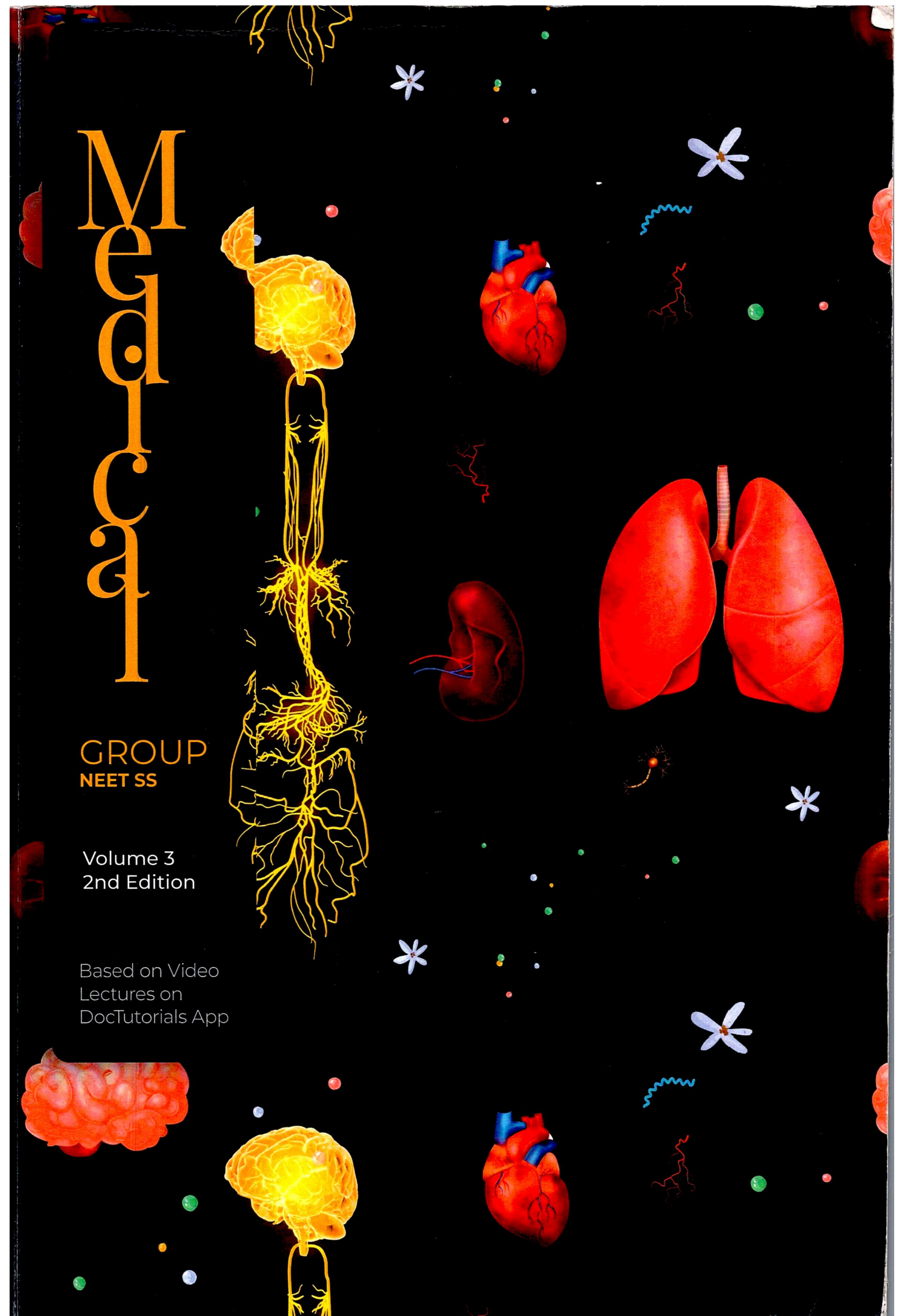
Medical

GROUP
NEET SS

Volume 3
2nd Edition

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ANTIBIOTICS- 1

Beta lactam Antibiotics 00:00:23

- Include Penicillins, Cephalosporins, Carbapenems and Monobactams (Aztreonam)
- Inhibits Peptidoglycan synthesis (cell wall) by inhibiting PBPs.

