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# Red Book®:

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## 2009 REPORT OF THE COMMITTEE ON INFECTIOUS DISEASES

### Errata

(6/17/10)

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**Page IV:** The following individuals should be added to the list of Collaborators:

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**Page 355:** In Table 3.22, last column, under “Unknown or Not Tested,” the second bullet *should be changed from* **If inadequate, no treatment to If adequate, no treatment.** ([See page 3 for revised text.](#))

**Page 494:** Under Epidemiology, the 5th sentence *should be changed from* **Human-to-human spread has not been documented.** *to* **Human-to-human spread has been documented vertically from mother to neonate, horizontally from colonized humans, and by contaminated blood products.**

([See page 4 for revised text.](#))

**Page 507:** In Table 3.44, in the adolescents and adults row, last column, the text *should be changed from* **TMP, 200 mg/day to TMP, 320 mg/day.**

([See page 5 for revised text.](#))

**Page 539:** In *Pneumocystis jirovecii* Infections, Treatment section, in the 2nd paragraph under the Chemoprophylaxis heading, in the 2nd sentence beginning “Prophylaxis for PCP should be discontinued...”, a portion of the text *should be changed from* **and 1 performed at 24 months of age or older to and 1 performed at 4 months of age or older.** ([See page 6 for revised text.](#))

**Page 566:** In Table 3.61, in the May row, under “29 Weeks, 0 Days Through 31 Weeks, 6 Days of Gestation and <6Months of Age at Start of Season,” the maximum number of doses *should be changed from 0<sup>d</sup> to 5.* ([See page 7 for revised text.](#))

**Page 645:** In Table 3.75, under “Clinical Status,” the text for (a)(iv) *should be changed from maternal evidence of reinfection or relapse (less than fourfold decrease in titers) to maternal evidence of reinfection or relapse (fourfold or greater increase in titers).* ([See page 8 for revised text.](#))

**Pages 745–746:** In Table 4.1, the following changes should be made:

- In the first column, the footnote <sup>e</sup> notation next to **Carbapenems** and **Metronidazole** should be *removed*.
- In the first column, the footnote <sup>e</sup> notation next to **Ampicillin** should be *changed to a footnote <sup>d</sup> notation*.
- In the footnotes, footnote <sup>e</sup> should be *deleted* from table, removing the text reading: **Safety in infants and children has not been established. Meropenem is preferred if a carbapenem is to be used in newborn infants.** ([See page 9 and 10 for revised text.](#))

**Pages 784–810:** The *Medical Letter* has informed the American Academy of Pediatrics of the following important pediatric dosage corrections in *The Medical Letter* table reprinted in the *Red Book*. In Table 4.9, the following changes should be made:

- **Page 789:** Under **CYCLOSPORIASIS** (*Cyclospora cayetanensis*), the pediatric dosage for **trimethoprim/sulfamethoxazole** *should be changed from TMP 5 mg/kg/SMX 25 mg/kg/d PO in 2 doses × 7–10d to TMP 10 mg/kg/SMX 50 mg/kg/d PO in 2 doses × 7–10d.* ([See page 11 for revised text.](#))
- **Page 793:** Under **GIARDIASIS** (*Giardia duodenalis*), the pediatric dosage for **quinacrine** *should be changed from 2 mg/kg/d PO in 3 doses × 5d (max 300 mg/d) to 6 mg/kg/d PO in 3 doses × 5d (max 300 mg/d).* ([See page 12 for revised text.](#))
- **Page 794:** Under **ISOSPORIASIS** (*Isospora belli*), the pediatric dosage for **trimethoprim/sulfamethoxazole** *should be changed from TMP 5 mg/kg/d/SMX 25 mg/kg/d PO in 2 doses × 10d to TMP 10 mg/kg/d/SMX 50 mg/kg/d PO in 2 doses × 10d.* ([See page 13 for revised text.](#))
- **Page 798:** Under **MALARIA, Treatment of**, the pediatric dosage for **tetracycline** *should be changed from 6.25 mg/kg/d in 4 doses × 7d to 25 mg/kg/d in 4 doses × 7d.* ([See page 14 for revised text.](#))

Additionally, the following change should be made:

- **Page 804:** Under **PNEUMOCYSTIS JIROVECI**, the pediatric dosage for atovaquone for children over 24 mos *should be changed from >24mos: 30 mg/d PO x 21d to >24mos: 30 mg/kg/d PO x 21d.* ([See page 15 for revised text.](#))

**Table 3.22. Recommendations for Hepatitis B Prophylaxis After Percutaneous Exposure to Blood That Contains or Might Contain HBsAg<sup>a</sup>**

