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A DIFFERENT ANTIBIOTICS STUDY

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1. Abstract

Antibiotics are by far the most common medications prescribed for children. Recent epidemiological data suggests an association between early antibiotic use and disease phenotypes in adulthood. Antibiotic use during infancy induces imbalances in gut microbiota, called dysbiosis.The gut microbiome's responses to antibiotics and its potential link to disease development are especially complex to study in the changinginfant gut. Here, we synthesize current knowledge linking antibiotics, dysbiosis, and disease and propose a framework for studying antibiotic- related dysbiosis in children. We recommend future studies into the microbiome-mediated effects of antibiotics focused on four types of dysbiosis: loss of keystone taxa, loss of diversity, shifts in metabolic capacity, and blooms of pathogens. Establishment of a large and diverse baseline cohort to define healthy infant microbiome development is essential to advancing diagnosis, interpretation, and eventual treatment of pediatric dysbiosis. This approach will also help provide evidence-based recommendations for antibiotic usage in infancy.(1)

2. INTRODUCTION

Discovery of antibiotics has helped to save the lives of an uncountable number of people. Antibiotics have been grouped in different classes based on their origin, structure, and mechanism of action. An intrinsic andacquired mechanism of antimicrobial resistance has been identified in many bacterial strains that are of high clinical importance. This has seriously jeopardized the use of antibiotics and has also caused the spread of microbes that are resistant to effective first-choice, or “first-line” drugs.

Thus, sensible use of antibiotics and the search for effective alternative measures are of high importance in order to minimize

Brief History of Antibiotics

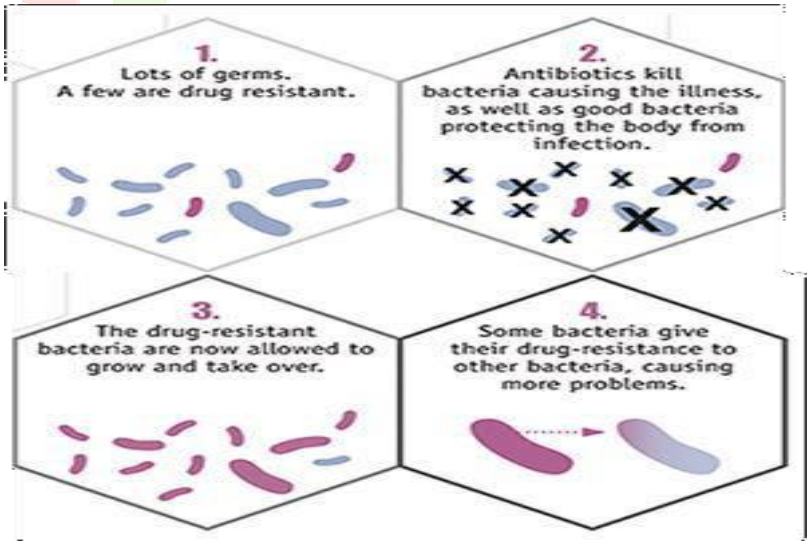
- 1928- Penicillin discovered by Fleming
- 1932- Sulfonamide antimicrobial activity discovered {Erlich}▪
- 1943- Drug companies begin mass production of penicillin
- 1948- Cephalosporins precursor sent to Oxford for synthesis
- 1952- Erythromycin derived from Streptomyces erythreus
- 1956- Vancomycin introduced for penicillin resistant staphylococcus
- 1962- Quinolone antibiotics first discovered
- 1970s- Linezolide discovered but not pursued
- 1980s- Fluorinated Quinolones introduced, making then clinically useful
- 2000- Linezolide introduced into clinical practice

he effect due to existing and emerging antimicrobial resistant microbes.(2)

DEFINATION OF ANTIBIOTICS:

It can be defined as any of a large group of chemical substances, as penicillin or streptomycin, produced by various microorganisms and fungi, having the capacity in dilute solutions to inhibit the growth of or to destroy bacteria and other microorganisms, used chiefly in the treatment of infectious diseases. In other words, it is a drug used to treat infections caused by bacteria and other microorganisms.Originally, an antibiotic was a substance produced by one microorganism that selectively inhibits the growth of another. Synthetic antibiotics, usually chemically related to natural antibiotics.

Antibiotic Resistance:-



It is important to understand why antibiotic resistance develops, in order to design strategies for its prevention. Factors that promote antibiotic resistance in communityand hospital settings are: antibiotic selective pressure, prolonged antibiotic treatment, inadequate doses, prior use of a less effective drug of the same antibiotic class, The best available ways to decrease and control antibiotic resistance(3)

3. Type of antibiotic:-

- Natural:-mainly fungal source.
- Semi-synthetic:-Chemically alter natural compound
- Synthetic:-Chemicallydesigned in lab.

Classification of antibiotic:-
Antibiotics are classified several ways.

