

Anthelmintic Drugs

Drugs for some common parasitic worms

	<u><i>Enterobius vermicularis</i> (Pin worms)</u>	<u><i>Ascaris lumbricoids</i></u>	<u><i>Ankylstoma duodenale</i></u>	<u><i>E. granulosus</i> (hydatid cyst)</u>	<u>neurocysticercosis</u> (due to the larval form of <i>Taenia solium</i>):
Mebendazole	100 mg once; repeated in 2 weeks to kill any worm that may have hatched from eggs after initial treatment	100 mg twelve hourly For 3 days	100 mg twelve hourly For 3 days		
Albendazole	400 mg once; repeated in 2 weeks	400 mg once	400 mg once	15mg/kg for 3 months	15mg/Kg for one month
Piperazine	75 mg/Kg (max. 3.5 gm) once a day for 7 days	4 gm once a day for 2 days			
Pyrantel pamoate	10 mg /Kg once repeated in 2 weeks	10 mg/Kg once	10 mg/Kg once		
Levamisole		150 mg single dose	150 mg 2 doses at 12 hour interval		

For pin worms (*Enterobius vermicularis*)

- ❖ Personal hygiene : washing hands before eating and after toilet, scrubbing nails, changing underwear, and washing anal region on awakening to remove worm eggs is important to break the cycle of autoinfection.
- ❖ All family members should be treated at the same time regardless of whether or not symptoms are present to avoid transmission the parasite.

Ankylstoma duodenal infestation may cause anaemia which require iron supplement.

MEBENDAZOLE

Mechanism of action: prevents uptake of glucose by susceptible intestinal worms, this results in energy depletion, immobilization followed by slow death. It is useful for *pin worms*, *Ankylostoma*, and *Ascaris*.

PKs: Tablet should be chewed before swallowing, Food particularly fatty foods increase absorption, so better to be administered on empty stomach. Only 10% of oral dose is absorbed, and rapidly metabolized, so side effects are low including: abdominal pain, diarrhea and hypersensitivity.

It is contraindicated in children below 2 years (not well studied in this age group) and during pregnancy because it is embryotoxic and teratogenic in animals.

ALBENDAZOLE

Mechanism of action is similar to mebendazole. It is effective against intestinal pin worms, *Ascaris*, *Ankylostoma*, eggs of *Ascaris lumbricoides*.

After absorption it is converted to active metabolites which is distributed to body tissues and act against tissue parasites as hydatid cyst (due to larva of *Echinococcus granulosus* or neurocysticercosis (due to larva of *T. solium*).

It is poorly absorbed orally. Absorption is enhanced by fatty meals, so it is given on empty stomach for intestinal parasites and with fatty meals for tissue parasites.

Side effects: high doses and prolonged use cause hepatotoxicity, leukopenia (Liver function test and blood counts should be done periodically).

Contraindication: pregnancy (teratogenic) and children below 2 years.

PIPERAZINE citrate

It blocks nicotinic receptors at worm's neuromuscular junction resulting in flaccid paralysis then worm is evacuated in the faeces.

Its use is declined due to its neurotoxic side effects. It may exacerbate seizures in epileptic, so it is Contraindicated in patient with epilepsy.

LEVAMISOLE: alternative to mebendazole and albendazole for intestinal worms, *ankylostoma* and *Ascaris*.

is a depolarizing neuromuscular blocker that cause depolarization followed by paralysis of and expulsion of live worms in faeces.

Contraindications: pregnancy and children below 2 years.

Drugs for schistosomiasis**PRAZIQUANTIL:**

Mechanism: causes spastic paralysis of adult worms and larvae resulting in detachment of worms from tissues and worm's death.

USES:

1- tape worms (T.solium, T. saginata), H. nana 2- neurocystisercosis
3- schistosomiasis : It is used in mass treatment control programmes for schistosomiasis because it is effective against all species of schistosomiasis(useful in mixed infections), cures in a single dose, is well tolerated and this will improve compliance

Side effects: nausea, headache, drowsiness

Contraindications: Pregnancy, breast feeding , ocular cysticercosis

METRIFONATE:

Is a cholinesterase inhibitor; causes paralysis of the worm.

It cures only S. haematobium infection with single dose or divided doses in one day. It can be used as monthly prophylactic in endemic areas.

Side effects: headache, vertigo, abdominal pain, diarrhea, vomiting

Drugs for taeniasis**PRAZIQUANTIL****NICLOSAMIDE**

Blocks glucose uptake in intestinal tape worms resulting in energy depletion, immobilization and finally death. It is lethal to scolex and segments but not for ova. Purgative is given after niclosamide administration to evacuate the dead segments and prevent occurrence of cysticercosis that results from digestion of larval forms and liberation of ova.

The tablet should be chewed before swallowing and taken on empty stomach.

Uses: T.solium, T.saginata, H.nana

Side effects: mild GIT disturbance

Drugs for filariasis**DIETHYLCARBAMAZINE**

Kills both microfilaria and adult parasite. Initial dose is best kept low because deaths of neumerous parasite produce immediate reactions as vomiting, headache, urticaria, fever and asthmatic attack due to release of antigenic particles.

