

FILARIASIS¹

	Drug	Adult dosage	Pediatric dosage
<i>Wuchereria bancrofti</i>, <i>Brugia malayi</i>, <i>Brugia timori</i>			
Drug of choice: ²	Diethylcarbamazine [*]	6 mg/kg/d PO in 3 doses x 12d ^{3,4}	6 mg/kg/d PO in 3 doses x 12d ^{3,4}
<i>Loa loa</i>			
Drug of choice: ⁵	Diethylcarbamazine [*]	6 mg/kg/d PO in 3 doses x 12d ^{3,4}	6 mg/kg/d PO in 3 doses x 12d ^{3,4}
<i>Mansonella ozzardi</i>			
Drug of choice:	See footnote 6		
<i>Mansonella perstans</i>			
Drug of choice:	Albendazole ^{7,8} OR Mebendazole ⁷	400 mg PO bid x 10d 100 mg PO bid x 30d	400 mg PO bid x 10d 100 mg PO bid x 30d
<i>Mansonella streptocerca</i>			
Drug of choice: ⁹	Diethylcarbamazine [*] OR Ivermectin ^{7,10}	6 mg/kg/d PO x 12d ⁴ 150 mcg/kg PO once	6 mg/kg/d PO x 12d ⁴ 150 mcg/kg PO once
Tropical Pulmonary Eosinophilia (TPE)¹¹			
Drug of choice:	Diethylcarbamazine [*]	6 mg/kg/d in 3 doses x 12-21d ⁴	6 mg/kg/d in 3 doses x 12-21d ⁴
<i>Onchocerca volvulus</i> (River blindness)			
Drug of choice:	Ivermectin ^{10,12}	150 mcg/kg PO once, repeated every 6-12 mos until asymptomatic	150 mcg/kg PO once, repeated every 6-12mos until asymptomatic

* Availability problems. See table below.