Exposed Person	Treatment When Source Is		
	HBsAg Positive	HBsAg Negative	Unknown or Not Tested
Unimmunized	Administer HBIG <sup>b</sup> (1 dose) and initiate hepatitis B vaccine series	Initiate hepatitis B vaccine series	Initiate hepatitis B vaccine series
Previously immunized			
Known responder	No treatment	No treatment	No treatment
Known nonresponder	HBIG (1 dose) and initiate reimmunization <sup>c</sup> or HBIG (2 doses)	No treatment	If known high-risk source, treat as if source were HBsAg positive
Response unknown	Test exposed person for anti-HBs <sup>d</sup> and administer vaccine booster dose <sup>e</sup>	No treatment	Test exposed person for anti-HBs <sup>d</sup> <ul style="list-style-type: none"> <li>• If inadequate, vaccine booster dose<sup>e</sup></li> <li>• <b>If adequate, no treatment</b></li> </ul>

HBsAg indicates hepatitis B surface antigen; HBIG, Hepatitis B Immune Globulin; anti-HBs, antibody to HBsAg.

<sup>a</sup>Centers for Disease Control and Prevention. Updated US Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR Recomm Rep* 2001;50(RR-11):1–52.

<sup>b</sup>Dose of HBIG, 0.06 mL/kg, intramuscularly.

<sup>c</sup>The option of giving 1 dose of HBIG (0.06 mL/kg) and reinitiating the vaccine series is preferred for nonresponders who have not completed a second 3-dose vaccine series. For people who previously completed a second vaccine series but failed to respond, 2 doses of HBIG (0.06 mL/kg) are preferred, 1 dose as soon as possible after exposure and the second 1 month later.

<sup>d</sup>Adequate anti-HBs is  $\geq 10$  mIU/mL.

<sup>e</sup>The person should be evaluated for antibody response after the vaccine booster dose. For people who receive HBIG, anti-HBs testing should be performed when passively acquired antibody from HBIG no longer is detectable (eg, 4–6 months); for people who did not receive HBIG, anti-HBs testing should be performed 1 to 2 months after the vaccine booster dose. If anti-HBs is inadequate (less than 10 mIU/mL) after the vaccine booster dose, 2 additional doses should be administered to complete a 3-dose reimmunization series.

**EPIDEMIOLOGY:** *Pasteurella* species are found in the oral flora of 70% to 90% of cats, 25% to 50% of dogs, and many other animals. Transmission can occur from the bite or scratch of a cat or dog or, less commonly, from another animal. Respiratory tract spread from animals to humans also occurs. In a significant proportion of cases, no animal exposure can be identified. **Human-to-human spread has been documented vertically from mother to neonate, horizontally from colonized humans, and by contaminated blood products.**

**Table 3.4.4. Recommended Antimicrobial Therapy and Postexposure Prophylaxis for Pertussis in Infants, Children, Adolescents, and Adults<sup>a</sup>**

Age	Recommended Drugs		Alternative
	Azithromycin	Erythromycin	
Younger than 1 mo	10 mg/kg/day as a single dose for 5 days <sup>b</sup>	40 mg/kg/day in 4 divided doses for 14 days	<b>TMP-SMX</b> Contraindicated at younger than 2 mo of age
1 through 5 mo	See above	See above	2 mo of age or older; TMP, 8 mg/kg/day; SMX, 40 mg/kg/day in 2 doses for 14 days
6 mo or older and children	10 mg/kg as a single dose on day 1 (maximum 500 mg); then 5 mg/kg/day as a single dose on days 2 through 5 (maximum 250 mg/day)	40 mg/kg/day in 4 divided doses for 14 days (maximum 2 g/day)	See above
Adolescents and adults	500 mg as a single dose on day 1, then 250 mg as a single dose on days 2 through 5	2 g/day in 4 divided doses for 14 days	<b>TMP, 320 mg/day; SMX, 1600 mg/day</b> in 2 divided doses for 14 days

TMP indicates trimethoprim; SMX, sulfamethoxazole.

<sup>a</sup>Centers for Disease Control and Prevention. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis; 2005 CDC guidelines. *MMWR Recommen Rep* 2005;54(RR-14):1–16

<sup>b</sup>Preferred macrolide for this age because of risk of idiopathic hypertrophic pyloric stenosis associated with erythromycin.

**Chemoprophylaxis.** Prophylaxis against a first episode of PCP is indicated for many patients with significant immunocompromise, including people with HIV infection (see Human Immunodeficiency Virus Infection, p 380) and people with primary or acquired immunodeficiency.