Penicillin's 00:01:45

1. Natural Penicillin's
2. Anti- staphylococcal Penicillin's- Cloxacillin, Nafcillin, Oxacillin, Methicillin (Not used now d/t risk of Interstitial nephritis)
3. Amino Penicillin's- Amoxicillin, Ampicillin
4. Anti-Pseudomonal Penicillin's (Broad spectrum)- Piperacillin, Ticarcillin

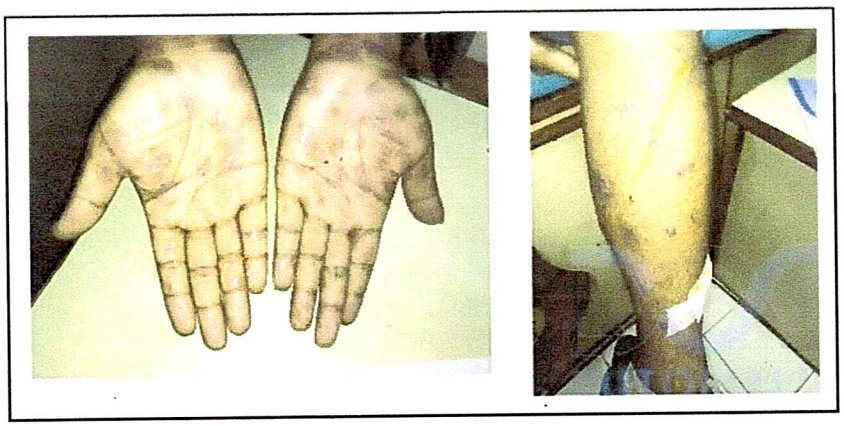
- Natural Penicillin's
  1. Benzyl Penicillin (Penicillin G)
  2. Procaine Penicillin
  3. Benzathine Penicillin- Longest acting, IM depot injections



Cellulitis

Proposed Case Definition for the Streptococcal Toxic Shock Syndrome [a]
I. Isolation of group A streptococci (Streptococcus pyogenes)
A. From a normally sterile site
B. From a nonsterile site
II. Clinical signs of severity
A. Hypotension and
B. ≥2 of the following signs
1. Renal impairment
2. Coagulopathy
3. Liver function impairment
4. Adult respiratory distress syndrome
5. A generalized erythematous macular rash that may desquamate
6. Soft tissue necrosis, including necrotizing fasciitis or myositis; or gangrene

- DOC: Inj Benzyl Penicillin + Clindamycin + IVIg
- A 47-year-old male patient presented with c/o maculopapular lesions all over the body

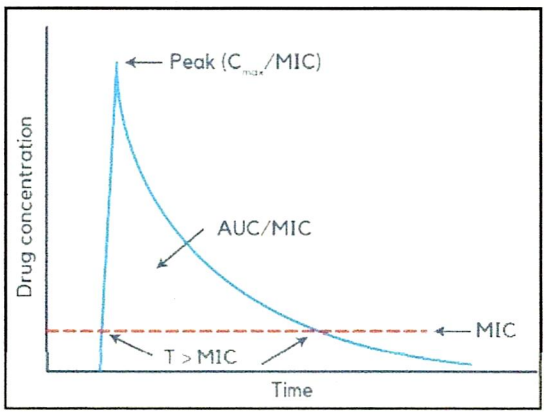


- VDRL- 1:128
- TPHA- Positive
- No neurological S/S

- Treatment of Secondary Syphilis- Benzathine Penicillin 2.4 MU IM single dose
- Treatment of Tertiary Syphilis and Late Latent Syphilis- Benzathine Penicillin 2.4 MU IM once weekly for 3 weeks
- A 46-year-old HIV patient presented with complaints of headache and vomiting. His CD4 count is 113cells /muL His serum VDRL is positive (1:64).
  - CSF:
  - TLC - 64cells /muL
  - DC - L100
  - Protein - 88mg / dL
  - Sugar - 60mg / dL
  - VDRL – Positive
- Treatment of Neurosyphilis- Crystalline Penicillin

Recommendations for the Treatment of Syphilis

STAGE OF SYPHILIS	PATIENTS WITHOUT PENICILLIN ALLERGY	PATIENTS WITH CONFIRMED PENICILLIN ALLERGY
Primary, secondary, or early latent	CSF normal or not examined: Penicillin G benzathine (single dose of 2.4 mU IM) CSF abnormal: Treat as neurosyphilis.	CSF normal or not examined: Tetracycline HCl (500 mg PO qid) or doxycycline (100 mg PO bid) for 2 weeks CSF abnormal: Treat as neurosyphilis.
Late latent (or latent of unknown duration), cardiovascular, or benign tertiary	CSF normal or not examined: Penicillin G benzathine (2.4 mU IM weekly for 3 weeks) CSF abnormal: Treat as neurosyphilis.	CSF normal and patient not infected with HIV: Tetracycline HCl (500 mg PO qid) or doxycycline (100 mg PO bid) for 4 weeks CSF normal and patient infected with HIV: Desensitize and treat with penicillin if compliance cannot be assured. CSF abnormal: Treat as neurosyphilis.
Neurosyphilis (asymptomatic or symptomatic)	Aqueous crystalline penicillin G (18-24 mU/d IN, given as 3-4 mU q4h or continuous infusion) for 10-14 days or Aqueous procaine penicillin G (2.4 mU/d IM) plus oral probenecid (500 mg qid), both for 10-14 days	Desensitize and treat with penicillin.
Syphilis in pregnancy	According to stage	Desensitize and treat with penicillin.