- Antihistamines or corticosteroids may be required to decrease allergic reactions to components of disintegrating microfilariae that result from treatment, especially in infection caused by *Loa loa*. Endosymbiotic *Wolbachia* bacteria may have a role in filarial development and host response, and may represent a potential target for therapy. Addition of doxycycline 100 or 200 mg/d PO x 6-8wks in lymphatic filariasis and onchocerciasis has resulted in substantial loss of *Wolbachia* and decrease in both micro- and macrofilariae (MJ Taylor et al, Lancet 2005; 365:2116; AY Debrah et al, Plos Pathog 2006; e92:0829); but use of tetracyclines is contraindicated in pregnancy and in children <8 yrs old.
- Most symptoms are caused by adult worm. A single-dose combination of albendazole (400 mg PO) with either ivermectin (200 mcg/kg PO) or diethylcarbamazine (6 mg/kg PO) is effective for reduction or suppression of *W. bancrofti* microfilaria, but the albendazole/ivermectin combination does not kill all the adult worms (D Addiss et al, Cochrane Database Syst Rev 2004; CD003753).
- For patients with microfilaria in the blood, Medical Letter consultants start with a lower dosage and scale up: d1: 50 mg tid; d3: 100 mg tid; d4-14: 6 mg/kg in 3 doses (for *Loa loa* d4-14: 9 mg/kg in 3 doses). Multi-dose regimens have been shown to provide more rapid reduction in microfilaria than single-dose diethylcarbamazine, but microfilaria levels are similar 6-12 months after treatment (LD Andrade et al, Trans R Soc Trop Med Hyg 1995; 89:319; PE Simonsen et al, Am J Trop Med Hyg 1995; 53:267). A single dose of 6 mg/kg is used in endemic areas for mass treatment (J Figueredo-Silva et al, Trans R Soc Trop Med Hyg 1996; 90:192; J Noroes et al, Trans R Soc Trop Med Hyg 1997; 91:78).
- Diethylcarbamazine should not be used for treatment of *Onchocerca volvulus* due to the risk of increased ocular side effects including blindness associated with rapid killing of the worms. It should be used cautiously in geographic regions where *O. volvulus* coexists with other filariae. Diethylcarbamazine is contraindicated during pregnancy. See also footnote 13.
- In heavy infections with *Loa loa*, rapid killing of microfilariae can provoke encephalopathy. Apheresis has been reported to be effective in lowering microfilarial counts in patients heavily infected with *Loa loa* (EA Ottesen, Infect Dis Clin North Am 1993; 7:619). Albendazole may be useful for treatment of loiasis when diethylcarbamazine is ineffective or cannot be used, but repeated courses may be necessary (AD Klion et al, Clin Infect Dis 1999; 29:680; TE Tabi et al, Am J Trop Med Hyg 2004; 71:211). Ivermectin has also been used to reduce microfilaremia, but albendazole is preferred because of its slower onset of action and lower risk of precipitating encephalopathy (AD Klion et al, J Infect Dis 1993; 168:202; M Kombila et al, Am J Trop Med Hyg 1998; 58:458). Diethylcarbamazine, 300 mg PO once/wk, has been recommended for prevention of loiasis (TB Nutman et al, N Engl J Med 1988; 319:752).
- Diethylcarbamazine has no effect. A single dose of ivermectin 200 mcg/kg PO reduces microfilaria densities and provides both short- and long-term reductions in *M. ozzardi* microfilaremia (AA Gonzalez et al, W Indian Med J 1999; 48:231).
- Not FDA-approved for this indication.
- Albendazole must be taken with food; a fatty meal increases oral bioavailability.
- Diethylcarbamazine is potentially curative due to activity against both adult worms and microfilariae. Ivermectin is active only against microfilariae.
- Safety of ivermectin in young children (<15 kg) and pregnant women remains to be established. Ivermectin should be taken on an empty stomach with water.
- AK Boggild et al, Clin Infect Dis 2004; 39:1123. Relapses occur and can be treated with a repeated course of diethylcarbamazine.
- Diethylcarbamazine should not be used for treatment of this disease because rapid killing of the worms can lead to blindness. Periodic treatment with ivermectin (every 3-12 months), 150 mcg/kg PO, can prevent blindness due to ocular onchocerciasis (DN Udall, Clin Infect Dis 2007; 44:53). Skin reactions after ivermectin treatment are often reported in persons with high microfilarial skin densities. Ivermectin has been inadvertently given to pregnant women during mass treatment programs; the rates of congenital abnormalities were similar in treated and untreated women. Because of the high risk of blindness from onchocerciasis, the use of ivermectin after the first trimester is considered acceptable according to the WHO. Doxycycline (100 mg/day PO for 6 weeks), followed by a single 150 mcg/kg PO dose of ivermectin, resulted in up to 19 months of microfilaridermia and 100% elimination of *Wolbachia* species (A Hoerauf et al, Lancet 2001; 357:1415).

Information provided by The Medical Letter. For a copy of the entire **Drugs for Parasitic Infections** article, go to: www.medicalletter.org/parasitic_cdc

