

Penicillins

I. Medications

- a. Penicillin
- b. Dicloxacillin
- c. Nafcillin
- d. Oxacillin
- e. Amoxicillin
- f. Ampicillin
- g. Amoxicillin/Clavulanic Acid
- h. Ampicillin/Sulbactam
- i. Piperacillin/Tazobactam
- j. Ticarcillin/Clavulanic Acid

II. Mechanism

- a. Cell wall inhibitor
 - i. Inhibits transpeptidation
- b. Inactivation of penicillin binding proteins (PBPs)
 - i. Binding causes morphologic changes, weakening cell wall
- c. Autolysins
 - i. Produced by bacteria, degrade cell wall in absence of new construction

III. Resistance

- a. Beta-lactamase
 - i. Hydrolyzes beta-lactam ring
- b. ↓Drug penetration
- c. Efflux pumps
- d. Modified PBPs

IV. Adverse Effects

- a. Nephritis
- b. Neurotoxicity
- c. Hypersensitivity

Cephalosporins

I. 1st Generation

- a. Cefazolin
- b. Cefadroxil
- c. Cephalexin

II. 2nd Generation

- a. Cefaclor
- b. Cefotetan
- c. Cefoxitin
- d. Cefprozil
- e. Cefuroxime

III. 3rd Generation

- a. Cefdinir
- b. Cefditoren
- c. Cefixime
- d. Cefotaxime
- e. Cefpodoxime
- f. Ceftazidime
- g. Ceftibuten
- h. Ceftriaxone

IV. 4th Generation

- a. Cefepime

V. 5th Generation

- a. Ceftaroline

VI. Mechanism

- a. Cell wall inhibitor
- b. Inactivation of PBPs
- c. Autolysins

VII. Resistance

- a. Beta-lactamase
- b. ↓Drug penetration
- c. Efflux pumps
- d. Modified PBPs

VIII. Adverse Effects

- a. Neurotoxicity
- b. Hypersensitivity

Carbapenems

I. Medications

- a. Doripenem
- b. Ertapenem
- c. Meropenem
- d. Imipenem

II. Mechanism

- a. Cell wall inhibitor
- b. Inactivation of PBPs
- c. Autolysins

III. Resistance

- a. Rare carbapenemases
- b. ↓Drug penetration
- c. Efflux pumps
- d. Modified PBPs

IV. Adverse Effects

- a. Hypersensitivity

Monobactams

I. Medication

- a. Aztreonam

II. Mechanism

- a. Cell wall inhibitor
- b. Inactivation of PBPs
- c. Autolysins

III. Resistance

- a. Resistant to most beta-lactamases
 - i. Not effective against ESBL

Vancomycin

I. Mechanism

- a. Inhibits cell wall synthesis
- b. Alters permeability of cell membrane
- c. Inhibits RNA synthesis