- On the basis of mechanism of action
- On the basis of spectrum of activity
- On the basis of mode of action

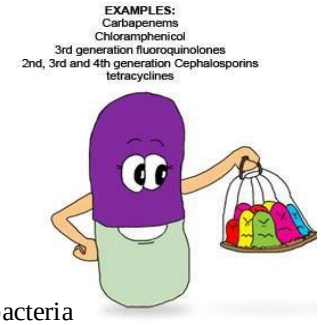
On the basis of mechanism of action

Antibiotics are classified as followings

1. Protein synthesis inhibitor
2. Cell wall synthesis inhibitor
3. DNA synthesis inhibitor
4. RNA synthesis inhibitor
5. Folic acid inhibitor
6. My colic acid synthesis inhibitor.

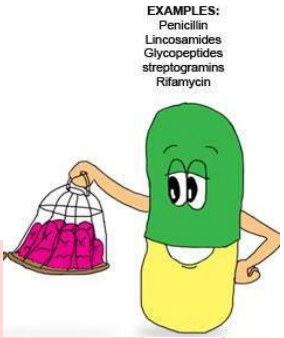
On the basis of spectrum activity:-

- **Broad spectrum antibiotic:-**
  The term brood spectrum antibiotic that acts against a wide rangeOf disease causing bacteria.



- TetracyclineChlormphenacial
- Amoxicillin
- Cephalosporin
- Erythromycin

- **Short spectrum antibiotic:-**
  The term short spectrum antibiotic that acts against a narrow range ofdisease causingbacteria



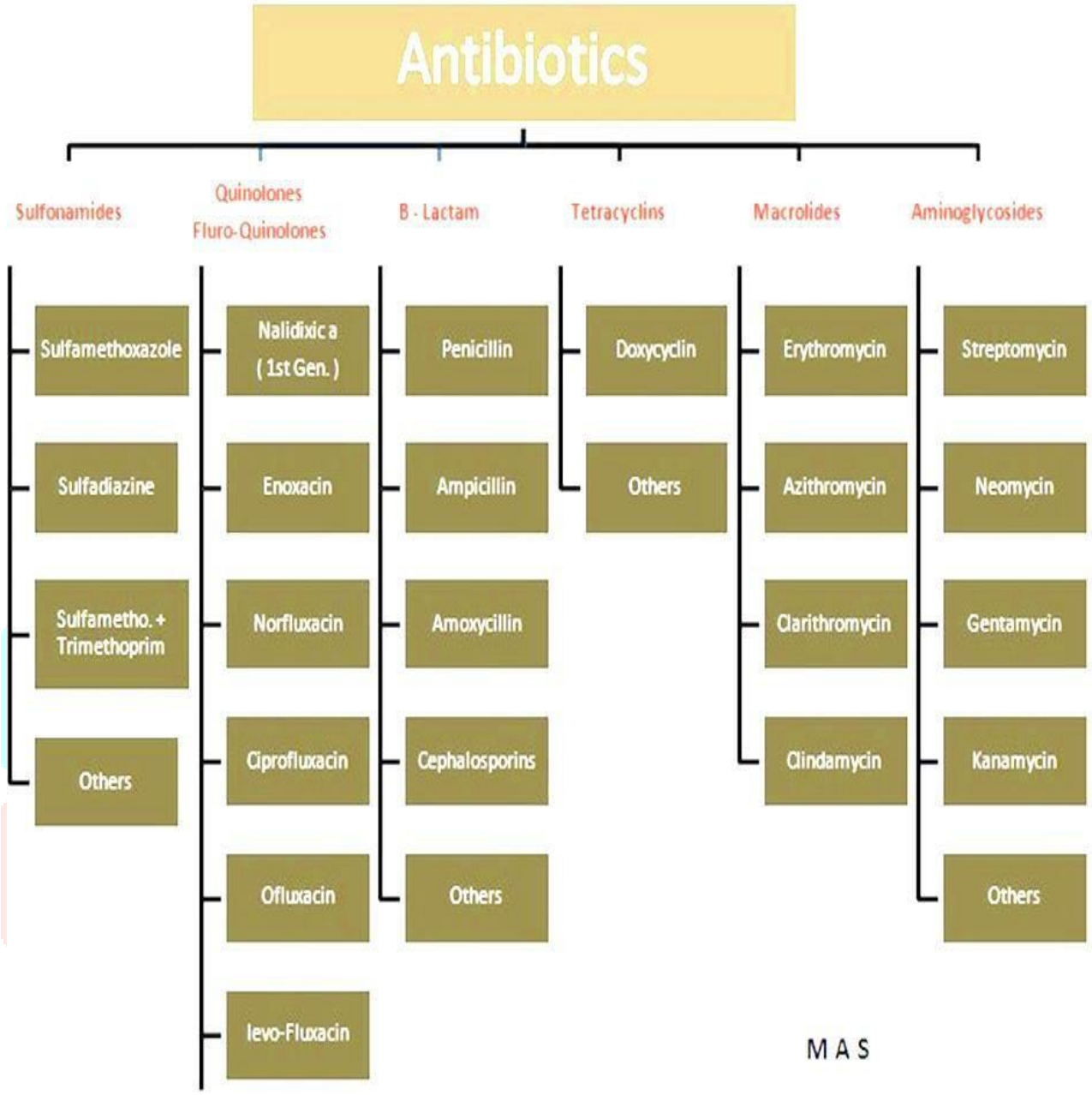
- Penicillin-G
- Cloxacillin
- Vaancomycin
- Bacitracin
- Fluxacillin