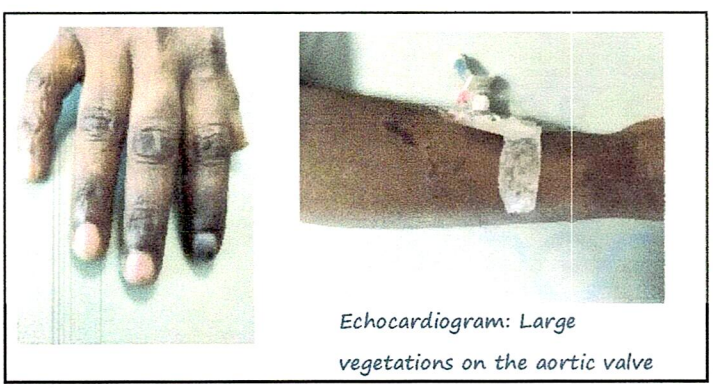


- Uses of Penicillin's:
  1. S. pyogenes
  2. Syphilis
  3. Leptospirosis
  4. Strep Infections- IE
  5. Actinomycosis

  Drug Parameters
- Side effects:
  1. Allergic reactions (0.05%) – IgE mediated- Urticaria, Wheeze, Anaphylaxis
- Syphilis patient mentioned before was started on Inj. Benzathine Penicillin. 6 hours after the injection the patient developed fever with chills and myalgia. His heart rate was 120 /bpm and BP was 100/60 mm Hg. Respiratory rate was 34 / cpm
- What is your diagnosis?
  2. Jarish Herxheimer reaction: 50% of Primary Syphilis, 90% of Secondary Syphilis
  3. Interstitial Nephritis- Fever, Rash, Myalgia, Eosinophilia, Hematuria and Proteinuria
  4. Neurotoxicity- Max for Imipenem and Cefepime → Seizure
  5. Cytopenia's
- Anti-Staphylococcal Penicillin's
  1. Methicillin
  2. Cloxacillin
  3. Oxacillin
  4. Nafcillin
  5. Dicloxacillin
  6. Flucloxacillin
- MSSA = OSSA = FCSSA

Case:

- A 48-year-old female patient presented with complaints of fever for 3 weeks duration and progressive shortness of breath
- O/E: She had an early diastolic murmur in the second aortic area



Echocardiogram: Large vegetations on the aortic valve

Ans:

- MSSA Bacteremia- Cloxacillin / Flucloxacillin
- First generation Cephalosporin- i/v Cefazolin

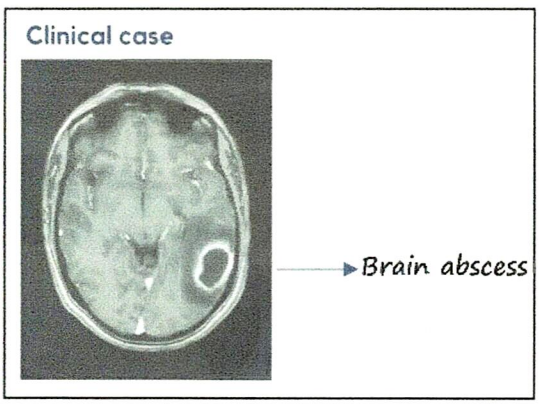
CASE

- Look at the below blood culture
- Blood culture

Staphylococcus aureus	
Penicillin	R
Methicillin	S
Clindamycin	S
Tetracycline	S
Cotrimoxazole	S
Vancomycin	S
Teicoplanin	S
Linezolid	S
Daptomycin	S

Ans:

- MSSA Bacteremia- Cloxacillin / Flucloxacillin
- First generation Cephalosporin- i/v Cefazolin



Treatment for the above condition:

- Meningitis or Brain abscess→ As adequate CNS penetration is required Cefazolin is not recommended
- Cloxacillin/Flucloxacillin is recommended
- Look at the below blood culture

Bacteraemic: Blood culture

Staphylococcus aureus	
Penicillin	R
Methicillin	S
Clindamycin	S
Tetracycline	S
Cotrimoxazole	S
Vancomycin	S
Teicoplanin	S
Linezolid	S
Daptomycin	S

- Will you use Vancomycin?
  Ans: when MSSA is seen Beta lactams are preferred like cloxacillin
- Vancomycin is inferior for treatment of MSSA

Aminopenicillins:

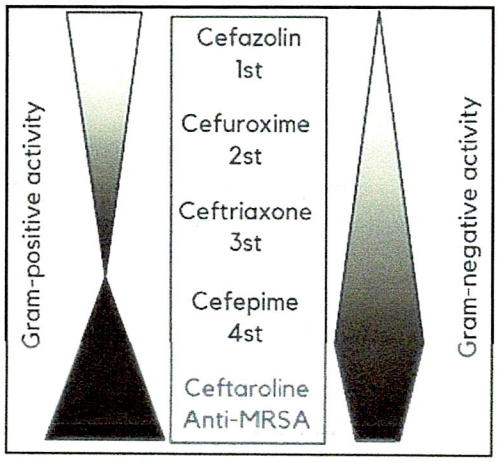
- Ampicillin and Amoxicillin

CASE

- A 71-year-old male, known case of Aortic Stenosis presented with low grade fever x 2 weeks duration.
  - CVS: ESM in the aortic area
  - Echo: Small vegetations on the aortic valve

Blood culture

Enterococcus faecalis (4/4)	
Ampicillin	Sensitive
Penicillin	sensitive
Vancomycin	sensitive
Teicoplanin	Sensitive
Linezolid	Sensitive
Gentamicin	Resistant

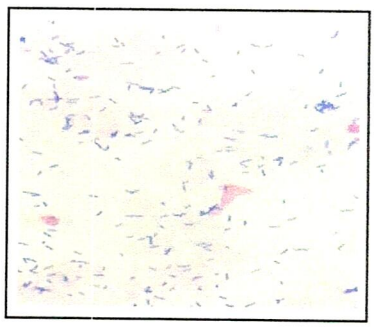


- Blood culture shows E. feacalis
- Enterococcus faecalis- Ampicillin sensitive →
  - Ampicillin + Gentamycin -low risk of Nephrotoxicity
  - Penicillin + Gentamycin
  - Ampicillin + Ceftriaxone
- Enterococcus Faecium
  - Ampicillin Resistant, sometimes Vancomycin Resistance (VRE)

CASE

- A 64-year-old, alcoholic patient presented with complaints of fever, headache and multiple episodes of vomiting. He also has one episode of generalized tonic-clonic seizures

CSF study	
Total cells	240/μL
DC	N70L30
Protein	110 mg/dL
Glucose	70 mg/dL



- Listeria monocytogenes- Can be associated with Brain stem (Rhombencephalitis)
- Ceftriaxone + Vancomycin + Ampicillin
- Ampicillin + Gentamycin

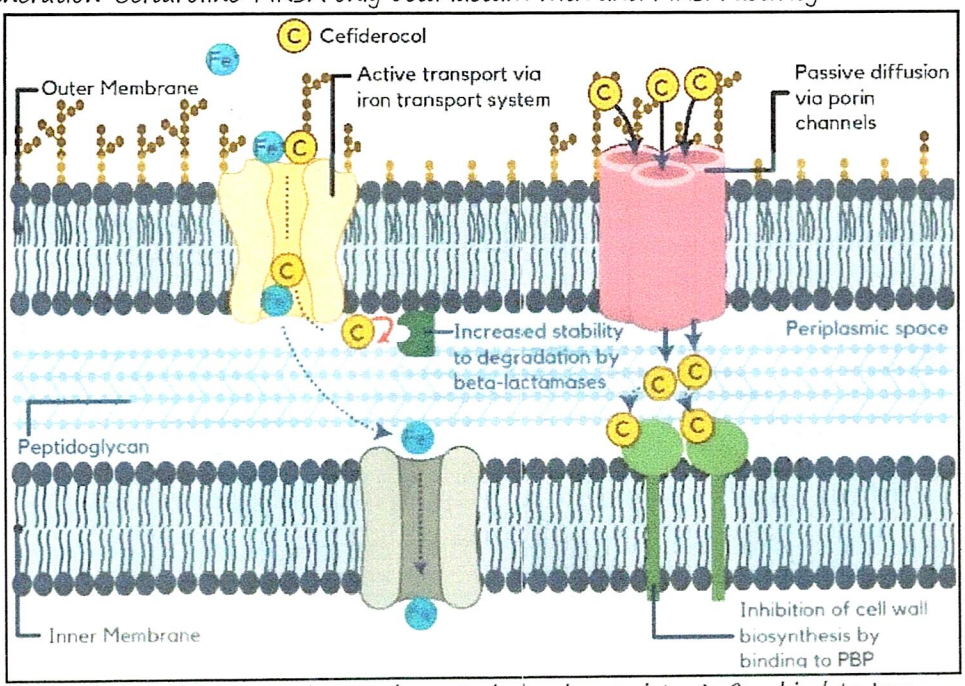
Cephalosporins

00:31:15

First generation	Second generation	Third generation	Fourth generation	Fifth generation
Cefazolin (IV) Cephalexin (PO) Cefadroxil (PO)	Cefuroxime Cefuroxime axetil (PO)	Ceftriaxone (IV) Cefotaxime (IV) Ceftazidime (IV) Cefoperazone (IV) Cefixime (PO) Cefpodoxime-proxetil (PO)	Cefepime (IV)	Ceftaroline (IV)