Because rapid changes in CD4+ T lymphocytes can occur in HIV-infected infants, prophylaxis for PCP is recommended for all infants born to HIV infected women beginning at 4 to 6 weeks of age unless the diagnosis has been excluded presumptively (2 negative virologic test results, 1 performed at 2 weeks of age or older and 1 performed at 4 weeks of age or older; or 1 negative virologic test result, performed at 8 weeks of age or older) (see Table 3.55, p 538). Prophylaxis for PCP should be discontinued in children in whom HIV infection has been excluded definitively (2 negative virologic test results, 1 performed at 4 weeks of age or older **and 1 performed at 4 months of age or older**; or 2 negative HIV antibody test results from 2 separate specimens at 6 months of age or older). Children who are HIV infected or whose status is indeterminate should continue prophylaxis throughout the first year of life.

**Table 3.61. Maximum Number of Palivizumab Doses for RSV Prophylaxis of Preterm Infants Without Chronic Lung Disease, on the Basis of Birth Date, Gestational Age, and Presence of Risk Factors (Shown for Geographic Areas Beginning Prophylaxis on November 1)<sup>a</sup>**

Month of Birth	Maximum No. of Doses for Season Beginning November 1		
	≤28 Weeks, 6 Days of Gestation and <12 Months of Age at Start of Season	29 Weeks, 0 Days Through 31 Weeks, 6 Days of Gestation and <6 Months of Age at Start of Season	32 Weeks, 0 Days Through 34 Weeks, 6 Days of Gestation and With Risk Factor <sup>b</sup>
November 1– March 31 of previous RSV season	5 <sup>c</sup>	0 <sup>d</sup>	0 <sup>e</sup>
April	5	0 <sup>d</sup>	0 <sup>e</sup>
May	5	5	0 <sup>e</sup>
June	5	5	0 <sup>e</sup>
July	5	5	0 <sup>e</sup>
August	5	5	1 <sup>f</sup>
September	5	5	2 <sup>f</sup>
October	5	5	3 <sup>f</sup>
November	5	5	3 <sup>f</sup>
December	4	4	3 <sup>f</sup>
January	3	3	3 <sup>f</sup>
February	2	2	2 <sup>f</sup>
March	1	1	1 <sup>f</sup>

<sup>a</sup>If infant is discharged from the hospital during RSV season, fewer doses may be required.

<sup>b</sup>For risk factors, see p 565–566.

<sup>c</sup>Some of these infants may have received 1 or more doses of palivizumab in the previous RSV season if discharged from the hospital during that season; if so, they still qualify for up to 5 doses during their second RSV season.

<sup>d</sup>Zero doses because infant will be older than 6 months of age at start of RSV season.

<sup>e</sup>Zero doses because infant will be older than 90 days of age at start of RSV season.

<sup>f</sup>On the basis of the age of patients at the time of discharge from the hospital, fewer doses may be required, because these infants will receive 1 dose every 30 days until the infant is 90 days of age.

**Table 3.75. Recommended Management of Neonates (1 Month of Age or Younger) Born to Mothers With Reactive Serologic Tests for Syphilis**

Clinical Status	Evaluation (in Addition to Physical Examination and Quantitative Nontreponemal Testing)	Antimicrobial Therapy <sup>a</sup>
<p>Proven or highly probable disease<sup>b</sup></p> <p>Normal physical examination and serum quantitative nontreponemal titer the same or less than fourfold the maternal titer:</p>	<p>CSF analysis for VDRL, cell count, and protein</p> <p>CBC and platelet count</p> <p>Other tests as clinically indicated (eg, long-bone radiography, liver function tests, ophthalmologic examination)</p>	<p>Aqueous crystalline penicillin G, 100 000–150 000 U/kg/day, administered as 50 000 U/kg/dose, IV, every 12 h during the first 7 days of age and every 8 h thereafter for a total of 10 days</p> <p>OR</p> <p>Penicillin G procaine,<sup>c</sup> 50 000 U/kg/day, IM, in a single dose for 10 days</p>
<p>(a) (i) Mother was not treated or inadequately treated or has no documented treatment; (ii) mother was treated with erythromycin or other nonpenicillin regimen; (iii) mother received treatment 4 wk or less before delivery; (iv) <b>maternal evidence of reinfection or relapse (fourfold or greater increase in titers)</b></p>	<p>CSF analysis for VDRL, cell count, and protein<sup>d</sup></p> <p>CBC and platelet count<sup>d</sup></p> <p>Long-bone radiography<sup>d</sup></p>	<p>Aqueous crystalline penicillin G, IV, for 10 days<sup>d</sup></p> <p>OR</p> <p>Penicillin G procaine,<sup>c</sup> 50 000 U/kg, IM, in a single dose for 10 days<sup>d</sup></p> <p>OR</p> <p>Penicillin G benzathine,<sup>c</sup> 50 000 U/kg, IM, in a single dose<sup>d</sup></p>
<p>(b) (i) Adequate maternal therapy given more than 4 wk before delivery; (ii) mother has no evidence of reinfection or relapse</p>	<p>None</p>	<p>Clinical, serologic follow-up, and penicillin G benzathine, 50 000 U/kg, IM, in a single dose<sup>e</sup></p>
<p>(c) Adequate therapy before pregnancy and mother's nontreponemal serologic titer remained low and stable during pregnancy and at delivery</p>	<p>None</p>	<p>None<sup>f</sup></p>

