Chapter-12
Pharmacology & Toxicology

D.Pharma 2nd Year Notes

Chapter- 12

Chemotherapeutic Agents:

Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, indication and contraindications of drugs belonging to

1. Penicillins	8. Anti-tubercular drugs
2. Cephalosporins	9. Anti-fungal drugs
3. Aminoglycosides	10. Anti-viral drugs
4. Fluoroquinolones	11. Anti-amoebic agents
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Chemotherapeutic Agents:

- Chemotherapeutic agents are drugs that are used to treat cancer.
- They work by interfering with the growth and division of cancer cells, either by killing the cells outright or by preventing them from multiplying.
- Chemotherapy can be given as a standalone treatment or in combination with other treatments such as radiation therapy or surgery.
- Chemotherapy can be very effective in treating cancer, it can also cause a range of side effects such as nausea, hair loss, and fatigue.

There are many different types of chemotherapeutic agents.

1. **Alkylating agents:** These drugs work by damaging the DNA inside cancer cells, preventing them from dividing and reproducing.
2. **Antimetabolites:** These drugs work by interfering with the cancer cell's ability to make DNA, RNA, and other essential components needed for growth and division.
3. **Anthracyclines:** These drugs work by binding to the DNA inside cancer cells, preventing them from replicating and dividing.
4. **Topoisomerase inhibitors:** These drugs work by preventing the enzyme topoisomerase from working properly, which is needed for DNA replication.
5. **Mitotic inhibitors:** These drugs work by interfering with the mitotic spindle, which is needed for cell division.

Principles of chemotherapy:

The principles of chemotherapy involve using drugs to kill or slow the growth of cancer cells. The following are some of the key principles of chemotherapy:

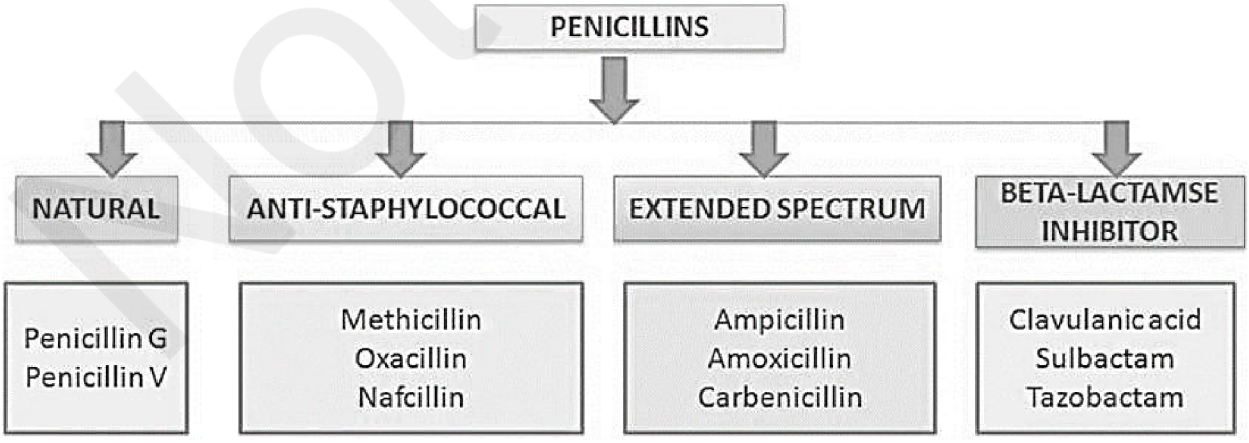
1. **Cytotoxicity:** Chemotherapy drugs work by targeting rapidly dividing cells, including cancer cells. They disrupt the normal cell division process, which can lead to cell death.
2. **Systemic treatment:** Chemotherapy drugs are typically given systemically, meaning they travel through the bloodstream to reach cancer cells throughout the body. This allows chemotherapy to treat cancer cells that may have spread beyond the initial tumor site.

3. **Combination therapy:** Often, chemotherapy drugs are given in combination with other drugs or treatments, such as surgery or radiation therapy. This can increase the effectiveness of treatment and help to prevent the development of drug resistance.
4. **Dose and schedule:** The dose and schedule of chemotherapy drugs are carefully chosen to balance effectiveness with minimizing side effects. The drugs are typically given in cycles, with rest periods in between to allow the body to recover.
5. **Adjuvant therapy:** Chemotherapy may be used as adjuvant therapy, meaning it is given after surgery or radiation therapy to help reduce the risk of cancer recurrence.