- **On the basis of mode of action.**

- **Bacteriostatic**
  A bacteriostatic agent is a biological or chemical agentThat stop bacteria from reproducing while agent Necessarily killing them otherwise.

- **Bactericidal**:-
  A bactericidal agent is a biological or chemical agent kill bacteria.(4)

CLASS:



4. Sulphonamides:-

The sulpha-related group of antibiotics, which are used totreat bacterialinfection and some fungalinfections.

Examples of sulphonamides

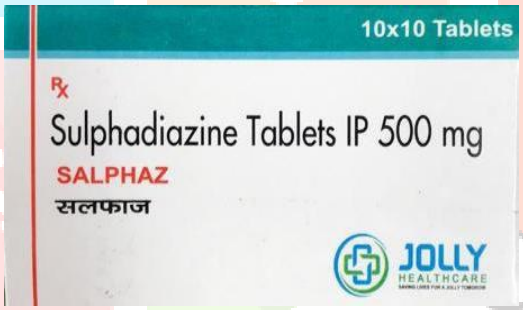
1) Sulfamethaxazole:-(Brand Name:-*Bactrim*)

Sulfamethoxazole is an intermediate-acting sulphonamide that is closely related to sulfisoxazole, but with a slower rate of absorption and excretion. It is completely absorbed following oral administration and hasa half-life of about 10 hours. Sulfamethoxazole is indicated for uncomplicated urinary tract infections and systemic infections

Uses: -This medication is a combination of
two antibiotics: sulfamethoxazole and trimethoprim. It is used to treat a wide variety of bacterial infections (such as middle ear, urine, respiratory,and intestinal infections).
It is also used to prevent and treat a certain type ofpneumonia (pneumocystis-type).

Side effect: -Nausea, vomiting, diarrhea, and loss of appetite may occur.
If any of these effects persist or worsen, tell your doctoror pharmacist promptly.(5)

2) Sulphadiazine :-(Brand name: **ThiosulfilForte**)



Sulfadiazine is a short-acting sulphonamide. It is readily absorbed from the gastrointestinal tract and rapidly excreted by the kidney. As with other sulphonamides, there are few specific indications because of the wide range of safer and more effective alternative antibiotics. In addition, the emergence of resistance. This medication is used to treat and prevent a wide variety of infections. Sulfadiazine belongs to the class of drugs known as sulfa antibiotics.It works by stopping the growth of bacteria and other organisms.This antibiotic treatsonly certain types of infections. It will not work for viral infections (e.g., common cold, flu). Unnecessary use or misuse of any antibiotic can lead to its decreased effectiveness.This medication should not be used in infants younger than 2 months because of the risk of serious side effects, unless treatment is for a very serious infection(congenital toxoplasmosis).

Uses: - This medication is used to treat and prevent a wide variety of infections. . It works by stopping the growth of bacteria and other organisms.

Side-effect;-

- Nausea
- Vomiting, Diarrhea
- Loss Of Appetite, Or Headache May Occur.

3) **Sulfametho+triomethorpin** :-(Brandname:**Bactrim, Septra**)

Trimethoprim-sulfamethoxazole (TMP-SMX), also known as co- trimoxazole, is a combination of two antimicrobial agents that act synergistically against a wide variety of bacteria. Although other combinations of sulphonamides are available with trimethoprim, TMP- SMX is by far the most widely used. This medication is a combination of two antibiotics: sulfamethoxazole and trimethoprim. It is used to treat a wide variety of bacterial infections (such as middle ear, urine, respiratory,and intestinal infections). It is also used to prevent and treat a certain type of pneumonia (pneumocystis-type).

This medication should not be used in children less than 2 months of age due to the risk of serious side effects.This medication treats only certain types of infections. It will not work for viral infections (such as flu). Unnecessary use or misuse of any antibiotic can lead to its decreased effectiveness.

This topic will review basic issues related to the clinical use of trimethoprim-sulfamethoxazole. The multiple clinical settings in which this combination may be used are discussed separately in the appropriate topic reviews.