**Table 4.1 Antibacterial Drugs for Newborn Infants: Dose<sup>a</sup> (mg/kg or U/kg) and Frequency of Administration**

Drug	Route	Infants 0–4 wk of Age			Infants <1 wk of Age			Infants ≥1 wk of Age		
		BW <1200 g	BW 1200–2000 g	BW >2000 g	BW <1200 g	BW 1200–2000 g	BW >2000 g	BW 1200–2000 g	BW >2000 g	BW >2000 g
<b>Aminoglycosides<sup>b,c</sup></b>										
Amikacin	IV, IM	7.5 every 18–24 h	7.5 every 12 h	7.5–10 every 12 h	7.5–10 every 8 or 12 h	10 every 8 h				
Gentamicin	IV, IM	2.5 every 18–24 h	2.5 every 12 h	2.5 every 12 h	2.5 every 8 or 12 h	2.5 every 8 h				
Neomycin	PO only	...	25 every 6 h	25 every 6 h	25 every 6 h	25 every 6 h				
Tobramycin	IV, IM	2.5 every 18–24 h	2.5 every 12 h	2.5 every 12 h	2.5 every 8 or 12 h	2.5 every 8 h				
<b>Antistaphylococcal penicillins<sup>d</sup></b>										
Methicillin	IV, IM	25 every 12 h	25–50 every 12 h	25–50 every 8 h	25–50 every 8 h	25–50 every 6 h				
Nafcillin	IV, IM	25 every 12 h	25 every 12 h	25 every 8 h	25 every 8 h	25–35 every 6 h				
Oxacillin	IV, IM	25 every 12 h	25–50 every 12 h	25–50 every 8 h	25–50 every 8 h	25–50 every 6 h				
<b>Monobactam</b>										
Aztreonam	IV, IM	30 every 12 h	30 every 12 h	30 every 8 h	30 every 8 h	30 every 6 h				
<b>Carbapenems</b>										
Imipenem/cilastatin	IV	25 every 12 h	25 every 12 h	25 every 12 h	25 every 8 h	25 every 8 h				
<b>Cephalosporins</b>										
Cefotaxime	IV, IM	50 every 12 h	50 every 12 h	50 every 8 or 12 h	50 every 8 h	50 every 6 or 8 h				
Ceftazidime	IV, IM	50 every 12 h	50 every 12 h	50 every 8 or 12 h	50 every 8 h	50 every 8 h				
Ceftriaxone <sup>e</sup>	IV, IM	50 every 24 h	50 every 24 h	50 every 24 h	50 every 24 h	50–75 every 24 h				

**Table 4.1 Antibacterial Drugs for Newborn Infants: Dose<sup>a</sup> (mg/kg or U/kg) and Frequency of Administration, continued**

Drug	Route	Infants 0–4 wk of Age				Infants <1 wk of Age		Infants ≥1 wk of Age	
		Infants 0–4 wk of Age		Infants <1 wk of Age		Infants <1 wk of Age		Infants ≥1 wk of Age	
		BW <1200 g	BW 1200–2000 g	BW >2000 g	BW >2000 g	BW 1200–2000 g	BW >2000 g	BW >2000 g	BW >2000 g
<b>Clindamycin</b>	IV, IM, PO	5 every 12 h	5 every 12 h	5 every 8 h	5 every 8 h	5 every 8 h	5 every 8 h	5–7.5 every 6 h	
<b>Erythromycin</b>	PO	10 every 12 h	10 every 12 h	10 every 12 h	10 every 12 h	10 every 8 h	10 every 8 h	10 every 8 h	
<b>Metronidazole</b>	IV, PO	7.5 every 24–48 h	7.5 every 24 h	7.5 every 12 h	7.5 every 12 h	7.5 every 12 h	7.5 every 12 h	15 every 12 h	
<b>Oxazolidinone</b>									
Linezolid	IV	10 every 8–12 h <sup>f</sup>	10 every 8–12 h <sup>f</sup>	10 every 8–12 h	10 every 8–12 h	10 every 8 h	10 every 8 h	10 every 8 h	
<b>Penicillins</b>									
Ampicillin <sup>d</sup>	IV, IM	25–50 every 12 h	25–50 every 12 h	25–50 every 12 h	25–50 every 8 h	25–50 every 8 h	25–50 every 8 h	25–50 every 6 h	
Penicillin G, <sup>d</sup> aqueous	IV, IM	25 000–50 000 U every 12 h	25 000–50 000 U every 12 h	25 000–50 000 U every 12 h	25 000–50 000 U every 8 h	25 000–50 000 U every 8 h	25 000–50 000 U every 8 h	25 000–50 000 U every 6 h	
Penicillin G procaine	IM	...	50 000 U every 24 h	50 000 U every 24 h	50 000 U every 24 h	50 000 U every 24 h	50 000 U every 24 h	50 000 U every 24 h	
Ticarcillin <sup>e</sup>	IV, IM	75 every 12 h	75 every 12 h	75 every 12 h	75 every 8 h	75 every 8 h	75 every 8 h	100 every 8 h	
<b>Vancomycin<sup>b</sup></b>	IV	15 every 24 h	10–15 every 12–18 h	10–15 every 12–18 h	10–15 every 8–12 h	10–15 every 8–12 h	10–15 every 8–12 h	10–15 every 6–8 h	

