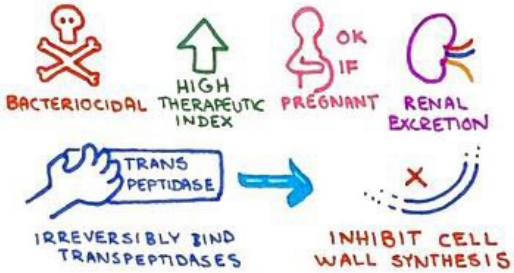
beta lactam abs



- **PENICILLINS**
  - **STANDARD** — PENICILLIN G, V — DENTAL INFECTION — GROUP A STREP, SYPHILIS, ACTINOMYCES, most MENINGOCOCCI
  - **ANTISTAPHYLOCOCCAL** — DICLOXACILLIN, OXACILLIN, NAFCILLIN — METHICILLIN-SUSCEPTIBLE STAPH AUREUS (MSSA)
  - **AMINOPENICILLIN** — AMOXICILLIN, AMPICILLIN — ENTEROCOCCAL ENDOCARDITIS — LISTERIA, E. FAECALIS, E. COLI, HEMOPHILUS
  - **ANTIPSEUDOMONAL** — PIPERACILLIN (+TAZOBACTAM)* TICARCILLIN — PSEUDOMONAS, ENTEROBACTER, BACTERDIDES FRAGILIS

- **CEPHALOSPORINS** — require dose adjustment in renal failure
  - **1ST GEN** CEFAZOLIN, CEPHALEXIN — GRAM ⊕ INFECTIONS, SKIN/SOFT TISSUE INFECTION — SURGICAL PROPHYLAXIS
  - **2ND GEN** CEFOXITIN, CEFACLOR, CEFUROXIME — SINUSITIS, OTITIS — furry (angry fox w/ ear + sinus infections)
  - **3RD GEN** CEFTRIAXONE, CEFOTAXIME, CEFTAZIDIME — not excreted through kidney!* — MENINGITIS, PNEUMONIA, GONORRHEA, SEPSIS — EMPIRIC THERAPY FOR BACTERIAL MENINGITIS — PENETRATE CSF
  - **4TH GEN** CEFEPIME — broad-spectrum especially gram⊖, PSEUDOMONAS — BROAD POTENT (NOSOCOMIAL)
  - **5TH GEN** CEFTAROLINE — ~~BROAD-SPECTRUM~~, MRSA ONLY

- **CARBAPENEMS** "-PENEM"S — LIFE-THREATENING/RESISTANT INFECTIONS
  - IMIPENEM - RISK OF SEIZURES
  - MEROPENEM - less risk of seizures
  - ERTAPENEM - no pseudomonas activity!

- **MONOBACTAMS** AZTREONAM — AEROBIC/FACULTATIVE ANAEROBIC GRAM⊖ ONLY; IF ALLERGIC TO PENICILLIN e.g. PSEUDOMONAS — NO CROSS-REACTIVITY WITH PENICILLINS → SAFE IN ALLERGIC PTS!

RESISTANCE

- EXPRESS BETA LACTAMASES
- ALTER PENICILLIN-BINDING PROTEINS
- BARRIER e.g. gram⊖ outer membrane

BETA LACTAMASE INHIBITORS

- * CLAVULANIC ACID
- * SULBACTAM
- * TAZOBACTAM

[EXTEND THE SPECTRUM OF PENICILLINS] [+COVERAGE FOR ANAEROBES]

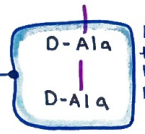
- AUGMENTIN = AMOXICILLIN + CLAVULANATE
- UNASYN = AMPICILLIN + SULBACTAM
- TIMENTIN = TICARCILLIN + CLAVULANATE
- ZOSYN = PIPERACILLIN + TAZOBACTAM