1. Penicillin:

- Penicillin are antibiotics that got their name from the Penicillium mold, from which they were originally extracted.
- They belong to the pharmacological group of beta-lactam antibiotics, because they have a beta- lactam ring in their structure.
- Penicillin work by preventing the bacteria from forming a cell wall, which is essential for their survival. This causes the bacteria to burst and die.

Classification of penicillin:



1. **Penicillin G:** This is the original form of penicillin and is used to treat many types of infections, including strep throat, pneumonia, and syphilis.

2. **Ampicillin:** This is a broad-spectrum penicillin that is used to treat a wide range of infections, including urinary tract infections, respiratory infections, and ear infections.
3. **Amoxicillin:** This is a more commonly used penicillin that is used to treat bacterial infections such as ear infections, urinary tract infections, and respiratory infections.
4. **Augmentin:** This is a combination of amoxicillin and clavulanic acid, which is used to treat more resistant bacteria and infections.

Dose:

- Penicillin (except bacampicillin tablets, amoxicillin, penicillin V, pivampicillin, and pivmecillinam) are best taken with a full glass (8 ounces) of water on an empty stomach (either 1 hour before or 2 hours after meals) unless otherwise directed by your doctor.

Indications:

- Upper respiratory infections
- Otitis media
- Pneumonia
- Rheumatic fever
- Erysipelas
- Skin and soft-tissue infections
- Gonorrhea

Contraindications:

- Hypersensitivity to penicillin

2. Cephalosporins:

- Cephalosporins are the largest group of beta-lactam antibiotics, cover a broad range of organisms, are generally well-tolerated, are easy to administer, and are thus frequently used.
- The classification, spectrum of activity, and pharmacology of the cephalosporins will be reviewed here.
- The spectrum of activity of cephalosporins combined with beta-lactamase inhibitors are discussed separately.
- The **mechanisms of action** and resistance and major adverse reactions of the beta-lactam antibiotics, and the penicillins and other beta-lactam drugs are also discussed separately.

Classification of Cephalosporins:

1. **First Generation Cephalosporins:**
   - Cefazolin
   - Cephalexin
   - Cefadroxil
2. **Second Generation Cephalosporins:**
   - Cefuroxime
   - Cefaclor
   - Cefprozil
   - Cefoxitin
3. **Third Generation Cephalosporins:**
   - Ceftriaxone
   - Cefotaxime
   - Ceftazidime
   - Cefixime
   - Cefpodoxime
   - Ceftibuten
4. **Fourth Generation Cephalosporins:**
   - Cefepime
   - Cefpirome
5. **Fifth Generation Cephalosporins:**
   - Ceftaroline

- Ceftobiprole

Cefazolin:

- Cefazolin is used to treat bacterial infections in many different parts of the body. This medicine is also given before certain types of surgery to prevent infections.
- Cefazolin belongs to the class of medicines known as cephalosporin antibiotics. It works by killing bacteria or preventing their growth. However, this medicine will not work for colds, flu, or other virus infections.

Dose:

- For adults: 1 to 2 grams given every 8 hours (directed by the healthcare provider)
- For children: 25 to 50 mg per kilogram of body weight per day, divided into 3 or 4 doses (directed by the healthcare provider)

Indications:

- Skin and soft tissue infections
- Urinary tract infections
- Respiratory tract infections
- Bone and joint infections
- Endocarditis

Contraindication:

- Diarrhea
- Nausea
- Vomiting
- Indigestion
- Stomach pain
- Vaginal itching or discharge.

3. Aminoglycosides:

Aminoglycosides are a class of antibiotics that are derived from Streptomyces bacteria. Amikin (amikacin) is an aminoglycoside antibiotic used to treat serious bacterial infections.

Classification:

1. **Systemic:**
    - Streptomycin
    - Amikacin
    - Gentamicin
    - Kanamycin
    - Netilmicin
    - Tobramycin
    - Sisomicin
2. **Topical:**
    - Neomycin
    - Framycetin

Streptomycin:

- Streptomycin belongs to a class of drugs known as aminoglycoside antibiotics.
- It works by killing the organisms that cause the infection.
- This drug may also be used to treat other serious infections (such as Mycobacterium avium complex-MAC, tularemia, endocarditis, plague) along with other medications.

Dose:

Daily	Twice Weekly	Twice Weekly
Children	20-40mg /kg	25-30 mg/kg
	Max 1 g	Max 1.5 g

Adults	15 mg/kg	25-30 mg/kg
	Max 1 g	Max 1.5 g

Indication:

- Tuberculosis
- Tularemia
- Plague

Contraindications:

- Hypersensitivity
- Neuromuscular disorders
- Renal impairment
- Pregnancy and breastfeeding

4. Fluoroquinolones:

- Fluoroquinolones are highly effective antibiotics with many advantageous pharmacokinetic properties including high oral bioavailability, large volume of distribution, and broad-spectrum antimicrobial activity. With widespread use, antimicrobial resistance to fluoroquinolones has grown.

