

Penicillin: An Antibiotic

Miss. Sonali Gorave, Miss. Pooja Shinde, Miss. Swapnali Kasture

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ABSTRACT :

Antibiotics are most commonly prescribed medications. They are the basic agents for the treatment of bacterial infections in humans as well as animals. Among of them penicillin is one of the oldest available pure antibiotic in primary care. Penicillin was and will be the drug of choice for many mild, localized soft tissue infections and also safely used in specific situations during pregnancy. Although it has some allergic effect by their use is not prohibited. This paper outlines the Introduction, Discovery, Structure, Classification, Mechanism And Therapeutic Uses Of Penicillin.

KEYWORDS : Penicillin, Antibiotic, Skin Allergy, Infection, Staphylococcus Bacteria, Streptococcal Infection, β -Lactum Ring.

I. INTRODUCTION :

Penicillin is an ancient accessible pure antibiotic [1]. Since the introduction of penicillin in the 1940's antibiotics have become the cornerstone of modern medicine. They form the basis of the treatment disease in the human and animals without antibiotics many treatments and methods of treatment that are now widely used such as medical treatment, body modification, joint surgery or early observation control of children would not be possible. There are many situation the life of humans or animals were antibiotics can save lives [2].

According to estimate of the World Health Organization (WHO), global antibiotics are the biggest threats to the health of the some people around the world current estimate indicate that approximately 25,000 patients have died due to antibiotic resistance. There are concerns that the lack of effective antibiotic threatens progress in many areas of medicine, including intensive care alternative medicine oncology and surgery [2].

DISCOVERY :

Although the discovery of penicillin started of wrong, it was more than just luck while on vacation 1928, bacteriologist Alexander Fleming worked in St. Petersburg Mary's Hospital In London in discovered that the petri dish containing staphylococcus bacteria that he placed

on his chair was infected found that fungal infection inhibits growth of nearby bacteria. It turned out that the fungus was penicillium and the antibiotic it produced was called as penicillium. Fleming recorded his observation in a paper in the British Journal of the experimental pathology in 1929 where, he showed that penicillin inhibited bacterial growth in-vitro Fleming believed that penicillin could be used as an antibiotic, but he was unable to purify penicillin or increase its activity[3].

Fleming's article on penicillin in 1939 researches at Oxford University began researching new antibiotic at that time, Howard Florey was working on lysozyme and its ability to kill bacteria, Florey along with analyst ernst chain, was interested in Fleming's observation of penicillins diseases fighting ability chain and Florey decided to develop a method for growing mushrooms to further test their effectiveness [3].

THE FIRST TRIAL IN HUMANS :

When the first trial was attended in human, a women who receive penicillin as a part of toxicity testing having advanced breast cancer. Shortly after penicillin injection fever and adversity developed, caused by pyrogenic contamination in the penicillin mixture Edward Abraham is a Biochemist at Florey Hospital. He proposed along with chain, that penicillin could be further purified to remove any remaining pyrogens before administration to patient. The second patient who received the specific amount of purified penicillin was a clerk at the Radcliffe Infirmary who suffered from several staphylococcal and streptococcal infections. Repeated penicillin dose for 5 days had great effect on his recovery. Because the penicillin is so small the patient's urine must be collected and reprocessed to replenish the penicillin for the next patient. Finally, a lack of penicillin led to discontinuation of treatment and the patient deteriorated again and died soon after. Between 1941 and 1942, Florey Heatley and chain attended several additional clinical involve in 170 patients. Result prove that penicillin is effective in fighting bacteria with no side effects.

A chance event in a London laboratory in 1928 revolutionized medicine. Bacteriologist Alexander Fleming, St. he returned from vacation at St. Mary's Hospital and while talking with associator, found an area around the bacteria dominating the agar plate where the bacteria couldn't grow. After segregating the mold and named it the penicillin agent. He concluded that the penicillin had antibacterial properties against

staphylococci and other gram positive bacteria. In 1945, Fleming, Florey and Chain won the Nobel Prize for "Discovery Of Penicillin and Its Effectiveness Against Various Infectious Disease". They also introduced other antibiotic species in 1940s and 1950s, such as Streptomycin, Chloramphenicol, Erythromycin, Vancomycin etc. [3]

STRUCTURE OF PENICILLIN :

