**MLT 2nd**

**Course Title: General pharmacology I (LAB)**

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**Discuss mechanism of antibiotics according to different targets and classify them one by one**

**Ans:**

**Antimicrobial or antibiotic modes of action  
  
Antibacterial action generally falls within one of four mechanisms, three of which involve the inhibition or regulation of enzymes involved in cell wall biosynthesis, nucleic acid metabolism and repair, or protein synthesis, respectively. The fourth mechanism involves the disruption of membrane structure. Many of these cellular functions targeted by antibiotics are most active in multiplying cells. Since there is often overlap in these functions between prokaryotic bacterial cells and eukaryotic mammalian cells, it is not surprising that some antibiotics have also been found to be useful as anticancer agents.**

However, antibiotics can in some cases have an important quality for an antimicrobial drug is **selective toxicity**, meaning that it selectively kills or inhibits the growth of microbial targets while causing minimal or no harm to the host. Most **antimicrobial drugs** currently in clinical use are antibacterial because the prokaryotic cell provides a greater variety of unique targets for selective toxicity, in comparison to fungi, parasites, and viruses. Each class of antibacterial drugs has a unique **mode of action** (the way in which a drug affects microbes at the cellular level),npleasant side effects.

## **Antibiotic targets in bacteria**

**There are several different classes of antibiotics. These can have completely different bacterial targets or act on the same target but at a different place. In principal, there are three main antibiotic targets in bacteria:**

1. **The cell wall or membranes that surrounds the bacterial cell**
2. **The machineries that make the nucleic acids DNA and RNA**
3. **The machinery that produce proteins (the ribosome and associated proteins)**

**These targets are absent or different in the cells of humans and other mammals, which means that the antibiotics usually do not harm our cells but are specific for bacteria.**

## **Narrow-spectrum and broad-spectrum antibiotics**

**Antibiotics can either have a narrow or broad spectrum of activity. Narrow-spectrum antibiotics are more specific and only active against certain groups or strains of bacteria. Broad-spectrum antibiotics instead inhibit a wider range of bacteria. Narrow-spectrum antibiotics are to prefer since the effect on other, non-disease causing bacteria are more limited. Unfortunately broad-spectrum antibiotics are often used since it can be difficult for doctors to diagnose the correct bacteria in time or when knowledge about how to correctly treat an infection is lacking.**

**Clasification**

**3 main groups:**

* **(1) Inhibition of cell wall synthesis**
* **(2) Inhibition of protein synthesis**
* **(3) Inhibition of bacterial nucleic acid synthesis**

****CLASSIFICATION****

**(1) Inhibition of cell wall synthesis**

* **Penicillin**

**(i) penicillinase susceptible – pen V & G  
(ii) penicillinase resistance – methicillin, oxacillin  
(iii) penicillinase susceptible with activity against gram negative bacilli – ampicillin, amoxicillin, piperacillin  
(iv) penicillins with beta-lactamase inhibitors – amoxicillin-clavulanate**

* **cephalosporins**

**1st generation – cephazolin, cephalexin  
2nd generation – cefuroxime, cefoxitin  
3rd generation – cefotaxime, ceftriaxone  
4th generation – cefepime**

* **Glycopeptide derivatives — vancomycin, teicoplanin, bleomycin**
* **Carbopenems — imipenem, meropenem**

**(2) Inhibition of protein synthesis**

* **Aminoglycosides – gentamicin, tobramycin, amikacin**
* **Macrolides – erythromycin, clarithromycin, azithromycin**
* **Tetracyclines – Tetracycline, Doxycycline**
* **Chloramphenicol**
* **Lincomycins – clindamycin**

**(3) Inhibition of bacterial nucleic acid synthesis**

* **Sulfonamides – sulfisoxazole, sulfamethoxazole**
* **Metronidazole**
* **Pyrimidine derivatives – trimethoprim**
* **Rifampicin**
* **Quinolones**

**1st generation – not available  
2nd generation – ciprofloxacin, norfloxacin  
3rd generation – moxifloxacin  
4th generation – not currently available**

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