MANUFACTURERS OF DRUGS USED TO TREAT PARASITIC INFECTIONS

- albendazole – *Albenza* (GlaxoSmithKline)
- Albenza* (GlaxoSmithKline) – albendazole
- Alinia* (Romark) – nitazoxanide
- AmBisome* (Gilead) – amphotericin B, liposomal
- amphotericin B – *Fungizone* (Apothecan), others
- amphotericin B, liposomal – *AmBisome* (Gilead)
- Ancobon* (Valeant) – flucytosine
- § *Antiminth* (Pfizer) – pyrantel pamoate
- *Aralen* (Sanofi) – chloroquine HCl and chloroquine phosphate
- § artemether – *Artenam* (Arenco, Belgium)
- § artemether/lumefantrine – *Coartem*, *Riamet* (Novartis)
- § *Artenam* (Arenco, Belgium) – artemether
- § artesunate – (Guilin No. 1 Factory, People's Republic of China)
- atovaquone – *Mepron* (GlaxoSmithKline)
- atovaquone/proguanil – *Malarone* (GlaxoSmithKline)
- azithromycin – *Zithromax* (Pfizer), others
- *Bactrim* (Roche) – TMP/Sulfa
- § benznidazole – *Rochagan* (Brazil)
- *Biaxin* (Abbott) – clarithromycin
- § *Biltricide* (Bayer) – praziquantel
- † bithionol – *Bitin* (Tanabe, Japan)
- † *Bitin* (Tanabe, Japan) – bithionol
- § *Brolene* (Aventis, Canada) – propamidine isethionate
- chloroquine HCl and chloroquine phosphate – *Aralen* (Sanofi), others
- clarithromycin – *Biaxin* (Abbott), others
- *Cleocin* (Pfizer) – clindamycin
- clindamycin – *Cleocin* (Pfizer), others
- Coartem* (Novartis) – artemether/lumefantrine
- crotamiton – *Eurax* (Westwood-Squibb)
- dapsone – (Jacobus)
- § *Daraprim* (GlaxoSmithKline) – pyrimethamine USP
- † diethylcarbamazine citrate (DEC) – *Hetrazan*

(continued)

