Pencillin:A Breakthrough Antibiotic Revolutionizing Modern Medicine

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***Abstract*—Penicillin is a class of antibiotics that treat bacterial infections by killing or preventing the growth of bacteria. In 1928, at St. Mary's Hospital, London, Alexander Fleming discovered penicillin. This discovery led to the introduction of antibiotics that greatly reduced the number of deaths from infection. Penicillins treat bacterial infections like strep throat, ear infections and urinary tract infections. They work by attaching to and damaging the cell walls of bacteria. Penicillium is an important genus of phylum ascomycota, found in the natural environment as well as in food and drug production. Some members of the genus produce penicillin,a molecule used as an antibiotic that kills orstops the growth of certain kinds of bacteria inside the body.**

I. INTRODUCTION

Penicillin and other antibiotics in the beta-lactam family contain a characteristic four-membered beta-lactam ring. Penicillin kills bacteria through binding of the beta-lactam ring to DD-transpeptidase, inhibiting its cross-linking activity and preventing new cell wall formation. Penicillin kills susceptible bacteria by specifically inhibiting the transpeptidase that catalyzes the final step in cell wall biosynthesis, the cross-linking of peptidoglycan. It was hypothesized. Alexander Fleming was a Scottish physician-scientist who was recognised for discovering penicillin. The simple discovery and use of the antibiotic agent has saved millions of lives, and earned Fleming – together with Howard Florey and Ernst Chain, who devised methods for the large-scale isolation and production of penicillin.

II. TYPES OF PENICILLINS

Penicillins are antibiotics that disrupt bacterial cell walls and are used to treat a variety of infections:

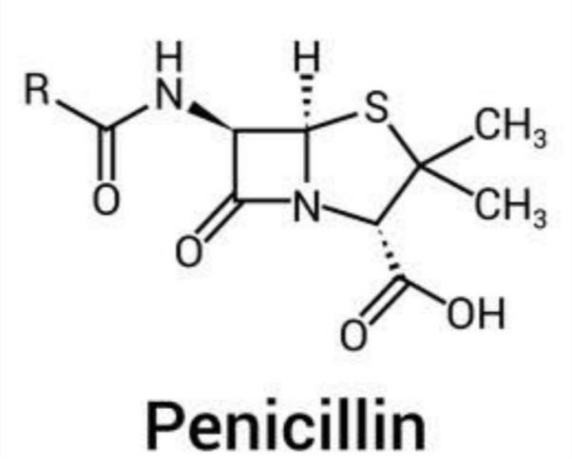
- Natural penicillins: These include penicillin G and penicillin V. Penicillin G is used to treat syphilis, group A streptococcal pharyngitis, and some anaerobic infections.
- Penicillinase - resistant penicillins: These include methicillin, nafcillin, and isoxazolyl penicillins. They are effective against sensitive strains of Staphylococcus aureus.
- Aminopenicillins: These include ampicillin and amoxicillin. They have a similar spectrum to penicillin but are also effective against aerobic gram-negative bacteria.
- Carboxypenicillins: These include carbenicillin and ticarcillin.
- Acyl ureidopenicillins: These include azlocillin, mezlocillin, and piperacillin.
- Combination medications: These include augmentin, unasyn, and zosyn.

Penicillin's can be taken orally, intravenously, intramuscularly, or by injection. The best way to take penicillin depends on the type of penicillin and whether you have renal impairment. Penicillin is susceptible to resistance mechanisms.

III. STRUCTURE

The basic chemical structure of all penicillins consists of a beta-lactam ring, a thiazolidine ring, and a side chain (6-aminopenicillanic acid). The term "penam" is used to describe the common core skeleton of a member of the penicillins. This core has the molecular formula R-$C_9H_{11}N_2O_4S$, where R is the variable side chain that differentiates the penicillins from one another.

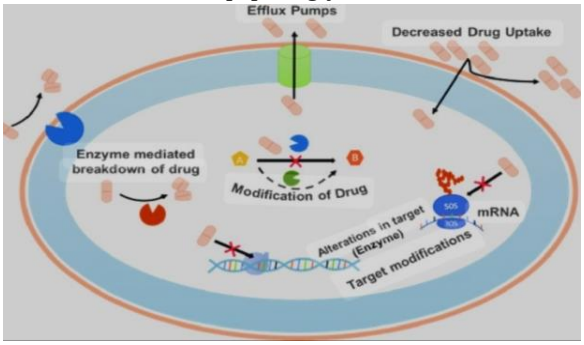
The penam core has a molar mass of 243 g/mol, with larger penicillins having molar mass near 450—for example, cloxacillin has a molar mass of 436 g/mol. 6-APA ($C_8H_{12}N_2O_3S$) forms the basic structure of penicillins. It is made up of an enclosed dipeptide formed by the condensation of L-cysteine and D-valine. This results in the formations of β-lactam and thiazolidinic rings.



IV. MECHANISM OF ACTION OF PENICILLIN

Penicillin's mechanism of action is to inhibit the transpeptidase enzyme, which is responsible for the final step in bacterial cell wall biosynthesis. Penicillin and other antibiotics in the beta-lactam family contain a characteristic four-membered beta-lactam ring. Penicillin kills bacteria through binding of the beta-lactam ring to DD-transpeptidase, inhibiting its cross-linking activity and preventing new cell wall formation.

By disrupting the synthesis of peptidoglycan in the cell walls of bacteria, penicillin effectively kills bacteria by lysis. Penicillin mechanism of action is bactericidal because it kills bacteria by inhibiting the construction of their peptidoglycan cell walls.



V. ADVERSE DRUG REACTIONS:

1. Delayed reactions resulting from penicillin allergy. These conditions include:
2. Serum sickness
3. May cause fever
4. Joint pain
5. Rashes
6. Swelling
7. Nassuea
8. Drug induced anaemia
9. A reduction in red blood cells
10. Irregular heart beats
11. Shortness of breath

VI. ADVANTAGES OF PENICILLIN

- Have excellent tissue penetration.
- Bactericidal aganist sensitive stains.
- Relatively nontoxic.
- Efficacious in the treatment of infections.
- Inexpensive in comparision with other antibiotics.
- Newer penicilllins are resistant to stomach acid, such as penicillin V or a broader spectrum, such as ampicillin and amoxicillin.

VII. DISADVANTAGES OF PENICILLIN

- They were effective for gram positive bacteria.
- They were defective for gram negative bacteria.
- Hydrolysis by gastric acids, so that it cannot be taken orally.
- Inactivation by beta-lactamases.
- It has not been overcome is hypersensitivity.

VIII. USES OF PENICILLINS

- Most of the penicillins are active aganist gram positive bacteria, in which they inhibit the cell well synthesis leading to the death of bacteria.
- Used therapeutically in the treatment of infectious diseases of humans caused by gram positive bacteria.

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