ANTIBIOTICS

INHIBITS CELL WALL SYNTHESIS

BETA LACTAMS

Class	Mechanism	Uses	Adverse/SE	Nursing Implications
PENICILLINS -narrow spectrum -PCNase-resistance -aminopencilllins -anti-pseudomonas	-Inhibits cell wall synthesis by inhibiting cross-linking of polymers required for bacterial cell wall	-infections: caused by aerobic, Gram + organisms	-allergic rx: anaphylaxis infrequent but can be fatal -pain at IM site -lg doses leads to CNS effects -rash -diarrhea (oral dose)	-assess for allergies Penicillinase Resistant PCN: hepatoxic & blood dyscrasias Aminopenicillins=broad spectrum PCN -ampicillin + sulbactam (Unasyn): inhibit beta-lactamases -clavulanatic acid + amoxicillin=Augmentin -**ampicillin** is **leading cause** of **pseudomembranous colitis**-***C. difficile*** -**toxic rash**: **8-10 days** after therapy
CEPHALASPORINS	-inhibits bacterial cell wall synthesis, similar to PCN	Four generations: 1st: Gram + organisms 2nd: incr. activity against Gram – **3rd**:decr. Gram + activity; incr. Gram –; **penetrates CNS** 4th: incr. beta-lactamase activity; incr. Gram + activity	-allergic rx-cross-allergy in some pts allergic to PCN -pain at IM injection site -rash; abdomen, scalp & arms -pseudomembranous colitis—*C.difficile*; diarrhea -superinfections DDIs: alcohol, NSAIDs, anticoagulants, thrombolytics, Probenecid, bacteriostatic agents, aminoglycosides	-**CSF penetration w/ 3rd generation** -assess for previous allergies; fewer allergic Rx than PCN—DC if allergic -monitor for seizures w/ renal dx -may need to give w/ food -monitor IV infusion closely -monitor glucose levels in diabetic -monitor renal status: I&O, CrCl -assess for superinfections; suggest yogurt
MONOBACTAMS aztreonam (AZACTAM)	-interference w/ cell wall synthesis	-Gram – aerobic bacteria -UTI, septicemia, lower resp. tract infections, soft tissue--*Pseudomonas*	-**pain or phlebitis @ admin site** -GI symptoms: N/V, diarrhea -rash	-must be administered parenterally -can be used for pts allergic to PCNs or cephalosporins
CARBAPENEMS imipenem,(PRIMAXIN) meropenem (MERREM)	-potent cell wall inhibitor -resistant to beta-lactamase	-**very** broad spectrum -MRSA, *P. aeruginosa* -MEROPENEM used for resistant nosocomial infections & meningitis, intra-abdominal infections	-GI: N/V, diarrhea -Hypersensitivity rx: rashes, pruritus -*P. colitis*, seizures (rarely)	-IM or IV only -penetrates meninges -renally eliminated
VANCOMYCIN VANCONIN, LYPHOCIN	-inhibits bacterial cell wall synthesis (differs from PCN) -bactericidal	-narrow spectrum-primarily against Gram+ (resistant infections) -*Staph* (**MRSA**); *Strep* - Pseudomembranous colitis caused be *C. difficile*	-**ototoxicity** (high doses) -**nephrotoxicity** (high doses) -neutropenia -"**Red man/neck**" syndrome -drug allergy -give intermittent IV for best effect DDIs: ototoxic & nephrotoxic drugs—aminoglycosides, Amphotericin B, Lasix, aspirin	-caution w/ other ototoxic/nephrotoxic drugs

