

**PNSG 2303**  
**Pharmacology II**  
**Anti-Infectives**  
**Chapters**  
**6, 7, 8, 9, 10, 11, 14, 15**

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**ANTI-INFECTIVE  
AGENTS**

SULFONAMIDES  
CHAPTER 6  
PAGES 71-77

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**Sulfonamides**

- First antibiotic drug developed.
- Antibacterial agent
- Action: bacteriostatic

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## SULFONAMIDES

- Uses:
  - Urinary tract infections
  - Topical agent for second and third degree burns.

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## SULFONAMIDES ADVERSE REACTIONS

- Hematological changes
- Abdominal pain
- Loss of appetite
- Fever/chills
- Urticaria
- Stomatitis
- Pruritus
- Crystalluria
- N/V/D
- Rash

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## SULFONAMIDES

- Stevens-Johnson syndrome



– A serious and sometimes fatal hypersensitivity reaction. Symptoms include lesions on the skin and mucous membranes, often starting on the face, in the mouth, on the lips, neck, or extremities. Will also experience fever, cough, muscular aches and pains.

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## SULFONAMIDES

- Contraindications:
  - Hypersensitivity to the drugs
  - Pregnancy/lactation
  - Children under the age of 2
  - Infections caused by group A beta-hemolytic streptococci.

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## SULFONAMIDES

- Precautions:
  - Renal/hepatic impairment
  - Bronchial asthma
  - Allergies to drugs

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## SULFONAMIDES

- Interactions:
  - When given with anticoagulants, may increase effects of the anticoagulant.
  - Sulfonamide and methotrexate: may cause bone marrow depression
  - Sulfonamide and hydantoin: dilantin level may be increased
  - May affect some oral hypoglycemic meds causing increased risk for hypoglycemic episodes.

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## Burn management

- Mafenide or silver sulfadiazine
- Clean and remove debris according to protocols or physician's order
- Apply with a sterile technique
- Apply cream 1/16 inch thick
- Keep patient away from any drafts of air
- Warn patient that stinging or burning may occur



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PENICILLINS  
CHAPTER 7  
PAGE 79-89

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## PENICILLINS

- Discovered in 1928 by Sir Alexander Fleming while performing research on influenza.
- Not used clinically for treatment of infections until 1941.

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## PENICILLINS DRUG RESISTANCE

- Natural penicillins are less effective due to microorganisms developing drug-resistant strains.
- Certain bacteria can develop **PENICILLINASE** (an enzyme that can inactivate penicillin)

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## PENICILLINS

- Actions:
  - Bactericidal:
    - Destroy the bacteria
  - Bacteriostatic:
    - Slow or retard the multiplication of bacteria

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## PENICILLINS

- Uses:
  - Urinary tract infections
  - Septicemia
  - Meningitis
  - Intra-abdominal infections
  - Gonorrhoea
  - Syphilis
  - Pneumonia
  - Respiratory infections

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## PENICILLINS

- Prophylaxis use:
  - Against a potential secondary infection that can occur in a patient with a viral infection
  - Given for those at a high-risk for a potential infection
    - Rheumatic fever
    - Chronic ear infections

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## PENICILLINS ANVERSE REACTIONS

- Mild nausea
- Vomiting
- Diarrhea
- Sore tongue
- Sore mouth
- Fever
- Pain at injection site
- Hypersensitivity and Super infections

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## Hypersensitivity reactions

- Defined: allergic reaction within the body.
- S/S display 7-3 page 69
- Anaphylactic shock: severe hypersensitivity reaction

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## Anaphylactic shock

- S/S:
  - Severe hypotension
  - Loss of consciousness
  - Acute respiratory distress
  - Can be fatal if not treated emergently

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## PENICILLINS SUPERINFECTIONS

- Defined:
  - Disruption of the normal flora allowing uncontrolled growth of bacteria or fungal microorganisms.
- Can develop rapidly, and is potentially serious and even life threatening.

