Sri Aurobindo College of Dentistry

Indore, Madhya Pradesh

INDIA

MODULE PLAN

- TOPIC : ANTIMICROBIALS AND ANALGESIC USED IN PEDIATRIC DENTISTRY
- SUBJECT: PEDODONTICS
- TARGET GROUP: UNDERGRADUATE DENTISTRY
- MODE: POWERPOINT – WEBINAR
- PLATFORM: INSTITUTIONAL LMS
- PRESENTER: DR UPDESH MASIH

INTRODUCTION

The most common clinical situation in dentistry amenable to drug therapy in children are pain and infection. The control is vital to all phases of the art and science of analgesic and antibiotic therapy is essential for proper patient care.

ANALGESIC IN PEDIATRIC DENTISTRY

PAIN

it is defined as unpleasant emotional experience usually initiated by a noxious stimulus and transmitted over a specialized neural network to the central nervous system where it is interpreted as such

CONCEPT ABOUT PAIN IN CHILDREN

1. Children have higher tolerance to pain
2. Pain perception is low because of biologic immaturity
3. Little or no memory of a painful experience
4. More sensitive to side effect of analgesic
5. Special risk for addition to narcotics

PAIN PERCEPTION

A good understanding of pain reaction and pain perception is required for a proper pain management. Pain perception is objective and measurable with an anatomic and neurologic basis, initiated by physical and chemical stimuli. pain perception is similar in all patient.

