

ASSIGNMENT:

pharmacology

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

**Answer.**

**Five Basic Mechanisms of Antibiotic Action against Bacterial Cells**

* Inhibition of Cell Wall Synthesis (most common mechanism)
* Inhibition of Protein Synthesis (Translation) (second largest class)
* Alteration of Cell Membranes.
* Inhibition of Nucleic Acid Synthesis.
* Antimetabolite Activity.

**Inhibition of Cell Wall Synthesis**

* (most common mechanism)
* Mechanism of cell wall synthesis inhibition a- Penicillin may competitively inhibits transpeptidase. Inhibits transpeptidation by binding to the substrate at the free NH2 group of pentaglycine and preventing the formation of the peptide bond in the cross-linking reaction. (penicillin binds through its COOH group).

**Inhibitors of Protein Synthesis**

* Bacterial cells are 50% protein by dry weight
* Inhibition of protein synthesis leads to cessation of growth or cell death
* Bacterial 70S ribosomes differ sufficiently from eukaryotic ribosomes to allow selective toxicity
* Other properties of the antibiotics still produce side effects.
* Ribosomes are cytoplasmic
* Drug must successfully enter (and stay) in the cytoplasm and exert effect.
* Inhibition of cell wall synthesis
* • The cross linkage of precursors during synthesis of the bacterial cell wall is catalyzed by specific enzymes.
* These enzymes are called Penicillin Binding Proteins (PBPs).
* The rigid structure of the cell wall permits bacteria to maintain a very high internal osmotic pressure. However, when bacteria are exposed to penicillin and the antibiotic binds to the PBPs in the cell wall, autolytic enzymes are released that degrade the preformed cell wall.

**Alteration of cell membranes**

* The polymyxin class of antibiotics consists of cationic branched cyclic decapeptides, that destroy the cytoplasmatic membranes of susceptible bacteria.
* The antifungal polyene antimycotics (e.g. amphotericin B, nystatin) have a similar activity on cell membranes.
* **Alternation of bacterial cell membranes**
* Polymyxins (E)
* Mainly active against gr-via “P. aeruginosa”
* **Alteration of fungal cell membranes**
* Amphotericin B “high affinity for ergosterol” (polyene)
* Nystatin “topically, Candida”
* Azoles “act by inhibiting ergosterol synthesis” Alternation of cell membrane function 33

**Inhibition of Bacterial Cell Wall Synthesis**

* Bacteria have rigid cell walls containing complex macromolecules, which are formed through biosynthetic pathways.
* The osmotic pressure within the cell is very high and relies on the integrity of the cell wall to resist the absorption of water.
* Several antimicrobial drugs weaken the cell wall, allowing the cell to absorb water, a process that causes bacterial death.
* Penicillin’s and cephalosporins bind to specific proteins located within the bacterial cytoplasmic membrane.

**Antimetabolites**

* Antimetabolites are structurally compounding that exist within the cell. related to normal
* Antimetabolites generally interfere with the availability of normal purine or pyrimidine nucleotide precursors, either by inhibiting their synthesis or by competing with them in DNA or RNA synthesis.
* Their maximal cytotoxic effects are in S-phase (and are, therefore, cell-cycle specific).