ADVERSE EFFECTS

- ALLERGIC RXN (rash, anaphylaxis)
- CNS TOXICITY (seizure, altered mental status)
- HEMATOLOGIC (↓ WBC/platelets)

glycopeptides

VANCOMYCIN also inhibits cell wall synthesis, but by a different mechanism than β lactams



binds to terminal two D-Alanine residues, hinders elongation of peptidoglycan

Active against **GRAM POSITIVES** only

- use for multidrug-resistant gram positives — MRSA, Coag-neg staph (CONS); amp-resistant enterococci; pen-resistant S. pneumoniae (PRSP)
- alternative for β-lactam-allergic pts — soft tissue/skin infection, bacteremia, endocarditis, osteomyelitis, pneumonia
- not absorbed orally → stays in the gut → give **ORALLY** for **C. DIFFICILE**
- to be truly **BROAD-SPECTRUM** add **CEFEPIME FOR GRAM NEGATIVES**

* USE THIS IF YOU'VE GOT A MYSTERY STAPH INFECTION — COULD BE MRSA, CoNS... *

Excreted by the kidney → dose adjustment needed → monitor TROUGH serum levels

- infuse too rapidly ---→ **PATIENT FLUSHES (RED MAN SYNDROME)** (this is not an allergic reaction) → slow the infusion rate!
- watch for nephrotoxicity

Other Adverse Effects

- ototoxicity → ask "can you hear me?"
- hematologic: neutropenia ? thrombocytopenia

also **BACITRACIN**

"Line Solid"

LINEZOLID bind 50S ribosome → inhibit protein synthesis (bacteriostatic)

RESERVE for RESISTANT GRAM POSITIVES - MRSA, PRSP, VRE, CoNS

└ MRSA bacteremia, hospital-acquired pneumonia, skin/soft tissue infections (SSTI); serious VRE infections

$$$ very expensive

CAUTION: weak MAOI → use with SSRIs can cause SEROTONIN RELEASE SYNDROME

Other Adverse Effects: thrombocytopenia, headache, lactic acidosis, neuropathy (peripheral, optic)

DAPTOMYCIN rapidly depolarizes bacterial cell membranes (bactericidal)

Also for GRAM POSITIVES only — MRSA, MSSA, VRE, CoNS, JK Corynebacteria

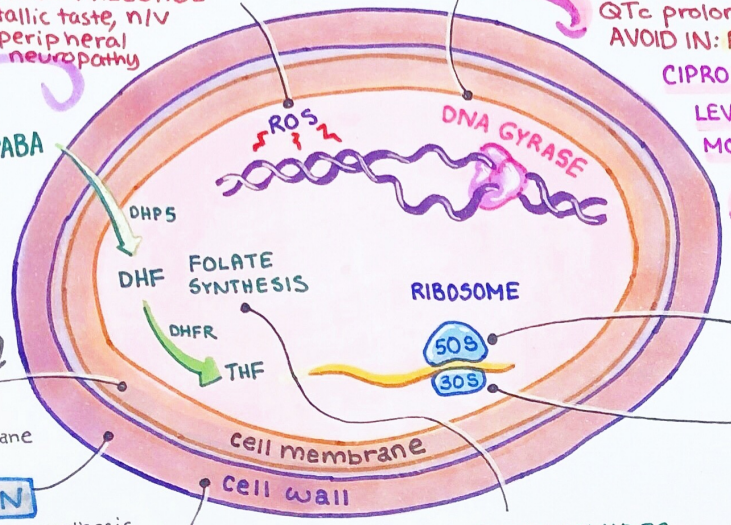
APPROVED for MRSA, MSSA bacteremia, R-side endocarditis, complicated SST I

NOTE: INACTIVATED by ALVEOLAR SURFACTANT → *don't use for pneumonia!*

ADVERSE EFFECTS: MYALGIA, weakness, monitor rise in CK, neuropathy

METRONIDAZOLE
- reduced by nitroreductase to toxic metabolites
- BACTERIOCIDAL and ANTIPARASITIC
- PRO: good ORAL absorption → high serum levels
  - enters CSF • BRAIN
- ACTIVE vs. parasites and anaerobes
  - ... clostridium difficile colitis, brain abscess, vaginosis, giardia, trichomonas, amoeba ...
- ⚠ DON'T DRINK ALCOHOL
- CONS: metallic taste, n/v seizures, peripheral neuropathy