Classification of Fluoroquinolones:

1. **First-generation fluoroquinolones:**
   - Ciprofloxacin (Cipro)
   - Norfloxacin (Noroxin)
2. **Second-generation fluoroquinolones:**
   - Levofloxacin (Levaquin)
   - Ofloxacin (Floxin)
3. **Third-generation fluoroquinolones:**
   - Gemifloxacin (Factive)
   - Moxifloxacin (Avelox)

- Delafloxacin (Baxdela)

4. **Fourth-generation fluoroquinolones:**

- Besifloxacin (Besivance)
- Gatifloxacin (Tequin)
- Sparfloxacin (Zagam)

Ciprofloxacin:

- Ciprofloxacin is a broad-spectrum antibiotic that belongs to the fluoroquinolone class.
- It is used to treat a variety of bacterial infections, including urinary tract infections, respiratory infections, skin infections, and gastrointestinal infections, among others.

Dose:

For gonorrhea:

Adults—250 milligrams (mg) taken as a single dose.

- Children—Use and dose must be determined by your doctor.

For other infections:

- Adults—250 to 750 milligrams (mg) 2 times a day, taken every 12 hours.
- Children—Use and dose must be determined by your doctor.

Indication:

- Typhoid fever
- Gonorrhea
- Diarrhea
- Urinary tract infections
- Sexually transmitted infections

Contraindication:

- Nausea, Diarrhea, Headache, Dizziness, And Rash.
- More serious side effects are rare but can include tendon ruptures, central nervous system effects, and allergic reactions.

5. Macrolides:

- Macrolides are a class of drugs used to manage and treat various bacterial infections.
- They are also used in uncomplicated skin infections and otitis media in pediatric patients.

Classification of Macrolides: Macrolides

- Erythromycin
- Clarithromycin
- Azithromycin
- Roxithromycin
- Spiramycin
- **Ketolides**
- Telithromycin

Drugs Note

- **Erythromycin:** This is the first macrolide antibiotic that was discovered. It is commonly used to treat respiratory tract infections, skin infections, and sexually transmitted infections. It is also used to treat some forms of acne.
- **Azithromycin:** This is a newer macrolide antibiotic that is commonly used to treat respiratory tract infections, skin infections, and sexually transmitted infections. It is also used to treat some forms of traveler's diarrhea.
- **Clarithromycin:** This is another newer macrolide antibiotic that is commonly used to treat respiratory tract infections, skin infections, and sexually transmitted infections. It is also used to treat some forms of stomach ulcers.
- **Telithromycin:** This is a newer macrolide antibiotic that is commonly used to treat respiratory tract infections. It is also used to treat some forms of community-acquired pneumonia.
- **Spiramycin:** This macrolide antibiotic is commonly used to treat toxoplasmosis and some sexually transmitted infections.

Dose:

Erythromycin:

- Adults is 250-500 mg orally every 6 hours or 500-1000 mg orally every 12 hours.
- Children, the dose is usually 30-50 mg/kg/day in divided doses.

Azithromycin:

- Adult is 500-1000 mg orally once daily for 3-5 days.
- Children, the dose is usually 10-30 mg/kg/day in a single daily dose for 3-5 days.

Indications of Macrolides:

- Bronchitis
- Pneumonia
- Sinusitis
- Skin infections
- Stomach ulcers
- Stomach ulcers

Contraindications:

- Hypersensitivity
- Liver or kidney disease
- Myasthenia gravis
- Pregnancy and breastfeeding

6. Tetracyclines:

- Tetracycline is used to treat infections caused by bacteria including pneumonia and other respiratory tract infections; certain infections of skin, eye, lymphatic, intestinal, genital and urinary systems; and certain other infections that are spread by ticks, lice, mites, and infected animals.
- It is also used along with other medications to treat acne.
- Tetracycline will not work for colds, flu, or other viral infections.

Classification of Tetracyclines:

1. **First-generation tetracyclines:**
   - Tetracycline hydrochloride

- Achromycin
- Sumycin
- Panmycin

2. **Second-generation tetracyclines:**
   - Doxycycline
   - Vibramycin
   - Adoxa
   - Monodox
3. **Third-generation tetracyclines:**
   - Tigecycline
   - Tygacil

Dose:

- **Tetracycline:** For adults 250-500 mg every 6 hours
- **Doxycycline:** 100 mg twice a day or 200 mg once a day.
- **Minocycline:** 100-200 mg once or twice a day.