II. Resistance

- a. Certain bacteria including Enterobacteriaceae

III. Adverse Effects

- a. Red-man syndrome

Daptomycin

I. Mechanism (proposed)

- a. Cell wall disruption
- b. Inhibits DNA/RNA/protein synthesis

II. Adverse Effects

- a. Myopathy/rhabdomyolysis

Telavancin	Tetracyclines	Glycylcyclines	Aminoglycosides
I. Mechanism	I. Medications	I. Medications	I. Medications
a. Inhibits cell wall synthesis	a. Demeclocycline	a. Tigecycline	a. Amikacin
b. Disrupts cell wall membrane	b. Doxycycline	II. Mechanism	b. Gentamicin
II. Adverse Effects	c. Minocycline	a. Binds 30s subunit of bacterial ribosome	c. Neomycin
a. QTc prolongation	d. Tetracycline	III. Treatment	d. Streptomycin
b. Fetal harm risk in pregnancy	II. Mechanism	a. Gram-negative infections	e. Tobramycin
c. Taste disturbance	a. Binds 30s subunit of bacterial ribosome	b. Gram-positive infections	II. Mechanism
d. Renal impairment	III. Resistance	c. ESBL	a. Binds 30s subunit of bacterial ribosome, inhibits function/assembly
	a. Efflux pumps	d. Anaerobes	III. Resistance
	b. Enzymatic inactivation	e. Atypical infections	a. Efflux pumps
Fosfomycin	IV. Adverse Effects	IV. Resistance	b. Enzymatic inactivation
I. Mechanism	a. Phototoxicity	a. Efflux pumps	c. Decreased uptake
a. Inhibits cell wall synthesis	b. Vertigo	V. Adverse Effects	IV. Adverse Effects
i. Blocks UDP-N-acetylglucosamine enolpyruvyl transferase	c. Tinnitus	a. Phototoxicity	a. Ototoxicity
II. Treatment	d. Tooth discoloration, children < 8	b. Esophagitis/gastritis	b. Vertigo
a. Single dose for UTI, concentrates in urine over several days	e. Hepatotoxicity	c. Dental hypoplasia and deposits, children <8	c. Neuromuscular paralysis
	f. Pseudotumor cerebri	d. Hepatotoxicity	i. Care in myasthenia gravis patients
		e. Pseudotumor cerebri	
		f. Increased mortality in some studies	
Polymyxins			
I. Medications			
a. Polymyxin B			
b. Colistin			
II. Mechanism			
a. Disrupts cell wall integrity			
III. Treatment			
a. Gram-negative infections			
IV. Adverse Effects			
a. Nephrotoxicity			
b. Neurotoxicity			

Macrolides	Chloramphenicol	Quinupristin/Dalfopristin	Fluoroquinolones
I. Medications	I. Mechanism	I. Mechanism	I. Medications
a. Azithromycin	a. Binds 50s subunit of bacterial ribosome	a. Binds 50s subunit of bacterial ribosome separately	a. Ciprofloxacin
b. Clarithromycin	II. Treatment	i. Quinupristin inhibits translocation	b. Levofloxacin
c. Erythromycin	a. Only used in life-threatening infections with no alternative	ii. Dalfopristin inhibits addition of amino acids	c. Moxifloxacin
d. Telithromycin	III. Resistance	II. Treatment	d. Ofloxacin
II. Mechanism	a. Enzymatic inactivation	a. VRE	II. Mechanism
a. Binds 50s subunit of bacterial ribosome	b. Changes in binding site	b. Gram-positive infections including MRSA	a. Inhibits DNA gyrase
III. Resistance	c. Decreased penetration	III. Resistance	b. Inhibits topoisomerase IV
a. Efflux pumps	IV. Adverse Effects	a. Efflux pumps	III. Resistance
b. Changes to 50s subunit	a. Hemolytic & aplastic anemia	b. Enzymatic Activation	a. Mutated DNA gyrase/topoisomerase IV
c. Decreased uptake	b. Grey baby syndrome	IV. Adverse Effects	b. Efflux pumps
d. Enzymatic inactivation	i. Poor feeding	a. Venous irritation	c. Decreased uptake
IV. Adverse Effects	ii. Respiratory depression	b. Arthralgias/myalgias	IV. Adverse Effects
a. ↑ GI motility	iii. Cardiovascular collapse	c. Hyperbilirubinemia	a. Tendinopathy
b. Ototoxicity	iv. Hypoxia/cyanosis		b. Prolonged QT interval
c. Hepatotoxicity	v. Death		c. Psychosis & neurotoxicity
d. Prolonged QT interval	c. Drug-drug interactions		d. Phototoxicity
e. CYP450 interactions	d. Blurry vision		e. Avoid in pregnancy/breastfeeding
		Linezolid	
		I. Mechanism	
		a. Inhibits 70s initiation complex	
		i. Binds 23s ribosomal RNA of 50s subunit	
		II. Treatment	
		a. Resistant gram-positive infections	
		i. VRE	
		ii. MRSA	
		iii. Penicillin resistant strep	
		III. Resistance	
		a. Reduced affinity at binding site	
		IV. Adverse Effects	
		a. Risk of serotonin syndrome w/ MAOi	
		b. Optic neuritis	
Fidaxomicin	Clindamycin		
I. Mechanism	I. Mechanism		
a. Inhibits RNA polymerase at transcription	a. Binds 50s subunit of bacterial ribosome		
II. Treatment	II. Resistance		
a. C. difficile diarrhea	a. Efflux pumps		
III. Adverse Effects	b. Enzymatic Activation		
a. Nausea, vomiting, abdominal pain	III. Adverse Effects		
	a. C. difficile diarrhea association		