Uses:-

This medication is two antibiotics: sulfamethoxazole and trimethoprim. It is used to treat a wide variety of bacterial infections (such as middle ear, urine, respiratory, and intestinal infections). It is also used to prevent and treat a certain type of pneumonia (pneumocystis-type)

Side Effects:-

- Nausea
- Vomiting
- Diarrhea
- Loss of appetite

5. Quinolones:-

A quinolone antibiotic is a member of a large group of broad-
spectrum bactericides that share a bicyclic core structure related to the substance 4-quinolone. They are used in human and veterinary medicine to treat

bacterial infections, as well as in animal husbandry.

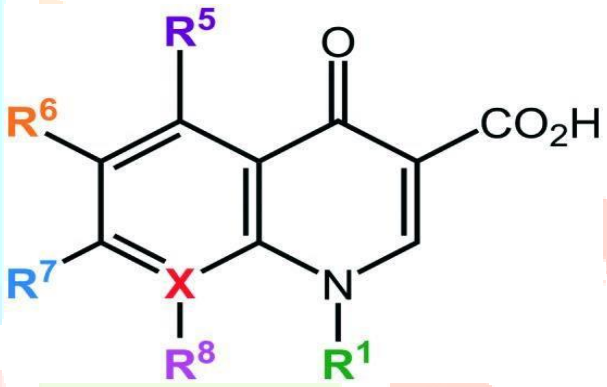
Quinolones are a type of antibiotic. Antibiotics kill or inhibit the growth of bacteria.

There are five different quinolone classes.

In addition, another class of antibiotic, called fluoroquinolones,were derived from quinolones by modifying their structure with fluorine.

Quinolones and fluoroquinolones have many things in common, but also afew differences such as what organisms they are effective against. Some people usethe words quinolones and fluoroquinolones interchangeably.

Quinolones and fluoroquinolones detrimentally affect the function of two enzymes produced by bacteria, topoisomerase IV and DNA gyrase, so that they can no longerrepair DNA or help in its manufacture.



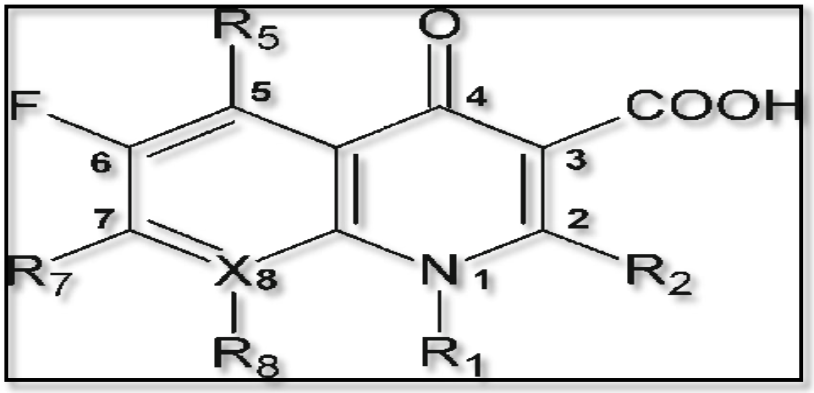
Structure of quinolone antibiotics. There are 6 important positions for modificationsto improve the activity of the drug: R_1, R_5, R_6, R_7, R_8, and X. X = C defines quinolones, X = N defines naphthyridones.

FLURO- QUINOLONES;-

The fluoroquinolones are a family of broad spectrum, systemic antibacterial agentsthat have been used widely as therapy of respiratory and urinary tract infections.

Fluoroquinolones are active against a wide range of aerobic gram-positive and gram-negative organisms. Gram-positive coverage includes penicillin's- and non- penicillin's producing Staphylococci, Streptococcus pneumoniae and viridian, Enterococcus faecal is,

Listeria monocytogenes, and Nocardia species. Gram negative coverage includes Neisseria meningitides and gonorrhoeae, Haemophilusinfluenzae, and most clinically important Enterobacteriaceae species, Pseudomonas aeruginosa and Vibriospecies. The fluoroquinolones are believed to act by inhibition of type II DNA topoisomerases (gyrases) that are required for synthesis of bacterial mRNAs (transcription) and DNA replication. They demonstrate littleinhibition of human, host enzymes and have had an excellent safety record.



General structure of fluoroquinolones, using the accepted numbering scheme for positions on the molecule. The radicals R 1, R 2, R 5, R 7 and R 8 indicate possible positions for structural modification; X usually corresponds to a C or N atom.

EXAMPLE OFQUINOLONES & FLURO-QUINOLONES;-

1) **Nalidixica a:-(Brand name:Neggram):-**

NegGram (nalidixicacid, USP) is indicated for the treatment of urinarytract infections caused by susceptible gram-negative microorganisms, including the majority, Enterobacter species, *Klebsiella* species,
and *Proteus* species. Disc susceptibility testing with the 30 mcg discshould be performed prior to administration of the drug, and during
treatment if clinical response warrants.