Indications:

- Acne
- Chlamydia
- Non-gonococcal urethritis
- Trachoma
- Lymphogranuloma venereum
- Plague
- Respiratory tract infections
- Certain infections of skin
- Eye
- Lymphatic
- Intestinal, genital and urinary systems

Contraindication:

- Contraindicated in pregnancy because of the risk of hepatotoxicity in the mother, the potential for permanent discoloration of teeth in the fetus (yellow or brown in appearance), as well as impairment of fetal long bone growth.
- Tetracyclines usually are not used in young children because tetracyclines can permanently stain teeth.
- This drug is contraindicated in persons who have shown hypersensitivity to any of the tetracyclines, in children<8 years. Avoid in complete renal failure. Use with caution in patients with hepatic dysfunction.

7. Sulphonamides:

- Sulfonamides or sulfa drugs are a class of antibiotics that target bacteria causing infections.
- These classes of drugs are generally broad-spectrum antibiotics that act on a wide range of bacterial types and are therefore employed in treating many kinds of bacterial infections.
- Sulphonamides do not kill bacteria, but it interferes with the ability of bacteria to grow and multiply (bacteriostatic).

Classification of Sulphonamides:

1. **Short-acting sulfonamides:**
   - Sulfisoxazole
   - Sulfamethoxazole
   - Sulfadiazine
2. **Intermediate-acting sulfonamides:**
   - Sulfadimidine
   - Sulfamethazine
   - Sulfamoxole
3. **Long-acting sulfonamides:**
   - Sulfadoxine
   - Sulfamethoxypyridazine

- Sulfasalazine

4. **Topical sulfonamides:**
    - Silver sulfadiazine
    - Mafenide

Dose:

1. **Short-acting sulfonamides:**
    - Sulfisoxazole: 500-1000 mg orally 2-4 times daily
    - Sulfamethoxazole: 800 mg orally twice daily
    - Sulfadiazine: 1-1.5 grams orally 3-4 times daily
2. **Intermediate-acting sulfonamides:**
    - Sulfadimidine: 500-1000 mg orally 3-4 times daily
    - Sulfamethazine: 1 gram orally twice daily
    - Sulfamoxole: 1-2 grams orally daily in divided doses
3. **Long-acting sulfonamides:**
    - Sulfadoxine: 1 gram orally as a single dose
    - Sulfamethoxypyridazine: 500 mg orally twice daily
    - Sulfasalazine: 1-2 grams orally daily in divided doses.

Indication:

- Urinary tract infections (UTIs)
- Malaria
- Toxoplasmosis
- Rheumatoid arthritis
- Otitis media,
- Acute exacerbations of chronic bronchitis,
- Diarrhea.

Contraindication:

- Allergy
- Renal impairment

8. Anti-tubercular drugs:

- Anti-tubercular drugs are a group of medications used in the treatment of tuberculosis (TB), a bacterial infection caused by Mycobacterium tuberculosis.

Classification of Anti-tubercular Drugs:

1. **First-line drugs:**
   - Isoniazid
   - Rifampin
   - Ethambutol
   - Pyrazinamide
2. **Second-line drugs:**
   - Streptomycin
   - Kanamycin
   - Capreomycin
   - Amikacin
3. **Other drugs:**
   - Bedaquiline
   - Delamanid
   - Linezolid

Dose:

1. **Isoniazid (INH):**
   - Adult dose: 5 mg/kg to 15 mg/kg of body weight, up to a maximum of 300 mg per day
   - Pediatric dose: 10 mg/kg to 20 mg/kg of body weight, up to a maximum of 300 mg per day
2. **Rifampin (RIF):**
   - Adult dose: 10 mg/kg to 20 mg/kg of body weight, up to a maximum of 600 mg per day
   - Pediatric dose: 10 mg/kg to 20 mg/kg of body weight, up to a

maximum of 600 mg per day.

3. **Ethambutol (EMB):**
    - Adult dose: 15 mg/kg to 25 mg/kg of body weight, up to a maximum of 1,200 mg per day
    - Pediatric dose: 15 mg/kg to 25 mg/kg of body weight, up to a maximum of 1,200 mg per day
4. **Pyrazinamide (PZA):**
    - Adult dose: 15 mg/kg to 30 mg/kg of body weight, up to a maximum of 2,000 mg per day
    - Pediatric dose: 15 mg/kg to 30 mg/kg of body weight, up to a maximum of 2,000 mg per day

Indications of anti-tubercular drugs:

- Tuberculosis
- Gaucher's disease
- Mycobacterium avium

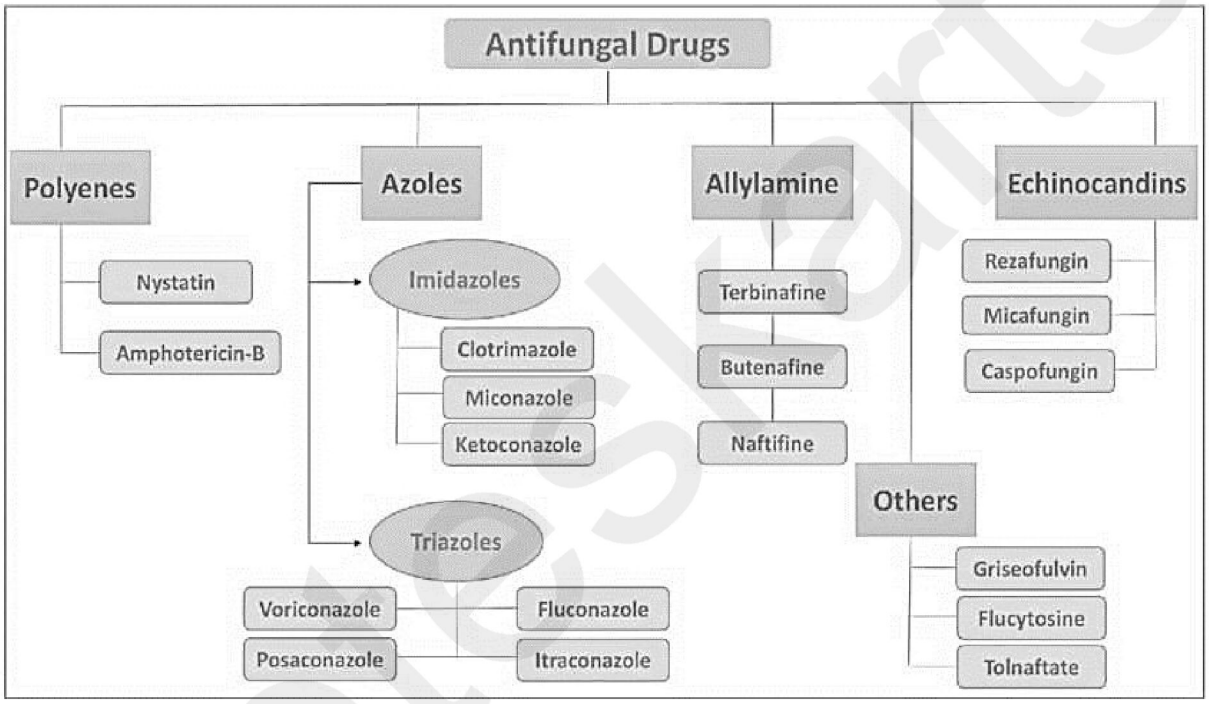
Contraindication

- Diarrhea
- Nausea
- Vomiting
- Abdominal pain
- Headache
- Muscle/joint pain
- Upset stomach
- Heartburn

9. Anti-fungal drugs:

- Antifungal medicines are used to treat fungal infections, which most commonly affect your skin, hair and nails.
- Fungal infections can occur in various parts of the body, such as the skin, nails, hair, mouth, throat, and genitals. Some fungal infections can be serious, especially in people with weakened immune systems or underlying medical conditions.

Classification of antifungal drugs:



Dose:

- **Fluconazole:** 150-400 mg orally once daily
- **Itraconazole:** 200-400 mg
- **Posaconazole:** 300 mg orally twice daily
- **Amphotericin B:** given intravenously, and the dose can range from 0.3-1.5 mg/kg/day.
- **Caspofungin:** 70 mg intravenously once on the first day.
- **Terbinafine:** 250 mg orally once daily for 2-4 weeks

Indications:

- Fungal infections
- Onychomycosis
- Tinea capitis
- Cryptococcosis
- Prophylaxis