Ivermectin: is effective in single dose. It may cause immediate reactions (similar to diethylcarbamazine) due to death of the parasite

[Antiprotozoal Drugs]

Drugs for amoebiasis

1) Tissue amebicides:

a) **For both intestinal and extra intestinal amoebiasis:**

- Metronidazole and tinidazole
- Emetine and dehydroemetine(use is declined because of cardiac toxicity)

b) **For extra intestinal amoebiasis :** chloroquine

Metronidazole

Spectrum of activity:

- 1-protozoa: *E. histolytica*, *giardia lamblia*, *trichomonas vaginalis*
- 2-anaerobic bacteria: *Cl difficile*, *Cl perfringes*, *H.pylori*, *fusobacterium*, *bacteroides fragilis* and *gardenerella vaginalis*

Mechanism of action: inside the anaerobic bacteria and sensitive protozoa . metronidazole is converted into an active form by reduction of its nitro group ;this binds to DNA and prevents nucleic acid synthesis; it is bacteriostatic.

It is effective against trophozoites but not the cysts of *E.histolytica* .

Kinetics: It

is well absorbed after oral or rectal administration. achieves sufficient concentration to eradicate infection in intestinal wall, pelvic tissues, liver, brain, CSF, semen and vaginal fluid and it can cross the placenta is metabolized in liver and is excreted in urine, inducing a harmless dark -brown color. Plasma t1/2 is 8 hrs; administered 8 hourly.

Uses:

- 1) amoebiasis including acute intestinal amoebic dysentery, amoebic hepatitis and amoebic liver abscess.
- 2) giardiasis
- 3) urogenital trichomoniasis in both sexes
- 4) anaerobic bacterial infections as: postsurgical infections, intra-abdominal infections , septicaemia , osteomyelitis, brain and lung abscess
- 5) anaerobic vaginosis
- 6) pseudomembranous colitis (caused by *Cl. Difficile*), due to use of some antibiotics.
- 7) acute ulcerative gingivitis and dental infections
- 8) eradication of *H. pylori* associated with peptic ulcer
- 9)cutaneous leishmaniasis

Side effects

- 1-GIT: nausea, vomiting, metallic taste, furred tongue

2- CNS: headache, dizziness, vertigo, ataxia, peripheral neuropathy, high doses may cause seizures

3- Disulfiram-like effect with alcohol(nausea , vomiting, sweating, flushing, tachycardia, hypotension).

4- carcinogenic in rodents and mutagenic in bacteria so it is not recommended during 1st trimester of pregnancy and cautiously used later on.

5-Inhibits metabolism and Potentiates anticoagulant effect of warfarin.

Tinidazole

Similar to metronidazole in efficacy and spectrum of activity but:

- It has longer duration of action, allowing once daily administration .
- single (2g) dose is effective for giardiasis, trichomoniasis and acute ulcerative gingivitis.
- lower side effects

Chloroquine

is an antimalarial drug; highly concentrated in liver ; used for prevention and treatment of amebic liver abscess.

2) Luminal amebicides

-act in intestinal lumen but do not have tissue amoebicidal action

- must be administered with or after tissue amoebicides during treatment of acute intestinal dysentery or liver abscess, **to eradicate cysts (the infective stage of the parasite)** from the colon and prevent carriers.

- Cure the asymptomatic cyst passers.

a) Diloxanide furoate

Mechanism of action: Oral dose is hydrolyzed by intestinal flora into diloxanide and furoic acid; about 90% of the diloxanide is absorbed, metabolized in liver and excreted in the urine. The unabsorbed fraction reaches colon and acts as a luminal meboecide; kills trophozoites responsible for production of cysts and eradicates cysts in the lumen of the colon.

dverse effects: flatulence, nausea, abdominal pain, proteinurea and rashes.

b)Iodoquinol is an iodinated hydroxyquinolone. Kills the cyst-forming trophozoites

Other uses: Trichomoniasis ,giardiasis

Side effects: Thyroid enlargement, optic atrophy, visual loss, skin rash, anorexia, diarrhea, abdominal pain.

c)Antibiotics:Paromomycin, Tetracycline , Doxycycline**Paromomycin :**

is an aminoglycoside antibiotic ,given orally, doesn't absorbed, reaches colon in large amounts. It has a direct action on the cyst membrane causing leakage of intracellular components and indirect action as it inhibits colonic flora on which the amoeba feed so reduces proliferation of the amoeba in intestinal lumen.

Other Uses:

- Cutaneous and visceral Leishmaniasis

Adverse Effects: abdominal cramps, nausea and vomiting

Tetracycline & Doxycycline**Mechanism:**

They eradicate colonic flora on which amoeba feed so reduce proliferation of the amoeba in intestinal lumen which reduces the risk of intestinal invasion, perforation and peritonitis.

Drugs for TOXOPLASMOSIS

1)Spiramycin (macrolide antibiotic) for toxoplasmosis in pregnant women.

2) Combination of pyrimethamine with either sulphadiazine , clindamycin, clarithromycin or azithromycin.

DRUGS FOR LEISHMANIASIS**Sod.stibogluconate:**

is pPoorly absorbed orally; administered IV , IM or intralesionally
has a cumulative effect on repeated administration because it remains stored in tissues.

Side effects: pain and stiffness at injection site, bradycardia and ECG changes.

Pentamidine:administered i.m. or i.v

Mechanism: unknown.

Side effects: hypotension, fainting and dyspnea, due to histamine releas

OTHERS:amphotercin B, metronidazole , paromomycin