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## PENICILLINS ADVERSE REACTIONS

- Anemia
- Thrombocytopenia
- Leukopenia
- Bone marrow depression
- Glossitis
- Stomatitis
- Gastritis
- N/V
- Abdominal pain
- Pain at injection site
- Phlebitis
- Dry mouth

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## PENICILLINS

- Contraindications:
  - Patients with a history of hypersensitivity to penicillin or the cephalosporins.

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## PENICILLINS PRECAUTIONS

- Renal disease
- Pregnancy/lactation
- History of allergies
- Asthma
- Bleeding disorders
- Gastrointestinal disease

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## PENICILLINS INTERACTIONS

- Can decrease the effectiveness of some birth control pills containing estrogen
- Decrease in effectiveness of PCN when given with tetracycline
- Increase bleeding risks if taking anticoagulants
- PCN should be given 1 hour before or 2 hours after a meal

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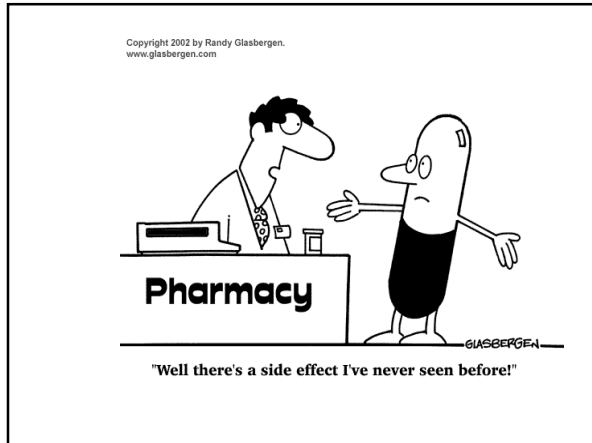
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## CEPHALOSPORINS CHAPTER 8

PAGES 91-98

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## CEPHALOSPORINS

- Structurally and chemically related to penicillin
- Divided into first, second, and third generation drugs.

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## CEPHALOSPORINS

- Actions:
  - Affect the bacterial cell wall, making it defective and unstable.

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## CEPHALOSPORINS

- Uses:
  - Pharyngitis
  - Tonsillitis
  - Otitis media
  - Lower respiratory infections
  - Urinary tract infections
  - Septicemia
  - Gonorrhoea

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**CEPHALOSPORINS  
ADVERSE REACTIONS**

- Most common: GI disturbances
- Skin rashes
- Steven Johnson syndrome
- Hepatic and renal dysfunction
- malaise
- Aplastic anemia
- Epidermal necrosis
- Headache
- Dizziness
- Nephrotoxicity
- Fever

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**CEPHALOSPORINS**

- Contraindications:
  - If a patient has a history of allergies to cephalosporins or penicillins.

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**CEPHALOSPORINS**

- Precautions:
  - Renal or hepatic impairment
  - Bleeding disorders
  - Pregnancy/lactation

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## CEPHALOSPORINS

- Interactions:
  - Risk of nephrotoxicity increases when the cephalosporins are administered with the aminoglycosides.
  - The risk for bleeding increases when the cephalosporins are taken with anticoagulants
  - Alcohol when consumed within 72 hours after cephalosporins administered.
    - Flushing, throbbing in the head and neck, dyspnea, vomiting, sweating, chest pain, and hypotension.

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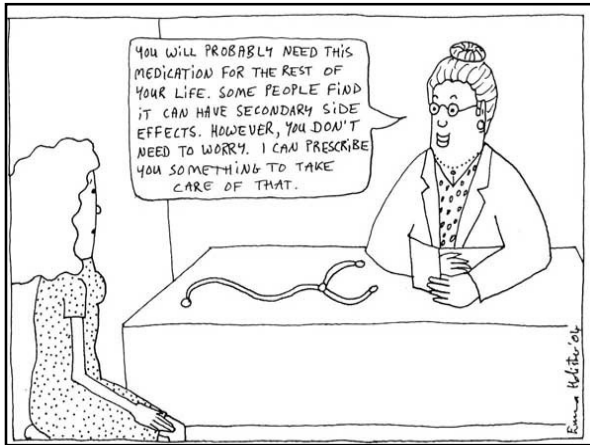
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## TETRACYCLINES MACROLIDES LINCOSAMIDES

