**Beta Lactams**

* Penicillins bind and inhibit Penicillin Binding Proteins (PBP) to prevent crosslinking
  + Ligases, Mur A, Pyrophosphatases, Penicillin Binding Proteins (PBP)
* Resistance to penicillins develops quickly due to  β-lactamases or PBP mutations
  + β-lactamases, acid-base condition changes, alteration of side chains
* Clavulanic acid, Sulbactam, and Tazobactam are all examples of β-lactamase inhibitors
  + Inducers, inhibitors, producers
* Cilastatin is combined with imipenem to avoid degradation in the kidney
  + Polymixin, colistin, cilastatin, clavulanic acid
* Carbapenem resistant Enterobacteriaceae (CRE) can be treated with polymixin and colistin
  + Cilastatin, clavulanic acid, sulbactam, colistin
* Carbapenems cannot be combined with aminoglycosides
  + Tetracyclines, other beta lactams, aminoglycosides, macrolides
* Cephalosporins are inherently less active than Penicillins but are more resistant to β-lactamases
  + First drop down: less, more
  + Second drop down: less, more
* Cephalosporins substituted with a MTT group can extend the spectrum but also cause side effects such as hypothrombocytopenia and Disulfiram-like effect
  + First drop down: amide, imine, MTT group, ester, sulfa group
  + Second drop down: hemolytic anemia, thrombocytosis, hypothrombocytopenia, leukopenia
* Monobactams are mostly reserved for serious Gram-negative infections such as meningitis
  + Carbapenems, Beta Lactams, Aminoglycosides, Monobactams
* Aztreonam is an inhalent to treat chronic pseudomonas infections with CF patients, has activity against pseudomonas because it has the same side chain as ceftazidine
  + First drop down: Imipenem, Azteronam, Meropenem, Ertapenem
  + Second drop down: Cefixime, ceftaxime, cephalexin, ceftazidine