- 1st generation:
  - Cefazolin: MSSA, Surgical Prophylaxis
  - Inoculum effect
- 2nd Generation

- Slightly high gram-negative coverage compared to 1st generation like H. Influenza
- 3rd Generation IV forms -Pseudomonal Activity are Ceftazidime and Cefoperazone
- Without pseudomonal Activity-Ceftriaxone, Cefotaxime
  - Oral forms- Cefixime, Cefpodoxime-
- 4th generation: Gram Negative coverage -Pseudomonas-Neurotoxicity
- 5th generation-Ceftaroline-MRSA only beta lactam with anti MRSA activity



- Cefiderocol: Has beta lactam moiety and a catecholamine moiety → Can bind to Iron

Carbapenems

00:38:52

1. Meropenem
2. Imipenem- Cilastatin
3. Doripenem
4. Ertapenem- Has no action against P. aeruginosa and Acinetobacter baumanni
   - Long acting, once daily dosing
   - A 60 years old diabetic female was admitted with complaints of fever associated with chills and flank pain. Urine routine examination pyuria. HR: 90 /bpm, BP- 80 / 60 mm Hg.
   - Blood and Urine culture:
     - Ecoli
     - Ceftriaxone – Resistant → ESBL→ Treatment: Carbapenem
     - Piperacillin-Tazobactam - Sensitive
     - Ciprofloxacin - Resistant
     - Amikacin - Resistant
     - Meropenem - Sensitive
     - Ertapenem – Sensitive
   - A 68-year-old man with history of cerebrovascular accident was on urinary catheter for prolonged duration. He presented with fever associated with rigor and chills. Patient was in shock at presentation.
   - Blood and Urine CS:
   - Enterobacter cloacae
     - Ampicillin - Resistant
     - Ceftriaxone - Sensitive

- Piperacillin-Tazobactam - Sensitive
- Cefepime - Sensitive
- Ertapenem - Sensitive
- Meropenem – Sensitive

Drug of Choice?

- Inducible expression of Amp C genes → Certain bacteria on exposure to Penicillin/ Cephalosporins → Become resistant → DOC: Carbapenems
  1. Enterobacter cloacae
  2. Citrobacter freundii
  3. Klebsiella aerogens
  4. Serratia
  5. Providencia
  6. Indole positive Proteus

  DOC-Carbapenem
- Carbapenem Resistant bacteria: Via Carbapenamase enzyme production
  - Efflux pumps
  - Porin mutations

  Carabapenemase enzymes

A — KPC

B — Metallo Beta -lactamase (Zn)
- NDM
- VIM
- IMP

D — OXA-48 like

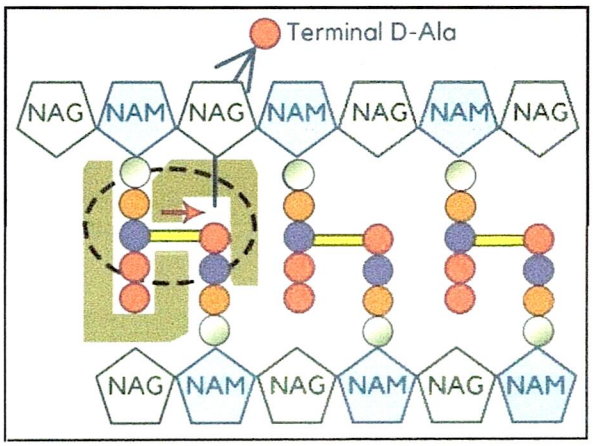
- KPC, OXA-48 - can be treated by a beta lactam+ Beta lactamase inhibitor
- Ceftazidime+ Avibactam
- Class B - metallo beta lactamses-we can add

