

Microbiology (Bio 206) #14: Antibiotics and Resistance

Terms you should know:

| | | |
|-------------------------|-----------------|-------------|
| selective toxicity | semi-synthetic | sulfa drugs |
| chemotherapeutic agents | broad-spectrum | folic acid |
| antibiotics | narrow-spectrum | resistance |

Questions you should be able to answer:

- What is selective toxicity? Why is this a very important characteristic for an antibiotic?
- What is the difference between an antibiotic and another type of chemotherapeutic agent?
- What are some targets that antibiotics can attack? Which antibiotics use these mechanisms?
- Why might your doctor give you amoxicillin, instead of penicillin?
- Why is it harder to find antifungal antibiotics than antibacterial antibiotics?
- What are some ways in which bacteria can become resistant to antibiotics?

Lecture outline:

I. Antibiotics and chemotherapeutic agents

A. Importance of selective toxicity

B. Chemotherapeutic agents:

1. Antibiotics: natural products
2. Semi-synthetic antibiotics: modified natural products
3. Synthetic drugs

C. Discovery of penicillin by Alexander Fleming

II. Activity of some major antibiotics

| Chemotherapeutic Agent | Type | Spectrum | Mechanism of Action | Mechanism of Resistance |
|---------------------------|---------------------------|--------------------------|------------------------------|------------------------------|
| Penicillin G | Antibiotic | Narrow (G ⁺) | Cell Wall Bactericidal | Inactivated by enzyme |
| Ampicillin Amoxicillin | Semi-synthetic penicillin | Broad | same as penicillin | same as penicillin |
| Streptomycin | Antibiotic | Broad | 70S Ribosome Bacteriostatic | Mutation of ribosome |
| Tetracycline | Antibiotic | Broad | 70S Ribosome Bacteriostatic | Active transport out of cell |
| Chloramphenicol | Antibiotic | Broad | 70S Ribosome Bacteriostatic | Inactivated by enzyme |
| Nystatin Amphotericin | Antibiotic | Antifungal | Cell Wall Fungicidal | |
| Sulfa drugs | Synthetic | Broad | DNA synthesis Bacteriostatic | |

III. Resistance

A. Mechanisms (see chart)

B. Development and spread