# Antihelmintic Drugs



# Mechanism of action of anti-helminthes:

## (1) Paralysis:

1- Pyrantel: Depolarizing NMB ⟶ spastic paralysis & worm expulsion.

2- Levamisole: Depolarizing NMB & immunostimulant.

3- Ivermectin: Increases GABA transmission.

4- Praziquantel: Increases permeability of worm cell membrane to Ca2+ → contraction followed by spastic paralysis & death.

5- Metrifonate: Organophosphorus cholineesterase inhibitor → worm paralysis.

6- Oxamniquine: worm paralysis → hepatic shift & death

# (2) Other mechanisms:

1- Benzimidazoles: Inhibit microtubules synthesis & glucose uptake.
2- Niclosamide: Inhibits glucose uptake & oxidative phosphorylation.
3- Diethylcarbamazine:
   *Alters surface structure of microfilaria displacing them from tissues.
   *Increases destruction by host defense mechanism

# Drugs for Nematodes



# I. Benzimidazoles:

1. ***Mebendazole*** :

(ascaris, ankylostoma, enterobius, trichurius):

a. **Enterobiasis**: single 100 mg, repeated after 2 & 4 weeks.

*All family is treated at the same time + general hygienic measures.

**b. Other nematode infections**: 100 mg twice daily for 3 successive days.

* Fe2+ is given in Ankylostomiasis to correct the associated anemia.

***side effects:** patients may complain of abdominal pain and diarrhea

## 2. FIubendazole:

similar to Mebendazole but also effective in strongyloides

## 3. Albendazole:

(broad-spectrum for nematodes & cestodes).

**a.Nematode infection**

(ascaris, ankylostoma, enterobius & trichurius):

*Single oral dose 400 mg (repeated after 3 days for ascaris & in 2 weeks for enterobius).

**b. Cestode infection :** 1st choice in:

* Hydatid disease.

*Neurocysticercosis: (parasitic infection of the central nervous system and is caused by the pork tapeworm Taenia solium) .

*Medical treatment of **neurocysticercosis** is associated with inflammatory responses to dying parasites in the CNS, , including headache, vomiting, hyperthermia, convulsions, and mental changes ( add corticosteroids to eliminate CN symptoms).

- The drug  should not be given during pregnancy or children under 2 years of age

- It is contraindicated in ocular cysticercosis.

- **Adverse effects:**

  * When used in *short-course therapy (1–3 days)* for nematodal infestations, adverse effects are *mild and transient* and include headache and nausea.

  * With Treatment of hydatid disease *for 3 months* has a risk of *hepatotoxicity* and, rarely, *agranulocytosis or pancytopenia*

## 4. Thiabendazole:

for treatment of Strongyloides, trichinosis and cutaneous larva migrans

*** Adverse effects :**

- most often encountered are dizziness, anorexia, nausea, and
- vomiting, erythema multiforme and Stevens-Johnson syndrome which may cause death

# II. Pyrantel pamoate:

- Alternative to mebendazole in ancylostoma, ascaris & enterobius.

***Adverse effects :**

are mild and include nausea, vomiting, and diarrhea

# III. Levamisole:

Broad-spectrum for nematodes.

# IV. Anti-filarial drugs:



## 1 . Diethylcarbamazine:

- **Effective** on blood microfilaria of Wucheraria bancrofti
- **Mechanism of action:**

  used in the treatment of filariasis because of its ability to immobilize microfilariae and render them susceptible to host defense mechanisms

***Pharmacokinetics:**

- It is rapidly absorbed following oral administration with meals and is excreted primarily in urine.

- Urinary alkalosis and renal impairment may require dosage reduction.

***Adverse effects**

- are primarily caused by host reactions to the killed organisms.
- Symptoms include fever, malaise, rash, myalgias, arthralgias, and headache, and their severity is related to parasite load.
- Most patients have leukocytosis.

**2.Ivermectin**: well-tolerated.

* **1st choice** for onchocerciasis -strongyloidiasis.

* **Mechanism of action:**

Targets the parasite's glutamate-gated chloride channel receptors. Chloride influx is enhanced, and hyperpolarization occurs, resulting in paralysis of the worm.

***Pharmacokinetics:**

- The drug is given orally.
- It does not cross the blood-brain barrier
- and has no pharmacologic effects in the CNS. However, it is contraindicated in patients with meningitis?? because their blood-brain barrier is more permeable, making CNS effects possible.

***Adverse effects:**

The killing of the microfilaria can result in a Mazotti-like reaction

(fever, headache, dizziness, somnolence, and hypotension)

# Anti bilharzial drugs



# Praziquantel

- **Broad-spectrum for trematodes & cestodes.**

**1.Schistosomiasis:**

* 1st choice for all species.
* Dose: 20 mg/kg (in 2 doses at 4-6 hrs interval).

## 2.Cestodes:

*1st choice in Tenia, H. nana and D. latum (single dose of 5-10 mg/kg).

*Neurocysticercosis (2nd choice to albendazole) plus corticosteroids.

*Hydatid disease (as an adjunct to albendazole

## Mechanism of action:

- It increases membrane permeability to $Ca^{2+}$ $\longrightarrow$ marked contraction followed by paralysis; this is followed by vacuolization and parasite death.

- **Advantages:**

1. Drug of choice in all species.
2. High cure rate.
3. One-day treatment

## Adverse effects:

- Headache, dizziness
- abdominal pain
- arthralgia, rash and pruritis.

## Contraindications:

- Pregnancy& lactation.
- Children below 4 years

# Metrifonate

- is an organophosphate prodrug that is converted in the body to the active metabolite.
- It acts only against Schistosomahaematobium.
- Toxic effects occur due to excess cholinergic stimulation.
- The drug is contraindicated in pregnancy

# Oxamniquine

- It causes paralysis of the worms, but mechanism is unknown.
- effective only in Schistosoma mansoni.
- Dizziness is a common adverse effect (no driving for 24 h).
- It is not advisable to use the drug in pregnancy or in patients with a history of seizure disorders.

# Mirazid

- Natural (of plant origin).
- It induces muscle contraction.
- Dose: 10mg/kg orally for 3-6 days (92-98% cure rate).
- Also effective in Fascioliasis.

# Drugs for Cestodes (Tapeworms)

- They include praziquantel and niclosamide

# Niclosamide

* **2nd line to praziquantel for**
  - T. saginata & solium
  - D. latum & H. nana

# Precaution:

- In T. solium infection, a purgative is given to avoid cysticercosis; as damaged segments release ova which are not affected by the drug

*(the drug is not effective against cysticercosis*).

- It is not effective in hydatid disease (caused by Echinococcus granulosus"dog tapeworm") which is treated by albendazole

# Thank you