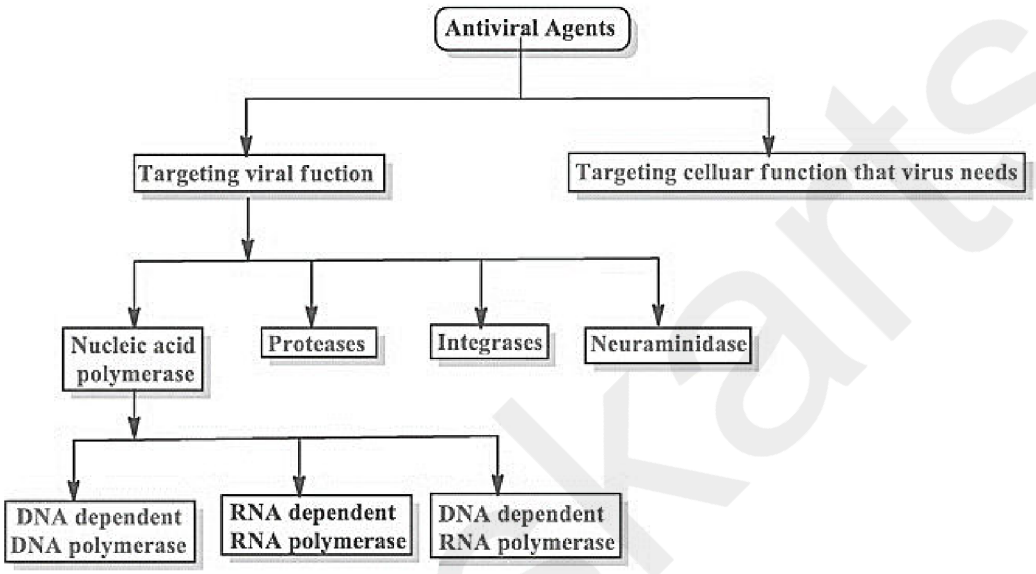
Contraindication:

- Hypersensitivity
- Hepatic dysfunction
- Endocrine or fertility problems

10. Anti-viral drugs

- Antiviral drugs are medications used to treat viral infections. Most antivirals target specific viruses, while a broad-spectrum antiviral is effective against a wide range of viruses.

Classification of Anti-viral drugs:



Dose of Anti-viral drugs:

- **Acyclovir:** Adults is 200 mg five times daily or 400 mg three times daily for 5-10 days.
- **Oseltamivir:** Adults and adolescents weighing 40 kg or more is 75 mg twice daily for 5 days.
- **Ribavirin:** Oral dose for adults is 600 mg twice daily for 3-7 days.

Indication of Anti-viral drugs:

- Acyclovir
- Valacyclovir
- Famciclovir
- Oseltamivir
- Zanamivir

Contraindications of Antiviral drugs:

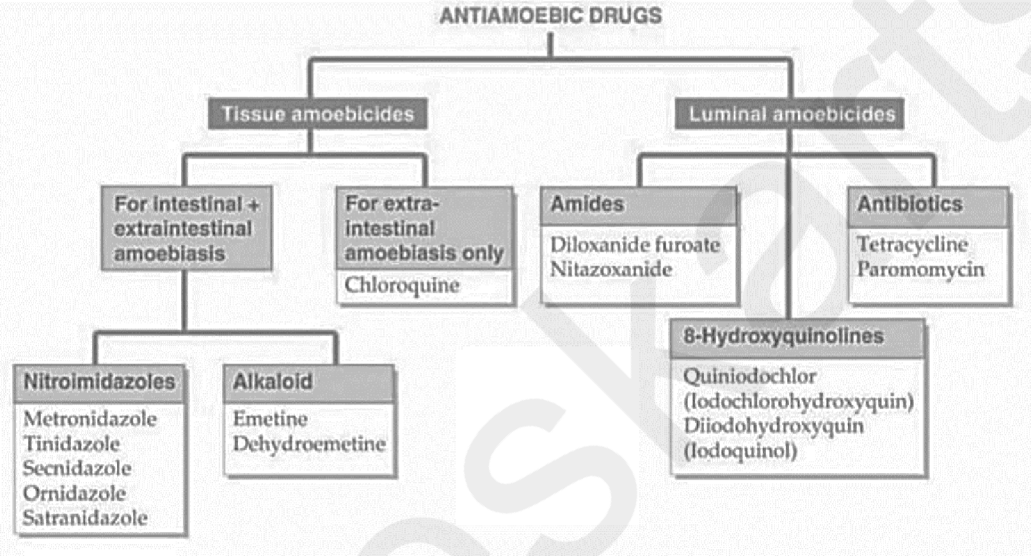
- Decompensate psychiatric disease
- Decompensate diabetes mellitus

- Decompensate arterial hypertension
- Decompensate hemoglobinopathy

11. Anti-amoebic agents:

- Anti-amoebic agents are compounds of drugs used to cure amoebiasis, a parasitic illness carried by a protozoan that causes intestinal amebiasis and extraintestinal manifestations.

Classification of Anti-amoebic agents:



Dose of Anti-amoebic agents:

- Metronidazole: Adults—500 or 750 milligrams (mg) 3 times a day for 5 to 10 days
- IV: 15 mg/kg
- Capsule: 375mg

Indication:

- Infections of the reproductive system, gastrointestinal (GI) tract, skin, heart, bone, joint, lung, blood, nervous system, and other areas of the body.
- Anaerobic infections
- Bacterial vaginosis

Contraindications:

- Individuals who have encountered certain blood disorders, pregnant women, and alcoholics are advised against consuming antiamoebic agents.