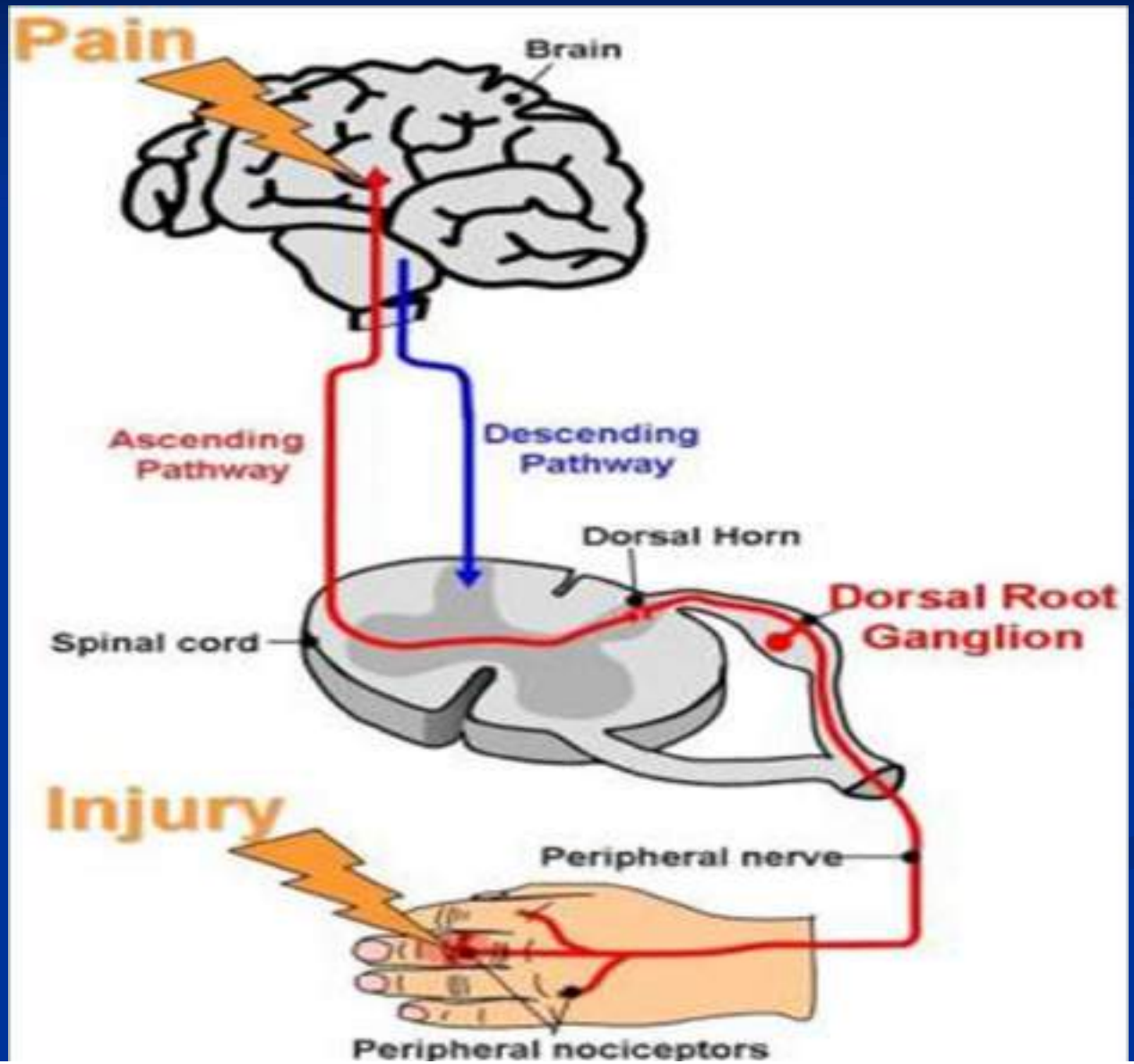
PAIN REACTION

- In contrast to this , pain reaction depends upon Learned experience , ethnic background , age, suggestion of peers and friends. Emotional status , And presence of fear and anxiety

ORIGIN OF PAIN

- Most dental pain is inflammatory in origin and hence respond well to drug with anti-inflammatory component