Uses:

This medication is an antibiotic used to treat urinary tract infections.

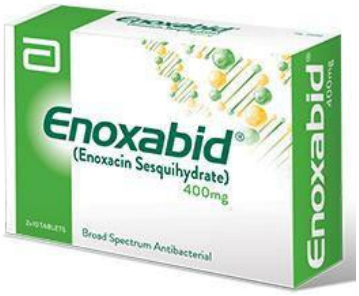
Side Effects:

This medication may cause stomach

upset, appetite, diarrhea, nausea, headache, drowsiness, or dizziness during the first few days asyour body adjusts to the

medication**.**

2) Enoxacin:- (Brand names: **Penetrex):-**



Enoxacin is an oral broad-spectrum fluoroquinolone antibacterial agent used in thetreatment of urinary tract infections and gonorrhea. Enoxacin is bactericidal drugs,eradicating bacteria by interfering with DNA replication.

Like other fluoroquinolones, enoxacin functions
By inhibiting bacterial DNA gyrase and topoisomerase IV. The inhibition of these enzymes prevents bacterial DNA replication, transcription, repairand recombination. Enoxacin is active against many Gram-positive bacteria. After oral administration enoxacin is rapidly and well absorbed from the gastrointestinal tract.

Used:-

- Escherichia coli Infections
- Gonorrhea
- Haemophilus Infections
- Klebsiella Infections

Side Effects

- An Allergic Reaction (Difficulty Breathing; Closing Of The Throat; Swelling Of The Lips,Tongue, Or Face; Or Hives);
- Confusion Or Hallucinations;
- Muscle Or Joint pain

3) Norfloxacin: -(Brand Name: **Noroxin**)

Norfloxacin is a widely used third generation quinolone synthetic antibiotic which has the characteristics of broad bacterium contradicting, small side-effects and cross-resistance with other drugs. NFX is used against both gram-positive and gram- negative bacteria as well as trimethoprim/sulphonamide resistant microbes
This antibiotic shows promise as an antimicrobial agent for a variety of bacterialdiseases

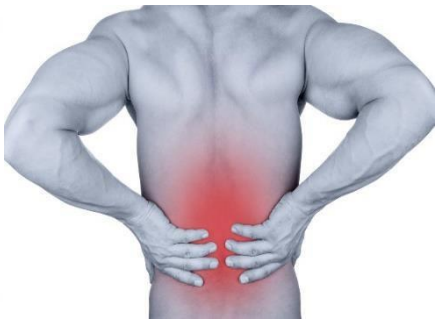
Uses:-

Norfloxacin is used to treat different bacterial infections of the prostate or urinarytract (bladder and kidneys). Norfloxacin is also used to treat gonorrhea.

Norfloxacin may also be used for purposes not listed in this medication guide.

Side Effect:-

- Nausea,
- Diarrhea,
- Dizziness.

4) Ciprofloxacin: -(Brand names**: Cipro**, **CiproXR**)

Ciprofloxacin is a synthetic antimicrobial agent of the fluoroquinolone class,effective in the treatment of a wide range of infections, including
inhalational anthrax. Severe adverse reactions are very rare, but may be life-threatening. These include toxic epidermal necrolysis, agranulocytosis,
and hypersensitivity. In addition, cross-sensitivity to other fluoroquinolones mayoccur. Reports of tendon rupture have been associated with ciprofloxacin use, especially with concomitant steroid therapy. .

Used:-

- Skin and Structure Infection
- Skin or Soft Tissue Infection
- Surgical Prophylaxis
- Traveller'sDiarrhea
- Typhoid Fever

Side Effect:-

- Dizziness,
- Headache,
- Stomach Upset,
- Abdominal Pain,
- Nausea/Vomiting,


5) Ofloxacin :-(BRAND NAME: **Floxin**)

Ofloxacin is a second generation fluoroquinolone antibiotic. Its proposed mechanism of action is interference with DNA gyrase, an enzyme essential for the replication of bacterial DNA. It works by inhibiting bacterial growth. This medication was being used as therapy for many bacterial infections including pneumonia, cellulitis, urinary tract infections, prostatitis gonorrhea, and otitis media.

Used:-

- Urinary tract infections
- Prostatitis
- Lower respiratory infections
- Skin and soft tissue infections

Side Effects

- Nausea
- Vomiting
- Abdominal pain
- Diarrhoea

6) Levofloxacin :-(Brand name**:-Leveque):-**

Levofloxacin is a third generationfluoroquinoloneantibacterialagentwith abroadspectrum

Activityagainst Gram-positive and Gram-negative bacteria and atypical pathogens Itshows its Bactericidal activity by inhibiting topoisomerase IV and DNA gyrase. Levofloxacinhas show

Levofloxacin is a prescription drug that comes as an oral tablet, oral solution, and ophthalmic solution (eye drop). It also comes in an intravenous (IV) form that's onlygiven by a healthcare provider.