CHAPTER 9  
PAGES 99-107

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## TETRACYCLINES

- Broad-spectrum antibiotic
- Composed of natural and semisynthetic compounds
- Useful in infections that show sensitivity to the drug
  - Cholera
  - Rocky mountain spotted fever
  - typhus

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## TETRACYCLINES

- Actions:
  - Inhibit bacterial protein synthesis
    - This is a process necessary for reproduction of the microorganism
  - Bacteriostatic
    - Slowing or retarding the multiplication of bacteria

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## TETRACYCLINES

- Uses:
  - Infections caused by gram-negative and gram-positive organisms.
  - Used when PCN is contraindicated with intestinal amebiasis, and some skin and soft tissue infections.
  - Uncomplicated urethral, endocervical, or rectal infections
  - Used with other treatments for severe acne and peptic ulcer disease

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## TETRACYCLINES ADVERSE REACTIONS

- N/V/D
- Epigastric distress
- Stomatitis
- Sore throat
- Photosensitivity reaction
- May cause permanent yellow, gray-brown discoloration of the teeth.
- Skin rash

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## TETRACYCLINES

- Contraindications:
  - Hypersensitivity to the drug
  - Pregnancy/lactation
  - Children under the age of 9

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## TETRACYCLINES

- Precautions:
  - Patients with renal function impairment
  - Doses greater than 2 grams can be extremely damaging to the liver
  - Check expiration date before giving
    - If degradation of the drug occurs, the drug becomes extremely toxic to the kidneys

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## TETRACYCLINES

- Interactions:
  - Antacids
  - High calcium foods
  - Oral anticoagulants
  - Oral contraceptives
  - digoxin

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## MACROLIDES

- Used against a wide variety of pathogenic organisms.
- Used especially with infections of the respiratory and genital tract.

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## MACROLIDES

- Actions:
  - Bacteriostatic or bactericidal
  - Binds to cell membranes and cause changes in protein function

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## MACROLIDES

- Uses:
  - For wide range of gram-negative and gram-positive microorganisms
  - Acne vulgaris
  - Upper respiratory infections

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## MACROLIDES

- Adverse reactions:
  - N/V/D
  - Abdominal pain
  - Cramping
  - Pseudomembranous colitis

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## MACROLIDES

- Contraindications:
  - Hypersensitivity to macrolides
  - Pre-existing liver disease

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## MACROLIDES

- Precautions:
  - Pregnancy/lactation
  - Patients with liver dysfunction

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## MACROLIDES

- Interactions:
  - Increases serum levels of digoxin
  - Increases the effects of anticoagulants
  - May increase serum theophylline levels
  - Decrease in therapeutic activity with
    - Clindamycin
    - Lincomycin
    - chloramphenicol

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## LINCOSAMIDES

- Used against gram-positive organisms
- Because of potential of high toxicity:
  - Used only for the treatment of serious infections in which penicillin and erythromycin are not effective

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## LINCOSAMIDES

- Actions:
  - Causing death to susceptible bacteria through inhibiting protein synthesis

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## LINCOSAMIDES

- Uses:
  - Gram-negative and gram-positive microorganisms
  - Used for more serious infections usually in conjunction with other medications

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## LINCOSAMIDES ADVERSE REACTIONS

- Abdominal pain
- Blood dyscrasias
- Esophagitis
- Pseudo-membranous colitis
- N/V/D
- Skin rash

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## LINCOSAMIDES

- Contraindications:
  - Hypersensitivity to lincosamides
  - Minor infections
  - Lactation
  - Infancy

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## LINCOSAMIDES

- Precautions:
  - Gastrointestinal disorders
  - Renal disease
  - Liver impairment
  - Myasthenia gravis