FLUOROQUINOLONES
- inhibit bacterial DNA gyrase, topoisomerase IV
- BACTERIOCIDAL RENAL EXCRETION
- RESISTANCE: ALTERED DNA GYRASE, ↓PERMEABILITY
- PROS: HIGH levels via oral route, enters prostate
- CAUTION: do not take w/ antacids, iron ⚠
- CONS: arthropathy, tendonitis/tendon rupture
  - CNS: insomnia, delirium, seizures
  - QTc prolongation
- AVOID IN: Pregnancy, Kids, simple infections!
- CIPROFLOXACIN gram − UTI, prostatitis, anthrax, diarrhea
- LEVOFLOXACIN + MOXIFLOXACIN gram + bronchitis, C.A. pneumonia



MACROLIDES
- reversibly bind 50S BACTERIOSTATIC
- METABOLIZED IN LIVER → INHIBIT CYP450 → DRUG INTERACTIONS ⚠
- ACTIVE vs. C.A. Pneumonia, STIs (chlamydia, chancroid) Bartonella, Pertussis MAC (mycobacterium avian complex)

- CONS: GI motility, N/D
  - QTc prolongation
  - AZITHROMYCIN (best tolerated)
  - CLARITHROMYCIN
  - ERYTHROMYCIN

LINEZOLID | COVERED ELSEWHERE

CLINDAMYCIN
- similar to macrolides except...
- ACTIVE vs. gram ⊕, anaerobes
- Inhibits toxin synthesis → Tx T.S.S.
- CON: C. difficile colitis high risk

PROTEIN SYNTHESIS INHIBITORS

50S SUBUNIT

30S SUBUNIT

AMINOGLYCOSIDES
- BACTERIOCIDAL RENAL EXCRETION
- irreversibly bind 30S
- RESISTANCE: INACTIVATING ENZYMES
- NARROW therapeutic index
- CONS: NEPHROTOXIC, OTOTOXIC
- ACTIVE vs. gram ⊖, staph, mycobacteria
- TX via PARENTERALLY (IV or IM)
  - GENTAMICIN — synergy with penicillin, vancomycin for enterococcal endocarditis
  - STREPTOMYCIN — used for TB
  - AMIKACIN — reserved for resistant gram negatives

TETRACYCLINES
- BACTERIOSTATIC GUT EXCRETION
- reversibly bind 30S
- RESISTANCE: ↓INFLUX, ↑EFFLUX
- ACTIVE vs. rickettsia, Lyme disease, C.A. pneumonia, STIs esp chlamydia, malaria, amoebiasis
- CONS: n/v/d, photosensitivity/bronzing, vertigo
  - kids: ↓bone growth (<8yo)
  - crosses placenta → X in pregnant
- DOXYCYCLINE, MINOCYCLINE

COVERED ELSEWHERE
DAPTOMYCIN
depolarizes cell membrane

VANCOMYCIN
affects peptidoglycan synthesis

BETA LACTAMS
affects peptidoglycan cross-linking

SULFONAMIDES
TRIMETHOPRIM-SULFAMETHOXAZOLE
aka TMP-SMX aka BACTRIM
- BACTERIOCIDAL
- RESISTANCE: ↑PABA, ↓DHPS
- ⚠ CAUTION: RESISTANCE due to OVERUSE
- USED vs: PJP/pneumocystis, toxoplasmosis, nocardia, UTI, prostatitis, CA MRSA, *stenotrophomonas*
- CONS: rash, stevens-Johnson, hemolytic anemia in G6PD def. pt. leukopenia, nausea

SAI

CYCLE-WHEEL

CAUTION: ANTIBIOTICS
CAUTION CAUTION CAUTI