Guidelines for the Prevention and Treatment of Opportunistic Infections in Children With and Exposed to HIV

Developed by the HHS Panel on Opportunistic Infections in Children With and Exposed to HIV—A Working Group of the NIH Office of AIDS Research Advisory Council (OARAC) and in collaboration with the National Institutes of Health, the HIV Medicine Association of the Infectious Diseases Society of America, and the Pediatric Infectious Diseases Society

How to Cite the Pediatric Opportunistic Infection Guidelines:

Panel on Opportunistic Infections in Children With and Exposed to HIV. Guidelines for the Prevention and Treatment of Opportunistic Infections in Children With and Exposed to HIV. Department of Health and Human Services. Available at https://clinicalinfo.hiv.gov/en/guidelines/pediatric-opportunistic-infection. Accessed (insert date) [insert page number, table number, etc., if applicable].

It is emphasized that concepts relevant to HIV management evolve rapidly. The Panels have a mechanism to update recommendations on a regular basis, and the most recent information is available on the Clinicalinfo website (https://clinicalinfo.hiv.gov/).

Table of Contents

Bacterial Infections

Updated: November 21, 2024
Reviewed: November 21, 2024

Dosing Recommendations for Prevention and Treatment of Invasive Bacterial Infections

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis *S. pneumoniae* and other invasive bacteria	• Pneumococcal, meningococcal, and Hib vaccines • IVIG 400 mg/kg body weight every 2–4 weeks (only in cases of hypogammaglobulinemia, IgG <400 mg/dL)	TMP-SMX 75/375 mg/m^2 body surface area per dose by mouth twice daily	See CDC website for detailed immunization schedule. Criteria for Discontinuing IVIG • Resolution of hypogammaglobulinemia Criteria for Restarting IVIG • Relapse of hypogammaglobulinemia
Secondary Prophylaxis *S. pneumoniae* and other invasive bacteria	TMP-SMX 75/375 mg/m^2 body surface area per dose by mouth twice daily	IVIG 400 mg/kg body weight every 2–4 weeks	Secondary Prophylaxis Indicated • More than two serious bacterial infections in a 1-year period in children who are unable to take ART Criteria for Discontinuing Secondary Prophylaxis • Sustained (≥3 months) immune reconstitution (CD4 percentage ≥25% if ≤6 years old; CD4 percentage ≥20% or CD4 count >350 cells/mm^3 if >6 years old) Criteria for Restarting Secondary Prophylaxis • More than two serious bacterial infections in a 1-year period despite ART
Treatment Bacterial pneumonia; *S. pneumoniae*; occasionally *S. aureus*, *H. influenzae*, *P. aeruginosa*	• Amoxicillin 90 mg/kg/dose orally divided every 8 or 12 hours (max 1 g/dose) for outpatient management, *or* • Ampicillin 200–400 mg/kg/day divided every 6 hours (max 2 g/dose) (use higher dose if *S. pneumoniae* MIC ≥4 mcg/mL), *or* • Ceftriaxone 50–100 mg/kg body weight per dose once daily, or 25–50 mg/kg body weight per dose twice daily IV or IM (max 4 g/day)	• Ceftazidime 200–300 mg/kg/day divided every 8 hours IV or IM (max 12 g/day), *or* • Cefepime 50 mg/kg/dose every 8 hours IV or IM (max 2 g/dose)	Alternative treatment should be determined based on local antimicrobial susceptibility patterns or that of the bacterial isolate, if available. For children who are receiving combination ART, have mild or no immunosuppression, and have mild-to-moderate community-acquired pneumonia, oral therapy option would be amoxicillin 45 mg/kg/dose twice daily (maximum dose: 4 g per day). Add azithromycin for hospitalized patients to treat other common community-acquired pneumonia pathogens (*M. pneumoniae, C. pneumoniae*).

Indication	First Choice	Alternative	Comments/Special Issues
			Add clindamycin or vancomycin if methicillin-resistant *S. aureus* is suspected (base the choice on local susceptibility patterns). For patients with neutropenia, chronic lung disease other than asthma (e.g., LIP, bronchiectasis) or indwelling venous catheter, consider regimen that includes activity against *P. aeruginosa* (such as ceftazidime or cefepime instead of ceftriaxone). Consider PCP in patients with severe pneumonia or more advanced HIV disease. Evaluate for tuberculosis, cryptococcosis, and endemic fungi as epidemiology suggests.

Key: ART = antiretroviral therapy; CD4 = CD4 T lymphocyte; CDC = Centers for Disease Control and Prevention; Hib = *Haemophilus influenzae* type b; IgG = immunoglobulin G; IM = intramuscular; IV = intravenous; IVIG = intravenous immune globulin; LIP = lymphocytic interstitial pneumonia; MIC = minimum inhibitory concentration; PCP = *Pneumocystis jirovecii* pneumonia; TMP-SMX = trimethoprim-sulfamethoxazole

Candida Infections

Updated: December 22, 2025
Reviewed: December 22, 2025

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	Not routinely recommended	N/A	N/A
Secondary Prophylaxis	Not routinely recommended but can be considered for frequent severe recurrences despite ART. • Fluconazole 6 mg/kg body weight (maximum 200 mg/dose) PO three times weekly	• Fluconazole 3–6 mg/kg body weight PO daily (maximum 200 mg/day) • Itraconazole oral solution, 2.5 mg/kg body weight/dose PO twice daily	Secondary Prophylaxis Indicated (Limited Data in Children) • Frequent or severe recurrences despite ART • In patients with initial fluconazole-refractory OPC or esophageal candidiasis that subsequently responded to voriconazole, posaconazole, or an echinocandin, may consider continuation of the effective drug until immune reconstitution Criteria for Discontinuing Secondary Prophylaxis • When CD4 count or percentage has risen to HIV stage 1 or 2. See HIV Infection Stage Table for more infection. Criteria for Restarting Secondary Prophylaxis • Frequent severe recurrences
Treatment	Oropharyngeal *Uncomplicated Infection* • Clotrimazole troches, 10-mg troche PO four or five times daily	Oropharyngeal (Fluconazole-Refractory) • Itraconazole oral solution 2.5 mg/kg body weight/dose PO twice daily (maximum 200–400 mg/day) for 7–14 days	Itraconazole oral solution **should not** be used interchangeably with itraconazole capsules. Itraconazole capsules are generally ineffective for treatment of esophageal disease.

	• Nystatin suspension 4–6 mL PO four times daily, *or* one or two 200,000-unit flavored pastilles by mouth four or five times daily *Moderate to Severe OPC* • Fluconazole 3–6 mg/kg/dose PO once daily (maximum dose: 400 mg/day) *Treatment Duration* • 7 to 14 days	• Posaconazole PowderMix for delayed-release oral suspension in children age ≥2 years and in the weight band for 7–14 days: o *10 kg to <12 kg*: 90 mg PO twice daily on Day 1, followed by 90 mg PO once daily o *12 kg to <17 kg:* 120 mg PO twice daily on Day 1, followed by 120 mg PO once daily o *17 kg to <21 kg:* 150 mg PO twice daily on Day 1, followed by 150 mg PO once daily o *21 kg to <26 kg:* 180 mg PO twice daily on Day 1, followed by 180 mg PO once daily o *26 kg to <36 kg:* 210 mg PO twice daily on Day 1, followed by 210 mg PO once daily o *36–40 kg:* 240 mg PO twice daily on Day 1, followed by 240 mg PO once daily • Posaconazole delayed-release *tablets* in children ≥2 years old and >40 kg body weight: 300 mg PO twice daily on Day 1, followed by 300 mg PO once daily for 7–14 days • Posaconazole oral suspension: 6 mg/kg/dose three times daily for 7–14 days • Posaconazole IV: 6 mg/kg/dose (maximum 300 mg) IV twice daily on Day 1, followed by 6 mg/kg/dose (maximum 300 mg) IV once daily for 7–14 days • *Alternative:* Voriconazole: Dosing as per esophageal disease below • *Alternative:* Echinocandins: Dosing as per esophageal disease below • *Alternative:* Lipid formulation amphotericin B 3–4 mg/kg daily. Note: Low-dose lipid formulation amphotericin B dosing has not been established.	Fluconazole Dosing Considerations If a neonate's creatinine level is >1.2 mg/dL for >3 consecutive doses, the dosing interval for fluconazole 12 mg/kg body weight may be prolonged to one dose every 48 hours until the serum creatinine level is <1.2 mg/dL.

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
		• *Alternative:* Amphotericin B (deoxycholate) 0.3–0.5 mg/kg body weight IV once daily	
	Esophageal Disease • Fluconazole 6 mg/kg/day PO once on Day 1, then 3-6 mg/kg/dose PO once daily (maximum dose: 12 mg/kg/day, 400 mg/day) *Treatment Duration* • 14–21 days	Esophageal Disease (Intolerance of Oral Therapy) • Fluconazole 6 mg/kg/day IV once on Day 1, then 3–6 mg/kg/dose IV once daily (maximum dose: 12 mg/kg/day, 400 mg/day) for 14–21 days *Echinocandins* • Anidulafungin o *Aged 1 Month–17 Years*: Loading dose of 3 mg/kg body weight/daily and then maintenance at 1.5 mg/kg body weight/dose daily IV (maximum 100 mg/day) • Caspofungin o Infants Aged *<3 Months*: 25 mg/m^2 BSA/dose daily IV o *Aged 3 Months–17 Years*: 70 mg/m^2/day IV loading dose followed by 50 mg/m^2/day IV (maximum 70 mg). Note: Dosing of caspofungin for children should be based on body surface area. • Micafungin o Note: In the United States, optimal dosing for infants younger than 4 months is not yet established. Studies indicate linear PK; age and clearance are inversely related (see recommended doses below). o *Neonates*: Up to 10–12 mg/kg body weight/dose daily IV may be required to achieve therapeutic concentrations. o *Ages ≥4 Months and Weight ≤30 kg:* 3 mg/kg body weight/dose IV daily	

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
		o *Ages ≥4 Months and Weight >30 kg:* 2.5 mg/kg body weight/dose IV daily (maximum dose: 150 mg/day) • Lipid formulation amphotericin B 3–4 mg/kg daily. Note: Low-dose lipid formulation amphotericin B dosing has not been established. • Amphotericin B (deoxycholate) 0.3–0.5 mg/kg body weight IV once daily Esophageal Disease (Fluconazole-Refractory) • Itraconazole oral solution 2.5 mg/kg body weight/dose PO twice daily • Voriconazole o *Ages 2 Years to <12 Years:* 4 mg/kg body weight/dose IV every 12 hours. Consider switch to 9 mg/kg/dose (maximum 350 mg) PO every 12 hours only after significant clinical improvement. o *Ages 12–14 Years and Weight <50 kg:* 4 mg/kg body weight/dose IV every 12 hours. Consider switch to 9 mg/kg/dose (maximum 350 mg) PO every 12 hours only after significant clinical improvement. o *Ages 12–14 Years and Weight ≥50 kg:* 200 mg PO/IV every 12 hours o *Ages ≥15 Years and Weight <40 kg:* 100 mg PO/IV every 12 hours o *Ages ≥15 Years and Weight ≥40 kg:* 200 mg PO/IV every 12 hours • *Alternative:* Echinocandins: Dosing as above	

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
		• *Alternative:* Lipid formulation amphotericin B: Dosing as above • *Alternative:* Amphotericin B (deoxycholate): Dosing as above • *Alternative:* Posaconazole: Dosing as above • *Alternative:* Isavuconazonium sulfate IV (372 mg/vial) o *Ages 1 Year to <3 Years and Weight <18 kg:* 15 mg/kg body weight/dose every 8 hours IV loading for six doses (48 hours), followed by 15 mg/kg once daily o *Ages 3 Years to <18 Years and Weight <37 kg:* 10 mg/kg every 8 hours IV loading for 6 doses (48 hours), followed by 10 mg/kg once daily IV o *Ages 3 Years to <18 Years and Weight ≥37 kg:* 372 mg (total dose) every 8 hours IV loading for 6 doses (48 hours), followed by 372 mg (total dose) once daily IV • *Alternative:* Isavuconazonium sulfate capsules (74.5 mg/capsule) o *Ages 6 Years to <18 Years and Weight 16 kg to <25 kg:* 149 mg (2 capsules) PO every 8 hours loading for six doses (48 hours), followed by 149 mg (2 capsules) PO once daily o *Ages 6 Years to <18 Years and Weight 18 kg to <25 kg:* 223.5 mg (3 capsules) PO every 8 hours loading for 6 doses (48 hours), followed by 223.5 mg (3 capsules) PO once daily	

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
		○ *Ages 6 Years to <18 Years and Weight 25 kg to <32 kg:* 298 mg (4 capsules) PO every 8 hours loading for six doses (48 hours), followed by 298 mg (4 capsules) PO once daily ○ *Ages 6 Years to <18 Years and Weight ≥32 kg:* 372 mg (5 capsules) PO every 8 hours loading for six doses (48 hours), followed by 372 mg (5 capsules) PO once daily *Treatment Duration* • 14–21 days	
	Invasive Disease: Moderately Severe to Severely Ill *Echinocandin Recommended* • Anidulafungin ○ *Aged 1 Month–17 Years*: Load with 3 mg/kg body weight/daily dose IV and then maintenance dose at 1.5 mg/kg body weight once daily (maximum 100 mg/day) • Caspofungin: ○ *Infants Aged <3 Months*: 25 mg/m^2 BSA/dose once daily IV ○ *Aged 3 Months–17 Years:* 70 mg/m^2 BSA/day loading dose followed by 50 mg/m^2 once daily (maximum 70 mg). Note: Dosing of caspofungin in children should be based on body surface area.	Invasive Disease • Fluconazole 25 mg/kg body weight/dose once IV/PO loading for Day 1, followed by 12 mg/kg body weight IV/PO once daily (maximum 600 mg/day) for minimum 2 weeks after last positive blood culture (if uncomplicated candidemia) ○ For infants aged ≤3 months and gestational age <30 weeks, maintenance dosing is 9 mg/kg/dose IV/PO daily • Lipid formulations of amphotericin B, 3–5 mg/kg body weight IV once daily • Amphotericin B deoxycholate, 1 mg/kg body weight IV once daily in the neonatal period • Voriconazole: ○ *Ages 2 Years to <12 Years:* 9 mg/kg body weight/dose every 12 hours IV loading for two doses, followed by voriconazole 8 mg/kg body weight/dose IV every 12 hours. Conversion to oral voriconazole should be at 9 mg/kg/dose (maximum 350 mg) PO every 12 hours.	Central venous catheters should be removed, when feasible, in children with HIV with fungemia. The preferred treatment for invasive disease in children with HIV depends on severity of disease, previous azole exposure, and *Candida* isolate obtained (if known). If a child with uncomplicated invasive candidiasis is initiated on an intravenous antifungal agent, such as an echinocandin or an amphotericin B formulation, step-down therapy to an oral agent such as fluconazole can be considered when the patient is clinically improved, has isolates susceptible to the oral agent, and have negative repeat blood cultures following initiation of antifungal therapy. Voriconazole can be used in situations in which mold coverage is also warranted.