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INHIBIT PROTEIN SYNTHESIS

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TETRACYCLINES Short acting: Tetracycline, oxytetracycline Intermediate-acting: demeclocycline, methacycline Long-acting: dosycycline, minocycline	-binds to 30S ribosomal subunit, inhibiting binding of tRNA to mRNA-ribosome complex -inhibition of bacterial protein synthesis -bacteriostatic	-broad spectrum, but widespread resistance limits use -**1st line for rickettsial infections (RMSF & typhus, Q fever)** -**Lyme dx; *Chlamydial* dx** **-Cholera, *Mycoplasma pneumonia*** -gonorrhea, chlamydia, -acne; *Propionibacterium acnes* -Peptic ulcer dx-*H. pylori*	-gastrointestinal irritation -**photosensitivity** -CNS: dizziness or unsteadiness -discoloration of teeth -**depression of bone growth** in children < 8yrs or fetuses -**superinfections** common (*Staphylococcal enterocolitis, C. difficile*) or *Candida* (throat, vagina & bowel -hepatic toxicity from large doses -nephrotoxicity -delayed blood coagulation	-**food impairs absorption**, **avoid milk** and antacids (best on empty stomach) -ZITHROMAX (azithromycin) on empty stomach for 5days -doxycycline can be taken w/ food -use protection from sunlight -assess for signs of superinfection -administer w/ full glass of water -**stools** may be **yellow or green** -tongue can discolor -avoid taking old drug (bad rx) -**avoid taking iron or vit C within 2-3 hrs** DDIs: Questran, iron, calcium binds & impair oral absorption; decr. effectiveness of estrogen contraceptives or PCN
MACROLIDES erthromycin, clarithromycin (BIAXIN), azithromycin (ZITHROMAX)	-inhibition of bacterial protein synthesis -binds to 50s ribosome and blocks addition of new amino acids -bacteriostatic (low) -bactericidal(high)	-may be used as alternative to PCN G if allergic -PCN resistant *Streptococcal* & *Staphylococcal* infections -*Mycoplasma pneumoniae* infections -*Mycobacterium avium* (clarithromycin)	-GI irritation (oral erthromycin) -N/V, diarrhea, abdominal cramping -hepatoxicity in pregnancy -**cholestatic hepatitis** **-> than 4 Gm/d=hearing loss** -thrombophlebitis when given IV	-assess for frequent diarrhea, monitor wt -monitor for hepatoxicity -give w/ water or food; best on empty stomach -azithromycin should be given on empty stomach (5 days not 7-14) -instruct not to chew or break capsules DDIs: cytochrome P450 inhibitor-incr. levels of theophylline, carbamazepine, warfarin; prevents binding of chloramphenicol & clindamycin to ribosomes (antagonizes effects)
AMINOGLYCOSIDES (gentamicin, tobramycin, amikacin)	-binds to 30S subunit and produces abnormal proteins -bacteriocidal (high)	-**Gram – aerobic infections only**; *Enterobacter, Proteus, Pseudomonas, Klebsiella*, *Serratia* -serious or life-threatening infections For some microorganisms, the combo of aminoglycoside & PCN/cephalosporin leads to incr. synergistic antibacterial activity -topical w/ gentamicin, tobramycin, neomycin	-**Ototoxicity** (dose-dependent & cumulative) -**nephrotoxicity** (dose-dependent & cumulative) -acute muscular paralysis (rare) -dizziness, vertigo, ataxia	-does not penetrate CNS -IM or IV only; not absorbed orally -short plasma t1/2; long inner ear & renal tubule t1/2 -**assess hearing & balance** -**monitor serum drug levels**—peaks/troughs : ototoxicity when levels > 8-10 ug/ml -**peak**: 1hr after IM, 30 min after IV -**trough**: prior to next dose -caution w/ anesthetics & muscle relaxants -**monitor renal function-CrCl, I & O** -**DO NOT** administer or mix in syringe w/ other drugs DDIs: PCN & cephalosporin (synergy) ototoxic drugs: ethacrynic acid, Lasix nephrotoxic drugs: methoxyluarne, Amphotericin B, cephalosporins, polymixins, vancomycin, cisplatin