BW indicates birth weight; IV, intravenous; IM, intramuscular; PO, oral.

<sup>a</sup>Unless otherwise listed, dosages are given as mg/kg.

<sup>b</sup>Optimal dosage should be based on determination of serum concentrations, especially in low birth weight (less than 1500 g) infants. In very low birth weight infants (less than 1200 g), dosing every 18 to 24 hours may be appropriate in the first week of life.

<sup>c</sup>Dosages for aminoglycosides may differ from dosages recommended by the manufacturer in the package insert.

<sup>d</sup>For meningitis, the larger dosage is recommended. Some experts recommend even larger dosages for group B streptococcal meningitis.

<sup>e</sup>Drug should not be administered to neonates with hyperbilirubinemia, especially, infants born preterm. Neonates should not receive ceftriaxone intravenously while receiving calcium in any form (including hyperalimentation).

<sup>f</sup>Dosing every 12 hours is recommended for infants less than 34 weeks' gestation and less than 1 week of age.

<sup>g</sup>Same dosage for ticarcillin and clavulanate potassium.

Table 4.9. Drugs for Parasitic Infections, continued

Infection	Drug	Adult dosage	Pediatric dosage
<b>CUTANEOUS LARVA MIGRANS</b> (creeping eruption, dog and cat hookworm)			
Drug of choice: <sup>25</sup>	Albendazole <sup>7,12</sup>	400 mg PO daily × 3d	400 mg PO daily × 3d
OR	Ivermectin <sup>7,16</sup>	200 mcg/kg PO daily × 1–2d	200 mcg/kg PO daily × 1–2d
<b>CYCLOSPORIASIS</b> ( <i>Cyclospora cayentensis</i> )			
Drug of choice: <sup>26</sup>	Trimethoprim/ sulfamethoxazole <sup>7</sup>	TMP 160 mg/SMX 800 mg (1 DS tab) PO bid × 7–10d	<b>TMP 10 mg/kg/SMX</b> <b>50 mg/kg/d PO in 2 doses × 7–10d</b>
<b>CYSTICERCOSIS</b> , see TAPEWORM infection			
<b>DIENTAMOEBIA fragilis</b> infection <sup>27</sup>			
Drug of choice:	Iodoquinol <sup>2,7</sup>	650 mg PO tid × 20d	30–40 mg/kg/d (max. 2g) PO in 3 doses × 20d
OR	Paromomycin <sup>3,7</sup>	25–35 mg/kg/d PO in 3 doses × 7d	25–35 mg/kg/d PO in 3 doses × 7d
OR	Tetracycline <sup>7,21</sup>	500 mg PO qid × 10d	40 mg/kg/d (max. 2g) PO in 4 doses × 10d
OR	Metronidazole <sup>7</sup>	500–750 mg PO tid × 10d	35–50 mg/kg/d PO in 3 doses × 10d
<b>Diphyllobothrium latum</b> , see TAPEWORM infection			
<b>DRACUNCULUS medinensis</b> (guinea worm) infection			
Drug of choice:			
<b>Echinococcus</b> , see TAPEWORM infection			
<b>Entamoeba histolytica</b> , see AMEBIASIS			

\*Availability problems. See table on page 814.

25. G. Albanese et al, *Int J Dermatol* 2001; 40:67; D Maloy et al, *J Travel Med* 2006; 13:244.

26. HIV-infected patients may need higher dosage and long-term maintenance. Successful use of nitazoxanide (see also footnote 5) has been reported in one patient with sulfia allergy (SM Zimmer et al, *Clin Infect Dis* 2007; 44:466).

