ALBENDAZOLE

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Albendazole, a heterocyclic benzimidazole, was initially introduced as an antihelminthic with a wide spectrum of activity against many different nematodes. Structurally related to mebendazole(1), this drug has assumed increasingly importance in view of its efficacy in neurocysticercosis and hydatid disease as well.

Mechanism and Spectrum of Action

Albendazole, *i.e.,* 'Methyl-5-propylthio-1H-benzimidazole-2yl carbamate', is similar to mebendazole in chemical composition, with a methyl group in place of propyl. The carbamate moiety prevents deactivation of the parent drug(2). The machanism of action is thought to be similar to that of mebendazole, *i.e.,* by inhibition of parasitic metabolism. Albendazole has been shown to inhibit the uptake of glucose by parasitic membranes, thus causing an energy depletion in them(3). The drug is effective against *E. vermicularis, Ascaris lumbricoides, Ancylocystomiasis, Nector americanus, Strongyloides stercoralis* and *Trichura trichuris* among round bodied worms(4). It is ovicidal for hookworms, roundworms, and whipworms. It is also effective against the preintestinal larval migrating stages of these worms(5). In addition, albendazole is also therapeutically efficacious against tapeworms (*Taenia saginatum, Taenia solium*), as well as *Echinococcus granulosus.* No action has been demonstrated against Trematodes such as the liver flukes (*Clonorchis sinensis* and *Fasciola hepatica*) *Schistosoma mansoni,* or against *Hymenolopis nana*(6).

Absorption, Metabolism and Excretion(1,7)

The drug is not very well absorbed from the gastrointestinal tract. It is metabolized very rapidly during first pass through the liver, being converted to an active metabolite, *i.e.,* albendazole sulphoxide, along with other metabolites such as albendazole sulphone, and 2 amino sulphoxide. The former has considerable antihelminthic activity, with a protein binding of 70% and a half life of 8.5 hours. Peak plasma concentrations of the active metabolite vary considerably, ranging from 0.04 to 1.14 mcg/ml. All the metabolites are excreted in the urine.

Preparations(8)

The various preparations are summarized in *Table I.*

Therapeutic Uses and Dosage

Albendazole is one of various drugs which are highly effective against the common worm infestations. The relative efficacies of the various drugs is shown in *Table II*(9). Albendazole, given in the dose of (200 mg) 2 tablets as a single dose eradicates infestations due to hookworm, roundworm, whipworm, pinworm and tapeworm. In children

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TABLE I–*Albendazole Preparations*

Brand name	Company	Strength	Cost (Per 2 tablets/10 ml suspension)
Albazole	Khandelwal	Tab - 400 mg	Rs. 3.80
Bendex	Protec	Tab - 400 mg	Rs. 5.00
		Susp - 200 mg/5 ml	Rs. 6.00
Emanthal	MM Labs	Tab - 200 mg	Rs. 5.50
		Susp - 200 mg/5 ml	Rs. 7.50
Noworm	Alkem	Tab - 400 mg	Rs. 6.00
		Susp - 200 mg/5 ml	Rs. 8.10
Nubend	Kopran	Tab - 400 mg	Rs. 5.50
		Susp - 200 mg/5 ml	Rs. 7.75
Ulben	Anand	Tab - 400 mg	Rs. 5.81
		Susp - 200 mg/5 ml	Rs. 7.82
Womiban	Blue Cross	Tab - 400 mg	Rs. 6.00
Zentel	Eskayef	Tab - 400 mg	Rs. 5.70
		Susp - 200 mg/5 ml	Rs. 7.80

Tab = Tablet, Susp = Suspension.

<2 years a single dose of (200 mg) 1 tablet, or in suspension, should be used. For *S. stercoralis,* a three-day course in the same dosage is necessary(4). Albendazole scores over the other routinely used antihelminthics like mebendazole, pyrantel pamoate, and piperazine citrate in the following:

(*i*) Easy single dose administration (like piperazine citrate and pyrantel pamoate, unlike mebendazole); (*ii*) Relatively broad spectrum of action (similar to mebendazole) as shown in *Table I*; (*iii*) No bitter taste (as with bephenium); (*iv*) Does not require purgation and can be used even in reduced intestinal movements; (*v*) Inexpensive (similar cost to all other antihelminthics(4). Thus, albendazole combines the advantages of all the other anthihelminthic drugs without having any of their disadvantages.

Use in Neurocysticercosis

Albendazole has revolutionized the therapy of neurocysticercosis. For many years, there was no effective therapy for this disease, till the advent of praziquantel(10). Even praziquantel is associated with drawbacks such as prohibitively high cost, significant failure rate, adverse interactions with dexamethasone, and poor penetration into CSF. Albendazole was first tried for cerebral cysticercosis by Escobedo *et al.*(11); and 86% of patients showed a response with 30 days therapy of 15 mg/kg/day. Subsequently, later studies have demonstrated that shorter courses of this drug, *i.e.*, 15 days(12) or 8 days(13) or 3 days are also efficacious(14). Follow up CT scans done 3 months after starting therapy have demonstrated reduction in both cyst size and number.

TABLE II—*Comparative Efficacy of Anti-Helminthic Drugs in Worm Infestations*

Infestation	Alben-dazole	Meben-dazole	Piperazine citrate	Pyrantel pamoate	Leva-misole	Bephenium hydroxy-napthoate
Ancylostomiasis	+++	+++	++	++	++	++
Ascariosis	+++	+++	+++	+++	+++	+
Strongyloidiosis	+	+	-	-	+	-
Trichuriasis	++	++	-	-	-	-
Enterobiasis	+++	+++	+++	+++	-	-

+++ 85% cure.
++ 60-85% cure.
+ 30-60% cure.
- 30% cure.

Good results have also been shown in our country by Puri *et al.*(15). An inflammatory reaction occurs in the host due to destruction of parasites by anticyst drugs, which can be controlled with the simultaneous use of dexamethasone. The presence of this reaction should be taken as a good sign, indicating efficacy of the drug against the parasite.

While both albendazole and praziquantel are effective in neurocysticercosis, the former possesses considerable advantages. Albendazole is a fairly inexpensive drug, an important consideration in our country. It is effective in patients in whom praziquantel has failed earlier. The use of dexamethasone to control reactions has been shown to *reduce* plasma praziquantel levels(16); in contrast, albendazole levels are *raised* by dexamethasone(17). Albendazole achieves good penetration into CSF whereas praziquantel does not(18). This property allows albendazole to be effective in treating subarachnoid cysticercosis as well(19). These advantages have led Sotelo *et al.*(20) to conclude that albendazole is now the drug of choice in the treatment of neurocysticerosis.

Hydatid Disease

Both mebendazole and albendazole have been used with success in the medical treatment of human hydatid disease. However, albendazole sulphoxide levels in cyst fluid and serum have been shown to be 10 times higher than mebendazole(21). The dose currently recommended is 10-15 mg/kg/day × 1 month(7,21). The use of albendazole post operatively after removal of cysts may also help in preventing recurrence(2).

Adverse Effects

By and large, this drug is very well tolerated, with minimal side effects such as gastrointestinal disturbances and headache(1). No serious side effect was seen in over 10,000 patients given this drug for worm infestation(2). In neurocysticercosis, its use has been associated with headache, hyperthermia, nausea and vomiting in the 1st or 2nd week of therapy. This is due to pericystic

inflammation around dying parasites and can be controlled with dexamethasone.

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