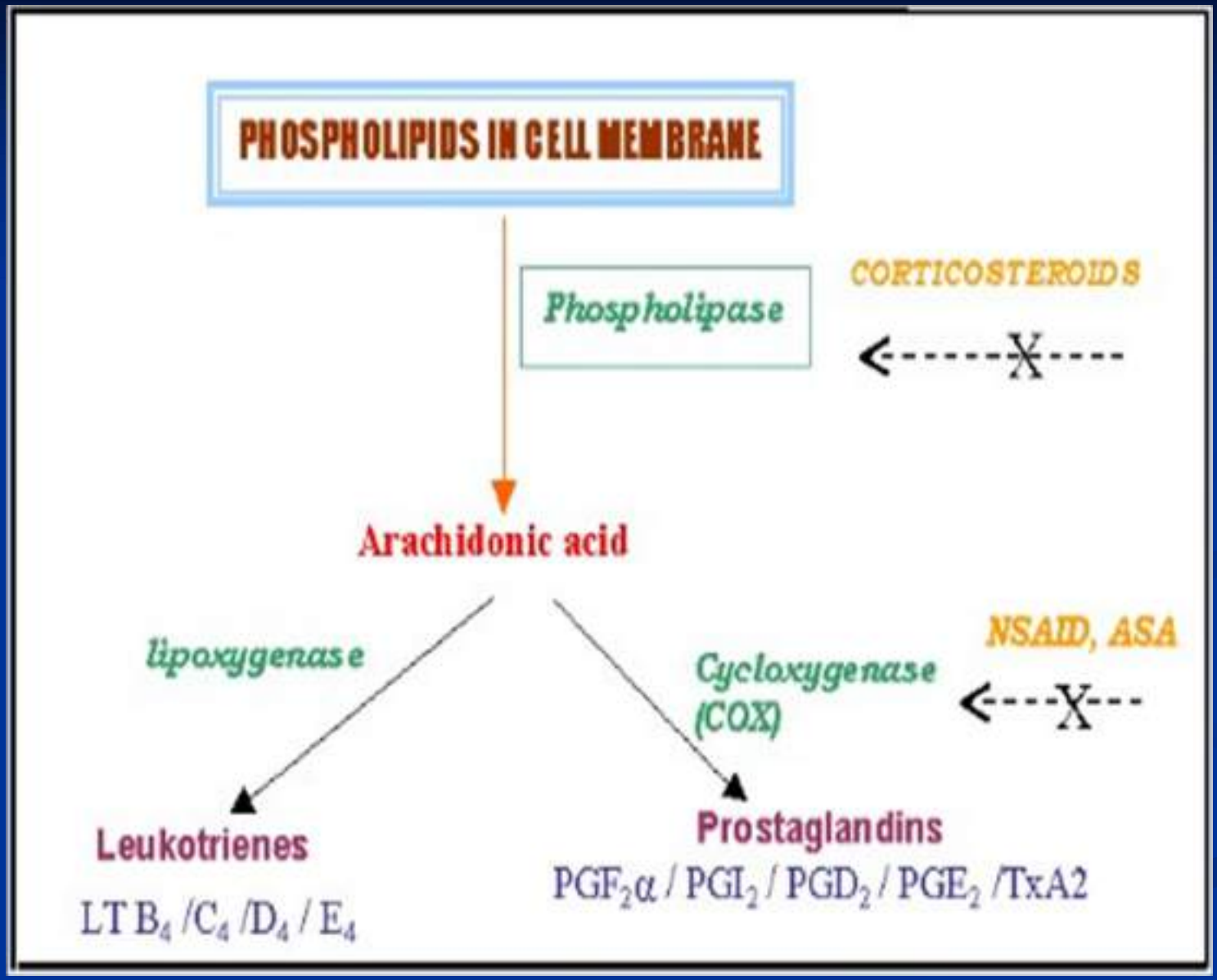
PAIN PATHWAY



CLASSIFICATION OF ANALGESIC

1. Centrally acting (narcotic)
2. Peripheral acting (non narcotic)

CENTRALLY ACTING	PERIPHERAL ACTING
Effective against severe and /or acute pain	Less effective against severe pain
Greater incidence of adverse effect	Lower incidence of adverse effect
Administrated parentrally	orally
Serious drug dependence and abuse liability has limited their use in pediatric dentistry	Low drug dependence and abuse liability has increased scope in pediatric dentistry
E.g. :morphine , codeine , pethidine , methadone , etc	Ibuprofen , diclofenac , nimesulide , paracetamol , etc


PHOSPHOLIPIDS IN CELL MEMBRANE
Phospholipase
CORTICOSTEROIDS
Arachidonic acid
lipoxygenase
Cycloxygenase (COX)
NSAID, ASA
Leukotrienes
LT B4 /C4 /D4 / E4
Prostaglandins
PGF2α / PGI2 / PGD2 / PGE2 /TxA2

IBUPROFEN

- **MECHANISM OF ACTION :**

Inhibit prostaglandin synthesis by interfearing with Cyclo-oxygenase needed for biosynthesis.

- **USES**

Mild to moderate pain

- **DOSAGE**

CHILD:

6 to 12 month: 150 mg

1 to 2 year :150 to 200 mg

3 to 7 year : 300 to 400 mg

8 to 12 year : 600 to 800 mg

ADULT:

1.2 to 1.8 g daily in divided doses

BRAND NAME

1. Alfam
2. Bren
3. Ibucon
4. Ibugin
5. Ibugesic
6. Ibubid

AVAILABLE SYRUP

1. Febrilix

DOSE

100mg/5ml

AVAILABLE FORM

60 ml

CONTRA INDICATION

- Bronchial asthma
- Peptic ulcer
- Hyper sensitivity
- Severe renal disease

SIDE EFFECT

- Nausea
- Vomiting
- Jaundice
- Nephrotoxicity
- Peptic ulcer
- breathlessness

DICLOFENAC

- **MECHANISM OF ACTION**

Inhibit prostaglandin synthesis by interfearing with Cyclo-oxygenase

- **USES**

Moderate pain

- **DOSES**

CHILD:

>1 yr -1 to 3 mg/kg/day in divided doses

ADULT:

50 mg bid/tid in divided doses

BRAND NAME

- Diclofan
- Diclomax
- Diclomol]
- Dicron
- voveran

CONTRAINDICATION

- Hyper sensitivity to other NSAID's
- Bronchial asthma
- Peptic ulcer

SIDE EFFECT

- **Dry mouth**
- **Bitter taste**
- **Dysarrythmias**
- **Bronchospasm**
- **nephrotoxicity**

NIMESULIDE

- **MECHANISM OF ACTION**

Inhibit selectively prostaglandin synthesis .inhibit Platelet activating factor , tumor necrosis factor , metalloprotease and histamine release.