27. A Norberg et al, *Clin Microbiol Infect* 2003; 9:65; O Vandenberg et al, *Int J Infect Dis* 2006; 10:255.

28. No drug is curative against *Dracunculiasis*. A program for monitoring local sources of drinking water to eliminate transmission has dramatically decreased the number of cases worldwide (M Barry, N Eng J Med 2007; 356:25). The treatment of choice is slow extraction of worm combined with wound care and pain management (C Greenaway, *CMAJ* 2004; 170:495).

Table 4.9. Drugs for Parasitic Infections, continued

Infection	Drug	Adult dosage	Pediatric dosage
<b>GIARDIASIS</b> ( <i>Giardia duodenalis</i> )			
Drug of choice:	Metronidazole <sup>7</sup>	250 mg PO tid × 5–7d	15 mg/kg/d PO in 3 doses × 5–7d
<b>OR</b>	Timidazole <sup>6</sup>	2 g PO once	50 mg/kg PO once (max. 2 g)
<b>OR</b>	Nitazoxanide <sup>5</sup>	500 mg PO bid × 3d	1–3yrs: 100 mg PO q12h × 3d 4–11yrs: 200 mg PO q12h × 3d >12yrs: 500 mg PO q12h × 3d
Alternative: <sup>43</sup>	Paromomycin <sup>9,7,44</sup>	25–35 mg/kg/d PO in 3 doses × 5–10d	25–35 mg/kg/d PO in 3 doses × 5–10d
<b>OR</b>	Furazolidone <sup>8</sup>	100 mg PO qid × 7–10d	6 mg/kg/d PO in 4 doses × 7–10d
<b>OR</b>	Quinacrine <sup>4,45a*</sup>	100 mg PO tid × 5d	<b>6 mg/kg/d PO in 3 doses × 5d</b> (max 300 mg/d)
<b>GNATHOSTOMIASIS</b> ( <i>Gnathostoma spinigerum</i> ) <sup>46</sup>			
Treatment of choice:	Albendazole <sup>7,12</sup>	400 mg PO bid × 21d	400 mg PO bid × 21d
<b>OR</b>	Ivermectin <sup>7,16</sup>	200 mcg/kg/d PO × 2d	200 mcg/kg/d PO × 2d
Either	± Surgical removal		
<b>GONGYLOMIASIS</b> ( <i>Gongylonema sp.</i> ) <sup>47</sup>			
Treatment of choice:	Surgical removal		
<b>OR</b>	Albendazole <sup>7,12</sup>	400 mg/d PO × 3d	400 mg/d PO × 3d

\* Availability problems. See table on page 814.

43. Another alternative is albendazole 400 mg/d PO × 5d in adults and 10 mg/kg/d PO × 5d in children (K. Yereci et al, Clin Microbiol Infect 2004; 10:527; O Karabay et al, World J Gastroenterol 2004; 10:1215). Combination treatment with standard doses of metronidazole and quinacrine × 3wks has been effective for a small number of refractory infections (TE Nash et al, Clin Infect Dis 2001; 33:22). In one study, nitazoxanide was used successfully in high doses to treat a case of *Giardia* resistant to metronidazole and albendazole (P Abboud et al, Clin Infect Dis 2001; 32:1792).

44. Poorly absorbed; may be useful for treatment of giardiasis in pregnancy.

45. Quinacrine should be taken with liquids after a meal.

46. P Nontasut et al, Southeast Asian J Trop Med Pub Health 2005; 36:650; M de Gorgolas et al, J Travel Med 2003; 10:358. All patients should be treated with medication whether surgery is attempted or not.

47. ME Wilson et al, Clin Infect Dis 2001; 32:1378; G Molavi et al, J Helminth 2006; 80:425.

Table 4.9. Drugs for Parasitic Infections, continued

Infection	Drug	Adult dosage	Pediatric dosage
<b>HOOKWORM</b> infection ( <i>Ancylostoma duodenale</i> , <i>Necator americanus</i> )			
Drug of choice:	Albendazole <sup>7,12</sup>	400 mg PO once	400 mg PO once
<b>OR</b>	Mebendazole	100 mg PO bid × 3d or 500 mg once	100 mg PO bid × 3d or 500 mg once
<b>OR</b>	Pyrantel pamoate <sup>7,13*</sup>	11 mg/kg (max. 1g) PO × 3d	11 mg/kg (max. 1g) PO × 3d
<b>Hydatid cyst</b> , see TAPEWORM infection			
<b>Hymenolepis nana</b> , see TAPEWORM infection			
<b>ISOSPORIASIS</b> ( <i>Isospora belli</i> )			
Drug of choice: <sup>48</sup>	Trimethoprim-sulfamethoxazole <sup>7</sup>	TMP 160 mg/SMX 800 mg (1 DS tab) PO bid × 10d	<b>TMP 10 mg/kg/d/SMX 50 mg/kg/d PO in 2 doses × 10d</b>
<b>LEISHMANIA</b>			
<b>Visceral</b> <sup>49,50</sup>			
Drug of choice:	Liposomal amphotericin B <sup>51</sup>	3 mg/kg/d IV d 1–5, 14 and 21 <sup>52</sup>	3 mg/kg/d IV d 1–5, 14 and 21 <sup>52</sup>
<b>OR</b>	Sodium stibogluconate*	20 mg Sb/kg/d IV or IM × 28d	20 mg Sb/kg/d IV or IM × 28d
<b>OR</b>	Miltefosine <sup>53*</sup>	2.5 mg/kg/d PO (max 150 mg/d) × 28d	2.5 mg/kg/d PO (max 150 mg/d) × 28d