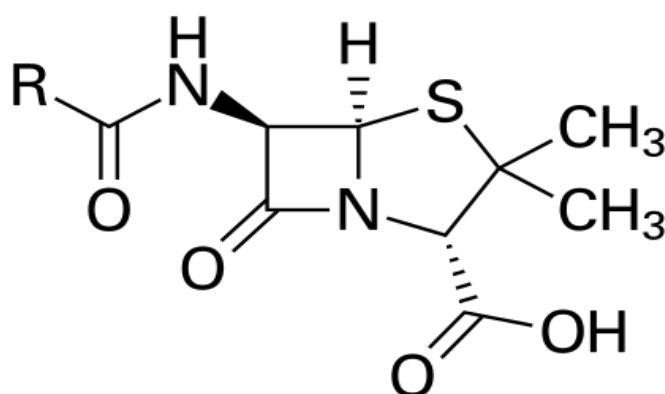


Fig. structure of penicillin[4]

MECHANISM OF ACTION :

MECHANISMS OF ANTIBIOTIC ACTION

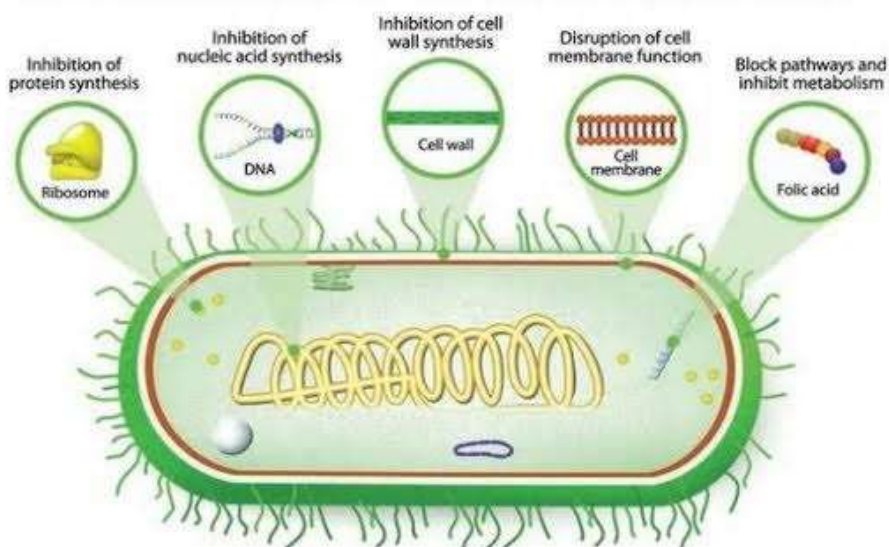


Fig. mechanism of action of penicillin[5]

CLASSIFICATION OF PENICILLIN :