Ceftazidime+ Avibactam + Aztreonam — Synergistic effect

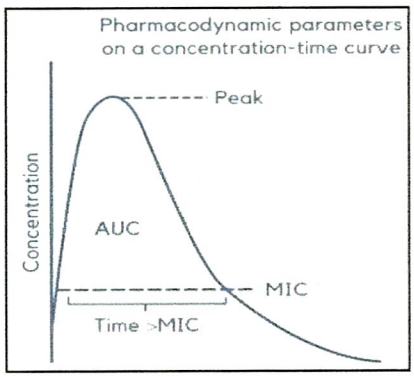
Agent	KPC-producer	NDM-producer	OXA-48-like-producer	Carbapenem-resistant Pseudomonas aeruginosa	Carbapenem-resistant Acinetobacter baumannii	Stenotrophomonas maltophilia
Aztreonam-avibactam						
Cefiderocol						
Ceftazidime-avibactam[1]						
Ceftolozane-tazobactam[1]						
Eravacycline[1,2]						
Fosfomycin (intravenous)						
Imipenem-relebactam[3]						
Meropenem-vaborbactam[1]						
Plazomicin[1,4]						
Polymyxin B[1,5] or Colistin[1,5]						
Tigecycline[1,2]						

ANTIBIOTICS- 2

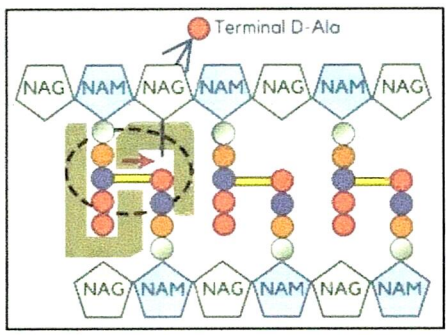
Vancomycin 00:00:18



- Treatment for MRSA
- Used in
  1. MRSA
  2. MR CONS
  3. Enterococcus
  4. S. pneumoniae
- A 21-year-old male patient presents with fever, headache and multiple episodes of vomiting.
  - O/ E: Neck stiffness +
  - CSF study
  - TC - 588cells / muL
  - DC - N90L10
  - Protein - 571mg / dL
  - Sugar - < 2mg / dL
  - Gram stain - No organisms
  - Culture - No growth
- Empirical treatment- Ceftriaxone + Vancomycin
- Strep pneumoniae- Ceftriaxone Resistant → Vancomycin
- Vancomycin requires TDM
- ADR:
  1. Red man syndrome → Vancomycin infusion reaction- Flushing, Erythema, Redness → especially when infusion is faster → stop the drug and antihistamines
  2. AKI



- Teicoplanin –
  - Advantages- Glycopeptide, can be given single daily dose, less AKI, less infusion reactions
  - Disadvantages- Costly, Poor CNS penetration, poor action at low doses
- Resistance to Glycopeptides:
  1. Enterococci
  2. S. aureus – VRSA is rare



Linezolid 00:13:35

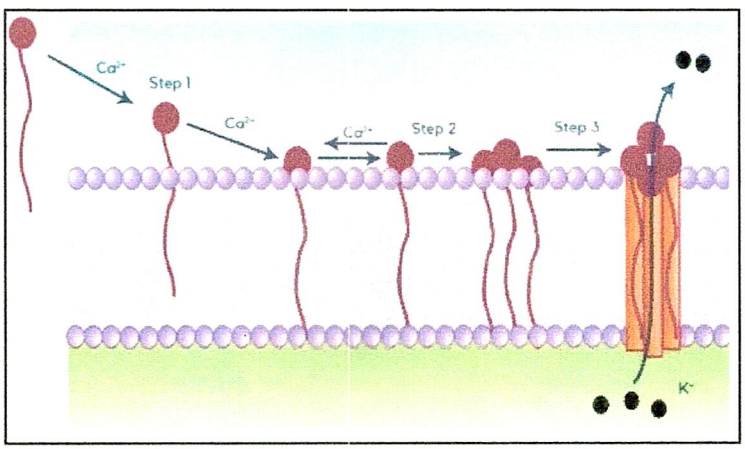
- Bacteriostatic antibiotic – Inhibiting 50s subunit of ribosome → Inhibits Protein synthesis
- Inhibit toxin release
- Use:
  1. MRSA / VISA
  2. VRE
  3. CONS
  4. Strep pneumonia
  5. Corynebacterium
  6. Bacillus