\* Availability problems. See table on page 814.

48. Usually a self-limited illness in immunocompetent patients. Immunosuppressed patients may need higher doses, longer duration (TMP/SMX qid × 10d, followed by bid × 3wks) and long-term maintenance. In sulfonamide-sensitive patients, pyrimethamine 50–75 mg daily in divided doses (plus leucovorin 10–25 mg/d) has been effective.
49. To maximize effectiveness and minimize toxicity, the choice of drug, dosage, and duration of therapy should be individualized based on the region of disease acquisition, a likely infecting species, and host factors such as immune status (Bl. Herwaldt, Lancet 1999; 354:1191). Some of the listed drugs and regimens are effective only against certain *Leishmania* species/strains and only in certain areas of the world (J Arevalo et al, Clin Infect Dis 2007; 195:1846). Medical Letter consultants recommend consultation with physicians experienced in management of this disease.
50. Visceral infection is most commonly due to the Old World species *L. donovani* (kala-azar) and *L. infantum* and the New World species *L. chagasi*.
51. Liposomal amphotericin B (*AmBisome*) is the only lipid formulation of amphotericin B FDA-approved for treatment of visceral leishmaniasis, largely based on clinical trials in patients infected with *L. infantum* (A Meyerhoff, Clin Infect Dis 1999; 28:42). Two other amphotericin B lipid formulations, amphotericin B lipid complex (*Abelcet*) and amphotericin B cholesteryl sulfate (*Amphoter*) have been used, but are considered investigational for this condition and may not be as effective (C Bern et al, Clin Infect Dis 2006; 43:917).
52. The FDA-approved dosage regimen for immunocompromised patients (e.g., HIV infected) is 4 mg/kg/d IV on days 1–5, 10, 17, 24, 31 and 38. The relapse rate is high; maintenance therapy (secondary prevention) may be indicated, but there is no consensus as to dosage or duration.
53. Effective for both antimony-sensitive and -resistant *L. donovani* (Indian); miltefosine (*Imfavitole*) is manufactured in 10- or 50-mg capsules by Zentaris (Frankfurt, Germany at [info@zentaris.com](mailto:info@zentaris.com)) and is available through consultation with the CDC. The drug is contraindicated in pregnancy; a negative pregnancy test before drug initiation and effective contraception during and for 2 months after treatment is recommended (H Murray et al, Lancet 2003; 366:1561). In a placebo-controlled trial in patients ≥12 years old, oral miltefosine 2.5 mg/kg/d × 28d was also effective for treatment of cutaneous leishmaniasis due to *L. (V.) panamensis* in Colombia, but not *L. (V.) braziliensis* or *L. mexicana* in Guatemala (J Soto et al, Clin Infect Dis 2004; 38:1266). “Motion sickness,” nausea, headache and increased creatinine are the most frequent adverse effects (J Soto and P Soto, Expert Rev Anti Infect Ther 2006; 4:177).

**Table 4.9. Drugs for Parasitic Infections, continued**

<b>Infection</b>	<b>Drug</b>	<b>Adult dosage</b>	<b>Pediatric dosage</b>
<b>MALARIA, Treatment of, continued</b>			
<b>OR</b>	Quinine sulfate <b>plus</b> doxycycline <sup>7,21,71</sup> <b>or plus</b> tetracycline <sup>7,21</sup> <b>or plus</b> clindamycin <sup>7,18,72</sup> Mefloquine <sup>7,4,75</sup>	650 mg q8h × 3 or 7d <sup>70</sup> 100 mg bid × 7d 250 mg qid × 7d 20 mg/kg/d in 3 doses × 7d <sup>73</sup> 750 mg followed 12 hrs later by 500 mg	30 mg/kg/d in 3 doses × 3 or 7d <sup>70</sup> 4 mg/kg/d in 2 doses × 7d <b>25 mg/kg/d in 4 doses × 7d</b> 20 mg/kg/d in 3 doses × 7d 15 mg/kg followed 12 hrs later by 10 mg/kg
Alternative: <sup>67</sup>			

\*Availability problems. See table on page 814.

