Mustansiriyah University

College of Medicine

Chemistry and Biochemistry Department

Medical Chemistry (Organic) / Lecturer. Dr. Tamara Sami Naji

Lecture 8: The Chemistry of Antibiotics

Antibiotics

Antibiotics are medications, also known as antibacterial. Antibiotics are used in the treatment, and prevention of bacterial infections. Antibiotics can inhibit growth of bacteria, or destroy other microorganisms at very low concentrations.

Types of Antibiotics

1. Synthetic antibiotics

Synthetic antibiotics are a type of antibiotics synthesize as chemical substances in the laboratory to be use later against harmful microorganisms in our environment, for example Tetracycline.

2. Naturally Antibiotics

Antibacterial drugs are naturally occurring antibiotics produced by a microorganism, i.e. bacteria or fungi, then send outside its cell to be harmful or kill another microorganism, for example Penicillin.

Penicillin

Penicillin is an active antibiotic consists of a heterocyclic ring called Beta - Lactam Ring attached to one or more sugar (R group). Penicillin is a key to generate other antibiotics by increasing the membered in its structures.



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Mechanism of Penicillin to destroy bacteria

- 1. Penicillin interferes with Peptidoglycan (a polymer that makes up the cell wall of most bacteria. It is made up of sugars and amino acids, and when many molecules of peptidoglycan joined together, they form an orderly crystal lattice structure. Bacteria are classified as being either Grampositive or Gram-negative based in differences in the structure of their peptidoglycan cell wall) of bacteria cell wall.
- 2. The cell wall component of bacteria will be lysis.
- **3.** Irreversible reaction of Penicillin cause inactivation of bacteria growth enzyme Transpeptidase, then undergo cell death.

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Sulfur

Sulfur (or Sulphur in British English). Elemental sulfur is non-toxic. When sulfur burns in air, it produces sulfur dioxide. In water, this gas produces sulfurous acid and sulfites; sulfites are antioxidants that inhibit growth of aerobic bacteria and a useful food additive in small amounts.

Importance of sulfur in life

- **1.** Three amino acids (cysteine, cysteine and methionine) present in all poly peptides, enzymes and proteins.
- 2. Two vitamins (biotin(B7) and thiamine(B1) are organosulfur compounds.
- **3.** Many cofactors (is a non-protein chemical compound or metallic ion that is required for an enzyme's role as a catalyst) are also contain sulfur including glutathione.

Using of Sulfur as Pharmaceuticals:

1. Pharmaceutical skin treatment of acne.

2. Kills bacteria, fungi, scabies mites and other parasites. (Sulfonamides are antimicrobials drugs used in the treatment of bacterial infections.

3. Sulfur is used, in lotions, creams, powders, & soaps, so sulfur-containing antibiotics