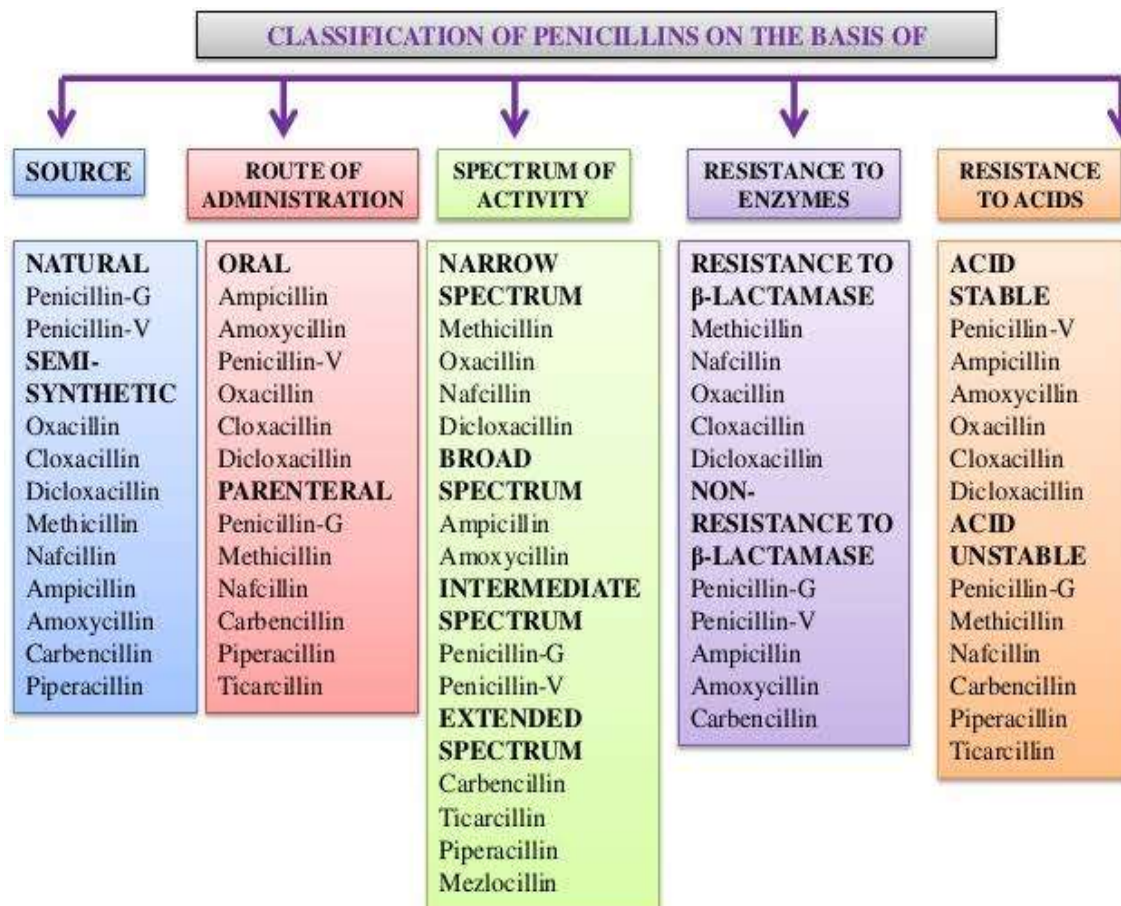


Fig. classification of penicillin[6]

PENICILLIN IN SKIN ALLERGY :

Allergies and allergic reaction are the most common and most misunderstood side effects of penicillin. Fear of anaphylaxis, the most severe form of allergic reaction, leads many doctors to diagnose penicillin overdose based absolutely on the patient's history, thus avoiding the use of penicillin in the appropriate layer in nature. Replace in the treatment of penicillin.

Penicillin allergy has been classified according to the type of vaccine, immune system, clinical syndrome or time of onset. Type I resistance is the most severe type of penicillin antibiotic. Type I reactions are attached with allergic actions such as erythema, pruritus, urticaria, angioedema, bronchospasm and laryngeal edema. This reaction is mediated by specific IgE antibodies and usually occurs within 1 hour after drug administration, but may occur as late as 72 hours. Anti-inflammatory effect occurs 1 hour after application. However, these are rare, delayed

reactions are reactions that occur 72 hours or more after exposure to the drug. Depending on immune system, these reactions can be classified as type II, type III, type IV, or idiopathic, none of these are IgE-mediated[1]

OTHER β-LACTAM AND CROSS-REACTIVITY :

Cephalosporin allergic reactions are growing trouble inside the United States ; about 2% patients have a said cephalosporin hypersensitivity and cephalosporins are rising as a common place reason of anaphylaxis, in particular in the perioperative setting. Allergic reactions to carbapenem and monobactam are unusual. Cross reactivity between penicillin and cephalosporin arise is about 2% of instances, less than the 8% said previously. But in the subset of patients with records of anaphylaxis often penicillin, nearly 40% have established cross reactivity with a cephalosporin[7].

IMPLEMENTATION ACROSS THE CARE CONTINUUM AND SPECIAL POPULATIONS :

Further to assessment on the time that the patient requires the antibiotics, penicillin hypersensitivity evolution have to be initiated at some point of ordinary care transport to manual future antibiotic use and prevent the need for emergent drug checking out an desensitization if a patient's develops a serious infection, penicillin hypersensitive reaction evolution can be adequately performed before the need for antibiotic use in toddlers, kids pregnant ladies, older adults, hospitalized patients and patient in the ICU. Program to assess penicillin hypersensitive reactions depends on offerings to be had and the form of facility in which care is delivered.

