# Anthelmintic drugs

## ❑ LEARNING OBJECTIVES

- **Classification of worms**
- **classification of anthelmintic drugs**
- **mechanism of action**
- **side effects**
- **broad spectrum anthelmintic ,Albendazole**

❖ **Mebendazole**
❖ **Pyrantel pamoate**
❖ **Piperazine**
❖ **Thialbendazole**
❖ **Ivermectin**

# Anthelmintic drugs

Three major groups of helminthes (worm)

- The trematodes (flukes worm) e.g. Schistosoma haematobium ,Schistosoma mansoni,and Schistosoma japonicum ,(Bilharziasis ),Fasciola hepatica (sheep liver fluke ).
- The nematodes (round worms) e.g. Ascaris lumbricoides ,wuchereria bancrofti (filariasis ),Enterobius vermicularis ,Trichuris trichiura .
- The cestodes (Tape worms)e.g. Taenia saginata (beef tape worm),Taenia solium (Pork tape worm), Echinococcus granulosus (Hydatid disease) .

# Anthelmintic drugs

❖ **Drugs for treatment of nematodes :-**

Mebendazole, Albendazole , Thialbendazole , Pyrantel pamoate ,Ivermectin , Diethylcarbamazine , Piperazine , Levamisole .

❖ **Drugs for treatment of trematodes :-**

Praziquantel ,
alternative drugs ,
Metrifonate and
Oxamniquine .

❖ **Drugs for treatment of cestodes :-**

Albendazole and
Niclosamide

# Praziquantel:-

- It is a drug of choice for treatment of Schistosoma infection of all species and most other trematodes and also effective in treatment cestodes infection ,include cysticercosis (this disease is caused by Taenia solium larvae ).

- **Mechanism of action :-**
- It increases the cell membrane permeability to calcium ions ,resulting in contracture and paralysis of the parasite and then its death .

# Praziquantel:-

- **Pharmacokinetic :-**
- Rapid absorption after oral administration ,distribution to the C.S.F. , about 80% of Praziquantel is bound to plasma proteins ,half life 1-2 hours ,extensively metabolized in the liver by oxidative process ,excretion is mainly through kidneys (60-80 %) and bile (15 -35%), plasma concentration of Praziquantel is increase when taken with high carbohydrate meal or taken with drugs inhibit cytochrom P-450 system like Cimetidine ,and increase its metabolism with drugs increase activity of cytochrom P-450 e.g. Phenytoin .
- **Side effects :-**
- 1-nausea ,vomiting, abdominal pain .
- 2- headache ,dizziness, drowsiness .
- 3 – Pruritus ,urticaria ,arthralgia and myalgia .
- **Contraindications :-**
- 1-Preganant women and nursing mothers .
- 2- Ocular cysticercosis .

# Drugs for treatment of cestodes :-

- Tape worms (cestodes) e.g. Taenia saginata(beef tape worm),Taenia solium(pork tapeworm),Echinococcus granulosus (Hydatid disease ),diphylobothrium latum (fish tare worm ), and cysticercosis .
- **Niclosamide :-**
- It is a drug of choice of most cestodes (tape worm),minimally absorbed from GIT, adult worms are rapidly killed by inhibition oxidative phosphorylation or stimulation of ATPase activity ,it is given in 2 gm once daily in morning on an empty stomach result in cure rate of over 85% for D. latum ,and about 95% for Taenia saginata and Taenia solium ,Niclosamide is not effective against cysticercosis or Hydatid disease .
- **Side effects :-** Infrequent and mild include nausea, vomiting, diarrhea, and abdominal discomfort .
- **Contraindications:-** pregnancy and children less than 2 years of age .

# Albendazole :-

Abroad spectrum anthelmintic ,it is a drug of choice for treatment cestodal infestation, such as cysticercosis and Hydatid disease .

**Mechanism of action :-**

It inhibits microtubule synthesis and impaired glucose uptake, lead to immobilization of parasite and its death .

**Pharmacokinetic :-**

Incomplete absorption from GIT , but absorption is enhanced by a high fat meal ,it undergoes extensive first pass metabolism ,its metabolite called Albendazole sulfoxide is also active which excreted in urine ,half life is 8-12 h., it reach its peak plasma concentration about 3 hours after 400mg oral dose .

Albendazole is administered on an empty stomach when used against intraluminal parasite ,but with a fatty meal when used against tissue parasite .

**Other clinical uses :-**

1-Ascariasis .

2- Trichuriasis .

3- Hook worm and pin worm .

4- Strongyloidiasis .

# Albendazole :-

- **Side effects :-**
  - When used for short time (1-3days ),is nearly mild side effects e.g. nausea, vomiting, epigastric distress and diarrhea ;
  - but in long term used for Hydatid disease (persist for 3 months ),can cause alopecia, increase liver enzymes and pancytopenia ,so blood counts and liver function tests should be followed during long –term therapy .
- **Contraindications :-**

Pregnancy , children less than 2 years age ,or hypersensitivity to Albendazole .

# Mebendazole:-

- Abroad spectrum anthelmintic activity against nematodes ,
- it is a drug of choice in the treatment of infection by :-

  1-Trichuris trichiura .

  2-Enterobius vermicularis .

  3- Necator americanus .

  4- Ancylostoma duodenale .

  5- Ascaris lumbricoides (round worm ) .

**Pharmacokinetic :-**

- Less than 10% of orally administered Mebendazole is absorbed ,plasma protein binding more than 90% ,rapidly metabolized by first pass effect in the liver ,half life is 2-6 hours .it excretes mostly in the urine , absorption is increase if the drug is ingested with a fatty meal .

# Mebendazole:-

- **Mechanism of action :-**
- It act by inhibiting microtubule synthesis of nematodes ,thus inhibit glucose uptake ,immobilized the parasite and its death .

- **Side effects :-**
- Short term Mebendazole therapy for intestinal nematodes associated with mild nausea , vomiting , diarrhea ,and abdominal pain ;in high doses include hypersensitivity reaction include urticaria ,rash ,agranulocytosis ,alopecia ,and elevated liver enzymes .

- **Contraindications :-**
- In pregnancy and children less than 2 years age , Mebendazole should used in caution in patients with liver cirrhosis .

# Pyrantel pamoate :-

- It is abroad spectrum anthelmintic ,
- highly effective for treatment pin worms , round worms and hook worms ,
- it is poorly absorbed orally and active against luminal organism .

## Mechanism of action :-

The drug is neuromuscular blocking agent that cause release of acetylcholine and inhibit cholinesterase, result in paralysis and death of organism ;

## Side effects :-

mild GIT upset ,headache and dizziness ;should be used in caution in patients with liver dysfunction .

# Piperazine :-

- Alternative for treatment of Ascariasis with cure rate over 90% when taken for 2 days
- readily absorbed from GIT, excreted in urine ;
- Piperazine causes paralysis of Ascaris by blocking acetylcholine receptors at neuromuscular junctions and expelled by normal peristalsis .

## Diethylcarbamazine :-

- Is a drug of choice in the treatment of Filariasis (Wuchereria bancrofti ), loiasis (Loa Loa ),and tropical eosinophilia .
- rapidly absorbed from GIT ,half life is 2-3 hours ,excreted in urine .
- Its adverse effects mild nausea, vomiting , diarrhea , abdominal pain and headache ; the drug should be used in caution in patients with renal disease or hypersensitivity reaction .