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Inhibits folic acid synthesis	SULFONAMIDES sulamethoxazole, sulfadiazine, sulfisoxazole	-act as competitive inhibitor in synthesis of folic acid from precursors; inhibits enzyme (dihydropteroate synthetase)	-broad spectrum -Gram + coccus, Gram- bacilli -**urinary tract infections**, acute otitis media, ulcerative colititis - infections on burned skin; SILVADENE	-GI irritation: N/V, diarrhea, pancreatitis, hepatitis -**hypersensitivity: skin rashes (Steven Johnson syndrome)** -nephrotoxic (**highly protein bound**) -bone marrow toxicity-**blood dyscrasia** (w/ G-P-6D deficient-hemolytic anemia) -crystalline aggregates in urine	-assess for allergy to sulfa, thiazide diuretics, oral hypoglycemic agents -encourage fluids; 2000-3000 cc/day -monitor I & O -monitor CBS & WBC -take on empty stomach if possible -don't give sulfa to children <12 y/o -**photosensitivity**-protect against sunlight (clothing) -check other drugs) -**sulfasalazine turn urine/skin yellow-orange** (harmless) DDIs: hepatic metabolism inhibitor-leads to incr. levels of warfarin, hypoglycemic agents, phenytoin
	TRIMETHOPRIM trimethoprim & sulfamethoxazole=BACTRIM or SEPTRA 1:5 ratio--synergistic	-inhibits dihydrofolic acid reductase enzy -penetrates tissues & concentrates in: breast milk, bile, prostatic fluid, vaginal fluids, liver, spleen & kidney	-active against Gram (-) organisms; *Proteus* & *Klebsiella* -in combo w/ (Bactrim & Septra) used to **treat *P. carinii*, UTI;s, traveler's diarrhea**	-rare w/ trimethroprim alone -blood dyscrasias	-if possible, should be avoided during pregnancy & lactation **-DO NOT USE** in folate deficient patients -inform patients about sx of blood disorders
	NITROFURANTOIN	-interferes w/ bacterial enzymes; damages DNA -2nd choice urinary tract antiseptic -Gram + & - organisms	-bactericidal concentrations in urine (not in blood or tissues) -effective for **UTIs**; *E.Coli, Enterobacter, Klebsiella, Proteus* , enterococci & staph	-GI-N/V, anorexia -pneumonititis or pulmonary fibrosis after long use -rashes, allergic rx -**urine turns brown** (harmless) -**peripheral neuropathy**	-instruct to monitor blood glucose -may cause false positives on urine tests -take w/ meals or snack -oral suspension may **stain teeth**-use straw & good oral hygiene
	METRONIDAZOLE (FLAGYL)	-interferes w/ bacterial DNA synthesis by causing strand breakage & loss of structure leads to inhibition of nucleic acid synthesis leads to cell death	-**anaerobic infections:** *Bacteroides, **C. diff**, H. pylori, Gardnerella* -**protozoal infections:** *Trichomoniasis, Amebiasis, Giardiasis*	-GI irritation -metallic taste -toxic (disulfiram-like effect) w/ alcohol	-may potentiate action of warfarin; observe for signs of bleeding -caution about disulfiram rx -avoid in pregnancy -avoid in pts w/ CNS disease or blood dyscrasias
	QUINOLONES Ciprofloxacin (CIPRO) Levofloxacin (LEVAQUIN) Ofloxacin (FLOXIN) Sparfloxacin (ZAGAM)	-inhibition of bacterial DNA synthesis by inhibiting enzyme (DNA gyrase); prevents supercoiling & DNA replication cannot take place -bactericidal	-broad spectrum -**UTI's** (Gram -) difficult to treat w/ other drugs -respiratory infections-pneumonia, bronchitis -bacterial diarrheas *(E.coli, Shigella, Salmonella)*	-GI irritation: N/V, diarrhea -CNS: dizziness, HA, tinnitus, seizures (rare), insomnia -**photosensitivity** -tendonitis -**damage to growing cartilage** -crystalluria w/ alkaline urine -skin rash, itching, SOB, serum sickness	-protect against sunlight -**urine** may be **brown or bright orange** -monitor renal status -may cause confusion in elderly -**do not use w/ children** -don't take AL or Mg antacids DDIs:CIPRO w/ theophylline & warfarin-lowers clearance; Al & Mg antacids, sucralfate, iron, milk-blocks absorption