	• Micafungin: o Note: In the United States, optimal dosing for infants younger than 4 months is not yet established. Studies indicate linear PK; age and clearance are inversely related (see recommended doses below). o *Neonates*: Up to 10–12 mg/kg body weight/dose daily IV may be required to achieve therapeutic concentrations. o *Infants <15 kg body weight:* 5–7 mg/kg/day o *Children* ≤40 kg body weight and aged 2–8 years: 3–4 mg/kg body weight/dose daily IV o *Children* ≤40 kg body weight and aged 9–17 years: 2–3 mg/kg body weight/dose daily o *Children* >40 kg body weight: 100 mg/dose daily IV *Treatment Duration* • Based on presence of deep-tissue foci and clinical response; in those with candidemia, treat until 2 weeks after last positive blood culture. Invasive Candidiasis: Mildly to Moderately Ill *Fluconazole Recommended* • Fluconazole 25 mg/kg body weight/dose once IV/PO loading for Day 1, followed by 12 mg/kg body weight/dose IV/PO daily (maximum dose: 600 mg)	o *Ages 12–14 Years and Weight <50 kg:* 9 mg/kg body weight/dose every 12 hours IV loading for two doses, followed by voriconazole 8 mg/kg body weight/dose IV every 12 hours. Conversion to oral voriconazole should be at 9 mg/kg/dose (maximum 350 mg) PO every 12 hours. o *Ages 12–14 Years and Weight ≥50 kg:* Load voriconazole 6 mg/kg body weight/dose every 12 hours IV for two doses, followed by 3–4 mg/kg body weight/dose IV every 12 hours. Conversion to oral therapy should be at 200 mg PO every 12 hours. If response is inadequate, may increase to 300 mg PO every 12 hours. o *Ages ≥15 Years and Weight <40 kg:* Load voriconazole 6 mg/kg body weight/dose every 12 hours IV for two doses, followed by 3–4 mg/kg body weight/dose IV every 12 hours. Conversion to oral therapy should be at 100 mg PO every 12 hours. If response is inadequate, may increase to 150 mg PO every 12 hours. o *Ages ≥15 Years and Weight ≥40 kg:* Load voriconazole 6 mg/kg body weight/dose every 12 hours IV for two doses, followed by 3–4 mg/kg body weight/dose IV every 12 hours. Conversion to oral therapy should be at 200 mg PO every 12 hours. If response is inadequate, may increase to 300 mg PO every 12 hours. *Treatment Duration* • Based on presence of deep-tissue foci and clinical response; in those with candidemia, treat until 2 weeks after last positive blood culture.	

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
	• For infants aged ≤3 months and gestational age <30 weeks, fluconazole maintenance dosing is 9 mg/kg/dose IV daily. • Avoid fluconazole for *C. krusei* and *C. glabrata.* See dosing for echinocandins above. • Use caution with echinocandins for *C. parapsilosis*. *Treatment Duration* • Based on presence of deep-tissue foci and clinical response; in those with candidemia, treat until 2 weeks after last positive blood culture.		
	Invasive Disease: CNS *Neonates* • *Initial:* Amphotericin B deoxycholate 1 mg/kg body weight/dose IV daily, *or* liposomal amphotericin B 5 mg/kg body weight/dose IV daily • *Step-Down (If Fluconazole-Susceptible):* Fluconazole 25 mg/kg body weight/dose once IV/PO loading for Day 1, followed by 12 mg/kg body weight/dose IV/PO daily *Children* • *Initial:* Liposomal amphotericin B 5 mg/kg body weight/dose IV daily +/- flucytosine 25 mg/kg body weight/dose PO four times daily	Invasive Disease: CNS *Neonates* • Amphotericin B deoxycholate 1 mg/kg body weight/dose IV daily, *or* liposomal amphotericin B 5 mg/kg body weight/dose IV daily, *and* • Flucytosine 25 mg/kg body weight/dose PO four times daily as salvage therapy *Children* • *Initial:* Amphotericin B deoxycholate 0.7–1 mg/kg body weight/dose IV daily IV daily (maximum 1.5 mg/kg/day) +/- flucytosine 25 mg/kg body weight/dose PO four times daily • *Step-Down (If Fluconazole-Susceptible):* Fluconazole 25 mg/kg body weight/dose once IV/PO loading for Day 1, followed by 12 mg/kg body weight/dose IV/PO daily (maximum dose: 800 mg)	Infected CNS devices should be removed if possible. For patients in whom a ventricular device cannot be removed, amphotericin B deoxycholate could be administered through the device into the ventricle. Intrathecal neonatal doses have ranged from 0.5 mg/day in 2 mL of D5W to 0.6 mg/day in 0.5 mL of D5W (total doses were 0.15 mg to 8.6 mg); doses of 0.125 to 0.25 mg have been administered to children via an Ommaya reservoir. Lipid formulations of amphotericin may not adequately penetrate the kidneys and should only be used with caution in neonates when urinary tract involvement is suspected or confirmed.

Dosing Recommendations for Prevention and Treatment of Candidiasis

Indication	First Choice	Alternative	Comments/Special Issues
	• *Step-Down (If Fluconazole-Susceptible):* Fluconazole 25 mg/kg body weight/dose once IV/PO loading for Day 1, followed by 12 mg/kg body weight/dose IV/PO daily (maximum dose: 800 mg) *Treatment Duration* • ≥1 month until all signs, symptoms, and CSF and radiographic abnormalities have resolved		Fluconazole dosing for CNS candidiasis is unknown but based on dosing for *Candida* invasive disease and maximums from cryptococcal meningitis. In neonates with CNS candidiasis, micafungin 10–15 mg/kg/dose IV daily may be considered as alternative therapy in special circumstances, such as salvage therapy or situations in which toxicity or drug resistance (e.g., *C. glabrata*) preclude the use of the preferred agents.

Key: ART = antiretroviral therapy; BSA = body surface area; CD4 = CD4 T lymphocyte; CNS = central nervous system; CSF = cerebrospinal fluid; D5W = 5% dextrose in water; IV = intravenous; OPC = oropharyngeal candidiasis; PK = pharmacokinetic; PO = oral

Coccidioidomycosis

Updated: June 05, 2025
Reviewed: June 05, 2025

Dosing Recommendations for Prevention and Treatment of Coccidioidomycosis

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	N/A	N/A	Primary prophylaxis not routinely indicated in children.
Secondary Prophylaxis	Fluconazole 6 mg/kg body weight (maximum 400 mg) per dose IV or PO once daily	Itraconazole 2–5 mg/kg body weight per dose (maximum dose 200 mg) PO per dose twice daily	Lifelong secondary prophylaxis with fluconazole for immunocompromised patients with meningitis or disseminated disease is recommended. Secondary prophylaxis should be considered after treatment of milder disease if CD4 count remains <250 cells/mm^3 or CD4 percentage <15%.
Treatment	Severe Illness With Respiratory Compromise Due to Diffuse Pulmonary or Disseminated Non-Meningitic Disease • Liposomal amphotericin B preparation at a dose of 5 mg/kg body weight IV once daily (dose can be increased to as much as 10 mg/kg body weight IV once daily for life-threatening infections) • Amphotericin B deoxycholate 0.5–1.0 mg/kg body weight IV once daily, until clinical improvement • Liposomal amphotericin B is the treatment of choice with similar efficacy with fewer adverse events. • After the patient is stabilized, therapy with an azole (fluconazole or itraconazole) can be substituted and continued to complete a 1-year course of antifungal therapy.	Severe Illness With Respiratory Compromise Due to Diffuse Pulmonary or Disseminated Non-Meningitic Disease *If unable to use amphotericin B:* • Fluconazole 12 mg/kg body weight (maximum 800–1,200 mg) per dose IV or by mouth once daily. • Treatment is continued for a total of 1 year, followed by secondary prophylaxis.	Surgical debridement of bone, joint, and/or excision of cavitary lung lesions may be helpful. Itraconazole is the preferred azole for treatment of bone infections. Fluconazole can be used as an alternative agent. Some experts initiate an azole during amphotericin B therapy. Others defer initiation of the azole until after amphotericin B is stopped. For treatment failure, can consider voriconazole, isavuconazole, caspofungin, or posaconazole (or combinations). However, experience is limited in children. Options should be discussed with an expert in the treatment of coccidioidomycosis. Chronic suppressive therapy (secondary prophylaxis) with fluconazole or itraconazole is routinely recommended following initial induction therapy for disseminated disease. Therapy with amphotericin B results in a more rapid clinical response in severe, non-meningeal disease.

Indication	First Choice	Alternative	Comments/Special Issues
	Mild-to-Moderate Non-Meningeal Coccidioidal Infection • Fluconazole 6–12 mg/kg body weight (maximum 400 mg) per dose IV or by mouth once daily for 6–12 months and clinical improvement	Mild-to-Moderate Non-Meningeal Coccidioidal Infection • Itraconazole 2–5 mg/kg body weight per dose (maximum dose 200 mg) per dose IV or PO three times daily for 3 days, then 2–5 mg/kg body weight (maximum dose 200 mg) PO per dose twice daily thereafter for 6–12 months and clinical improvement • Posaconazole oral (delayed-release tablets), 13 years and older: 300 mg twice daily for two doses, followed by 300 mg daily for 6–12 months and clinical improvement	Surgical debridement of bone, joint, and/or excision of cavitary lung lesions may be helpful. Itraconazole is the preferred azole for treatment of bone infections. Fluconazole can be used as an alternative agent. For treatment failure, can consider voriconazole, isavuconazole, caspofungin, or posaconazole (or combinations). However, experience is limited in children. Options should be discussed with an expert in the treatment of coccidioidomycosis. Chronic suppressive therapy (secondary prophylaxis) with fluconazole or itraconazole is routinely recommended following initial induction therapy for disseminated disease.
	Coccidioidal Meningitis • Fluconazole 12 mg/kg body weight (maximum 800–1,200 mg) per dose IV or PO once daily followed by lifelong secondary prophylaxis	Coccidioidal Meningitis • IV liposomal amphotericin B plus intrathecal amphotericin B deoxycholate followed by secondary prophylaxis	For treatment failure, can consider voriconazole, isavuconazole, caspofungin, or posaconazole (or combinations). However, experience is limited in children. Options should be discussed with an expert in the treatment of coccidioidomycosis. Chronic suppressive therapy (secondary prophylaxis) with fluconazole or itraconazole is routinely recommended following initial induction therapy for disseminated disease and is continued lifelong for meningeal disease.