- **USES**

1. mild to moderate pain

- **DOSES**

ADULT

100 mg bid

CHILD

5 mg/kg/day in 2 to 3 divided doses

BRAND NAME

- Nimegesic
- Nimulid
- Nim / rapitab
- Nile

AVAILABLE SYRUP

1. Nimtop
2. Pyranim

- **DOSE**

  50mg/5ml

- **AVAILABLE FORM**

  60ml

CONTRAINDICATION

Hypersensitivity

Impaired renal function

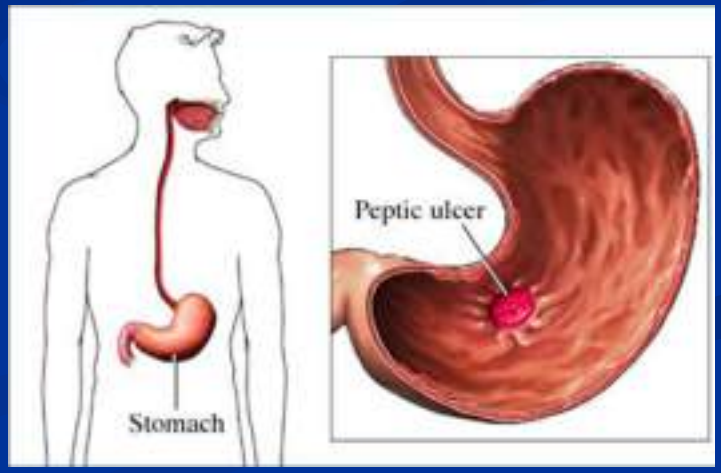
Pregnancy

lactation

SIDE EFFECT

- Allergy

- Gastric bleeding only in active peptic ulcer patient
- Hematuria
- Hepatic failure



WHY NIMESULIDE WAS BANNED IN CHILDREN

- It was banned because it causes liver failure Hepatitis , jaundice.
- It was banned in US , Australia , Europe , Turkey , Bangladesh.
- It is still available in Indian market with the Business of 250 crore per year

PARACETAMOL

- **MECHANISM OF ACTION**

It inhibit prostaglandin synthesis by inhibiting Cyclo oxygenase pathway

- **USES**

  mild pain

DOSES

ADULT

0.5 to 1 gm every 4 to 6 hr up to 4 gm/day max

CHILD

< 3 month	: 10 mg/kg body wt
3 month to 1 yr	: 60 to 120 mg
1 to 5 yr	: 120 to 250 mg
6 to 12 yr	: 250 to 500 mg 3 to 4 times daily