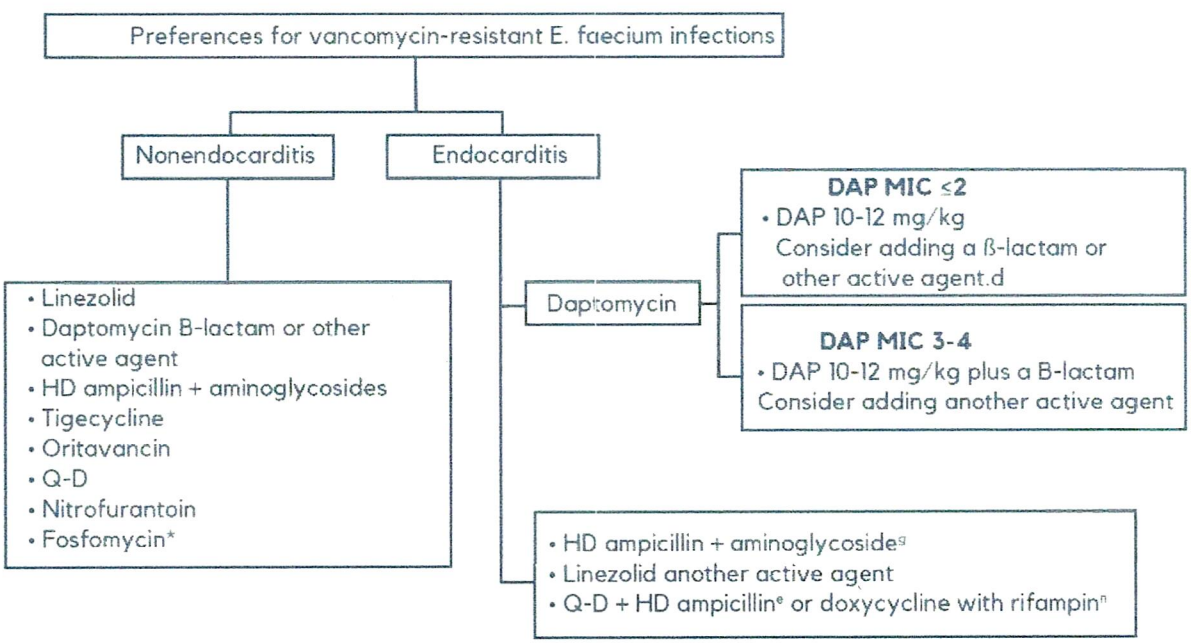
7. M. TB, NTM

- ADR:
  1. BM toxicity → Thrombocytopenia
  2. Peripheral neuropathy
  3. Optic neuritis (When used for Prolonged duration)
- A 48-year-old female patient was on treatment for depression. She developed a skin abscess for which she was started on Linezolid. 3 days later the patient presented with tremors and agitation. Her heart rate was 110/bpm, BP: 160/90 RR: 30 /min temperature: 38.9°C
- Neurologic examination: Generalized rigidity
  - Linezolid has MAO inhibitor effect
  - If combined with SSRIs / SNRIs → Serotonin syndrome

Daptomycin 00:18:05

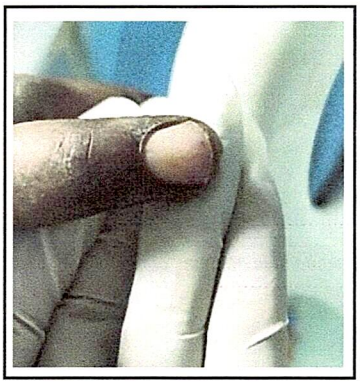
- Uses:
  1. DOC for VISA





- A 36-year-old female patient, with history of mitral regurgitation presented with complaints fever of two weeks duration. Echo showed a vegetation on the mitral valve
  - Staphylococcus aureus (4/4)
  - Penicillin - R
  - Methicillin - R
  - Clindamycin - S

- Tetracycline - S
- Cotrimoxazole - S
- Vancomycin - I
- Linezolid - S
- Daptomycin – S
- DOC- Daptomycin



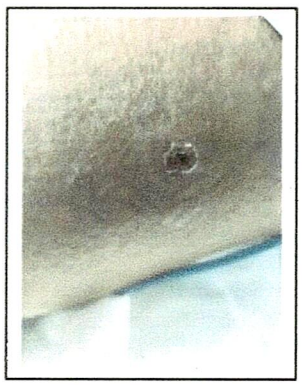
- Daptomycin is inhibited by alveolar surfactant → Not used in Pneumonia
- Poor CNS penetration → Cannot be used in Brain abscess or CNS infections
- ADR:
  1. Muscle toxicity- Monitor CPK
  2. Eosinophilic pneumonia

Clindamycin 00:22:00

- Inhibits Protein synthesis
- Inhibits Toxin production
- Staphylococcus TSS- Penicillin + Clindamycin + IVIG

Macrolides 00:23:30

- Erythromycin, Clarithromycin, Azithromycin
- Action against Gm positive and Gm negative organism and atypical organisms
- Inhibits 50s subunit of ribosome → Inhibits Protein synthesis
- ADR:
  1. QT Prolongation
  2. Activate intestinal motilin receptors → Diarrhea
- A 46-year-old male patient presented with fever for 8 days duration associated with headache and vomiting.
  - Blood
  - TLC - 11000 cells /µL
  - Hb - 13.4g /dL
  - PLC - 88000 cells /µL
  - Bilirubin - 1.1
  - ALT – 234 IU / L
  - AST – 187 IU / L
  - Creatinine - 0.9g / dL
  - Scrub typhus – DOC: Doxycycline