Key: CD4 = CD4 T lymphocyte; IV = intravenous; PO = oral

COVID-19

Updated: July 01, 2024
Reviewed: July 01, 2024

Dosing Recommendations for Prevention and Treatment of COVID-19

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	COVID-19 vaccines and updated vaccines	Pemivibart (Pemgarda) *Aged ≥12 Years and ≥40 kg* • Pemivibart injection solution: 4,500 mg administered as a single IV infusion	COVID-19 Vaccination Indicated for— • All children with HIV aged ≥6 months regardless of CD4 cell count or viral load • Household members and close contacts of children with HIV aged ≥6 months For up-to-date vaccine guidance, see CDC's Use of COVID-19 Vaccines in the United States webpage. Children with HIV may qualify for additional doses of COVID-19 vaccines if they have stage 3 HIV infection, history of an AIDS-defining illness without immune reconstitution, clinical manifestations of symptomatic HIV, or untreated HIV infection. Pemivibart Indicated for— • Adults and adolescents aged ≥12 years and who weigh ≥40 kg with moderate-to-severe immunocompromise (including those with advanced or untreated HIV infection) who are unlikely to have an adequate response to COVID-19 vaccination.
Secondary Prophylaxis	N/A	N/A	N/A
Treatment	Non-hospitalized Children at High Risk of Progression to Severe COVID-19 *Aged ≥28 Days to <12 Years* • Remdesivir (Veklury) o ≥3 to <40 kg: Lyophilized powder only; IV loading dose: 5 mg/kg/dose on Day 1, followed by 2.5 mg/kg/dose once daily on Days 2 and 3 o ≥40 kg: Injection solution or	Non-hospitalized Children at High Risk of Progression to Severe COVID-19 *Aged ≥28 Days to <12 Years* • N/A *Aged ≥12 Years* • Remdesivir (Veklury) o ≥3 to <40 kg: Lyophilized powder only, IV: loading dose: 5 mg/kg/dose on Day 1, followed by 2.5 mg/kg/dose once daily on Days	Remdesivir is administered intravenously. When given to non-hospitalized patients, duration is for 3 days. When given to hospitalized patients, duration is generally 5 days or until hospital discharge, whichever is first, but may extend to up to 10 days based on clinical response. Remdesivir should be started within 7 days of symptom onset but could be considered if presenting with >7 days of symptoms in children with severe immunosuppression. Ritonavir-boosted nirmatrelvir is an oral PI that may be administered with other ARVs, including those that contain ritonavir or cobicistat, without any interruption or modification to the usual ART. However, there is potential for significant drug–drug interactions with other medications, requiring dose or frequency adjustment or avoidance. Consult a drug interactions database, such as the University of Liverpool

Indication	First Choice	Alternative	Comments/Special Issues
	lyophilized powder; IV loading dose: 200 mg on Day 1, followed by 100 mg once daily on Days 2 and 3 *Aged ≥12 Years and ≥40 kg* • Nirmatrelvir 300 mg and ritonavir 100 mg, administered together (Paxlovid), twice daily for 5 days Hospitalized Children • Remdesivir (Veklury) o ≥3 to <40 kg: Lyophilized powder only; IV loading dose: 5 mg/kg/dose on Day 1, followed by 2.5 mg/kg/dose once daily on Days 2 through 5 o ≥40 kg: Injection solution or lyophilized powder; IV loading dose: 200 mg on Day 1, followed by 100 mg once daily on Days 2 through 5 • Dexamethasone 0.15 mg/kg (with a maximum dose of 6 mg), oral or IV, once daily for up to 10 days	2 and 3 o ≥40 kg: Injection solution or lyophilized powder, IV: loading dose: 200 mg on Day 1, followed by 100 mg once daily on Days 2 and 3	COVID-19 Drug–Drug Interaction website, for further guidance. Ritonavir-boosted nirmatrelvir should be started within 5 days of symptom onset. Renal and hepatic function should be evaluated prior to initiating ritonavir-boosted nirmatrelvir, and doses should be adjusted if needed. Dexamethasone has potential for drug–drug interactions, including with NNRTIs. Providers should consult a drug interactions resource, such as the University of Liverpool COVID-19 Drug–Drug Interaction website, for further guidance. Alternative corticosteroids, such as hydrocortisone or methylprednisolone, may be considered if dexamethasone is not available or if alternative corticosteroids are being administered for another indication.

Cryptococcosis (Last updated November 6, 2013; last reviewed November 6, 2013)

Dosing Recommendations for Prevention and Treatment of Cryptococcosis (page 1 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	Not recommended	Not recommended	N/A
Secondary Prophylaxis[a]	Fluconazole 6 mg/kg body weight (maximum 200 mg) by mouth once daily	Itraconazole oral solution 5 mg/kg body weight (maximum 200 mg) by mouth once daily	Secondary Prophylaxis Indicated: • Documented disease Criteria For Discontinuing Secondary Prophylaxis *If **All** of the Following Criteria are Fulfilled:* • Age ≥6 years • Asymptomatic on ≥12 months of secondary prophylaxis • CD4 count ≥100 cells/mm^3 with undetectable HIV viral load on cART for >3 months Criteria for Restarting Secondary Prophylaxis: • CD4 count <100/mm^3
Treatment	CNS Disease *Acute Therapy (Minimum 2-Week Induction Followed by Consolidation Therapy):* • Amphotericin B deoxycholate 1.0 mg/kg body weight (or liposomal amphotericin B 6 mg/kg body weight) IV once daily **PLUS** flucytosine 25 mg/kg body weight per dose by mouth given 4 times daily	CNS Disease *Acute Therapy (Minimum 2-Week Induction Followed by Consolidation Therapy)* *If Flucytosine Not Tolerated or Unavailable:* • **A.** Liposomal amphotericin B, 6 mg/kg body weight IV once daily, **or** Amphotericin B Lipid Complex, 5 mg/kg body weight IV once daily, **or** Amphotericin B deoxycholate, 1.0–1.5 mg/kg body weight IV once daily **alone or B. in combination** with high-dose fluconazole (12 mg/kg body weight on day 1 and then 10–12 mg/kg body weight [max 800 mg] IV). **Note:** Data-driven pediatric dosing guidelines are unavailable for fluconazole with use of such combination therapy.	In patients with meningitis, CSF culture should be negative prior to initiating consolidation therapy. Overall, *in vitro* resistance to antifungal agents used to treat cryptococcosis remains uncommon. Newer azoles (voriconazole, posaconazole, ravuconazole) are all very active *in vitro* against *C. neoformans*, but published clinical experience on their use for cryptococcosis is limited.

Dosing Recommendations for Prevention and Treatment of Cryptococcosis (page 2 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Treatment, continued	*Consolidation Therapy (Followed by Secondary Prophylaxis):* • Fluconazole 12 mg/kg body weight on day 1, then 10–12 mg/kg body weight (max 800 mg) once daily IV or by mouth for a minimum of 8 weeks Localized Disease, Including Isolated Pulmonary Disease (CNS Not Involved)[b]: • Fluconazole 12 mg/kg body weight on day 1 and then 6–12 mg/kg body weight (maximum 600 mg) IV or by mouth once daily Disseminated Disease (CNS Not Involved) or Severe, Pulmonary Disease[b]: • Amphotericin B 0.7–1.0 mg/kg body weight, or • Liposomal amphotericin, 3–5 mg/kg body weight, or • Amphotericin B lipid complex 5 mg/kg body weight IV once daily (± flucytosine)	*If Amphotericin B-Based Therapy Not Tolerated:* • Fluconazole, 12 mg/kg body weight on day 1 and then 10–12 mg/kg body weight (maximum 800 mg) IV or by mouth once daily **PLUS** flucytosine, 25 mg/kg body weight per dose by mouth given 4 times daily *Consolidation Therapy (followed by secondary prophylaxis):* • Itraconazole 5–10 mg/kg body weight by mouth given once daily, or 2.5–5 mg/kg body weight given twice daily (maximum 200 mg/dose) for a minimum of 8 weeks. A loading dose (2.5–5 mg/kg body weight per dose 3 times daily) is given for the first 3 days (maximum 200 mg/dose; 600 mg/day). See comment on itraconazole under Other Options/Issues. Localized Disease Including Isolated Pulmonary Disease (CNS Not Involved)[b]: • Amphotericin B, 0.7–1.0 mg/kg body weight, or • Amphotericin liposomal 3–5 mg/kg body weight, or • Amphotericin lipid complex, 5 mg/kg body weight IV once daily Disseminated disease (CNS not involved) or severe, pulmonary disease[b]: • Fluconazole, 12 mg/kg body weight on day 1 and then 6–12 mg/kg body weight (maximum 600 mg) IV or by mouth once daily	Liposomal amphotericin and amphotericin B lipid complex are especially useful for children with renal insufficiency or infusion-related toxicity to amphotericin B deoxycholate. Liposomal amphotericin and amphotericin B lipid complex are **significantly more expensive than amphotericin B deoxycholate**. Liquid preparation of itraconazole (if tolerated) is preferable to tablet formulation because of better bioavailability, but it is more expensive. Bioavailability of the solution is better than the capsule, but there were no upfront differences in dosing range based on preparation used. Ultimate dosing adjustments should be guided by itraconazole levels. Serum itraconazole concentrations should be monitored to optimize drug dosing. Amphotericin B may increase toxicity of flucytosine by increasing cellular uptake, or impair its renal excretion, or both. Flucytosine dose should be adjusted to keep 2-hour post-dose drug levels at 40–60 µg/mL Oral acetazolamide **should not** be used for reduction of ICP in cryptococcal meningitis. Corticosteroids and mannitol have been shown to be ineffective in managing ICP in adults with cryptococcal meningitis. Secondary prophylaxis is recommended following completion of initial therapy (induction plus consolidation)—drugs and dosing listed above.

[a] Secondary prophylaxis is also referred to as maintenance therapy or suppressive therapy.

[b] Duration of therapy for non-CNS disease depends on site and severity of infection and clinical response

Key to Acronyms: cART = combination antiretroviral therapy; CNS = central nervous system; CSF = cerebrospinal fluid; ICP = intracranial pressure; IV = intravenous

Cryptosporidiosis *(Last updated November 6, 2013; last reviewed November 6, 2013)*

Dosing Recommendations for Prevention and Treatment of Cryptosporidiosis

Preventive Regimen			
Indication	**First Choice**	**Alternative**	**Comments/Special Issues**
Primary Prophylaxis	ARV therapy to avoid advanced immune deficiency	N/A	N/A
Secondary Prophylaxis	N/A	N/A	N/A
Treatment	Effective cART: • Immune reconstitution may lead to microbiologic and clinical response	There is no consistently effective therapy for cryptosporidiosis in HIV-infected individuals; optimized cART and a trial of nitazoxanide can be considered. Nitazoxanide (**BI**, HIV-Uninfected; **BII***, HIV-Infected in Combination with Effective cART): • 1–3 years: Nitazoxanide (20 mg/mL oral solution) 100 mg orally twice daily with food • 4–11 years: Nitazoxanide (20 mg/mL oral solution) 200 mg orally twice daily with food • ≥12 years: Nitazoxanide tablet 500 mg orally twice daily with food *Treatment duration:* • 3–14 days	Supportive Care: • Hydration, correct electrolyte abnormalities, nutritional support Antimotility agents (such as loperamide) should be used with caution in young children.

Key to Acronyms: ARV = antiretroviral; cART = combination antiretroviral therapy

Cytomegalovirus

Updated: August 3, 2023
Reviewed: August 3, 2023

Dosing Recommendations for Preventing and Treating Cytomegalovirus

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	• For older children who can receive adult dose (based on their BSA), valganciclovir tablets 900 mg orally once daily with food • For children aged 4 months to 16 years, valganciclovir oral solution 50 mg/mL at dose in milligrams = 7 x BSA x CrCl (up to maximum CrCl of 150 mL/min/1.73 m^2) orally once daily with food (maximum dose 900 mg/day)	N/A	Primary Prophylaxis Can Be Considered for— • CMV antibody positivity and severe immunosuppression (i.e., CD4 count <50 cells/mm^3 in children age ≥6 years; CD4 percentage <5% in children age <6 years). Criteria for Discontinuing Primary Prophylaxis • Age ≥6 years with CD4 count >100 cells/mm^3 • Age <6 years with CD4 percentage >10% Criteria for Considering Restarting Primary Prophylaxis • Age ≥6 years with CD4 count <50 cells/mm^3 • Age <6 years with CD4 percentage <5%
Secondary Prophylaxis	• Ganciclovir 5 mg/kg body weight IV once daily, or • For older children who can receive adult dose (based on their BSA), valganciclovir tablets 900 mg orally once daily with food, or • For children aged 4 months to 16 years, valganciclovir oral solution 50 mg/mL at dose in milligrams = 7 x BSA x CrCl (up to maximum CrCl of 150 mL/min/1.73 m^2) orally once daily with food, or	• Cidofovir 5 mg/kg body weight per dose IV every other week. Must be given with probenecid and IV hydration.	Secondary Prophylaxis Indicated for— • Prior disseminated disease, retinitis, neurologic disease, or GI disease with relapse. Criteria for Discontinuing Secondary Prophylaxis (All of the Following Criteria Must Be Fulfilled) • Completed ≥6 months of ART • Age <6 years with CD4 percentage ≥15% for >6 consecutive months • Age ≥6 years with CD4 count >100 cells/mm^3 for >6 consecutive months • Consultation with ophthalmologist (if retinitis) o Routine (i.e., every 3–6 months) ophthalmological follow-up is

Dosing Recommendations for Preventing and Treating Cytomegalovirus

Indication	First Choice	Alternative	Comments/Special Issues
	• Foscarnet 90–120 mg/kg body weight IV once daily		recommended for early detection of relapse or immune restoration uveitis. Criteria for Restarting Secondary Prophylaxis • Age <6 years with CD4 percentage <15% • Age ≥6 years with CD4 count <100 cells/mm^3
Treatment	Symptomatic Congenital Infection • Ganciclovir 6 mg/kg body weight per dose IV every 12 hours for 6 weeks or valganciclovir 16 mg/kg body weight per dose orally twice daily for 6 months Disseminated Disease and Retinitis *Induction Therapy* • Ganciclovir 5 mg/kg body weight per dose IV every 12 hours for 14–21 days (may be increased to 7.5 mg/kg body weight per dose IV twice daily) *Chronic Maintenance Therapy* • Ganciclovir 5 mg/kg body weight once daily for 5–7 days Central Nervous System Disease *Induction Therapy* • Ganciclovir 5 mg/kg body weight per dose IV every 12 hours ***plus*** foscarnet 60 mg/kg body weight per dose IV every 8 hours (or 90 mg/kg body weight per dose IV every	Disseminated Disease and Retinitis *Induction Therapy* • Foscarnet, 60 mg/kg body weight per dose IV every 8 hours or 90 mg/kg body weight per dose IV every 12 hours for 14–21 days *Chronic Maintenance Therapy* • Foscarnet 90–120 mg/kg body weight IV once daily *Alternative Therapy for Retinitis (Followed by Chronic Maintenance Therapy; See Secondary Prophylaxis)* • Valganciclovir tablets 900 mg per dose orally twice daily for 14–21 days, followed by chronic suppressive therapy (see above). o Note: This is an option in older children who can receive the adult dose (based on their BSA) and in patients with mild disease. • IV ganciclovir ***plus*** IV foscarnet (at above induction doses) may be considered as initial induction therapy in children with sight-threatening disease or for treatment following failure/relapse on monotherapy. • Cidofovir is also used to treat CMV retinitis in adults who are intolerant to other therapies. Induction dosing in adults is	Data on valganciclovir dosing in young children for treatment of retinitis are unavailable, but consideration can be given to transitioning from IV ganciclovir to oral valganciclovir after improvement of retinitis is noted. Intravitreal injections of ganciclovir, foscarnet, or cidofovir are used in adults for retinitis but are not practical for most children. Combination ganciclovir and foscarnet is associated with substantial rates of adverse effects, and optimal treatment for neurologic disease in children is unknown, particularly if receiving optimized ART. Chronic suppressive therapy (secondary prophylaxis) is recommended in adults and children following initial therapy of disseminated disease, retinitis, neurologic disease, or GI disease with relapse.