12. Anthelmintics:

- Anthelmintics are a class of drugs used to treat infections caused by parasitic worms, also known as helminths.
- These worms can infect humans and animals and can cause a variety of symptoms ranging from mild discomfort to severe illness.

Classification of anthelmintics

- **Piperazines:** Diethylcarbamazine citrate (DEC), Piperazine citrate.
- **Benzimidazoles:** Albendazole, Mebendazole, Thiabendazole.
- **Heterocyclics:** Oxamniquine, Praziquantel.
- **Natural products:** Ivermectin, Avermectin.
- **Vinyl pyrimidines:** Pyrantel, Oxantel.
- **Amide:** Niclosamide.
- **Nitro derivative:** Niridazole.
- **Imidazo thiazole:** Levamisole.

Dose:

- **Albendazole:** 400 mg taken once daily for 1-3 days for most types of infections.
- **Mebendazole** is 100 mg taken twice daily for 3 days for most types of infections. For whipworm infections
- **Pyrantel** is 11 mg/kg (up to a maximum of 1 g) taken as a single dose for most types of infections.

Indications:

- Roundworm, hookworm, and whipworm infections.
- Lymphatic filariasis
- Onchocerciasis
- Schistosomiasis
- Veterinary use: Anthelmintics are also commonly used to treat parasitic infections in livestock and pets.

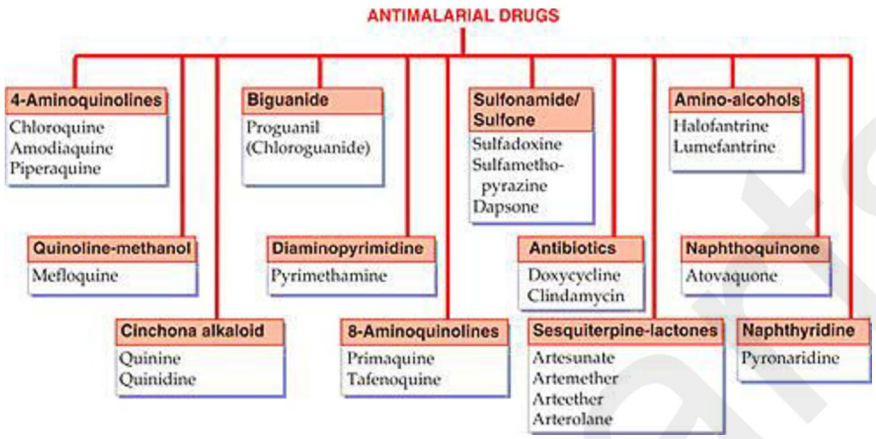
Contraindications:

- Pregnancy
- Breastfeeding
- Severe diarrhea
- Hepatic or renal disease

13. Anti-malarial agents:

- Anti-malarial agents are drugs used to prevent or treat malaria, a parasitic disease transmitted by infected mosquitoes.

Classification of Anti-malarial agents:



Dose:

1. **Chloroquine:** Adults- 500 mg once a week for malaria.
2. **Quinine:** Adults- 600 mg every 8 hours for 7 to 10 days for treatment of malaria.
3. **Mefloquine:** Adults- 250 mg once a week.

Indications:

- Malaria
- Pneumocystis carinii pneumonia
- Amebiasis, extraintestinal
- Rheumatoid arthritis
- Systemic lupus erythematosus
- Arrhythmias

Contraindication:

- Nausea and vomiting
- Headache
- Dizziness
- Fatigue
- Malaise (feeling of discomfort)
- Muscular pain (Myalgia)
- Diarrhea, Cough, Fever and chills

14. Anti-neoplastic agents:

- The antineoplastic agents or anticancer drugs represent a large and diverse class of medications.
- They generally have limited but important uses, and often have significant hepatotoxicity.

Classification of Anti-neoplastic agents:

1. **Alkylating Agents**
    - Altretamine, Bendamustine, Busulfan, Carmustine, Chlorambucil, Cyclophosphamide, D acarbazine, Ifosfamide, Trabectedin
    - Platinum Coordination Complexes
        - Carboplatin, Cisplatin
2. **Antibiotics, Cytotoxic**
    - Bleomycin, Dactinomycin, Daunorubicin, Doxorubicin
3. **Antimetabolites**
    - Antifolates: Methotrexate, Pemetrexed, Pralatrexate, Trimetrexate
    - Purine Analogues: Azathioprine, Cladribine, Fludarabine, Mercaptopurine, Thioguanine
    - Pyrimidine Analogues: Azacitidine, Capecitabine, Cytarabine,
4. **Biologic Response Modifiers**
    - Aldesleukin (IL-2), Denileukin Diftitox,
5. **Histone Deacetylase Inhibitors**
    - Belinostat, Panobinostat, Romidepsin, Vorinostat
6. **Hormonal Agents**
    - Antiandrogens: Abiraterone, Apalutamide, Bicalutamide, Cyproterone, Enzalutamide
    - Antiestrogens (including Aromatase Inhibitors): Anastrozole, Exemestane, Fulvestrant, Letrozole, Raloxifene, Tamoxifen, Tor emifene
    - Gonadotropin Releasing Hormone

