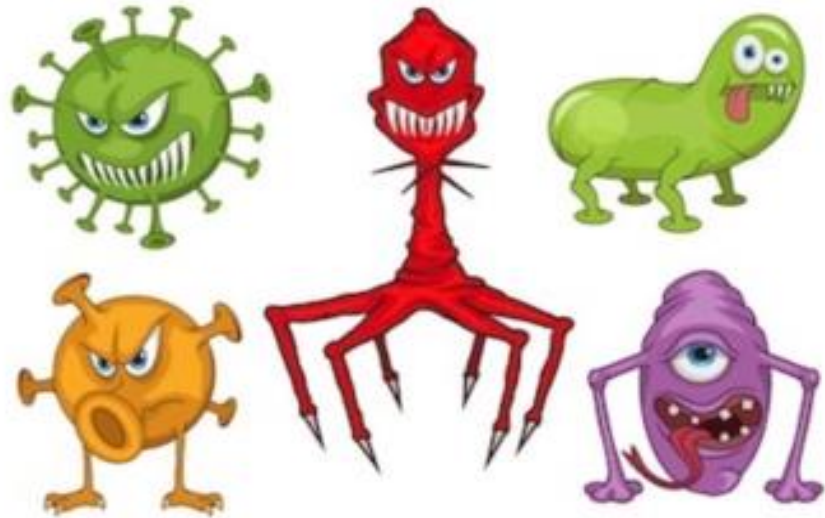
1. Aminoglycosides
2. Cephalosporins
3. Tetracyclines
4. Penicillins
5. Sulfonamides

6. Fluoroquinolones
7. Macrolides
8. Carbapenems
9. Lincosamides
10. Glycopeptides

Antibiotic Classes

Medication Names

1. Aminoglycosides - Mycin
2. Cephalosporins - Cef/Ceph
3. Tetracyclines - Cycline
4. Penicillins - Cillin
5. Sulfonamides - Sulfa
6. Fluoroquinolones - Floxacin
7. Macrolides - Thromycin
8. Carbapenems - Penem
9. Lincosamides - Mycin
10. Glycopeptides - In (Mycin)



Antibiotic Classes

Antibiotics	Aminoglycosides	Streptomycin Gentamicin	Gram (-)	Inhibit Protein Synthesis (30s)	Bacteremia, Abdominal Infections
Can	Cephalosporins	Ceftriaxone Cefepime	Gram (+)/(-)	Inhibit Cell Wall Synthesis	Skin, Urinary, Resp. Infections
Terminate	Tetracyclines	Tetracycline Doxycycline	Gram (+)/(-)	Inhibit Protein Synthesis (30s)	Lyme Disease, PID, STIs
Protein	Penicillins	Ampicillin Amoxicillin	Gram (+)/(-)	Inhibit Cell Wall Synthesis	ENT, Skin, Urinary Infections
Synthesis	Sulfonamides	Sulfasalazine Sulfamethoxazole	Gram (+)/(-)	Inhibit Folate Synthesis	UTIs, Burns, Eye Infections
For	Fluoroquinolones	Ciprofloxacin Levofloxacin	Gram (+)/(-)	Inhibit DNA Replication	Respiratory & Urinary Infections
Microbial	Macrolides	Azithromycin Erythromycin	Gram (+)	Inhibit Protein Synthesis (50s)	Pneumonia, Sinus, ENT, STIs
Cells	Carbapenems	Meropenem Ertapenem	Gram (+)/(-)	Inhibit Cell Wall Synthesis	Urinary, Abdom. Infections
Like	Lincosamides	Clindamycin	Gram (+)	Inhibit Protein Synthesis (50s)	Skin, Bone, Lung Infections
Germs	Glycopeptides	Vancomycin	Gram (+)	Inhibit Cell Wall Synthesis	MRSA, Skin, Endocarditis

CELL WALL INHIBITORS

Inhibit synthesis of bacterial cell walls

Penicillins & cephalosporins

Cycloserine,

Vancomycin

Bacitracin



CELL MEMBRANE DISRUPTORS

Agents that act directly on the cell membranes of the microorganisms

Polymixin

Alter cell memb. Permeability, leakage of intracellular comp

MODE OF ACTION

PROTEIN SYNTHESIS INHIBITORS

Agents that affect the function of 30S or 50S ribosomal subunits to cause a reversible inhibition of protein synthesis

Bacteriostatic drugs:

**Chloramphenicol, Tetracyclines,
Erythromycin, Clindamycin**

Agents that bind to 30S ribosomal subunit & alter protein synthesis, which eventually leads to cell death

Aminoglycosides

NUCLEIC ACID

Agents that affect bacterial nucleic acid metabolism.