Dosing Recommendations for Preventing and Treating Cytomegalovirus

Indication	First Choice	Alternative	Comments/Special Issues
	12 hours) continued until symptomatic improvement *Chronic Maintenance Therapy* • See Secondary Prophylaxis above.	5 mg/kg body weight IV once weekly for 2 weeks, followed by chronic suppressive therapy (see above); however, data on dosing in children are unavailable. Must be given with probenecid and IV hydration.	

Key: BSA = body surface area; ART = combined antiretroviral therapy; CD4 = CD4 T lymphocyte; CMV = cytomegalovirus; CrCl = creatinine clearance; GI = gastrointestinal; IV = intravenous

Giardiasis *(Last updated November 6, 2013; last reviewed November 6, 2013)*

Dosing Recommendations for Prevention and Treatment of Giardiasis

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	cART to avoid advanced immunodeficiency	N/A	N/A
Secondary Prophylaxis	N/A	N/A	N/A

Treatment	• Tinidazole, 50 mg/kg by mouth, administered as 1 dose given with food (maximum 2 g). **Note:** Based on data from HIV-uninfected children
	• Nitazoxanide. **Note:** Based on data from HIV-uninfected children
	  • 1–3 years: 100 mg by mouth every 12 hours with food for 3 days
	  • 4–11 years: 200 mg by mouth every 12 hours with food for 3 days
	  • ≥12 years: 500 mg by mouth every 12 hours with food for 3 days
		Metronidazole 5 mg/kg by mouth every 8 hours for 5-7 days.
		Note: Based on data from HIV-uninfected children
			Tinidazole is approved in the United States for children aged ≥3 years. It is available in tablets that can be crushed.
			Metronidazole has high frequency of gastrointestinal side effects. A pediatric suspension of metronidazole is not commercially available but can be compounded from tablets. It is not FDA-approved for the treatment of giardiasis.
			Supportive Care:
			• Hydration
			• Correction of electrolyte abnormalities
			• Nutritional support
			Antimotility agents (e.g., loperamide) should be used with caution in young children.

Key to Abbreviations: cART = combination antiretroviral therapy; FDA = U.S. Food and Drug Administration

Hepatitis B Virus Infection

Updated: June 05, 2025
Reviewed: June 05, 2025

Dosing Recommendations for Prevention and Treatment of HBV in Children With HIV/HBV Coinfection

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	All Children • HepB vaccine Infants Born to Women With HBV • HepB vaccine plus HBIG	HBIG following exposure	See Figure 1 for detailed vaccine recommendations. Primary Prophylaxis Indicated for— • All individuals who are not infected with HBV Criteria for Discontinuing Primary Prophylaxis • N/A Criteria for Restarting Primary Prophylaxis • N/A
Secondary Prophylaxis	HepA vaccine	N/A	Secondary Prophylaxis Indicated for— • Individuals with chronic HBV infection to prevent further liver injury Criteria for Discontinuing Secondary Prophylaxis • N/A Criteria for Restarting Secondary Prophylaxis • N/A
Treatment	Treatment of Both HIV and HBV Required *Child Not Already Receiving 3TC or FTC* • 3TC 4 mg/kg body weight (maximum 150 mg) per dose by mouth twice daily as part of a fully suppressive ART regimen • For children aged ≥2 years, TAF as part of ART regimen with 3TC or FTC • For children aged ≥14 kg to <25 kg, FTC 120 mg/TAF 15 mg FDC once daily • For children ≥25 kg, FTC 200 mg/TAF 25 mg FDC once daily,	Alternative for 3TC: FTC 6 mg/kg body weight (maximum 200 mg) once daily	Indications for Treatment Include— • Detectable serum HBV DNA, irrespective of HBeAg status, for >6 months; *and* • Persistent (≥6 months) elevation of serum transaminases (≥ twice the upper limit of normal); *or* • Evidence of chronic hepatitis on liver biopsy Choice of HBV treatment options for children with HIV/HBV infection depends upon whether concurrent HIV treatment is warranted. 3TC and FTC have similar activity (and have cross-resistance) and should not

Indication	First Choice	Alternative	Comments/Special Issues
	or 3TC 300 mg plus 25 mg TAF daily • Note: For children weighing <35 kg, FTC/TAF combination should not be used with protease inhibitors for HIV therapy. *Child Already Receiving ART Containing 3TC or FTC, Suggesting 3TC/FTC Resistance* • For children aged ≥2 years, include TDF or TAF as part of ART regimen with 3TC or FTC. o For children aged <12 years, TDF 8 mg/kg body weight per dose once daily (maximum dose 300mg) o For children aged ≥12 years, TAF 25 mg once daily • For children aged ≥12 years, add entecavir 0.5 mg by mouth once daily in addition to ART regimen.		be given together. FTC is not FDA-approved for treatment of HBV. TAF is approved for use in treatment of HIV in children aged ≥2 years but it is not approved for treatment of HBV infection in children aged <12 years. It should only be used for HBV in children with HIV/HBV coinfection as part of an ART regimen. Entecavir is approved for use in children without HIV ≥2 years of age for treatment of chronic HBV. It should only be used for HBV in children with HIV/HBV coinfection who also receive an HIV-suppressive ART regimen but cannot use or access tenofovir. IRIS may be manifested by dramatic increase in transaminases as CD4 counts rise within the first 6–12 weeks of ART. It may be difficult to distinguish between drug-induced hepatotoxicity and other causes of hepatitis and IRIS. In children receiving TDF or TAF and 3TC or FTC, clinical and laboratory exacerbations of hepatitis (flare) may occur if the drug is discontinued; thus, once anti-HIV/HBV therapy has begun, it should be continued unless contraindicated or until the child has been treated for >12 months after HBeAg seroconversion and can be closely monitored on discontinuation. If anti-HBV therapy is discontinued and a flare occurs, reinstitution of therapy is recommended because a flare can be life threatening.

Key: 3TC = lamivudine; ART = antiretroviral therapy; CD4 = CD4 T lymphocyte; FDA = U.S. Food and Drug Administration; FDC = fixed dose combination; FTC = emtricitabine; HBeAg = hepatitis B antigen; HBIG = hepatitis B immune globulin; HBV = hepatitis B virus; HepA = hepatitis A [vaccine]; HepB = hepatitis B [vaccine]; IRIS = immune reconstitution inflammatory syndrome; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate

Hepatitis C Virus Infection

Updated: November 21, 2024
Reviewed: November 21, 2024

Dosing Recommendations and Important Considerations for HCV Antiviral Therapy in Children and Adolescents With HIV

- The American Association for the Study of Liver Diseases (AASLD) and the Infectious Diseases Society of America (IDSA) have developed a web-based process for the rapid formulation and dissemination of evidence-based, expert-developed recommendations for hepatitis C virus (HCV) management. See the AASLD/IDSA HCV Guidance: Recommendations for Testing, Managing, and Treating Hepatitis C for more details.
- For detailed dosing recommendations for HCV antiviral therapy in children and adolescents, refer to the section on HCV in Children.
- For more information on other important considerations in the management of HCV in children and adolescents with HIV—such as drug–drug interactions, alternate therapies, dose adjustment, and extra monitoring—refer to the section on Patients With HIV/HCV Coinfection.

Dosing Recommendations for Prevention and Treatment of Herpes Simplex Virus (HSV) Infections

(page 1 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	None.	None.	Primary prophylaxis is not indicated.
Secondary Prophylaxis	Mucocutaneous Disease: • Acyclovir 20 mg/kg body weight/dose (maximum 800 mg/dose) by mouth BID Suppressive Therapy After Neonatal Skin, Eye, Mouth, or CNS Disease: • Acyclovir 300 mg/m^2 body surface area/dose by mouth TID for 6 months	Mucocutaneous Disease, For Adolescents Old Enough to Receive Adult Dosing: • Valacyclovir 500 mg by mouth BID, or • Famciclovir 500 mg by mouth BID	Secondary Prophylaxis Indicated: • Suppressive secondary prophylaxis can be considered for children with severe and recurrent mucocutaneous (oral or genital) disease Criteria for Discontinuing Secondary Prophylaxis: • After a prolonged period (e.g., 1 year) of prophylaxis, consider suspending prophylaxis and determine with the patient whether additional prophylaxis is necessary. Although level of immune reconstitution is a consideration, no specific CD4 threshold has been established.
Treatment	Neonatal CNS or Disseminated Disease: • Acyclovir 20 mg/kg body weight IV/dose TID for ≥21 days Neonatal Skin, Eye, or Mouth Disease: • Acyclovir 20 mg/kg body weight IV/dose TID for 14 days CNS or Disseminated Disease in Children Outside the Neonatal Period: • Acyclovir 10 mg/kg body weight (up to 20 mg/kg body weight/dose in children <12 years) IV TID for 21 days Moderate to Severe Symptomatic Gingivostomatitis: • Acyclovir 5–10 mg/kg body weight/dose IV TID. Patients can be switched to oral therapy after lesions have begun to regress and therapy continued until lesions have completely healed. Mild Symptomatic Gingivostomatitis: • Acyclovir 20 mg/kg body weight (maximum 400 mg/dose) dose by mouth QID for 7–10 days	• Valacyclovir is approved for immuno-competent adults and adolescents with first-episode mucocutaneous HSV at a dose of 1 g/dose by mouth BID for 7–10 days; also approved for recurrent herpes labialis in children ≥12 years using two, 2 g doses by mouth separated by 12 hours as single-day therapy.	For Neonatal CNS Disease: • Repeat CSF HSV DNA PCR should be performed on days 19 to 21 of therapy; do not stop acyclovir until repeat CSF HSV DNA PCR is negative.

Dosing Recommendations for Prevention and Treatment of Herpes Simplex Virus (HSV) Infections

Indication	First Choice	Alternative	Comments/Special Issues
Treatment, continued	Recurrent Herpes Labialis: • Acyclovir 20 mg/kg body weight (maximum 400 mg/dose) dose by mouth QID for 5 days For First-Episode Genital Herpes (Adults and Adolescents): • Acyclovir 20 mg/kg body weight (maximim 400 mg/dose) dose by mouth TID for 7–10 days Recurrent Genital Herpes (Adults and Adolescents): • Acyclovir 20 mg/kg body weight (maximum 400 mg/dose) dose by mouth TID for 5 days Children with HSV Keratoconjunctivitis: • Often treated with topical trifluridine (1%) or acyclovir (3%) applied as 1–2 drops 5 times daily. Many experts add oral acyclovir to the topical therapy. Children with ARN: • For children old enough to receive adult dose, acyclovir 10–15 mg/kg body weight/dose IV every 8 hours for 10–14 days, followed by oral valacyclovir 1 g/dose TID for 4–6 weeks • As an alternative, oral acyclovir 20 mg/kg body weight/dose QID for 4–6 weeks after IV acyclovir for 10–14 days	• Recurrent genital HSV can be treated with valacyclovir 500 mg BID for 3 days or 1 g by mouth daily for 5 days. • Immunocompetent adults with recurrent herpes labialis can be treated with famciclovir, 1 g/dose by mouth BID for 1 day. • Famciclovir is approved to treat primary genital HSV in immunocompetent adults at a dose of 250 mg/dose by mouth TID for 7–10 days. • Recurrent genital HSV is treated with famciclovir 1 g/dose by mouth BID at a 12-hour interval for 2 doses • Famciclovir is approved for use in HIV-infected adults and adolescents with recurrent mucocutaneous HSV infection at a dose of 500 mg/dose by mouth BID for 7 days. Acyclovir-Resistant HSV Infection: • Foscarnet 40 mg/kg body weight/dose given IV TID (or 60 mg/kg body weight/dose BID) should be administered slowly over the course of 2 hours (i.e., no faster than 1 mg/kg/minute).	• There is no pediatric preparation of valacyclovir (although crushed capsules can be used to make a suspension) and data on dosing in children are limited; can be used by adolescents able to receive adult dosing. • There is no pediatric preparation of famciclovir and data on dosing in children are unavailable; can be used by adolescents able to receive adult dosing. Alternative and Short-Course Therapy in Immunocompromised Adults with Recurrent Genital Herpes: • Acyclovir 800 mg per dose by mouth BID for 5 days • Acyclovir 800 mg per dose by mouth TID for 2 days **Note:** Consultation with an ophthalmologist experienced in managing herpes simplex infection involving the eye and its complications in children is strongly recommended when ocular disease is present.