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## LINCOSAMIDES

- Interactions:
  - Decreased absorption when aluminum or kaolin is given
  - Neuromuscular blocking drug is enhanced leading to severe respiratory depression

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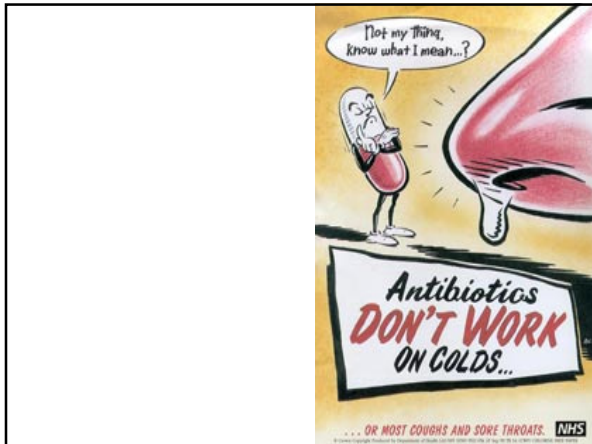
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FLUOROQUINOLONES  
&  
AMINOGLYCOSIDES  
CHAPTER 10  
PAGES 109-117

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FLUOROQUINOLONES &  
AMINOGLYCOSIDES

These are 2 groups of broad-spectrum antibiotics that would be more effective against more resistant pathogens.

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## FLUOROQUINOLONES

- Actions:
  - Interfere with an enzyme needed by bacteria for the synthesis of DNA which prevents cell production.

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## FLUOROQUINOLONES

- Uses:
  - Lower resp. infections
  - Skin infections
  - UTI
  - Sexually transmitted diseases
  - Infections of the eye

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## FLUOROQUINOLONES ADVERSE REACTIONS

- Superinfections
- Pseudomembranous Colitis
- Nausea
- Diarrhea
- Abdominal pain
- Dizziness
- Photosensitivity reaction

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## FLUOROQUINOLONES

- Contraindications:
  - Hypersensitivity of fluoroquinolones
  - Children younger than 18 years old
  - Pregnant women (Category C)
  - Life-styles that would not adhere to the precautions of photosensitivity reaction.

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## FLUOROQUINOLONES

- Precautions:
  - Renal impairment
  - History of seizures
  - Geriatric patients
  - Patients on dialysis

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## FLUOROQUINOLONES

- Interactions:
  - Theophylline
  - Cimetidine
  - Oral anticoagulant
  - NSAIDS
  - Cardiac drugs that increase the QT interval

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## AMINOGLYCOSIDES

- Actions:
  - Block a step in protein synthesis necessary for bacterial multiplication.

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## AMINOGLYCOSIDES

- Uses:
  - Suppressing gastrointestinal bacteria
  - Pre-op intestinal procedures
  - Hepatic coma
    - Reduces the number of ammonia forming bacteria in the intestines which in turn, will lower ammonia levels in the blood.

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## AMINOGLYCOSIDES ADVERSE REACTIONS

- Nephrotoxicity
  - Proteinuria
  - Hematuria
  - Decrease urine output
- Ototoxicity
  - Tinnitus
  - Dizziness
  - Roaring of the ears
  - Vertigo
  - Hearing loss
- Neurotoxicity
  - Numbness
  - Tingling
  - Tremors/muscle twitching
  - Oral/peripheral paresthesia
  - Muscle weakness
- N/V/D
- Superinfections/pseudo-membranous colitis

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## AMINOGLYCOSIDES

- Contraindications:
  - Hypersensitivity to aminoglycosides
  - Pre-existing hearing loss
  - Myasthenia gravis
  - Parkinsonism
  - Lactation/pregnancy
  - Long-term therapy
    - Except: streptomycin for management of tuberculosis

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## AMINOGLYCOSIDES

- Precautions:
  - Renal failure
  - Elderly clients
  - Neuromuscular disorders

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## AMINOGLYCOSIDES

- Interactions:
  - Cephalosporins
  - Loop diuretics
  - General anesthesia

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MISCELLANEOUS  
ANTI-INFECTIVES