BRAND NAME

- Alice
- Algina
- Calpol
- Crocin
- Dolo]
- Cofamol

AVAILABLE SYRUP

1. Doliprane
2. Cemol
3. Algina
4. Alice
5. Panact
6. Ultragin

- **DOSE**

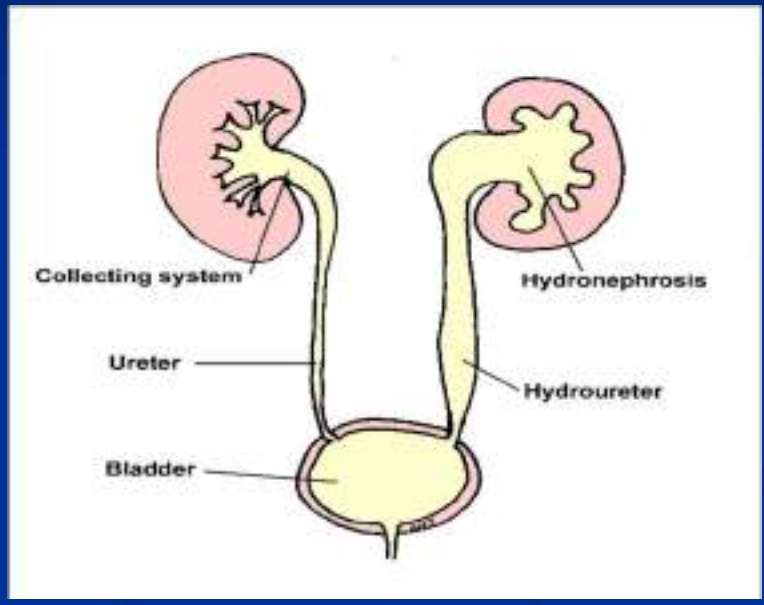
  125mg/5ml

- **AVAILABLE FORM**

  60 ml

CONTRAINDICATION

- Hypersensitivity
- Nephropathy
- jaundice



SIDE EFFECT

- Nausea
- Epigastric distress
- Acute toxicity
- Hepatic failure
- methamoglobiunurea

ASPIRIN

- **MECHANISM OF ACTION**

Inhibit prostaglandin synthesis

- **USES**

somatic pain

- **DOSES**

ADULT

300 to 900 mg every 6hr

max dose – 4 gm/day

CHILD

80 to 100 mg/kg body wt in 5 to 6 divided dose

BRAND NAME

- Alpyrin
- Asicom
- Codopyrin
- Prin
- Sprin
- zosprin

CONTRA INDICATION

1. Gastric and duodenal ulcer
2. Hepatic disease
3. Renal disease
4. Bleeding diathesis pt on anticoagulant therapy
5. Children <12 yr
6. Bronchial asthma

SIDE EFFECT

1. Epigastric distress
2. Nausea
3. Vomiting’
4. Tinnitus
5. Vertigo
6. Hypersensitivity
7. breathlessness

REYE'S SYNDROM

- **CAUSE**

Cause of the Reye's syndrome remains mystery. Bt
Study have shown that using aspirin or Salicylate
Containing medication to treat viral illness
Increased the risk of developing Reye's syndrome

CLINICAL FEATURE

- It affects all the organ of the body. But most

Harmful to brain , liver causing increased pressure

Within the brain and massive accumulation of fat

In the liver

- It is a 2 phase illness because it generally occur

In conjunction with previous viral infection , such

As flu , chicken pox,

SYMPTOMS

1. Vomiting
2. Listlessness
3. Irritability
4. Confusion
5. Convulsion
6. Combativeness
7. Loss of consciousness

TREATMENT

it is primarily aimed at protecting the brain against Irreversible damage by reducing swelling , Reversing metabolic injury , preventing Complication in lungs

- Hypertonic IV glucose solution prevent progression of the disease

COMBINATION THERAPY OF PAIN

The combination of two analgesic drug which

Produce analgesia by different mechanism

Might be expected to produce additive effect

COMMON COMBINATION OF ANALGESIC

- Ibuprofen and paracetamol
- Diclofenac sodium and paracetamol
- Nimesulide and paracetamol
- Mefenamic acid and paracetamol

ANTIBIOTIC THERAPY FOR CHILDREN

The rationale for choice and use of antibiotic
Begins with the review of likely microorganism
Responsible for common orofacial infection

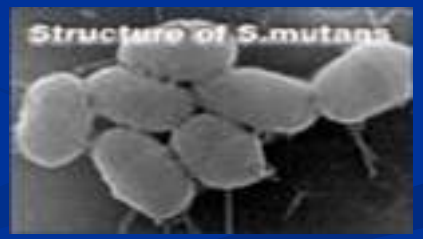
DEVELOPMENT OF ORAL MICROFLORA

- **Oral cavity is usually sterile at birth**
- Number of microorganism increase following 6 to 8hrs after birth
- At 12 months of age , most children have t microorganism in oral cavity

- **Streptococcus**

1. S.salivarious is the first oral streptococcus
2. S.mutans and S.sanguis are not established untill teeth erupt in oral cavity
3. S.mutans disappears when a full mouth extraction is done and again reappear with denture along with foloowing microorganism