Key to Acronyms: ARN = acute retinal necrosis; BID = twice daily; CD4 = CD4 T lymphocyte; CNS = central nervous system; CSF = cerebrospinal fluid; HSV = herpes simplex virus; IV = intravenous; PCR = polymerase chain reaction; QID = four times daily; TID = three times daily

Dosing Recommendations for Preventing and Treating Histoplasmosis (page 1 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	N/A	N/A	Primary Prophylaxis indicated for selected HIV-infected adults but not children. Criteria for Discontinuing Primary Prophylaxis: • N/A Criteria for Restarting Primary Prophylaxis: • N/A
Secondary Prophylaxis (Suppressive Therapy)	Itraconazole oral solution 5–10 mg/kg body weight (maximum 200 mg) per dose by mouth daily	Fluconazole 3–6 mg/kg body weight (maximum 200 mg) by mouth once daily	Secondary Prophylaxis Indicated: • Documented histoplasmosis in a patient with impaired immune function Criteria For Discontinuing Secondary Prophylaxis *If All of the Following Criteria Are Fulfilled:* • CD4 percentage >15% at any age; or CD4 cell count >150 cells/mm^3 aged ≥6 years. • Received ≥1 year itraconazole maintenance therapy • Established (e.g., ≥6 months) adherence to effective cART • Negative *Histoplasma* blood cultures • Serum Histoplasma antigen <2 ng/mL Use same initial itraconazole dosing for capsules as for solution. Itraconazole solution is preferred to the capsule formulation because it is better absorbed; solution can achieve serum concentrations 30% higher than those achieved with the capsules.
Treatment	Acute Primary Pulmonary Histoplasmosis: • Itraconazole oral solution loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (max 200 mg) per dose by mouth twice daily for 12 months. Duration of 12 weeks is sufficient for HIV-infected children, with functional cellular immunity (CD4 percentage >20% or if aged ≥6, CD4 cell count >300 cells/mm^3), provided monitoring confirms clinical improvement and decreased urine antigen concentrations. Mild Disseminated Disease: • Itraconazole oral solution loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for	Acute Primary Pulmonary Histoplasmosis: • Fluconazole 3–6 mg/kg body weight (maximum 200 mg) by mouth once daily Mild Disseminated Disease: • Fluconazole 5–6 mg/kg body weight IV or by mouth (maximum 300	Use same initial itraconazole dosing for capsules as for solution. Itraconazole solution is preferred to the capsule formulation because it is better absorbed; solution can achieve serum concentrations 30% higher than those achieved with the capsules. Urine antigen concentration should be assessed at diagnosis. If >39 ng/mL, serum concentrations should be followed. When serum levels become undetectable, urine concentrations should be monitored monthly during treatment and followed thereafter to identify relapse. Serum concentrations of itraconazole should be monitored and achieve a level of 1 µg/mL at steady-state. Levels

Dosing Recommendations for Preventing and Treating Histoplasmosis (page 2 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Treatment, continued	first 3 days of therapy, followed by 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth twice daily for 12 months Moderately Severe to Severe Disseminated Disease *Acute Therapy (Minimum 2-Week Induction, Longer if Clinical Improvement is Delayed, Followed by Consolidation Therapy):* • Liposomal amphotericin B 3–5 mg/kg body weight, IV once daily (preferred) • Amphotericin B deoxycholate 0.7–1 mg/kg body weight IV once daily (alternative) *Consolidation Therapy (Followed by Chronic Suppressive Therapy):* • Itraconazole oral solution initial loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (max 200 mg) per dose by mouth given twice daily for 12 months Central Nervous System Infection *Acute Therapy (4–6 Weeks, Followed by Consolidation Therapy):* • Liposomal amphotericin B, 5 mg/kg body weight IV once daily **(AII)** *Consolidation Therapy (Followed by Chronic Suppressive Therapy):* • Itraconazole oral solution initial loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (max 200 mg) per dose by mouth given twice daily for ≥12 months and until histoplasma antigen is no longer detected in cerebrospinal fluid	mg) per dose, twice daily (maximum 600 mg/day) for 12 months Moderately Severe to Severe Disseminated Disease: • If itraconazole not tolerated, amphotericin alone for 4–6 weeks can be used with monitoring that confirms decline in histoplasma urine and serum antigen levels. • Liposomal amphotericin B 3–5 mg/kg body weight IV once daily (preferred) for 4–6 weeks • Amphotericin B deoxycholate 0.7–1 mg/kg body weight IV once daily (alternative) for 4–6 weeks	exceeding 10 µg/mL should be followed by dose reduction. High relapse rate with CNS infection occurs in adults and longer therapy may be required; treatment in children is anecdotal and expert consultation should be considered. Chronic suppressive therapy (secondary prophylaxis) with itraconazole is recommended in adults and children following initial therapy. Amphotericin B deoxycholate is better tolerated in children than in adults. Liposomal amphotericin B is preferred for treatment of parenchymal cerebral lesions.

Key to Acronyms: cART = combination antiretroviral therapy; CD4 = CD4 T lymphocyte; CNS = central nervous system; IV = intravenous

Human Papillomavirus Disease

Updated: December 22, 2025
Reviewed: December 22, 2025

Dosing Recommendations for Prevention and Treatment of Warts Associated With Human Papillomavirus in Children

Indication	First Choice	Alternative*	Comments/Special Issues
Primary Prophylaxis	HPV vaccine	N/A	See Figure 1. Recommended Immunization Schedule for Children With HIV Infection Aged 0 to 18 Years for detailed vaccine recommendations.
Secondary Prophylaxis	N/A	N/A	N/A
Treatment	Monitoring for spontaneous resolution is a reasonable option; 30% resolve spontaneously within 6 months and 90% within several years. Patient- or Parent-Applied Treatment Options • Imiquimod (3.75% or 5%) cream applied topically at night and washed off in the morning for 3 nonconsecutive nights a week for up to 16 weeks (BII). • Podofilox (0.5%) solution/gel applied topically two times daily for 3 consecutive days a week. Withhold treatment for 4 days and repeat the cycle weekly up to four times (BIII). • Sinecatechins (15%) ointment applied three times daily for up to 16 weeks, until warts are cleared completely and not visible (BIII).	Patient- or Parent-Applied Treatment Options • Cidofovir topical gel (1%) is an experimental therapy studied in adults with HIV that is commercially available through compounding pharmacies and has very limited use in children; systemic absorption can occur with potential for renal toxicity (CIII). Provider-Applied Treatment Options • Intralesional IFN-α and 5-FU/epinephrine gel implant are generally not recommended because of high cost, difficult administration, potential for systemic side effects, and lack of testing in children (CIII). * These alternative therapies should include consultation with infectious disease and dermatological specialists.	When choosing treatment options, parent and child comfort in application should be considered. Children have a low pain threshold and, generally, sensitive skin. Adequate topical anesthetics to the genital area should be given before caustic modalities are applied. For young children, these approaches are poorly tolerated due treatment-related and postoperative pain, and as a result may require general anesthesia. Therefore, these should be mainly reserved for children with extensive lesions. Many of these agents are contraindicated in pregnancy and have potential teratogenic effect. When treatment options are considered, the potential for pregnancy should be discussed and proper

	Provider-Applied Treatment Options • TCA (80% to 90%) applied topically weekly for up to 3 to 6 weeks (BIII). • Cryotherapy with liquid nitrogen or cryoprobe applied every 1 to 2 weeks up to four times (BIII). • Surgical removal either by tangential excision, tangential shave excision, curettage, or electrosurgery (BIII).		precautions during pregnancy explained. ART has not been consistently associated with reduced risk of HPV-related abnormalities in individuals with HIV. Most treatments for genital warts cannot be used in the oral mucosa; some oral warts can be treated with TCA or surgical excision. Laryngeal papillomatosis generally requires referral to a pediatric otolaryngologist. Treatment is directed at maintaining the airway, rather than removing all disease.

Key: 5-FU = 5-fluorouracil; ART = antiretroviral therapy; HPV = human papillomavirus; IFN-α = interferon-alfa; TCA = trichloroacetic acid

Isosporiasis (Cystoisosporiasis) (Last updated November 6, 2013; last reviewed November 6, 2013)

Dosing Recommendations for Prevention and Treatment of Isosporiasis (Cystoisosporiasis)

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	There are no U.S. recommendations for primary prophylaxis of isosporiasis.	N/A	Initiation of cART to avoid advanced immunodeficiency may reduce incidence; TMP-SMX prophylaxis may reduce incidence.
Secondary Prophylaxis	If Severe Immunosuppression: • Administer TMP-SMX 2.5 mg/kg body weight of TMP component twice daily by mouth 3 times per week	Pyrimethamine 1 mg/kg body weight (maximum 25 mg) plus folinic acid, 10–25 mg by mouth once daily. Second-Line Alternative: • Ciprofloxacin, 10–20 mg/kg body weight given twice daily by mouth 3 times per week	Consider discontinuing secondary prophylaxis in a patient receiving cART after sustained improvement from severe immunosuppression (from CDC immunologic category 3 to CD4 values that fall within category 1 or 2) for longer than 6 months. In adults, the dose of pyrimethamine for secondary prophylaxis (25 mg daily) is lower than the dose for treatment (50–75 mg daily), but no similar data exist for children. Thus, the recommended dosing for secondary prophylaxis in children is 1 mg/kg per dose (maximum 25 mg) once daily. Ciprofloxacin is generally not a drug of first choice in children due to increased incidence of adverse events, including events related to joints and/or surrounding tissues.

Treatment	TMP-SMX 5 mg/kg body weight of TMP component given twice daily by mouth for 10 days	Pyrimethamine 1 mg/kg body weight plus folinic acid 10-25 mg by mouth once daily for 14 days
		Second-Line Alternatives:
		• Ciprofloxacin 10–20 mg/kg body weight/day twice daily by mouth for 7 days
		• Nitazoxanide (see doses below) for 3 consecutive days
		  • Children 1–3 years: 100 mg by mouth every 12 hours
		  • Children 4–11 years: 200 mg by mouth every 12 hours
		  • Adolescents ≥12 years and adults: 500 mg by mouth every 12 hours
			If symptoms worsen or persist, the TMP-SMX dose may be increased to 5 mg/kg/day given 3–4 times daily by mouth for 10 days or the duration of treatment may be lengthened. Duration of treatment with pyrimethamine has not been well established.
			Ciprofloxacin is generally not a drug of first choice in children due to increased incidence of adverse events, including events related to joints and/or surrounding tissues.

Key to Acronyms: CD4 = CD4 T lymphocyte; CDC = Centers for Disease Control and Prevention; cART = combination antiretroviral therapy; TMP-SMX = trimethoprim-sulfamethoxazole

Malaria

Updated: November 6, 2013
Reviewed: November 6, 2013

Dosing Recommendations for Prevention and Treatment of Malaria

Indication	First Choice	Comments/Special Issues
Primary Prophylaxis	For Travel To Chloroquine-Sensitive Areas: Chloroquine base 5 mg/kg body weight base by mouth, up to 300 mg once weekly (equivalent to 7.5 mg/kg body weight chloroquine phosphate). Start 1–2 weeks before leaving, take weekly while away, and then take once weekly for 4 weeks after returning home Atovaquone/proguanil once daily started 1–2 days before travel, for duration of stay, and then for 1 week after returning home 11–20 kg; 1 pediatric tablet (62.5 mg/25 mg) 21–30 kg, 2 pediatric tablets (125 mg/50 mg) 31–40 kg; 3 pediatric tablets (187.5 mg/75 mg) >40 kg; 1 adult tablet (250 mg/100 mg) Doxycycline 2.2 mg/kg body weight (maximum 100 mg) by mouth once daily for children aged ≥8 years. Must be taken 1-2 days before travel, daily while away, and then up to 4 weeks after returning Mefloquine 5 mg/kg body weight orally given once weekly (max 250 mg) For Areas with Mainly *P. Vivax*: Primaquine phosphate 0.6 mg/kg body weight base once daily by mouth, up to a maximum of 30 mg base/day. Starting 1 day before leaving, taken daily, and for 3–7 days after return	Recommendations are the same for HIV-infected and HIV-uninfected children. Please refer to the following website for the most recent recommendations based on region and drug susceptibility: http://www.cdc.gov/malaria/ For travel to chloroquine-sensitive areas. Equally recommended options include chloroquine, atovaquone/proguanil, doxycycline (for children aged ≥8 years), and mefloquine; primaquine is recommended for areas with mainly *P. vivax*. G6PD screening must be performed prior to primaquine use. Chloroquine phosphate is the only formulation of chloroquine available in the United States; 10 mg of chloroquine phosphate = 6 mg of chloroquine base.
	For Travel to Chloroquine-Resistant Areas: Atovaquone/proguanil once daily started 1–2 days before travel, for duration of stay, and then for 1 week after returning home 11–20 kg; 1 pediatric tablet (62.5 mg/25 mg) 21–30 kg; 2 pediatric tablets (125 mg/50 mg) 31–40 kg; 3 pediatric tablets (187.5 mg/75 mg) >40 kg; 1 adult tablet (250 mg/100 mg) Doxycycline 2.2 mg/kg body weight (maximum 100 mg) by mouth once daily for children aged	For travel to chloroquine-resistant areas, preferred drugs are atovaquone/proguanil, doxycycline (for children aged ≥8 years) or mefloquine