CHAPTER 11

PAGES 119-126

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**LINEZOLID (ZYVOX)**

- Actions:
  - Binds to a site on a specific ribosomal RNA and prevents the formation of a component necessary to duplicate bacteria.
- Uses:
  - VRE
  - Nosocomial/community acquired pneumonia
  - Pneumonia
  - Skin infections including MRSA

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## LINEZOLID

- Adverse reaction:
  - NV/D
  - Headache
  - Insomnia
  - Fatigue
  - Depression
  - Nervousness
  - Photosensitivity

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## LINEZOLID

- Contraindications:
  - Allergies: cephalosporins and penicillins
  - Renal failure
  - Children under 3 yrs. of age
  - Pregnancy/lactation
- Precautions:
  - CNS/seizure disorders
  - Renal/hepatic failure
- Interactions:
  - Probenecid

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## CARBAPENEMS

- Action:
  - Inhibits synthesis of the bacterial cell wall and causes the death of susceptible cells.
- Uses:
  - Intra-abdominal infections
  - Bacterial meningitis
  - Endocarditis
  - Septicemia
  - Community acquired pneumonia

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## CARBAPENEMS

- Adverse reactions:
  - Headache
  - N/V/D
  - Anorexia
  - Abdominal pain
  - Generalized pain
  - Flatulence
  - Rash
  - Superinfections
  - Abscess/phlebitis to injection site

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## CARBAPENEMS

- Contraindications:
  - Allergy to cephalosporins and PCNs
  - Renal failure
  - Pregnancy/lactation
  - Children younger 3 months
- Precautions:
  - CNS disorders
  - Seizures
  - Renal/hepatic failure
- Interactions:
  - Probenecid

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## METRONIDAZOLE (Flagyl)

- Actions:
  - Disrupts DNA and protein synthesis in susceptible organisms
- Uses:
  - Intra-abdominal infections
  - Bone infections
  - Soft tissue infections
  - Lower resp. infections
  - Gynecologic infections
  - CNS infections

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## METRONIDAZOLE

- Adverse reactions:
  - NV/D
  - Anorexia
  - Seizures
  - Numbness of extremities
  - Thrombophlebitis
  - Hypersensitivity reactions

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## METRONIDAZOLE

- Contraindications:
  - Hypersensitivity
  - First trimester of pregnancy
- Precautions:
  - Blood dyscrasias
  - Seizure disorders
  - Hepatic dysfunction
- Interactions:
  - Cimetidine
  - Phenobarbital
  - Warfarin

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## PENTAMIDINE ISETHIONATE (PENTAM 300 & NEBUPENT)

- Actions:
  - Unknown
- Uses:
  - Pneumonia
  - Pneumonia with AIDS

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## SPECTINOMYCIN

- Action:
  - Interferes with bacterial protein synthesis
  
- Uses:
  - Treatment of gonorrhea

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## SPECTINOMYCIN ADVERSE REACTIONS

- Soreness at site of injection
- Chills
  
- Urticaria
- Fever
  
- Dizziness
- Hypersensitivity reactions
  
- Rash

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## SPECTINOMYCIN

- Contraindications:
  - Known hypersensitivity
  - Infants
  
- Precaution:
  - Safe use in pregnancy/lactation not known
  
- Interactions:
  - None known

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## VANCOMYCIN

- Action:
  - Inhibits bacterial cell wall synthesis
  
- Uses:
  - Serious gram-positive that do not respond to other meds.
  - Effective in treating Clostridium difficile

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## VANCOMYCIN ADVERSE REACTIONS

- Nephrotoxicity
- Ototoxicity
- Nausea
- Chills
- Fever
- Urticaria
- Sudden drop in BP with parenteral admin.
- Skin rashes

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## VANCOMYCIN

- Contraindications:
  - Known hypersensitivity
  
- Precautions:
  - Renal impairment
  - Hearing impairment
  - Pregnancy/lactation
  
- Interactions:
  - Additive effects when given with ototoxic/nephrotoxic drugs.