Rifamycins which inhibit RNA polymerase

Quinolones which inhibit topoisomerases

METABOLISM

Anti-metabolites

including trimethoprim & sulphonamides

Cell Wall Synthesis

Beta Lactams

- Penicillins
- Cephalosporins
- Carbapenems
- Monobactams

Vancomycin
Bacitracin

Cell Membrane

- Polymyxins

Folate synthesis

- Sulfonamides
- Trimethoprim



Nucleic Acid Synthesis

DNA Gyrase

- Quinolones

RNA Polymerase

- Rifampin



50S

30S

50S subunit

- Macrolides
- Clindamycin
- Linezolid
- Chloramphenicol
- Streptogramins

30S subunit

- Tetracyclines
- Aminoglycosides

Protein Synthesis

Antibiotic Classes

Mechanism of Action

1. Aminoglycosides - Inhibit Protein Synthesis
2. Cephalosporins - Inhibit Cell Wall Synthesis
3. Tetracyclines - Inhibit Protein Synthesis
4. Penicillins - Inhibit Cell Wall Synthesis
5. SulFOnamides - Inhibit FOlate Synthesis = "FO"
6. FluoroQUINolones - Inhibit DNA Replication = QUINtuplets
7. Macrolides - Inhibit Protein Synthesis
8. Carbapenems - Inhibit Cell Wall Synthesis
9. Lincosamides - Inhibit Protein Synthesis
10. Glycopeptides - Inhibit Cell Wall Synthesis

MALT = Protein

Macrolides

Aminoglycosides

Lincosamides

Tetracyclines

TYPE OF ACTION

Bacteriostatic Agents

Bactericidal Agents



Bacteria multiplication
is inhibited



Bacteria are killed

- Antimicrobial agents may be either bactericidal, killing the target bacterium or fungus, or bacteriostatic, inhibiting its growth
- Bactericidal agents are more effective
- Bacteriostatic agents can be extremely beneficial
- permit the normal defenses of the host to destroy the microorganisms

Bacteriostatic Agents

Sulphonamides

Tetracyclines

Chloramphenicol

Erythromycin

Ethambutol

Bactericidal Agents

- **Penicillins/Cephalosporins/Carbapenems**
- **Aminoglycosides**
- **Rifampin**
- **Cephalosporins**
- **Vancomycin**
- **Nalidixic acid**
- **Ciprofloxacin**

SPECTRUM OF ACTIVITY

Narrow spectrum

Broad spectrum

Narrow spectrum

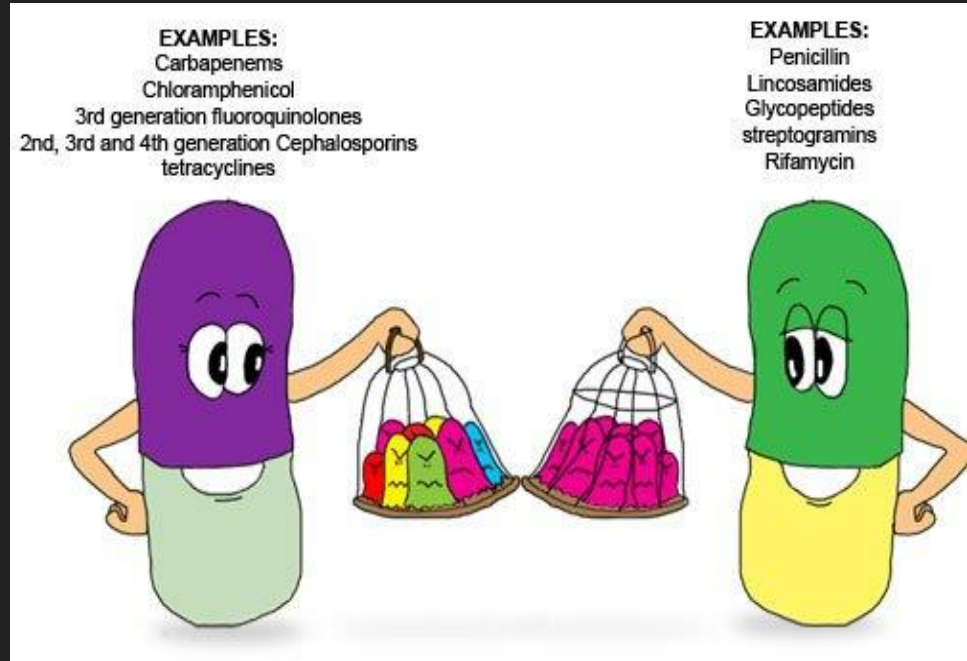
Penicillin G

Streptomycin

Broad spectrum

Tetracyclines

Chloramphenicol



Antibiotic Classes

Gram Coverage

1. Ami**NO**glycosides - Gram (-) = **NO**
2. Cephalosporins - Gram (+)/(-)
3. Tetracyclines - Gram (+)/(-)
4. Penicillins - Gram (+)/(-)
5. Sulfonamides - Gram (+)/(-)
6. Fluoroquinolones - Gram (+)/(-)
7. Macrolides - Gram (+)
8. Carbapenems - Gram (+)/(-)
9. Lincosamides - Gram (+)
10. Glycopeptides - Gram (+)

GLAM