Indication	First Choice	Comments/Special Issues
	≥8 years. Must be taken 1–2 days before travel, daily while away, and then up to 4 weeks after returning Mefloquine 5 mg/kg body weight orally given once weekly (maximum 250 mg)	
Secondary Prophylaxis	For *P. vivax* or *P. ovale*: Primaquine 0.5 mg/kg base (0.8 mg/kg salt) up to adult dose orally, daily for 14 days after departure from the malarious area	This regimen, known as PART, is recommended only for individuals who have resided in a malaria-endemic area for an extended period of time. Adult dose: 30 mg base (52.6 mg salt) orally, daily for 14 days after departure from the malarious area. http://wwwnc.cdc.gov/travel/yellowbook/2012/chapter-3-infectious-diseases-related-to-travel/malaria.htm#1939
Treatment	Uncomplicated *P. Falciparum* or Unknown Malaria Species, from Chloroquine-Resistant Areas (All Malaria Areas Except Those Listed as Chloroquine Sensitive) or Unknown Region: Atovaquone-proguanil (pediatric tablets 62.5 mg/25 mg; adult tablets 250 mg/100 mg), dosed once daily: 5–8 kg; 2 pediatric tablets for 3 days; 9–10 kg; 3 pediatric tablets for 3 days; 11–20 kg; 4 pediatric tablets or 1 adult tablet for 3 days; 21–30 kg; 2 adult tablets for 3 days; 31–40 kg; 3 adult tablets for 3 days; >40 kg; 4 adult tablets for 3 days Uncomplicated *P. Falciparum* OR Unknown Malaria Species From Chloroquine-Sensitive Region (See Comments for Link to Resistance Map): Chloroquine phosphate: 16.6 mg/kg body weight (10 mg/kg body weight chloroquine base) (maximum 1000 mg) by mouth once, then 8.3 mg/kg body weight (maximum 500 mg) by mouth at 6, 24, and 48 hours (total dose = 41.6 mg/kg body weight chloroquine phosphate [maximum 2500 mg] = 25 mg/kg body weight chloroquine base) *P. vivax*, *P. ovale*, *P. malariae*, *P. knowlesi* (All Areas Except Papua New Guinea, Indonesia; See Comments) *Initial Therapy (Followed by Anti-Relapse Therapy for P. Ovale and P. Vivax)*: Chloroquine phosphate 16.6 mg/kg body weight (10 mg/kg body weight chloroquine base) (maximum 1000 mg) by mouth once, then 8.3	For quinine-based regimens, doxycycline or tetracycline should be used only in children aged ≥8 years. An alternative for children aged ≥8 years is clindamycin 7 mg/kg body weight per dose by mouth given every 8 hours. Clindamycin should be used for children aged <8 years. Before primaquine is given, G6PD status must be verified. Primaquine may be given in combination with chloroquine if the G6PD status is known and negative, otherwise give after chloroquine (when G6PD status is available) For most updated prevention and treatment recommendations for specific region, refer to updated CDC treatment table available at https://www.cdc.gov/malaria/resources/pdf/Malaria_Treatment_Table_202306.pdf For sensitive and resistant malaria by country: https://wwwnc.cdc.gov/travel/yellowbook/2024/preparing/yellow-fever-vaccine-malaria-prevention-by-country High treatment failure rates due to chloroquine-resistant *P. vivax* have been documented in Papua New Guinea and Indonesia. Treatment should be selected from one of the three following options: Atovaquone-proguanil plus primaquine phosphate Quinine sulfate plus EITHER doxycycline OR tetracycline PLUS primaquine phosphate. This regimen cannot be used in children aged <8 years. Mefloquine plus primaquine phosphate

Indication	First Choice	Comments/Special Issues
	mg/kg body weight (maximum 500 mg) by mouth at 6, 24, and 48 hours (total dose = 41.6 mg/kg body weight chloroquine phosphate [maximum 2500 mg] = 25 mg/kg body weight chloroquine base) *Anti-Relapse Therapy for P. ovale*, *P. vivax*: Primaquine 0.5 mg base/kg body weight (max 30 mg base) by mouth once daily for 14 days Uncomplicated *P. falciparum* or Unknown Malaria Species from Chloroquine-Resistant Areas (All Malaria Areas Except Those Listed as Chloroquine Sensitive) or Unknown Region: Mefloquine (250-mg tablets only): 15 mg/kg body weight (maximum 750 mg) by mouth once, then 10 mg/kg body weight (maximum 500 mg) by mouth given 12 hours later Quinine sulfate 10 mg/kg body weight (maximum 650 mg) per dose by mouth every 8 hours for 3 to 7 days, plus Clindamycin 7 mg/kg body weight per dose by mouth every 8 hours for 7 days, or doxycycline: 2.2 mg/kg body weight per dose (maximum 100 mg) given by mouth every 12 hours, or tetracycline 6–12.5 mg/kg body weight per dose by mouth given every 6 hours (maximum dose: 500 mg per dose given 4 times daily) for 7 days. Artemether-lumefantrine: 1 tablet=20 mg Artemether and 120 mg lumefantrine, a 3-day treatment schedule for a total of 6 doses. The second dose follows the initial dose 8 hours later, then 1 dose twice daily for the next 2 days. 5 to <15 kg; 1 tablet per dose 15 to <25 kg; 2 tablets per dose 25 to <35 kg; 3 tablets per dose >35 kg; 4 tablets per dose	

Indication	First Choice	Comments/Special Issues
Severe Malaria	Quinidine gluconate 10 mg/kg body weight IV loading dose over 1–2 hours, then 0.02 mg/kg body weight/minute infusion for ≥24 hours (Treatment duration: 7 days in Southeast Asia, Oceania, otherwise 3 days) PLUS One of the Following: Doxycycline 100 mg per dose by mouth every 12 hours for 7 days; for children <45 kg, use 2.2 mg/kg body weight per dose OR Clindamycin 7 mg/kg body weight per dose by mouth given every 8 hours for 7 days. OR Tetracycline 6–12.5 mg/kg body weight per dose every 6 hours (maximum dose 500 mg per dose given 4 times daily) for 7 days Artesunate 2.4 mg/kg body weight IV bolus at 0, 12, 24, and 48 hours PLUS One of the Following: Doxycycline (treatment dosing as above), or Atovaquone-proguanil (treatment dosing as above), or Mefloquine 15 mg/kg body weight (maximum 750 mg) by mouth once, then 10 mg/kg body weight (maximum 500 mg) by mouth once given 12 hours later, or Clindamycin (dosing as above)	Quinidine gluconate is a class 1a anti-arrhythmic agent not typically stocked in pediatric hospitals. When regional supplies are unavailable, the CDC Malaria hotline may be of assistance (see below). Do not give quinidine gluconate as an IV bolus. Quinidine gluconate IV should be administered in a monitored setting. Cardiac monitoring required. Adverse events including severe hypoglycemia, prolongation of the QT interval, ventricular arrhythmia, and hypotension can result from the use of this drug at treatment doses. IND: IV artesunate is available from CDC. Contact the CDC Malaria Hotline at (770) 488-7788 from 8 a.m.–4:30 p.m. EST or (770) 488-7100 after hours, weekends, and holidays. Artesunate followed by one of the following: Atovaquone-proguanil (Malarone™), clindamycin, mefloquine, or (for children aged >8 years) doxycycline. Quinidine gluconate: 10 mg = 6.25 mg quinidine base. Doxycycline (or tetracycline) should be used in children aged >≥ years. For patients unable to take oral medication, may give IV. For children <45 kg, give 2.2 mg/kg IV every 12 hours and then switch to oral doxycycline. For children >45 kg, use the same dosing as per adults. For IV use, avoid rapid administration. For patients unable to take oral clindamycin, give 10 mg base/kg loading dose IV, followed by 5 mg base/kg IV every 8 hours. Switch to oral clindamycin (oral dose as above) as soon as a patient can take oral medication. For IV use, avoid rapid administration. Drug Interactions: Avoid co-administration of quinidine with ritonavir Use quinidine with caution with other protease inhibitors.

Key: CDC = Centers for Disease Control and Prevention; G6PD = glucose-6-phosphate dehydrogenase; IND = investigational new drug; IV = intravenous; PART = presumptive anti-relapse therapy

Dosing Recommendations for Preventing and Treating Microsporidiosis

Preventive Regimen			
Indication	**First Choice**	**Alternative**	**Comments/Special Issues**
Primary Prophylaxis	N/A	N/A	Not recommended
Secondary Prophylaxis	Disseminated, Non-Ocular Infection or GI Infection Caused by Microsporidia Other Than *E. Bieneusi* or *V. Corneae*: • Albendazole 7.5 mg/kg body weight (maximum 400 mg/dose) by mouth twice daily Ocular Infection: • Topical fumagillin bicyclohexylammonium (Fumidil B) 3 mg/mL in saline (fumagillin 70 µg/mL) eye drops: 2 drops every 2 hours for 4 days, then 2 drops QID (investigational use only in United States) **plus** albendazole 7.5 mg/kg body weight (maximum 400 mg/dose) by mouth twice daily for management of systemic infection	N/A	Criteria For Discontinuing Secondary Prophylaxis: • Continue until sustained immune reconstitution (more than 6 months at CDC immunologic category 1 or 2), or • After initiation of cART and resolution of signs and symptoms
Treatment	Effective cART Therapy: • Immune reconstitution may lead to microbiologic and clinical response For Disseminated (Not Ocular) and Intestinal Infection Attributed to Microsporidia Other Than *E. bieneusi* or *V. corneae*: • Albendazole 7.5 mg/kg body weight (maximum 400 mg/dose) by mouth twice daily *Treatment Duration:* • Continue until sustained immune reconstitution (longer than 6 months at CDC immunologic category 1 or 2) after initiation of cART and resolution of signs and symptoms For *E. bieneusi* or *V. corneae* infections: • Fumagillin adult dose 20 mg by mouth 3 times daily, or • TNP-470 (a synthetic analogue of fumagillin) recommended for treatment of infections due to *E. bieneusi* in HIV-infected adults For Ocular Infection: • Topical fumagillin bicyclohexylammonium (Fumidil B) 3 mg/mL in saline (fumagillin 70 µg/mL) eye drops: 2 drops every 2 hours for 4 days, then 2 drops QID (investigational use only in United States) **plus** albendazole 7.5 mg/kg body weight (maximum 400 mg/dose) by mouth twice daily for management of systemic infection *Treatment Duration:* • Continue until sustained immune reconstitution (longer than 6 months at CDC immunologic category 1 or 2) after initiation of cART and resolution of signs and symptoms.	N/A	• Supportive care: Hydration, correct electrolyte abnormalities, nutritional support • Fumagillin for systemic use is unavailable in the United States and data on dosing in children are unavailable. Consultation with an expert is recommended.

Key to Acronyms: cART = combination antiretroviral therapy; CDC = Centers for Disease Control and Prevention; GI = gastrointestinal; QID = four times a day

Mycobacterium avium Complex Disease *(Last updated January 8, 2019; last reviewed January 8, 2019)*

Dosing Recommendations for Prevention and Treatment of *Mycobacterium avium* Complex (MAC)
(page 1 of 2)

Preventive Regimen			
Indication	First Choice	Alternative	Comments/Special Issues

Primary Prophylaxis	• Clarithromycin 7.5 mg/kg body weight (maximum 500 mg) orally twice daily, *or*
	• Azithromycin 20 mg/kg body weight (maximum 1200 mg) orally once weekly
		• Azithromycin 5 mg/kg body weight (maximum 250 mg) orally once daily
		• Children aged >5 years: rifabutin 300 mg orally once daily with food
			Primary Prophylaxis Indicated for Children:
			• Aged <1 year: CD4 count <750 cells/mm^3;
			• Aged 1 to <2 years: CD4 count <500 cells/mm^3;
			• Aged 2 to <6 years: CD4 count <75 cells/mm^3;
			• Aged ≥6 years: CD4 count <50 cells/mm^3
			Criteria for Discontinuing Primary Prophylaxis:
			• Do not discontinue in children aged <2 years.
			• After ≥6 months of ART, *and*:
			  • Aged 2 to <6 years: CD4 count >200 cells/mm^3 for >3 consecutive months
			  • Aged ≥6 years: CD4 count >100 cells/mm^3 for >3 consecutive months
			Criteria for Restarting Primary Prophylaxis:
			• Aged 2 to <6 years: CD4 count <200 cells/mm^3
			• Aged ≥6 years: CD4 count <100 cells/mm^3

Secondary Prophylaxis (Chronic Suppressive Therapy)	• Clarithromycin 7.5 mg/kg body weight (maximum 500 mg) orally twice daily, plus • Ethambutol 15–25 mg/kg body weight (maximum 2.5 g) orally once daily, with or without food • Children aged >5 years who received rifabutin as part of initial treatment: Rifabutin 5 mg/kg body weight (maximum 300 mg) orally once daily with food	• Azithromycin 5 mg/kg body weight (maximum 250 mg) orally once daily, plus • Ethambutol 15–25 mg/kg body weight (maximum 2.5 g) orally once daily, with or without food • Children aged >5 years who received rifabutin as part of initial treatment: Rifabutin 5 mg/kg body weight (maximum 300 mg) orally once daily with food	Secondary Prophylaxis Indicated: • Prior disease Criteria for Discontinuing Secondary Prophylaxis *Fulfillment of All of the Following Criteria:* • Completed ≥6 months of ART • Completed ≥12 months MAC therapy • Asymptomatic for signs and symptoms of MAC • Aged 2 to <6 years: CD4 count >200 cells/mm^3 for ≥6 consecutive months • Aged ≥6 years: CD4 count >100 cells/mm^3 for ≥6 consecutive months Criteria for Restarting Secondary Prophylaxis: • Aged 2 to <6 years: CD4 count <200 cells/mm^3 • Aged ≥6 years: CD4 count <100 cells/mm^3

Dosing Recommendations for Prevention and Treatment of *Mycobacterium avium* Complex (MAC)
(page 2 of 2)

Preventive Regimen			
Indication	First Choice	Alternative	Comments/Special Issues
Treatment	Initial Treatment (≥2 Drugs): • Clarithromycin 7.5–15 mg/kg body weight (maximum 500 mg/dose) orally twice daily plus ethambutol 15–25 mg/kg body weight (maximum 2.5 g/day) orally once daily followed by chronic suppressive therapy For Severe Disease, Add: • Rifabutin 10–20 mg/kg body weight (maximum 300 mg/day) orally once daily	If Intolerant to Clarithromycin: • Azithromycin 10–12 mg/kg body weight (maximum 500 mg/day) orally once daily If Rifabutin Cannot Be Administered and a Third Drug is Needed in Addition to a Macrolide and Ethambutol, or if a Fourth Drug is Needed in Addition to Rifabutin for Patients with More Severe Symptoms or Disseminated Disease: • Ciprofloxacin 10–15 mg/kg orally twice daily (maximum 1.5 g/day), or • Levofloxacin 500 mg orally once daily, or • Amikacin 15–30 mg/kg body weight IV in 1 or 2 divided doses (maximum 1.5 g/day)	Combination therapy with a minimum of 2 drugs is recommended for ≥12 months. Clofazimine is associated with increased mortality in adults with HIV infection and should not be used. Children receiving ethambutol who are old enough to undergo routine eye testing should have monthly monitoring of visual acuity and color discrimination. Fluoroquinolones (e.g., ciprofloxacin and levofloxacin) are not labeled for use in children aged <18 years because of concerns regarding potential effects on cartilage; use in children aged <18 years requires an assessment of potential risks and benefits. Chronic suppressive therapy (secondary prophylaxis) is recommended in children and adults following initial therapy.

