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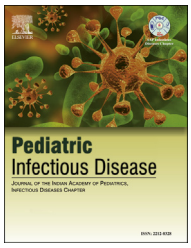

## Antimicrobials in Clinical Practice

# Drugs for intestinal helminths

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ABSTRACT

It is estimated that over a billion people in the world is infested by worms. The most common are the soil-transmitted helminthes (*Ascaris lumbricoides*, *Trichuris trichura*, *Ancylostoma duodenale* and *Necator americanus*). They have a significant effect on the health and growth of children nations, especially in developing nations. Commonly used anthelminths in children like Albendazole, Mebendazole, Pyrantel, Ivermectin are briefly discussed in this article.



Intestinal helminths (worms) are parasitic organisms that live in the gastrointestinal tract of their hosts. It is estimated that over a billion people (over a sixth of the world's population) is infested by worms.[1] Most worm infections are more common in Asia, Africa, and South America. The soil-transmitted helminths (*Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale*, and *Necator americanus*) are the most common. They have a significant effect on the health and growth of children, especially in developing nations. The intestinal worms that affect humans are listed in Table 1.

Drugs for the treatment of worms have been available for many years. In spite of this, worms still affect enormous numbers of people around the world. Apart from individual use, anthelmintics are also used in mass treatment drives. Systemic reviews have shown a beneficial effect of mass administration on hemoglobin levels of the treated population,[2,3] though not on growth and development.[4]

Worms also infect pet animals, livestock and other animals. Animals in diaries and farms are often given anthelmintics repeatedly and even continuously. This has led to a major drug resistance problem in veterinary medicine,[5] and this is a potential problem for human treatment also. It is important to use anthelmintics only after a firm diagnosis, and also to formulate non-drug strategies for helminth control.

## 1. Albendazole

Albendazole is a member of the drug class benzimidazoles. It acts by compromising the cytoskeleton, impairing locomotion and reproduction. It also has ovicidal and larvicidal effects. It is used for the treatment of pinworm and hookworm infections, ascariasis, trichuriasis and strongyloidiasis. It has systemic activity also, and is the drug of choice for treating cysticercosis and hydatid disease. Its ovicidal activity is better than that of mebendazole.[6]

Absorption is variable, and improved by a fatty meal. When given for intestinal parasites, it should be given on an empty

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**Table 1 – Drugs for intestinal helminths.**

| Parasite | First line drug | Other drugs |
|---|---|---|
| **Nematodes** | | |
| *Ascaris lumbricoides* (roundworm) | Albendazole, mebendazole | Pyrantel pamoate, ivermectin, piperazine |
| *Trichuris trichiura* (whipworm) | Albendazole, mebendazole, pyrantel pamoate | Ivermectin |
| *Necator americanus*, *Ancylostoma duodenale* (hookworms) | Albendazole, mebendazole | Pyrantel pamoate |
| *Enterobium vermicularis* (pinworms, threadworms) | Albendazole, mebendazole, pyrantel pamoate | Ivermectin |
| *Strongyloides stercoralis* | Ivermectin | Albendazole, tiabendazole |
| **Cestodes** | | |
| *Taenia saginata* (beef tapeworm), *Taenia solium* (pork tapeworm), *Diphyllobothrium latum* (fish tapeworm) | Praziquantel, niclosamide | Nitazoxanide, mebendazole |
| *Hymenolepsis nana* | Praziquantel | Niclosamide, nitazoxanide |

stomach. For most indications (ascariasis, hookworm infection, and pinworms), a single dose is adequate, but the treatment of trichuriasis and strongyloidiasis needs three daily doses. *Enterobium vermicularis* infection should be treated with a second dose two weeks after the first, because reinfection is common.

When used for 1–3 days, albendazole is a safe drug. Side effects are minor and transient, and include headache, nausea, vomiting, loose stools, abdominal pain, cramps, dizziness, insomnia and lassitude. When given for long courses for systemic disease, blood counts and liver function studies should be monitored.

Resistance to this drug is spreading in animals,[7,8] and may soon be a problem for clinicians also.

Dose: children above 2 years, 400 mg. Children between 1 and 2 years, use with caution, 200 mg.

## 2. Mebendazole

This is a synthetic benzimidazole anthelmintic and has the twin advantages of wide spectrum and safety. The drug has poor absorption when given orally and hence is used for intestinal parasites. It blocks the uptake of glucose by worms, thus reducing survival and reproduction. It also kills eggs of hookworms, ascaris, and trichuris.

Mebendazole is recommended for the treatment of ascaris, hookworms, pinworm and trichuris. The drug can be taken before or after meals, but tablets should be chewed before swallowing. Cure rates are good for ascaris and pinworms, but less satisfactory for hookworm and trichuris infections.

The drug is quite safe when given for short courses. Side effects are nausea, abdominal pain, vomiting, and diarrhea. Uncommon side effects are rash, urticaria, agranulocytosis, alopecia, and liver enzyme elevation, and these are usually seen only with long term use. Mebendazole is not recommended during pregnancy. Convulsions have been reported in children under two years; the drug should be used cautiously in this age group.

Dose: for hookworms, ascaris and trichuris, the dose is 100 mg twice a day for 3 days for children over age 2 years. For pinworms, a single dose of 100 mg is adequate, but should be repeated after two weeks, because reinfection is common. A single dose of 500 mg has also been tried in children, and found to be safe.[9]

## 3. Pyrantel pamoate

This drug is a nicotinic receptor agonist. It causes spastic muscular paralysis of the worms, which lose their grip in the intestines and are expelled by normal peristalsis. Pyrantel pamoate is effective against hookworms, pinworms, and ascaris, but not against trichuris and strongyloides. Since the drug is poorly absorbed, it is mainly useful against intestinal worms. For pinworms, a single dose is effective, but should be repeated after two weeks to take care of reinfection. For ascariasis, a single dose is usually enough, but a stool exam should be done two weeks later. If ova are seen, one more dose is indicated. For the treatment of hookworms, a single dose is adequate for light infections. For heavy infestations, three doses on successive days are recommended.

Adverse effects are few and mild. Nausea, vomiting, pain abdomen, cramps, diarrhea, headache, fever, rash, dizziness and drowsiness occur in some people, but these are transient. Pyrantel pamoate should be used with caution in people with liver dysfunction. Safety for use below age two years, and in pregnancy, have not been established.

Dose: the drug is given in a single daily dose of 11 mg/kg.

## 4. Tetramisole and levamisole

These drugs cause a prolonged activation of the excitatory nicotinic acetylcholine receptors in worms, leading to spastic paralysis. The paralysed worms are then expelled from the body by peristalsis. Levamisole is the more active isomer and can be used for the treatment of hookworms and ascariasis.

Levamisole dose: age less than 12 years: 2.5 mg/kg. Age 12–18 years: 150 mg.

## 5. Ivermectin

This is one of the newest anthelmintics, introduced in the 1980s. It is a semi-synthetic derivative of avermectin. Other similar drugs are moxidectin, doramectin, milbemycin oxime, eprinomectin, abomectin, and selamectin.

Ivermectin causes a paralysis of pharyngeal and body wall musculature of nematodes. It is the drug of choice for