- Analogues: Degarelix, Goserelin, Histrelin, Leuprolide, Triptorelin
- Peptide Hormones: Lanreotide, Octreotide, Pasireotide

7. **Monoclonal Antibodies**
   - Alemtuzumab, Tremelimumab
8. **Protein Kinase Inhibitors**
   - Abemaciclib, Acalabrutinib, Afatinib, Alectinib, Alpelisib, Axitinib, Ruxolitinib.
9. **Taxanes**
   - Cabazitaxel, Docetaxel, Paclitaxel
10. **Topoisomerase Inhibitors**
    - Etoposide, Irinotecan, Teniposide, Topotecan
11. **Vinca Alkaloids**
    - Vinblastine, Vincristine, Vinorelbine
12. **Miscellaneous**
    - Asparaginase(Pegaspargase), Bexarotene, Eribulin, Everolimus

Dose:

- **Vinblastine:** Adult dose is 6 mg/m2 to 10 mg/m2 once a week.
- **Vincristine:** This drug is also typically given by IV injection, and the usual adult dose is 1.4 mg/m2 to 2.0 mg/m2 once a week.
- **Vinorelbine:** This drug may be given by IV injection or by mouth, and the usual adult dose is 25 mg/m2 to 30 mg/m2 once a week.
- **Altretamine:** Capsule 50mg

Indications:

- Lymphoma,
- Leukemia,
- Melanoma,
- Solid tumor

Drug (generic name)	Dose	Indication
Cisplatin	20 mg/m² I.V	Metastatic testicular tumors
	50–70 mg/m² I.V	Advanced bladder carcinoma
	70–100 mg/m² I.V	Metastatic ovarian carcinoma
Mechlorethamine	0.4 mg/kg O.D intracavity, 0.2 mg/kg intrapericardial	Metastatic carcinoma Leukemia lymphomas polycythemia
	MOPP regimen 6mg/m²/day I.V	
Methotrexate	15–30 mg/day	Trophoblastic neoplasms
	12 mg/m² I.V	Meningeal leukemia, osteosarcoma
	40 mg/m &sup 2 I.V	Breast cancer, head and neck cancer
6-mercaptopurine	1.5–2.5 mg/kg orally O.D	ALL
5-FU	500 mg/sq.m I.V, 450–600 mg/sq.m I.V weekly, 200–400 mg/sq.m I.V continuous infusion (QD) do not exceed 800 mg/day	Cancers of colon, breast, ovary, liver, pancreas, rectum, and stomach
Bleomycin	0.25–0.5 units/kg I.V, I.M or SC weekly/twice weekly.	Head and neck cancer, leukemias, lymphomas, prostate cancer, and respiratory and thoracic cancer
Doxorubicin	50 mg/m² I.V Q 4 weeks	Ovarian cancer
	30 mg/m² I.V on day 4 following 1.3 mg/m² on days 1,4,8,11 & q 3 weeks	Multiple myeloma
Vincristine	1.4 mg/m² I.V q week	Acute leukemia
Paclitaxel	175 mg/m² I.V over 3 hours every 3 weeks	Breast cancer, metastatic breast cancer
Etoposide	50–100 mg/m²/day I.V, 100 mg/m²/day I.V on days 1,3,5 repeat q 3–4 weeks	Testicular cancer Small-cell lung cancer
	35 mg/m²/day I.V for 4 days	
Tamoxifen	20–40 mg/day PO, doses>20 mg/day should be divided BID (morning and evening)	Breast cancer
Adalimumab	375 mg/m² I.V infusion in relapsed or refractory low-grade or follicular, CD20 positive, B-cell NHL once weekly×4 doses	Non-Hodgkin's lymphoma Chronic lymphocytic leukemia
	In combination therapy with FC, 375 mg/m² I.V infusion on day 1 1st cycle then 500 mg/m² on day 1 of subsequent cycles	

Contraindication:

- Pregnancy and lactation.
- Known allergy to drugs.
- Bone marrow suppression.
- Suppressed renal or hepatic function.
- Pulmonary problems.
- Cardiac problems.