- *Diflucan* (Pfizer) – fluconazole
- § diloxanide furoate – *Furamide* (Boots, United Kingdom)
- doxycycline – *Vibramycin* (Pfizer), others
- eflornithine (Difluoromethylornithine, DFMO) – *Ornidyl* (Aventis)
- § *Egaten* (Novartis) – triclabendazole
- § *Elimite* (Allergan) – permethrin
- § *Ergamisol* (Janssen) – levamisole
- § *Eurax* (Westwood-Squibb) – crotamiton
- *Flagyl* (Pfizer) – metronidazole
- § *Flisint* (Sanofi-Aventis, France) – fumagillin
- fluconazole – *Diflucan* (Pfizer), others
- flucytosine – *Ancobon* (Valeant)
- § fumagillin – *Flisint* (Sanofi-Aventis, France)
- *Fungizone* (Apothecon) – amphotericin
- § *Furamide* (Boots, United Kingdom) – diloxanide furoate
- § furazolidone – *Furozone* (Roberts)
- § *Furozone* (Roberts) – furazolidone
- † *Germanin* (Bayer, Germany) – suramin sodium
- § *Glucantime* (Aventis, France) – meglumine antimonate
- † *Hetrazan* – diethylcarbamazine citrate (DEC)
- § *Humatin* (Monarch) – paromomycin
- § *Impavido* (Zentaris, Germany) – miltefosine
- iodoquinol – *Yodoxin* (Glenwood), others
- itraconazole – *Sporanox* (Janssen-Ortho), others
- ivermectin – *Stromectol* (Merck)
- ketoconazole – *Nizoral* (Janssen), others
- † *Lampit* (Bayer, Germany) – nifurtimox
- § *Lariam* (Roche) – mefloquine
- § *Leshcutan* (Teva, Israel) – topical paromomycin
- levamisole – *Ergamisol* (Janssen)
- lumefantrine/artemether – *Coartem*, *Riamet* (Novartis)
- § *Malarone* (GlaxoSmithKline) – atovaquone/proguanil
- malathion – *Ovide* (Medicis)
- mebendazole – *Vermox* (McNeil), others
- mefloquine – *Lariam* (Roche)
- § meglumine antimonate – *Glucantime* (Aventis, France)
- † melarsoprol – *Mel-B*
- † *Mel-B* – melarsoprol
- § *Mepron* (GlaxoSmithKline) – atovaquone
- metronidazole – *Flagyl* (Pfizer), others
- § miconazole – *Monistat i.v.*
- § miltefosine – *Impavido* (Zentaris, Germany)
- § *Monistat i.v.* – miconazole
- § *NebuPent* (Fujisawa) – pentamidine isethionate
- § niclosamide – *Yomesan* (Bayer, Germany)
- † nifurtimox – *Lampit* (Bayer, Germany)
- nitazoxanide – *Alinia* (Romark)
- § *Nix* (GlaxoSmithKline) – permethrin
- *Nizoral* (Janssen) – ketoconazole
- § ornidazole – *Tiberal* (Roche, France)
- § *Ornidyl* (Aventis) – eflornithine (Difluoromethylornithine, DFMO)
- § *Ovide* (Medicis) – malathion
- § oxamniquine – *Vansil* (Pfizer)
- § *Paludrine* (AstraZeneca, United Kingdom) – proguanil
- paromomycin – *Humatin* (Monarch); *Leshcutan* (Teva, Israel; topical formulation not available in US)
- § *Pentam 300* (Fujisawa) – pentamidine isethionate
- pentamidine isethionate – *Pentam 300* (Fujisawa), *NebuPent* (Fujisawa)
- † *Pentostam* (GlaxoSmithKline, United Kingdom) – sodium stibogluconate
- permethrin – *Nix* (GlaxoSmithKline), *Elimite* (Allergan)
- § praziquantel – *Biltricide* (Bayer)
- primaquine phosphate USP
- § proguanil – *Paludrine* (AstraZeneca, United Kingdom)
- proguanil/atovaquone – *Malarone* (GlaxoSmithKline)
- § propamidine isethionate – *Brolene* (Aventis, Canada)
- § pyrantel pamoate – *Antiminth* (Pfizer)
- pyrethrins and piperonyl butoxide – *RID* (Pfizer), others
- § pyrimethamine USP – *Daraprim* (GlaxoSmithKline)
- § *Qualaquin* – quinine sulfate (Mutual Pharmaceutical Co/AR Scientific)
- quinacrine
- * quinidine gluconate (Eli Lilly)
- § quinine dihydrochloride
- quinine sulfate – *Qualaquin* (Mutual Pharmaceutical Co/AR Scientific)
- § *Riamet* (Novartis) – artemether/lumefantrine
- *RID* (Pfizer) – pyrethrins and piperonyl butoxide
- *Rifadin* (Aventis) – rifampin
- § rifampin – *Rifadin* (Aventis), others
- § *Rochagan* (Brazil) – benznidazole
- * *Rovamycine* (Aventis) – spiramycin
- † sodium stibogluconate – *Pentostam* (GlaxoSmithKline, United Kingdom)
- * spiramycin – *Rovamycine* (Aventis)
- *Sporanox* (Janssen-Ortho) – itraconazole
- § *Stromectol* (Merck) – ivermectin
- sulfadiazine – (Eon)
- † suramin sodium – *Germanin* (Bayer, Germany)
- § *Tiberal* (Roche, France) – ornidazole
- § *Tindamax* (Mission) – tinidazole
- tinidazole – *Tindamax* (Mission)
- TMP/Sulfa – *Bactrim* (Roche), others
- § triclabendazole – *Egaten* (Novartis)
- § *Vansil* (Pfizer) – oxamniquine
- *Vermox* (McNeil) – mebendazole
- *Vibramycin* (Pfizer) – doxycycline
- *Yodoxin* (Glenwood) – iodoquinol
- § *Yomesan* (Bayer, Germany) – niclosamide
- *Zithromax* (Pfizer) – azithromycin

* Available in the US only from the manufacturer.

§ Not available commercially. It may be obtained through compounding pharmacies such as Panorama Compounding Pharmacy, 6744 Balboa Blvd, Van Nuys, CA 91406 (800-247-9767) or Medical Center Pharmacy, New Haven, CT (203-688-6816). Other compounding pharmacies may be found through the National Association of Compounding Pharmacies (800-687-7850) or the Professional Compounding Centers of America (800-331-2498, www.pccarx.com).

† Available from the CDC Drug Service, Centers for Disease Control and Prevention, Atlanta, Georgia 30333; 404-639-3670 (evenings, weekends, or holidays: 770-488-7100).

• Also available generically.