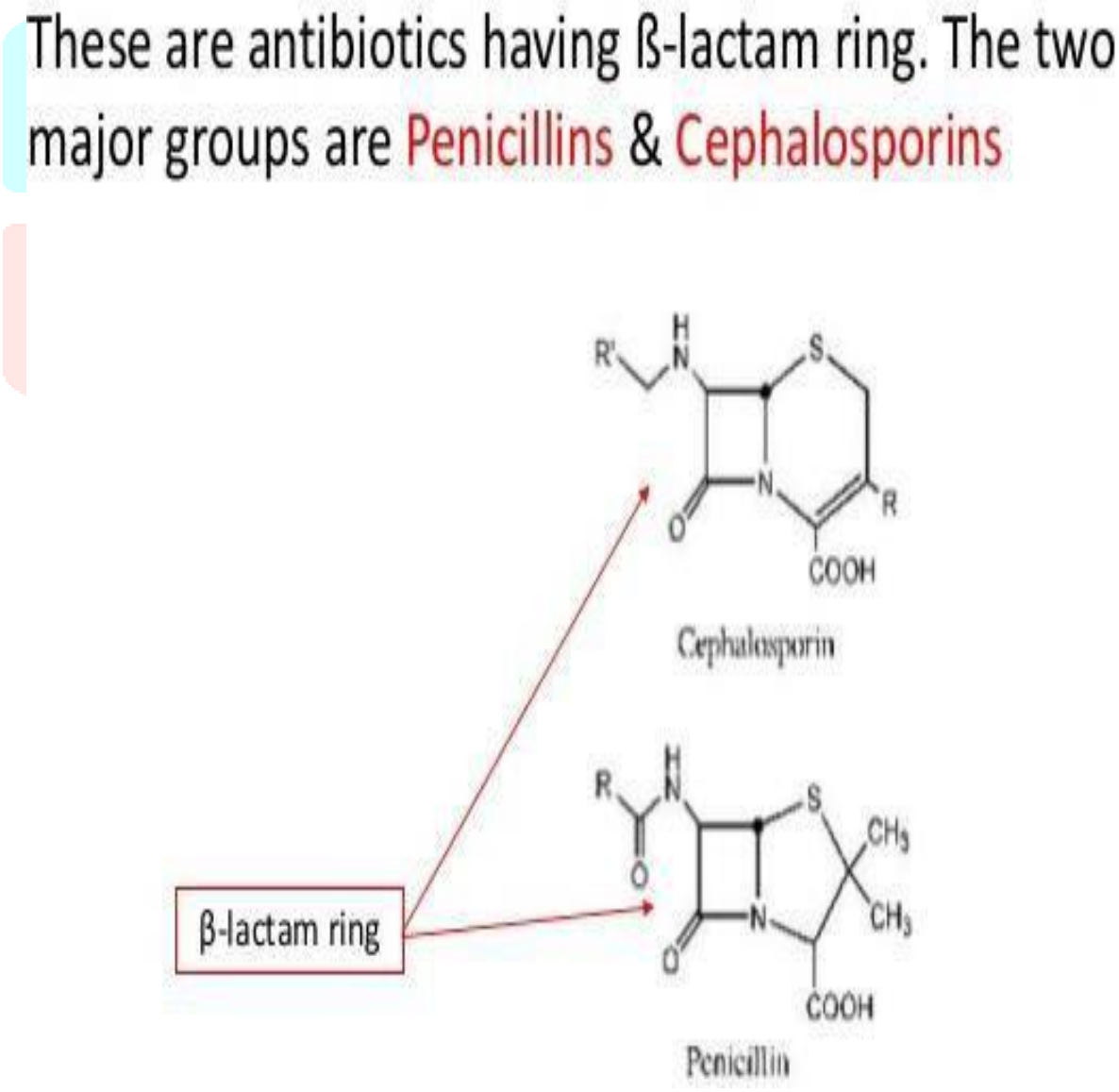
Used:-

- Pneumonia
- Sinus Infection
- Worsening Of Chronic Bronchitis

Side effects:-

- Nausea

6. β-lactam antibiotics



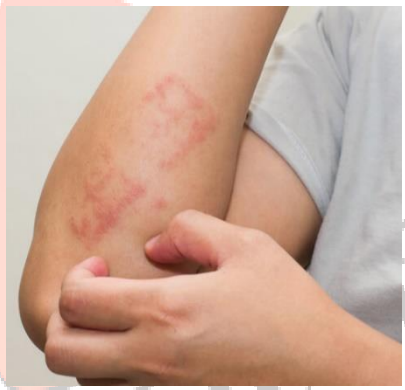
Examples of β-lactam antibiotic:-1.Penicillin:-