Sulfonamides/Trimethoprim

I. Medications

- a. Trimethoprim/sulfamethoxazole
- b. Sulfasalazine
- c. Silver sulfadiazine

II. Mechanism

- a. Sulfonamides
 - i. ↓ purine/pyrimidine synthesis
 - ii. Competes with PABA in production of DHFA, which is used in DNA/protein synthesis
- b. Trimethoprim
 - i. Inhibits dihydrofolate reductase
 - ii. DHFR is an enzyme used in production of precursors to DNA, proteins, etc.

III. Resistance

- a. Altered DHFR (trimethoprim)
- b. Efflux pumps
- c. Decreased uptake

IV. Adverse Effects

- a. Sulfonamides
 - i. Crystalluria
 - ii. Stevens-Johnson syndrome
 - iii. Hemolytic anemia
 - iv. Blood dyscrasias
 - v. Drug-drug interactions
 - vi. Kernicterus
- b. Trimethoprim
 - i. Megaloblastic anemia/granulocytopenia from folic acid deficiency

Nitrofurantoin

I. Mechanism

- a. Metabolites damage DNA and inhibit bacterial enzymes

II. Treatment

- a. Urinary tract infections

III. Adverse Effects

- a. Hemolytic anemia (G6PDD)
- b. Pneumonitis
- c. Avoid in 1st trimester of pregnancy

Nitroimidazoles

I. Medications

- a. Metronidazole
- b. Tinidazole

II. Mechanism

- a. Reduction of nitro group on drug results in cytotoxic intermediate that binds DNA/proteins

III. Treatment

- a. E. histolytica
- b. Giardia
- c. Trichomonas
- d. Anaerobes
- e. C. difficile colitis

IV. Adverse Effects

- a. Disulfiram-like reaction with EtOH
- b. Metallic taste
- c. N/V/abdominal cramps

TB Drugs

I. Ethambutol

- a. Mechanism
 - i. Inhibits arabinosyl transferase
 - ii. Effects cell wall
- b. Adverse Effects
 - i. Optic neuritis
 - ii. Loss of red-green color discrimination
 - iii. Gout precipitant

II. Isoniazid

- a. Mechanism
 - i. Decreases mycolic acid synthesis → disrupts cell wall
 - ii. Inhibits acyl carrier protein reductase
 - iii. Inhibits β -ketoacyl-ACP synthase
- b. Resistance
 - i. Mutation of enzymes
 - ii. Over-expression of enzymes
- c. Adverse Effects
 - i. Hepatitis
 - ii. Peripheral neuropathy (treated with vitamin B6)
 - iii. Seizures (treated with vitamin B6)

III. Pyrazinamide

- a. Mechanism: Unclear
- b. Resistance
 - i. Lack of pyrazinamidase (activating enzyme)
- c. Adverse Effects
 - i. Hepatitis

IV. Rifabutin

V. Rifampin

VI. Rifapentine

a. Mechanism

- i. Inhibits mycobacterial DNA-dependent RNA polymerase
- b. Resistance
 - i. Mutations of mycobacterial DNA-dependent RNA polymerase
- c. Adverse Effects
 - i. Induces CYP450
 - ii. Turns urine, sweat, secretions orange

Dapsone

I. Mechanism

- a. Inhibits dihydropteroate synthetase
 - i. Reduces folate synthesis

II. Treatment

- a. Leprosy
- b. Pneumocystis jirovecii

III. Adverse Effects

- a. Hemolytic anemia (G6PDD)
- b. Methemoglobinemia
- c. Peripheral neuropathy

Clofazimine

I. Treatment

- a. Leprosy
- b. TB & other mycobacteria

II. Adverse Effects

- a. Skin discoloration (pink/brown/black)
- b. Severe GI symptoms
- c. Prolonged QT interval