- **staphylococcus**
- **Veillonela**
- **Actinomyces**
- **Lactobacilli**
- **Nocardia**
- **fusobacterium**



DOSE CALCULATION BY WEIGHT

- CLARK'S RULE

$$\frac{\text{child's weight in lbs}}{150} \times \text{Adults dose} = \text{child's dose}$$

- YOUNG'S RULE

$$\frac{\text{age of the child}}{\text{age} + 12} \times \text{Adults dose} = \text{child's dose}$$

- ANDERS IN 1992

$$\text{Dose of the child} = \text{dose of the adult} \times \frac{\text{weight of child}}{\text{weight of adult}}$$

COMMONLY USED ANTIBIOTIC

AMOXICILLIN

- CATEGORY – amino penicillin

- MECHANISM OF ACTION

  Interferes with the cell wall replication of susceptible organism , the cell wall rendered osmotically instable , stable and burst from osmotic pressure

DOSE

- **ADULT**

  250 to 500 mg every 2 hrs

- CHILD

  < 20 kg – 20 to 40 mg/kg/day

  > 20 kg – same as adult

- **CONTRAINDICATION**

1. Hypersensitivity to penicillin in neonates
2. Renal and hepatic disease
3. Infectious mononucleosis

SIDE EFFECT

1. Increased thirst
2. Nausea
3. Vomiting
4. Diarrhoea
5. Urticaria
6. Angio edema
7. Bronchospasm
8. anaphalaxis

BRAND NAME

- Allmox
- Amoxil
- Amoxyn
- Aristomox

AVAILABLE SYRUP

1. Amoxil
2. Amoxybid
3. Biomoxil
4. Dynamox
5. Erox
6. Glamoxin

- **DOSE**
  125 mg/5ml

- **AVAILABLE FORM**
  60ml

AMPICILLIN

- CATEGORY – Aminopenicillin

- MECHANISM OF ACTION

  Same as amoxicillin

- INTERACTION

  Effect of it reduces with tetracycline ,
  erythromycin . Probenecid increase blood level

DOSE

- ADULT

  250 to 500 mg tid – qid

- CHILD

  post operative 50 to 100 mg/kg/day in

  4 divided dose

BRAND NAME

1. Ampilin
2. Ampicyn
3. Neocillin
4. Nepocil
5. campicillin

AVAILABLE SYRUP

1. Ampillin
2. Aristocillin
3. Biocillin

- **DOSE**

  125mg/5ml

- **AVAILABLE FORM**

  30 ml

- **CONTRAINDICATION**

Renal failure

- **ADVERSE EFFECT**

1. Superinfection
2. Urticaria
3. Diarrhoea

COTRIMOXAZOLE

- **MECHANISM OF ACTION**

  it is a combination of sulfamethoxazole and trimethoprim. sulfamethoxazole interferes with bacterial biosynthesis of protein by competitive antagonism of PABA , trimethoprim blocks synthesis of tetrahydrofolic acid , this combination-on blocks 2 conservative synthesis of nucleic acid , protein

- **DOSE**

ADULT

(Trimethoprim 80 mg , sulfamethoxazole 400mg) 2 tab bid

CHILD

6 month to 5 yrs – (Trim 20mg , sulf 100 mg) 2 tab bid

6 to 12 yrs – 1 tab bid

- **ITERACTION**

- Enhancement of renal failure with cyclosporin

- **CONTRAINDICATION**

1. Pregnancy
2. Lactation
3. Child below 2 month
4. Hyper sensitivity
5. Megaloblastic anemia

SIDE EFFECTS

1. Candidiasis
2. Steven Johnson syndrome
3. SLE
4. Nausea
5. Vomiting
6. Leukopenia
7. Agranulocytosis

BRNDS NAME

- Alcorim
- Timilol
- colizole

ERYTROMYCIN

- MECHANISM OF ACTION

  Binds to SDS ribosomal unit of susceptible bacteria and suppresses protein synthesis