Penicillin was first discovered in 1928 and is now the most widely used antibiotic inthe world. This year marks the 80th anniversary of the discovery of penicillin, the first naturally occurring antibiotic drug discovered and used therapeuticallySir*Alexander Fleming*, a Scottish researcher, is credited with the discovery of penicillin in 1928. At the time, Fleming was experimenting with the influenza virus in the Laboratory of the Inoculation Department at St. Mary's Hospital in London

Used:-

Treat certain infections caused by bacteria. It won't work to treat infections causedby viruses, such as the common cold. Bacterial infections this drug is used to treat include: streptococcal upper respiratory tract infections, scarlet fever, and erysipelas infections.

Side effects:-



- Diarrhea
- Headache
- Stomach upset
- Nausea or vomiting
- Rash or hives (usually mild to moderate)

2. **Ampicillin:** -(Brand names: **Principen)**

Ampicillin was discovered in 1958 and came into commercial use in 1961.

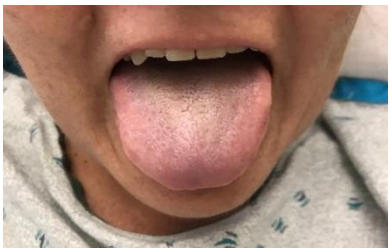
It is on the World Health Organization's List of Essential Medicines. The WorldHealth Organization classifies ampicillin as critically important for human medicine. It is available as a generic medication.

Used:-

prevent and treat a number of bacterial infections, such as respiratory tract infections, urinary tract infections, meningitis, salmonellosis, and endocarditis. Itmay also be used to prevent group B streptococcal infection in new-born.

Side effects:-

- Acute Inflammatory Skin Eruption
- Redness And Peeling Of TheSkin
- Rash.
- Hives.
- Fever.
- Black Hairy Tongue.



3. **Amoxicillin :-(**Brand Name**: Amoxil)**

Amoxicillin was discovered by scientists at *Beecham* Research Laboratories in 1972.Amoxicillin is a form of penicillin that is made in the laboratory. It kills certaintypes of bacteria. It is a type of antibiotic.

Uses:-

Amoxicillin is used to treat a wide variety of bacterial infections. This medication is a penicillin-type antibiotic. It works by stopping the growth of bacteria. This antibiotic treats only bacterial infections

Side Effects:-

- Abdominal or Stomach Cramps or Tenderness.
- Back, Leg, Or Stomach Pains.
- Black, Tarry Stools.
- Bloating.
- Blood inthe Urine.
- Bloody Nose.

4. Cephalosporin's:-

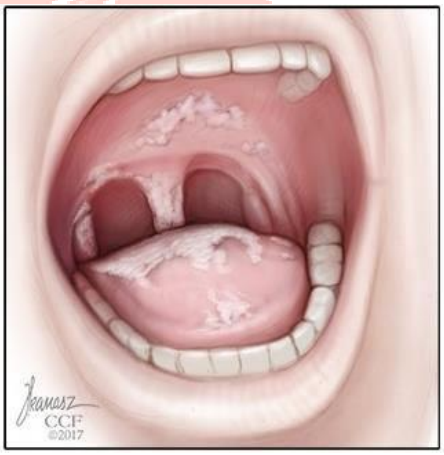
Cephalosporin's Were Discovered In 1945 By theItalian Pharmacologist *Giuseppe* Brotzu,Cephalosporin'sAre A Type Of Antibiotic. Antibiotics Are Medications ThatTreat Bacterial Infections. There Are Many Types, Often Called Classes, Of Antibiotics Available. Cephalosporin'sare a Type of Beta-Lactam Antibiotic.

Used: - to treat infections caused by susceptible bacteria

- Bone infections
- Ear infections (eg . otitis media)
- Skin infections
- Upper respiratory tract infections
- Urinary tract infections.

Side effects:-

- Stomach Upset
- Nausea
- Vomiting
- Diarrhea
- Yeast Infection Or Oral Thrush
- Dizziness