70. Available in the US in a 324-mg capsule; 2 capsules suffice for adult dosage. In Southeast Asia, relative resistance to quinine has increased and treatment should be continued for 7d. Quinine should be taken with or after meals to decrease gastrointestinal adverse effects.

71. Doxycycline should be taken with adequate water to avoid esophageal irritation. It can be taken with food to minimize gastrointestinal adverse effects.

72. For use in pregnancy and in children <8 yrs.

73. B Lell and PG Kremser, *Antimicrob Agents Chemother* 2002; 46:2315; M Ramharter et al, *Clin Infect Dis* 2005; 40:1777.

74. At this dosage, adverse effects include nausea, vomiting, diarrhea and dizziness. Disturbed sense of balance, toxic psychosis and seizures can also occur. Mefloquine should not be used for treatment of malaria in pregnancy unless there is no other treatment option because of increased risk for stillbirth (F Nosten et al, *Clin Infect Dis* 1999; 28:808). It should be avoided for treatment of malaria in persons with active depression or with a history of psychosis or seizures and should be used with caution in persons with any psychiatric illness. Mefloquine can be given to patients taking  $\beta$ -blockers if they do not have an underlying arrhythmia; it should not be used in patients with conduction abnormalities. Mefloquine should not be given together with quinine or quinidine, and caution is required in using quinine or quinidine to treat patients with malaria who have taken mefloquine for prophylaxis. Mefloquine should not be taken on an empty stomach; it should be taken with at least 8 oz of water.

75. *P. falciparum* with resistance to mefloquine is a significant problem in the malarious areas of Thailand and in areas of Myanmar and Cambodia that border on Thailand. It has also been reported on the borders between Myanmar and China, Laos and Myanmar; and in Southern Vietnam. In the US, a 250-mg tablet of mefloquine contains 228 mg mefloquine base. Outside the US, each 275-mg tablet contains 250 mg base.

Table 4.9. Drugs for Parasitic Infections, continued

Infection	Drug	Adult dosage	Pediatric dosage
<i>Naegleria</i> species, see AMEBIC MENINGOENCEPHALITIS, PRIMARY			
<i>Necator americanus</i> , see HOOKWORM infection			
<b>OESOPHAGOSTOMUM</b> <i>bifurcum</i>			
Drug of choice:		See footnote 98	
<i>Onchocerca volvulus</i> , see FILARIASIS			
<i>Opisthorchis viverrini</i> , see FLUKE infection			
<i>Paragonimus westermani</i> , see FLUKE infection			
<i>Pediculus capitis</i> , <i>humanus</i> , <i>Phthirus pubis</i> , see LICE			
Pinworm, see ENTEROBIUS			
<b>PNEUMOCYSTIS</b> <i>JIROVECI</i> (formerly <i>carinii</i> ) pneumonia (PCP) <sup>99</sup>			
Drug of choice:	Trimethoprim/ sulfamethoxazole	TMP 15 mg/SMX 75 mg/kg/d, PO or IV in 3 or 4 doses × 21d	TMP 15 mg/SMX 75 mg/kg/d, PO or IV in 3 or 4 doses × 21d
Alternative:	Primaquine <sup>7,79</sup> plus clindamycin <sup>7,18</sup>	30 mg base PO daily × 21d 600 mg IV q6h × 21d, or 300–450 mg PO q6h × 21d	0.3 mg/kg base PO daily × 21d 15–25 mg/kg IV q6h × 21d, or 10 mg/kg PO q6h × 21d
OR	Trimethoprim <sup>7</sup> plus dapsone <sup>7</sup>	5 mg/kg PO tid × 21d 100 mg daily × 21d	5 mg/kg PO tid × 21d 2 mg/kg/d PO × 21d
OR	Pentamidine	3–4 mg/kg IV daily × 21d	3–4 mg/kg IV daily × 21d
OR	Atovaquone	750 mg PO bid × 21d	1–3mos: 30 mg/kg/d PO × 21d 4–24mos: 45 mg/kg/d PO × 21d <b>&gt;24mos: 30 mg/kg/d PO x 21d</b>

\*Availability problems. See table on page 814.

98. Albendazole or pyrantel pamoate may be effective [JB Ziem et al, Ann Trop Med Parasitol 2004; 98:385].

99. Pneumocystis has been reclassified as a fungus. In severe disease with room air PO<sub>2</sub> ≤ 70 mmHg or A-a gradient ≥ 35 mmHg, prednisone should also be used (S Gagnon et al, N Engl J Med 1990; 323:1444; E Caumes et al, Clin Infect Dis 1994; 18:319).