- CATEGORY

  macrolide antibiotic

DOSE

- ADULT

  1 gm/ day bid or qid

- CHILD

  30 to 50mg /kg/day in 3 to 4 divided dose

BRANDS NAME

- Althrocin
- Eltocin
- Etomin

AVAILABLE SYRUP

1. Eroate
2. Erythrokem

- **DOSE**

  125mg/5ml

- **AVAILABLE FORM**

  60ml

3. Erymer
4. Thromycin

- **DOSE**

  125mg/5ml

- **AVAILABLE FORM**

  30ml

- **INTERACTION**

Theophyllin reduces plasma concentration of erythromycin. It increase serum digoxin level

- **CONTRAINDICATION**

1. Ranal disease
2. Hepatic disease
3. History of jaundice
4. Cholestatic hepatitis

SIDE EFFECT

1. Candidiasis
2. Rash
3. Urticaria
4. Prurits
5. Hypersensitivity
6. Nausea
7. Vomiting
8. Hepato toxicity
9. Abdominal pain

METRONIDAZOLE

- **CATEGORY** – Nitromidazole

- **MECHANISM OF ACTION**

  In anaerobia microorganism it is converted to active form by reduction of its nitro group this get bound to DNA and prevent nucleic acid formation

DOSE

ADULT

2 gm daily for 3 days

CHILD

5 mg/kg/day in 2 divided dose for 5 to 7 days

BRANDS NAME

- Flagyl
- Metrogyl
- Aristogyl
- Aldezole

CONTRAINDICATION

1. Hypersensitivity to this drug
2. Renal disease
3. Pregnancy
4. Lactation
5. Hepatic disease
6. Alcoholic patient

SIDE EFFECT

1. Dry mouth
2. Furry tongue
3. Bitter taste
4. Metallic taste
5. Leukopenia
6. Bone marrow aplasia
7. Urticaria
8. Nausea
9. Vomiting
10. Abdominal pain

COMBINATION OF DRUGS

AMOXICILLIN + CLOXACILLIN

- CATEGORY

  Aminopenicillin + penicillinase resistant penicillin

- MECHANISM OF ACTION

  Same as amoxicillin

- **DOSE**

  50 to 100 mg/kg/body wt in 3 divided dose

- **INTERACTION**

  failure of oral contraceptive , it loses its potency in presence of erythromycin , gentamycin , oxy-tetracycline. Sulfonamide and aspirin inhibit serum protein binding of cloxacillin

,

CONTRAINDICATION

- Allergy to penicillin
- Infectious mononucleosis
- Neonates with jaundice

SIDE EFFECT

1. Increased thrust
2. Nausea
3. Vomiting
4. Pruritis
5. Urticaria
6. Bronchospasm
7. anaphylaxis

AMOXICILLIN +CLAVULANATE POTTASIUM

- **MECHANISM OF ACTION**

Interferes with the cell wall replication of Susceptible organism , the cell wall rendered Osmotically unstable , swells and bursts from Osmotic pressure

- **DOSE**

Per oral 20 to 40 mg/kg/day in 3 divided dose

- CONTRAINDICATION

Hypersensitivity to penicillin in neonates

- SIDE EFFECT

1. Discolored tongue
2. Glossitis
3. Increased thrust
4. Nausea
5. Vomiting
6. Pruritis
7. bronchospasm

ANTIBIOTIC PROPHYLAXIS FOR INFECTIVE ENDOCARDITIS

DRUG	ORAL DOSE
AMOXICILLIN	50 mg/kg/hr prior to procedure and 25mg/kg 6hr after initial dose
ERYTHROMYCIN	20mg/kg /hr prior to procedure and 10mg/kg 6hr after initial dose
CLINDAMYCIN	10mg/kg/hr prior to procedure and 5mg/kg 6 hr after initial dose

NEWER ANTIBIOTICS

FOURTH GENERATION CEPHALOSPORIN

- CEFEPIME

Cefepime has displayed in vitro activity against gram-positive organisms including *Streptococcus pneumoniae*, *Streptococcus pyogenes*, and penicillin-susceptible Staphylococcus aureus.2-4> Cefepime's demonstrated activity against staphylococci is similar to cefotaxime and cefoperazone, but greater than ceftazidime.3> However, cefepime was not active against methicillin-resistant *S. aureus* or enterococcus.2-4 *S. faecalis* has also shown resistance to cefepime.3>