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**ANTIVIRAL DRUGS**

CHAPTER 14  
Pages 141-152

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**VIRUSES**

- Over 200 viruses have been identified as capable of producing disease.
- Over the past few years, more antiviral medication has been developed.

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## ANTIVIRAL DRUGS

- Action:
  - Inhibits viral DNA/RNA replication in the virus causing viral death.
- Uses:
  - HSV
  - HIV
  - CMV
  - Genital Herpes
  - Influenza A
  - RSV
  - Viral Herpes Infections

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## ANTIVIRAL DRUGS GENERAL SIDE EFFECTS

- Crystalluria
- Anorexia
- GI disturbances
- Burning
- N/V/D
- Stinging
- Pruritus

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## ANTIVIRAL DRUGS

- Contraindications
  - Hypersensitivity
- Precautions
  - Renal impairment –may require dose adjustments
  - Children/pregnancy/lactation
- Interactions
  - Drug specific

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## ACYCLOVIR

- Neurologic symptoms such as seizures may occur with the administration of Acyclovir.

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## ACYCLOVIR ADVERSE REACTION

- IV
  - Phlebitis
  - Lethargy
  - Confusion
  - Tremors
  - Skin rashes
  - Nausea
  - Crystalluria
- ORALLY
  - N/V/D
  - Headache
  - Dizziness
  - Skin rashes
- TOPICAL
  - Burning
  - Stinging
  - Pruritus

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## ANTIRETROVIRALS

- HIV: is considered a retro-virus
- RNA: primary component instead of DNA
- Multi-drug therapy used to control these types of infections.

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## ANTIRETROVIRALS

- Adverse Reaction:
  - NVD & altered taste
  - HA, fever, rash, numbness around mouth
- Contraindications:
  - Allergies
  - Lactation
  - Numerous medications
- Precautions:
  - Diabetes, hepatic prob., preg., sulfonamide allergy

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## ANTIFUNGAL DRUGS

CHAPTER 15

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## ANTIFUNGAL DRUGS

- Fungus: a colorless plant that lacks chlorophyll
- Humans: infection may be yeast-like or mold-like
- Range from superficial fungal infections to deep systemic fungal infections

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## ANTIFUNGAL DRUGS

- Ex. of superficial infections:
  - Athlete's foot
  - Jock itch
  - Ringworm
  - Nail fungus
  - Yeast infections
- Ex. of deep systemic infections:
  - Lungs
  - Blood

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## ANTIFUNGAL DRUGS

- Actions:
  - Fungicidal: able to destroy fungi
  - Fungistatic: able to slow or retard the multiplication of fungi

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## ANTIFUNGAL DRUGS

- Adverse Reactions:
  - Irritation
  - Redness/Rash
  - Abdominal pain (vaginal use)
  - HA
  - Anorexia
  - NVD
  - Muscle pain

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## ANTIFUNGAL DRUGS

- Contraindications:
  - Allergy
  - Pregnancy/lactation unless life threatening
- Precautions:
  - Renal/liver impairment
- Interactions:
  - Depends on the individual drug

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## ONGOING ASSESSMENT

- Topical application:
  - Nurse instructs patient to look for signs of adverse reaction and report any reaction to the physician.

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## PATIENT EDUCATION

- Ringworm Infection:
  - Keep all towels and wash clothes separate from other members of the family to avoid spreading the infection.
  - Keep affected area clean and dry.

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## AMPHOTERICIN B

- Adverse reactions:
  - Fever
  - Chills/shaking
  - Headache
  - Malaise
  - Anorexia
  - Joint/muscle pain
  - Abnormal renal function
  - N/V
  - Anemia

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## AMPHOTERICIN B

- Contraindications:
  - Hypersensitivity
- Interactions:
  - Digoxin
  - Nephrotoxic drugs
  - Miconazole
- Precautions:
  - Renal dysfunction
  - Electrolyte imbalances
  - Antineoplastic drugs
  - Pregnancy/lactation

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