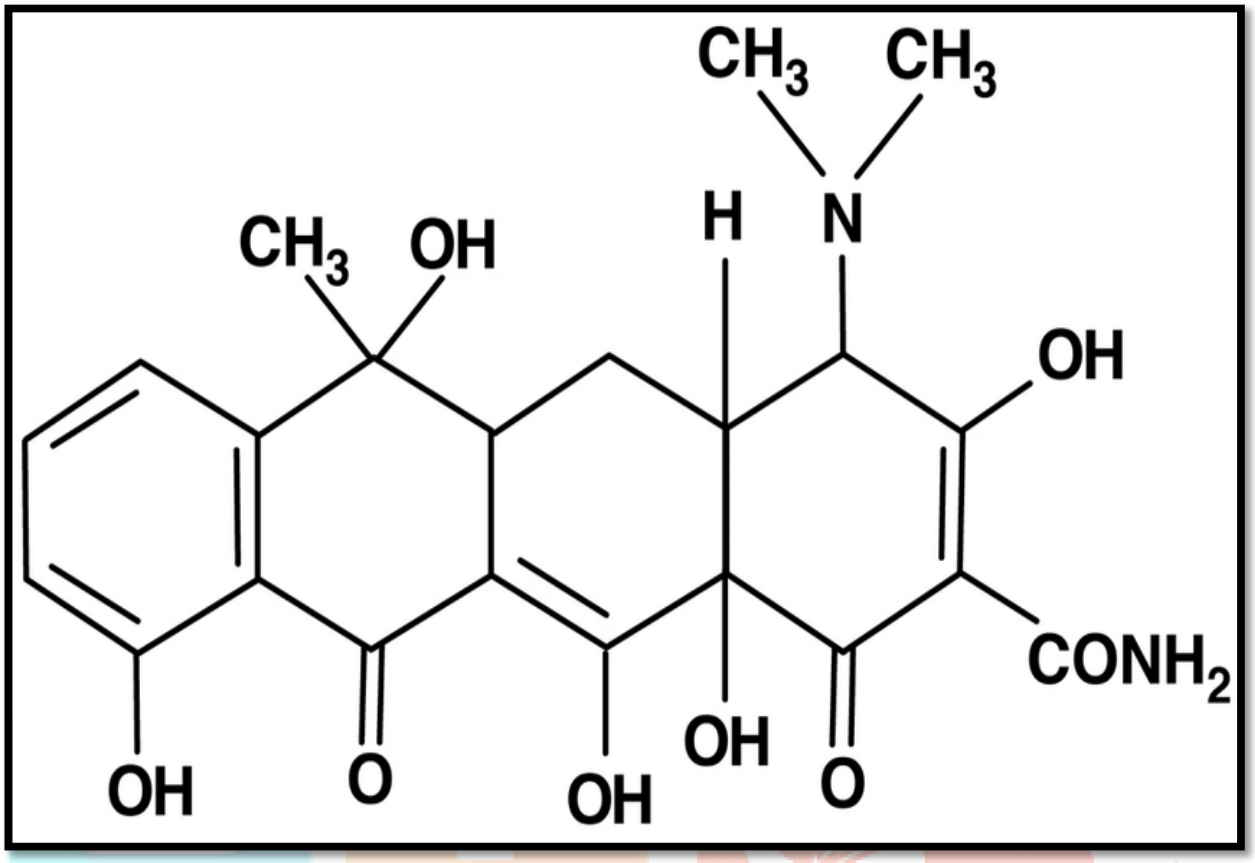


7. TETRACYCLINE

The tetracycline's, a large family of antibiotics, were discovered by Benjamin MingeDuggar in 1948 as natural products, and first prescribed in 1948. Benjamin Duggar, working under YellapragadaSubbarow at Lederle Laboratories, discovered the

first tetracycline antibiotic, chlortetracycline (Aureomycin), in 1945.

Tetracycline structure.



Molecular Formula: C H N O
22 24 2 8

Example of Tetracycline:-

1) Doxyclin :-(Brand names: **Vibramycin)**

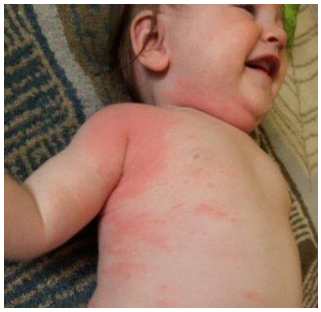
Doxycycline was invented and clinically developed in the early 1960s by Pfizer Inc., New York, NY, and marketed under the brand name Vibramycin. Vibramycinreceived FDA approval in 1967, becoming Pfizer's first once-a-day broad-spectrumantibiotic.(6)

Used:-

- lung infections
- sexually transmitted infections (STIs)
- nose and throat infections
- urinary tract infections (UTIs)

Side effects

- Difficulty swallowing
- Drug rash
- Esophageal ulcer
- Esophagitis
- Facial redness



AIM AND OBJECTIVES

Aim:- A Different Antibiotics Study

Objectives:-
1)To study the different types of antibiotics
2)To improve knowledge about antibiotics
3)To recognize the role of the antibiotics
4)To identify the major types of antibiotics

CONCLUSION:-

- Adverse reactions Development of resistant organisms
- Every time an antibiotic is prescribe
- If all possible order recommended cultures before antibiotics are given
- Make sure an indication dose an expected duration are part of the prescription order
- Reassess within 48 hr.at adjust antibiotic or discontinue if warranted

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