جامعة الانبار قسم التقنيات الاحيائية

كلية العلوم المادة: الاحياء المجهرية

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Antimicrobial Drugs

Introduction

I. An antimicrobial drug is a chemical substance that destroys pathogenic microorganisms with minimal damage to host tissues.
2. Chemotherapeutic agents include chemicals that combat disease in the body.

The History of Chemotherapy

I. Paul Ehrlich developed the concept of chemotherapy to treat microbial diseases; he predicted the development of chemotherapeutic agents, which would kill pathogens without harming the host.
2. Sulfa d rugs came into prominence in the late 1930s.
3. Alexander Fleming discovered the first antibiotic, penicillin, in 1929; its first clinical trials were done in 1940.

The Spectrum of Antimicrobial Activity

1. Antibacterial drugs affect many targets in a prokaryotic cell.
2. Fungal, protozoan, and helminthic infections arc more difficult to treat because these organisms have eukaryotic cells.
3. Narrow-spectrum drugs affect only a select group of microbes gram-positive cells, for example; broad-spectrum drugs affect a more diverse range of microbes.
4. Small, hydrophilic drugs can affect gram-negative cells.
5. Antimicrobial agents should not cause excessive harm to normal microbiota.
6. Super infections o(Cur when a pathogen develops resistance to the drug being used or when normally res istant microbiota multiply

excessively.

The Action of Antimicrobial Drugs

I. General action is either by directly killing microorganisms (bactericidal) or *by* inhibiting their growth (bacteriostatic).
2. Some agents, such as penicillin, inhibit cell wall synthesis in bacteria.

3. Other agents, such as chloramphenicol, tetracyclines, and streptomycin, inhibit protein synthesis by ac ting on 70S ribosomes.
4. Antifungal agents target plasma membranes.
5. Some agents inhibit nucleic acid synthesis.
6. Agents such as sulfanilamide act as antimetabolites by competitively inhibiting enzyme activity.

A Survey of Commonly Used Antimicrobial Drugs

Antibacterial Antibiotics: Inhibitors of Cell Wall Synthesis

I. All penicillins contain a IB-lactam ring.
2. Natural penicillins produced by *Penicillium* are effective against gram-positive cocci and spirochetes.
3. Penicillinases (B-Lactamases) are bacterial enzymes that destroy natural penicillins.
4. Semisynthetic penicillins are made in the laboratory by adding different side chains onto the IB-lactam ring made by the fungus .
5. Semisynthetic penicillins are resistant to penicillinases and have a broader spectrum of activity than natural penicillins.
6. Carbapcnems are broad-spectrum antibiotics that inhibit cell wall synthesis.
7. The monobactam aztreonam affects only gram-negative bacteria.
8. Cephalosporins inhibit cell wall synthesis and arc used against penicillin-resistant strains.
9. Polypeptides such as bacitracin inhibit cell wall synthesis primarily in gram-positive bacteria.
10. Vancomycin inhibits cell wall synthesis and may be used to kill penicillinase-producing staphylococci.

Antimycobacterial Antibiotics

11. Isoniazid (IN H) and ethambutol inhibit cell wall synthesis in Mycobacteria.

Inhibitors of Protein Synthesis

12. Chloramphenicol, aminoglycosides, tetracyclines, macrolides, and streptogramins inhibit protein synthesis at 70S ribosomes.
13. Oxazolidinones prevent formation of 70S ribosomes.

Injury to the Plasma Membrane

14. A new class of antibiotics inhibits fatty-acid synthesis, essential for plasma membranes.
15. Polymyxin B and bacitracin Cause damage to plasma membranes.

Inhibitors of Nucleic Acid (DNA/RNA) Synthesis

16. Rifamycin inhibits mRNA synthesis; it is used to treat tuberculosis.
17. Quinolones and fluoroquinolones inhibit DNA gyrase for treating urinary tract infections.

Competitive Inhibitors of the Synthesis of Essential Metabolites

18. Sulfonamides competitively inhibit folic acid synthesis.
19. TMP-SMZ competitively inhibits dihydrofolic acid synthesis.

References': 1- Microbiology an introduction TWELFTH EDITION. Gerard. Tortora.2016.

2- Microbiology an introduction TENTH EDITION. Gerard. Tortora.2010.