Key to Acronyms: ART = antiretroviral therapy; CD4 = CD4 T lymphocyte; MAC = *Mycobacterium avium* complex; IV = intravenous

Dosing Recommendations for Preventing and Treating TB in Children with HIV

Indication	First Choice	Alternative	Comments/Special Issues
Treatment of LTBI *Also Known as TB Preventive Therapy*	Source Case Drug Susceptible *Age 2 to <12 years* • 12 weekly doses of isoniazid (25 mg/kg for children aged 2–12 years) and rifapentine (10–14.0 kg: 300 mg; 14.1–25.0 kg: 450 mg; 25.1–32.0 kg: 600 mg; 32.1–49.9 kg: 750 mg; ≥50.0 kg: 900 mg maximum) *Age ≥12 years* • 12 doses of weekly isoniazid (15 mg/kg rounded up to the nearest 50 or 100 mg; 900 mg maximum) and rifapentine (10–14.0 kg: 300 mg; 14.1–25.0 kg: 450 mg; 25.1–32.0 kg: 600 mg; 32.1–49.9 kg: 750 mg; ≥50.0 kg: 900 mg maximum) Source Case Drug Resistant • For isoniazid-resistant source cases, daily rifampin 15–20 mg/kg (maximum 600 mg/day) for 4 months is recommended. • For isoniazid- and rifampin-resistant (i.e., MDR-TB) source cases, consult a TB expert and local public health authorities.	Rifampin 15–20 mg/kg (max 600 mg) daily for 4 months duration *or* Isoniazid 10–15 mg/kg (max 300 mg) daily and rifampin 15–20 mg/kg (maximum 600 mg/day) for 3 months duration *or* Isoniazid 10–15 mg/kg (max 300 mg) daily for 6–9 months	Indications • Positive TST (TST ≥5 mm in children with HIV) or IGRA without previous TB treatment • Close contact with any infectious TB case (repeated exposures warrant repeated post-exposure prophylaxis) Considerations • TB disease must be excluded before starting treatment for latent TB infection. • Drug-drug interactions with ART should be considered for all rifamycin-containing alternatives. Criteria for Discontinuing Prophylaxis • Only with documented severe adverse event, such as hepatotoxicity, hypersensitivity, or other adverse drug reactions, which are rare in children and adolescents. Adjunctive Treatment • Pyridoxine 1–2 mg/kg body weight once daily (maximum 25–50 mg/day) with isoniazid; pyridoxine supplementation is recommended for exclusively breastfed infants and for children and adolescents on meat- and milk-deficient diets; children with nutritional deficiencies, including all children with HIV; and pregnant girls and women.

Dosing Recommendations for Preventing and Treating TB in Children with HIV

Indication	First Choice	Alternative	Comments/Special Issues
Treatment of TB Disease	Intrathoracic Disease *Drug-Susceptible TB* • Intensive Phase (2 Months) o Isoniazid 10–15 mg/kg body weight (maximum 300 mg/day) by mouth once daily, plus o Rifampin 15–20 mg/kg body weight[a] (maximum 600 mg/day) by mouth once daily, plus o Pyrazinamide 30–40 mg/kg body weight (maximum 2 g/day) by mouth once daily, plus o Ethambutol 15–25 mg/kg body weight (maximum 1 g/day) by mouth once daily o In children with minimal disease with fully drug-susceptible TB, some experts recommend a three-drug intensive phase regimen excluding ethambutol. • Continuation Phase (4 Months) o Isoniazid 10–15 mg/kg body weight (maximum 300 mg/day) by mouth once daily, plus o Rifampin 15–20 mg/kg body weight[a] (maximum 600 mg/day) by mouth once daily Extrathoracic Disease Note: Depends on disease entity • Lymph node TB—treat as minimal intrathoracic disease • Bone or joint disease—consider extending the continuation phase to 10 months (for total duration of therapy of 12 months).	Alternative for Rifampin • Rifabutin 10–20 mg/kg body weight (maximum 300 mg/day) by mouth once daily (same dose if three times a week) • Discuss with an expert. Alternative Continuation Phase with Three Times Weekly Dosing *If Good Adherence and Treatment Response (4 months)* • Isoniazid 20–30 mg/kg body weight (maximum 900 mg/day) by mouth three times per week, plus • Rifampin 15–20 mg/kg body weight (maximum 600 mg/day) three times per week • In children with minimal disease with fully drug-susceptible TB, some experts recommend a continuation phase of 4 months (total duration of therapy of 6 months).	Treatment for TB disease should always be provided by DOT. If ART-naive, start TB therapy immediately and initiate ART within 2 to 8 weeks. If already on ART, review regimen to minimize potential toxicities and drug interactions; start TB treatment immediately. Potential drug toxicity and interactions should be reviewed at every visit. Drug interactions with ART should be considered for all rifamycin-containing alternatives. Adjunctive Treatment • Co-trimoxazole prophylaxis • Pyridoxine 1–2 mg/kg body weight/day (maximum 25–50 mg/day) with isoniazid or cycloserine/terizidone, if malnourished. Pyridoxine supplementation is recommended for exclusively breastfed infants and for children and adolescents on meat- and milk-deficient diets; children with nutritional deficiencies, including all children with HIV; and pregnant girls and women. • Corticosteroids (2 mg/kg body weight per day of prednisone [maximum 60 mg/day] or its equivalent for 4–6 weeks followed by tapering) with TB meningitis; may be considered with pleural effusions, pericarditis, severe airway compression, or severe IRIS.

Dosing Recommendations for Preventing and Treating TB in Children with HIV

Indication	First Choice	Alternative	Comments/Special Issues
	TB Meningitis • As an alternative to ethambutol, streptomycin 20–40 mg/kg body weight (maximum 1 g/day) IM once daily. During intensive phase, consider ethionamide 15–20 mg/kg body weight by mouth (maximum 1 g/day), initially divided into two doses until well tolerated. • Many experts recommend rifampin doses of 20–30 mg/kg daily for treatment of TB meningitis. See the AAP Red Book and WHO Operational Handbook on Tuberculosis for more information. • Consider extending the continuation phase to 10 months (for a total duration of therapy of 12 months). • Discuss with an expert. Drug-Resistant TB • Therapy should be based on the resistance pattern of the child (or of the source case where the child's isolate is not available); consult an expert.		Second-Line Drug Doses • Consult with an expert as dosing guidelines continue to evolve with emerging data.

[a] Some experts recommend using a daily rifampin dose of 20–30 mg/kg/day for infants and toddlers.

Key: AAP = American Academy of Pediatrics; ART = antiretroviral therapy; ATS = American Thoracic Society; CDC = Centers for Disease Control and Prevention; DOT = directly observed therapy; ERS = European Respiratory Society; IDSA = Infectious Diseases Society of America; IGRA = interferon-gamma release assay; IM = intramuscular; IRIS = immune reconstitution inflammatory syndrome; LTBI = latent TB infection; MDR-TB = multidrug-resistant TB; TB = tuberculosis; TST = tuberculin skin test; WHO = World Health Organization

Pneumocystis Pneumonia

Updated: December 22, 2025
Reviewed: December 22, 2025

Dosing Recommendations for Prevention and Treatment of *Pneumocystis* Pneumonia

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	• TMP-SMX: 5–10 mg/kg/DAY (TMP-component) • Maximum individual dose: 160 mg/DOSE TMP-component. Several dosing regimens have been used successfully: o 3 days per week on consecutive or alternate days in divided doses every 12 hours o Daily as a single dose o Administration 2 days per week on consecutive or alternate days in doses divided every 12 hours has been used successfully in pediatric oncology patients.	Dapsone and atovaquone are both first-line alternatives (see text for relative risks and benefits), followed by aerosolized pentamidine as second line and IV pentamidine as third line. Dapsone • *Children Aged ≥1 Month:* 2 mg/kg/dose (maximum: 100 mg/dose) PO once daily or 4 mg/kg/dose (maximum 200 mg/dose) PO once weekly Atovaquone • *Children Aged 1–3 Months or >24 Months–12 Years:* 30–40 mg/kg/dose PO once daily with food (maximum: 1,500 mg/dose) • *Children Aged 4–24 Months:* 45 mg/kg/dose PO once daily with food (maximum: 1,500 mg/dose) • *Children Aged ≥13 Years:* 1,500 mg PO once daily Aerosolized Pentamidine Via Respirgard II Nebulizer *For Children Able to Comply With Its Use* • *Children Aged <5 Years:* Limited data regarding dosing. 9 mg/kg/dose or 150 mg/dose every month have been suggested. • *Children Aged ≥5 Years:* 300 mg every month IV Pentamidine	Primary Prophylaxis Indicated for: • All infants with HIV or in whom HIV infection cannot be presumptively excluded beginning from age 4–6 weeks to 12 months, regardless of CD4 count or percentage • Children with stage 3 CD4 count: o *Children Aged 1 Year to <6 Years:* <500 cells/mm^3 or <22% o *Children Aged ≥6 Years:* <200 cells/mm^3 or <14% Criteria for Discontinuing Primary Prophylaxis • *Children Aged <1 Year:* Continue primary prophylaxis in children with HIV throughout the first year of life • Children Aged 1 year and older on ART for ≥6 months with CD4 count above age-specific stage 3 cutoff for >3 consecutive months: o *Children Aged 1 Year to <6 Years:* ≥500 cells/mm^3 *or* ≥22% o *Children Aged ≥6 Years:* ≥200 cells/mm^3 or ≥14% • Discontinuation can be considered in children ≥6 Years if on ART for ≥6 months with undetectable viral load and CD4 count 101–200 cells/mm^3 if intolerant of prophylaxis medications Criteria for Restarting Primary Prophylaxis

Indication	First Choice	Alternative	Comments/Special Issues
		• 4 mg/kg/dose every 3 to 4 weeks; maximum dose: 300mg/dose • Limited data regarding dosing frequency; based on use in oncology patients	• CD4 count below age-specific stage 3 cutoff
Secondary Prophylaxis Prior PCP	Same as for primary prophylaxis.	Same as for primary prophylaxis.	Secondary Prophylaxis Indicated for: • Children with prior episode of PCP Criteria for Discontinuing Secondary Prophylaxis • Same as for primary prophylaxis Criteria for Restarting Secondary Prophylaxis • Same as for primary prophylaxis
Treatment	TMP-SMX 15–20 mg/kg/day (TMP-component) in divided doses every 6–8 hours IV or PO for 21 days (followed by secondary prophylaxis dosing)	If TMP-SMX-Intolerant or Clinical Treatment Failure After 5–7 Days of TMP-SMX Therapy *Pentamidine* • 4 mg/kg/dose IV/IM once daily is the first-choice alternative regimen for severe disease. • Note: Close electrolyte and glucose monitoring required. Pentamidine can be changed to atovaquone after 7–10 days IV therapy. Atovaquone can be considered for initial therapy in mild-to-moderate disease. *Atovaquone* • Daily Dosing o *Children Aged 1–3 Months and >24 Months to 12 Years:* 30–40 mg/kg/dose PO once daily with food o *Children Aged 4–24 Months:* 45 mg/kg/dose PO once daily with food • Twice-Daily Dosing o *Children Aged ≥13 Years:* 750 mg/dose PO twice daily	After acute pneumonitis resolved in mild-to-moderate PCP, IV TMP-SMX can be transitioned to oral formulations. For oral administration, total daily dose of TMP-SMX can also be administered in three divided doses (every 8 hours). The following regimens have been used in adults, but data in children are limited: • Dapsone 2 mg/kg/dose PO once daily (maximum 100 mg/day) plus trimethoprim 5 mg/kg/dose PO every 8 hours • Primaquine base 0.3 mg/kg/dose PO once daily (maximum 30 mg/day) plus clindamycin 10mg/kg/dose IV or PO (maximum 600 mg/dose given IV and 300–450 mg/dose given orally) every 6 hours Chronic suppressive therapy (secondary prophylaxis) with TMP-SMX is recommended in children and adults following initial therapy (see Secondary Prophylaxis). Corticosteroids Adjunctive Therapy

Indication	First Choice	Alternative	Comments/Special Issues
		o Some experts use twice-daily dosing of atovaquone as alternative treatment for PCP in children aged <12 years. ▪ *Children Aged 1–3 Months and >24 Months to 12 Years*: 15–20 mg/kg/dose PO twice daily with food ▪ *Children Aged 4–24 Months:* 22.5 mg/kg/dose PO twice daily with food	*Indication* • PaO_2 <70 mmHg at room air or alveolar-arterial oxygen gradient ≥35 mmHg *Prednisone Dose* • Days 1–5: 1 mg/kg/dose PO twice daily, then • Days 6–10: 0.5–1 mg/kg/dose PO twice daily, then • Days 11–21: 0.5 mg/kg/dose PO once daily. *Alternative Corticosteroid Regimens* • Adult Dosage of Prednisone: o Days 1–5: 40 mg/dose PO twice daily, then o Days 6–10: 40 mg/dose PO once daily, then o Days 11–21: 20 mg/dose PO once daily • Methylprednisolone IV: o Days 1–7: 1 mg/kg/dose every 6 hours, then o Days 8–9: 1 mg/kg/dose twice daily, then o Days 10–11: 0.5 mg/kg/dose twice daily, then o Days 12–16: 1 mg/kg/dose once daily

Note: Information included in these guidelines might not represent U.S. Food and Drug Administration (FDA) approval or approved labeling for products or indications. Specifically, the terms "safe" and "effective" might not be synonymous with the FDA-defined legal standards for product approval.