1. Hospitalized patients : More than half of the patients admitted to the emergency department used antibiotics. If a particular beta-lactum drug will cure the infection (for ex. Cefazolin in a patient with Methicillin – sensitive staphylococcus aureus bacteremia) .hospitalized patients with this infection may benefit from certain beta-lactum drugs. Following this short term solution, penicillin allergy testing should be performed and if the patient can tolerate the test, the penicillin allergy label will be removed.
2. Ambulatory care : More than 260 million antibiotic prescriptions are written in outpatient clinics every year. Antibiotics are prescribed in 10% of all doctors visits; broad spectrum antibiotics accounted for 61% of this medications dentists prescribed 25 million classes of antibiotics each year. Ambulatory antibiotics administration includes not only to reduce unnecessary antibiotic but also to improve antibiotic selection. The ambulatory setting is ideal for penicillin allergy testing because the patient is healthy enough to resist diagnosis and antibiotic treatment is not required for many visits.
3. Pregnant patients : Antibiotics are the most common prescribed medications during pregnancy. Amoxicillin and Cephalexin are first-line treatments for asymptomatic bacteriuria and susceptibility to UTI during pregnancy penicillin combined with aminoglycosides is frequently used to treat patients with chorioamnionitis syphilis during pregnancy can be treated with penicillin.
4. Pediatric patients : Most minor infections, such as otitis media and pharyngitis, are usually treated with penicillin. The incidence of side

effects is higher when generic antibiotics are used to treat these diseases but there is no clear benefit. When children are evaluated for penicillin allergy compared to adults, the time since the reaction occurs in shorter.

5. Oncology : Antibiotics are frequently used for prevention and treatment in cancer patients. The rate of antibiotic resistance is higher than in general population. For example, beta-lactum antibiotics are important in the treatment of infectious diseases such as fever and neutropenia. Cancer patients are at high risk for complications such as the development of drug-resistant microbes and C. difficile infection therefor, efforts to evaluate penicillin allergy in cancer patients may improve treatment decision and potentially influence outcomes such as survival[7].

THERAPEUTIC USES OF PENICILLIN :

Penicillins are natural or synthetic antibiotics derived from fungi. All penicillins have the three chemical structures; a thiazolidine ring, beta-lactum ring and a side chain[1].

1. In contravention of the introduction of new, more powerful antibiotics, penicillin is still useful in the treatment of many diseases and is especially important in certain types of cancer and in gynecology.
2. Penicillins are generally effective in treating local skin and soft tissue infections in the nose, throat, respiratory tract and genitourinary system.
3. It is also used in the to prevent prophylaxis endocarditis during gastrointestinal and urogenital system surgery.
4. The most common cases of inappropriate use of penicillin in womens health are peripartum prophylaxis against group B streptococci (GBS) and treatment of syphilis. These is no alternative to penicillin for women diagnosed with syphilis during pregnancy. Other medications that have significant adverse effects on the fetus are also available for non-pregnant patients[1].

II. CONCLUSION :

Penicillin is still a useful group of antibiotics in first-line treatment. The development of synthetic penicillin has broadened there spectrum of action and increased there effectiveness. Large number of patients reported being allergic to penicillin but few received significant treatment.

REFERENCES :

- [1]. Elissa Lane Miller, CNM, PhD, THE PENICILLINS : A REVIEW UPDATE. Journal of Midwifery and Women's Health . vol.47, No.6, November/ December 2002.
- [2]. Akademie der Wissenschaften in Hamburg, Edmund-Siemers-Allee 1, 20146 Hamburg. ANTIBIOTICS RESEARCH : PROBLEMS AND PROSPERPECTIVES Academy of Sciences and Humanities in Hamburg German National Academy of Sciences Leopoldine. June 2013.
- [3]. MariyaLobanovska and Giulia Pilla, Penicillin's Discovery and Antibiotic Resistance : Lessons for the Future ?. YALE JOURNAL OF BIOLOGY AND MEDICINE 90 (2017), pp.135-145.
- [4]. <https://en.m.wikipedia.org/wiki/penicillin>
- [5]. <https://images.app.goo.gl/ZHLgGniqPZ5ERx3J8>
- [6]. <https://images.app.goo.gl/vPQ8tEU7p8MvM6Nr6>
- [7]. Erica S. Shenoy, MD, PhD; Eric Macy, MD, MS ; Theresa Rowe, DO, MS; Kimberly G. Blumenthal, MD, MSc. Evaluation and Management of Penicillin Allergy A Review.© 2019 American Medical Association, JAMA January 15,2019 Volume 321, Number 2.