- TRADE NAME : MEXIPIME

- MECHANISM OF ACTION

it inhibit bacterial cell wall synthesis

- DOSE

1. < 2 month : 30mg/kg every 8 hr
2. 2 month to 12 year : 50mg/kg every 8 hr

SIDE EFFECT

1. Nausea
2. Vomiting
3. Diarrhea
4. Abdominal pain
5. Redness of skin
6. Heart burn

OXAZOLIDINONE ANTIBIOTICS

- **MECHANISM OF ACTION**

  Oxazolidinone antibiotics, including linezolid, inhibit bacterial protein translation through a unique mechanism. Linezolid binds to the 23S subunit of the bacterial 50S ribosome. In doing so, the antibiotic blocks formation of the 70S translation initiation complex. Not surprisingly, no clinical strains that have 23S rRNA mutations have shown linezolid resistance in vitro.

SPECTRUM OF ACTION

- linezolid is bacteriostatic for staphylococci and enterococci, but is bactericidal for streptococci. Linezolid has activity against methicillin-sensitive and -resistant strains of *S aureus* and reportedly is active even against glycopeptide-intermediate and -resistant *S aureus* strains.

SIDE EFFECT

1. Rash
2. Headache
3. Stomach upset
4. Nausea
5. Vomiting
6. Decreased blood cell count

CARBAPENEM ANTIBIOTICS

- Carbapenems are beta-lactam antibiotics that have broad-spectrum aerobic and anaerobic activity. Like other beta-lactam antibiotics, they exert an antibacterial effect by binding penicillin-binding proteins, thereby disrupting bacterial cell wall synthesis. Because imipenem is rapidly degraded by renal proximal tubule dipeptidases, it is marketed in combination with the dipeptidase inhibitor cilastatin. Meropenem is stable to renal dipeptidases and requires no cilastatin.

SPETRUM OF ACTIVITY

- In adults and older children, imipenem and meropenem have been used extensively for treatment of a wide variety of infections, most notably intra-abdominal, ,lower respiratory tract, and urinary tract. These clinical uses, particularly in mixed and highly resistant infections, reflect the broad-spectrum activity of carbapenems against important clinical pathogens. Imipenem and meropenem have excellent in vitro activity against streptococci (including *S pyogenes*, *S agalactiae*, and viridans group streptococci), enterococci, pneumococci, and methicillin-susceptible (but not methicillin-resistant) staphylococci.

IMIPENEM

MECHANISM OF ACTION

It inhibit bacterial wall synthesis

DOSE

1omg /kg or 25 mg/kg , not to exceed 5oo mg

SIDE EFFECT

1. Rash
2. Diarrhea
3. Vomiting
4. Siezure
5. Dizziness
6. Fever
7. urticaria

MEROPENEM

- **DOSE** :

  - 3month : 24 or 40 mg/kg every 8 hr

  - **SIDE EFFECT**

1. Indigestion
2. Constipation
3. Dry mouth
4. headache

NEWER ANTIBIOTIC FOR SERIOUS GRAM POSITIVE INFECTION

1. **DAPTOMYCIN**

It is effective against only gram positive micro-Organism

- **MECHANISMOF ACTION**

It has bactericidal effect

- **DOSE**

ADULT : 4mg/kg

SIDE EFFECT

1. Skeletal myopathy
2. Rhabdomyolysis
3. Vomiting]
4. nausea

2 . ***TIGECYCLINE***

It is effective against multidrug resistant gram Positive organism

- MECHANISM OF ACTION

It inhibit protein synthesis needed for growth and Multiplication of bacteria

- DOSE

ADULT: IV 100 mg followed by 5omg 12 hr

CHILD : 100mg

SIDE EFFECT

1. Tooth discoloration
2. Nausea
3. Vomiting
4. Decreased heart rate