Tetracyclines 00:26:15

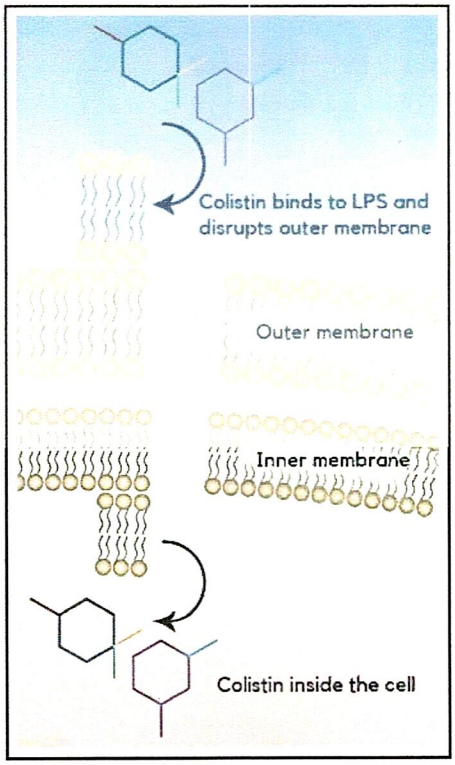
- Broad spectrum activity
  1. Clamydia
  2. Mycoplasma
  3. Legionella
  4. MRSA
  5. Brucella
- ADR:
  1. Gastric irritation
  2. In children- Tooth discoloration, Enamel hypoplasia → Avoid in children <8 years
- Tigecycline
  - Glycylcycline

- Broad spectrum Antibiotic
  1. S. aureus – MRSA
  2. VRE
  3. GNB- A baumannii, Enterobacter
  4. Anaerobic activity
  5. C. difficile
- Poor serum and urinary concentration → Not for bacteremia or UTIs
- ADR:
  1. Gastritis
  2. Increased mortality → Black box warning

Aminoglycosides 00:31:05

- Gentamicin/ Amikacin/ Streptomycin/ Tobramycin
- pH dependent → Poor action in low pH
- Action against: GNB
- Poor action against:
  1. GN anaerobes
  2. Burkholderia
  3. Stenotrophomonas
- Extended interval dosing → once daily dosing
  1. Concentration dependent killing
  2. Post antibiotic effect
  3. Less nephrotoxicity
- ADR:
  1. Nephrotoxicity- Gentamicin is the most nephrotoxic
  2. Ototoxicity

Polymyxins 00:36:20



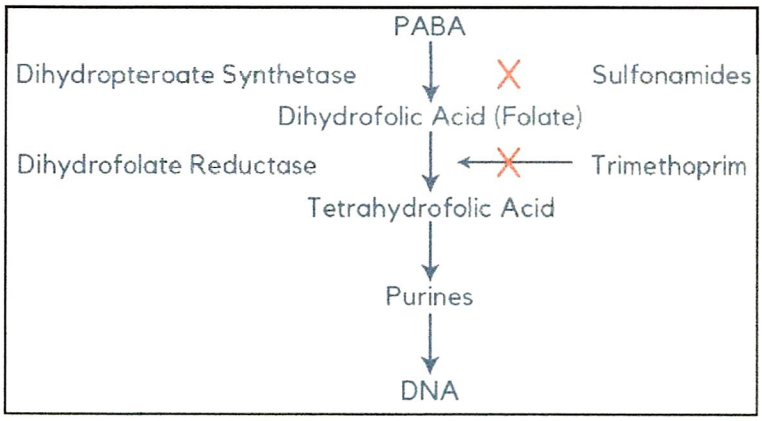
- Polymyxin B and Colistin (Polymyxin E)

Polymyxin B	Colistin (Polymyxin E)
Active drug	Pro drug: Colistimethate sodium → Colistin
Less Nephrotoxic	Less reliable serum concentration
Preferred to Colistin	Preferred in UTIs

- Used in MDR GN organisms

Cotrimoxazole 00:40:50

- Action against:
  1. S. aureus
  2. S. pneumonia
  3. GN Enterobacteria
  4. Nocardia
  5. Pneumocystis
- Drug reaction:
  1. SJS/ TEN
  2. Hyperkalemia
  3. Increase in Sr. Creatinine
  4. Folate deficiency
  5. Neonatal jaundice



Nitrofurantoin 00:45:10

- Urinary antibiotics
- Used in Acute Cystitis → High urine concentration
- Serum concentration Almost 0 → Not for Pyelonephritis
- For Acute cystitis:
  1. Nitrofurantoin
  2. TMP- SMX
  3. Oral Fosfomycin
- ADR:
  1. Acute Pulmonary reaction
  2. Hemolysis in G6PD deficiency – not used at term pregnancy