Key: ART = antiretroviral therapy; CD4 = CD4 T lymphocyte; IM = intramuscular; IV = intravenous; PCP = *Pneumocystis* pneumonia; PO = oral; TMP = trimethoprim; TMP-SMX = trimethoprim-sulfamethoxazole

Dosing Recommendations for Prevention and Treatment of Syphilis

Preventive Regimen			
Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	N/A	N/A	Primary Prophylaxis Indicated for: • N/A Criteria for Discontinuing Primary Prophylaxis: • N/A Criteria for Restarting Primary Prophylaxis: • N/A
Secondary Prophylaxis	N/A	N/A	Secondary Prophylaxis Indicated: • N/A Criteria For Discontinuing Secondary Prophylaxis: • N/A Criteria For Restarting Secondary Prophylaxis: • N/A
Treatment	Congenital *Proven or Highly Probable Disease*: • Aqueous crystalline penicillin G 100,000–150,000 units/kg body weight per day, administered as 50,000 units/kg body weight per dose IV every 12 hours for the first 7 days of life, and then every 8 hours for 10 days • If diagnosed after 1 month of age, aqueous penicillin G 200,000–300,000 unit/kg body weight per day, administered as 50,000 units/kg body weight per dose IV every 4–6 hours (maximum 18–24 million units per day) for 10 days *Possible Disease*: • Treatment options are influenced by several factors, including maternal treatment, titer, and response to therapy; and infant physical exam, titer,	Congenital *Proven or Highly Probable Disease (Less Desirable if CNS Involvement):* • Procaine penicillin G 50,000 units/kg body weight IM once daily for 10 days *Possible Disease*: • Treatment options are influenced by several factors, including maternal treatment, titer, and response to therapy; and infant physical exam, titer, and test results. Scenarios that include variations of these factors are described and treatment recommendations are provided in detail on pages 36–37 of the Centers for Disease Control STD Treatment Guidelines, 2010.	For treatment of congenital syphilis, repeat the entire course of treatment if >1 day of treatment is missed. Examinations and serologic testing for children with congenital syphilis should occur every 2–3 months until the test becomes non-reactive or there is a fourfold decrease in titer. Children with increasing titers or persistently positive titers (even if low levels) at ages 6–12 months should be evaluated and considered for re-treatment. In the setting of maternal and possible infant HIV infection, the more conservative choices among scenario-specific treatment options may be preferable. Children and adolescents with acquired syphilis should have clinical and serologic response monitored at 3, 6, 9, 12, and 24 months after therapy.

Preventive Regimen			
Indication	First Choice	Alternative	Comments/Special Issues
	and test results. Scenarios that include variations of these factors are described and treatment recommendations are provided in detail on pages 36–37 of the Centers for Disease Control STD Treatment Guidelines, 2010. Acquired *Early Stage (Primary, Secondary, Early Latent)*: • Benzathine penicillin 50,000 units/kg body weight (maximum 2.4 million units) IM for 1 dose *Late Latent* • Benzathine penicillin 50,000 units/kg body weight (maximum 2.4 million units) IM once weekly for 3 doses *Neurosyphilis (Including Ocular)*: • Aqueous penicillin G 200,000–300,000 units/kg body weight per day administered as 50,000 units/kg body weight per dose IV every 4–6 hours (maximum 18–24 million units per day) for 10–14 days		

Key: CDC = Centers for Disease Control and Prevention; IM = intramuscular; IV = intravenous; STD = sexually transmitted disease

Toxoplasmosis

Updated: December 22, 2025
Reviewed: December 22, 2025

Dosing Recommendations for the Prevention and Treatment of Toxoplasmosis

Indication	First Choice	Alternative	Comments/Special Issues
Primary Prophylaxis	TMP-SMX 150/750 mg/m^2 body surface area once daily PO	**For Children Aged ≥1 Month:** • Dapsone 2 mg/kg body weight or 15 mg/m^2 body surface area (maximum 25 mg) PO once daily, *plus* • Pyrimethamine 1 mg/kg body weight or 15 mg/m^2 body surface area (maximum 25 mg) PO once daily, *plus* • Leucovorin 5 mg PO every 3 days (continued for 1 week after pyrimethamine completed due to long half-life) **For Children Aged 1–3 Months and >24 Months:** • Atovaquone 30 mg/kg body weight (maximum 1,500 mg) PO once daily with food For Children Aged 4–**24 Months:** • Atovaquone 45 mg/kg body weight (maximum 1,500 mg) PO once daily with food, *with or without* • Pyrimethamine 1 mg/kg body weight or 15 mg/m^2 body surface area (maximum 25 mg) PO once daily, *plus* leucovorin 5 mg PO every 3 days Acceptable Alternative Dosage **Schedules for TMP-SMX** • TMP-SMX 150/750 mg/m^2 body surface area per dose PO three times weekly on 3 consecutive days per week • TMP-SMX 75/375 mg/m^2 body surface area per dose twice daily PO every day	Primary Prophylaxis Indicated for: *Children With IgG Antibody to Toxoplasma and Severe Immunosuppression Who Are:* • Aged <1 year with CD4% ≤26% or CD4 ≤750 cells/mm^3, *or* • Aged 1–5 years with CD4% ≤22% or CD4 ≤500 cells/mm^3, *or* • Aged ≥6 years with CD4 count ≤100 cells/mm^3 Criteria for Discontinuing Primary Prophylaxis Note: Do not discontinue in children aged <1 year. • Aged 1–5 years with CD4 count >500 cells/mm^3 for >3 consecutive months *or* • Aged ≥6 years with CD4 count >200 cells/mm^3 for >3 consecutive months Criteria for Restarting Primary Prophylaxis: • Aged 1–5 years with CD4 count <500 cells/mm^3 *or* • Aged ≥6 years with CD4 count <200 cells/mm^3

Indication	First Choice	Alternative	Comments/Special Issues
		• TMP-SMX 75/375 mg/m^2 body surface area per dose twice daily PO three times weekly on alternate days	
Secondary Prophylaxis (Suppressive Therapy)	• Sulfadiazine 85–120 mg/kg body weight per day in 2–4 divided doses (maximum 2–4 g per day) PO, *plus* • Pyrimethamine 1 mg/kg body weight or 15 mg/m^2 body surface area (maximum 25 mg) PO once daily, *plus* • Leucovorin 5 mg PO once every 3 days	• Clindamycin 7–10 mg/kg body weight per dose (max 600 mg/dose) PO three times daily, *plus* • Pyrimethamine 1 mg/kg body weight or 15 mg/m^2 body surface area (maximum 25 mg) PO once daily, *plus* • Leucovorin 5 mg PO once every 3 days **Children Aged 1–3 Months and >24 Months** • Atovaquone 30 mg/kg body weight PO (maximum 1,500 mg) once daily with food, *plus* • TMP-SMX, 150/750 mg/m^2 body surface area PO once daily Children Aged 4–**24 Months** *Option 1* • Atovaquone 45 mg/kg body weight PO once daily with food, *with or without* • Pyrimethamine 1 mg/kg body weight or 15 mg/m^2 body surface area (maximum 25 mg) PO once daily, *plus* leucovorin (when using pyrimethamine), 5 mg PO every 3 days *Option 2* • Atovaquone 45 mg/kg body weight (maximum 1,500 mg) PO once daily with food, *plus* • TMP-SMX, 150/750 mg/m^2 body surface area PO once daily	Secondary Prophylaxis Indicated • Prior TE Note: Limited data in children is available for alternative regimens. TMP-SMX only to be used if individual is intolerant to other regimens. Criteria for Discontinuing Secondary Prophylaxis *If All of the Following Criteria are Fulfilled*: • Completed initial therapy for TE, *and* • Asymptomatic for TE, *and* • Aged ≥6 years old with CD4 >200 cells/mm^3 in those or CD4% >22% (CD4 count >500 cells/mm^3) in those aged 1–5 years for 3 consecutive months Criteria For Restarting Secondary Prophylaxis: • CD4 count ≤200 cells/mm^3 and CD4% ≤22% (CD4 count ≤500 cells/mm^3) in those aged 1–5 years Note: Sulfadiazine may be given as 2–4 equal doses per day as long as the total daily dose is 85–120 mg/kg body weight.

Indication	First Choice	Alternative	Comments/Special Issues
Treatment	Congenital Toxoplasmosis • Pyrimethamine loading dose of 1 mg/kg body weight PO twice daily for 2 days, then 1 mg/kg body weight PO once daily for 2–6 months, then 1 mg/kg body weight PO three times weekly thereafter, *plus* • Leucovorin (folinic acid) 10 mg PO or IM three times weekly, *plus* • Sulfadiazine 50 mg/kg body weight PO twice daily *Treatment Duration* • 12 months Acquired Toxoplasmosis *Acute Induction Therapy (Followed by Chronic Suppressive Therapy)* • Pyrimethamine loading dose of 1 mg/kg body weight (maximum 50 mg) PO twice daily for 3 days, then 1 mg/kg body weight (maximum 25 mg) PO once daily, *plus*	For Sulfonamide-Intolerant Patients: • Pyrimethamine loading dose of 1 mg/kg body weight PO twice daily for 2 days, then 1 mg/kg body weight PO once daily for 2–6 months, then 1 mg/kg body weight PO three times weekly thereafter, *plus* • Leucovorin (folinic acid) 10 PO or IM three times weekly, *plus* • Clindamycin 5–7.5 mg/kg body weight PO or IV (maximum 600 mg/dose) per dose four times daily	Congenital Toxoplasmosis • For infants born mothers with symptomatic *Toxoplasma* infection during pregnancy, empiric therapy of the newborn should be strongly considered irrespective of treatment during pregnancy. Acquired Toxoplasmosis • Pyrimethamine use requires CBC monitoring at least weekly while on daily dosing and at least monthly while on less-than-daily dosing. • The following regimens are used in adults but have not been studied in children: o TMP-SMX 5/25 mg/kg body weight per dose IV or PO given twice daily as an alternative to pyrimethamine-sulfadiazine o Atovaquone 1,500 PO twice daily administered: ▪ with pyrimethamine and leucovorin, *or* ▪ with sulfadiazine, *or* ▪ alone, for those with pyrimethamine and sulfadiazine intolerance o Azithromycin 900–1,200 mg daily (corresponding to 20 mg/kg daily, maximum 1,000 mg in children) administered with pyrimethamine-leucovorin • Corticosteroids (e.g., prednisone, dexamethasone) have been used in children with CNS disease when CSF protein is very elevated (>1,000 mg/dL) or when focal lesions with significant mass effects are present, with discontinuation as soon as clinically feasible.

Indication	First Choice	Alternative	Comments/Special Issues
	• Sulfadiazine 25–50 mg/kg body weight (maximum 1–1.5 g/dose) PO per dose four times daily, *plus* • Leucovorin 10–20 mg PO once daily, continued for one week after stopping pyrimethamine *Treatment Duration (Followed by Chronic Suppressive Therapy)*: • ≥6 weeks (longer duration if clinical or radiologic disease is extensive or response in incomplete at 6 weeks)		• Anticonvulsants should be administered to people with a history of seizures and continued through the acute treatment but should not be used prophylactically. • Sulfadiazine may be given as 2 to 4 equal doses per day as long as the total daily dose is 85–120 mg/kg body weight. • Consider screening for G6PD deficiency before starting sulfadiazine or TMP-SMX in people from regions with high prevalence of severe G6PD deficiency.

Key: CBC = complete blood count; CD4 = CD4 T lymphocyte; CD4% = CD4 T lymphocyte percentage; CNS = central nervous system; CSF = cerebrospinal fluid; G6PD = glucose-6-phosphate dehydrogenase; IgG = immunoglobulin G; IM = intramuscular; IV = intravenous; PO = orally; TE = Toxoplasma encephalitis; TMP-SMX = trimethoprim-sulfamethoxazole

Varicella-Zoster Virus *(Last updated November 6, 2013; last reviewed November 6, 2013)*

Dosing Recommendations for Preventing and Treating Varicella-Zoster Virus (page 1 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Pre-Exposure Prophylaxis	Varicella vaccine	N/A	See Figures 1 and 2 for detailed vaccine recommendations.
Primary (Post-Exposure) Prophylaxis	VariZIG 125 IU/10 kg body weight IM (maximum 625 IU), administered ideally within 96 hours (potentially beneficial up to 10 days) after exposure	• If VariZIG cannot be administered within 96 hours (up to 10 days), IVIG 400 mg/kg body weight, administered once should be considered. IVIG should ideally be administered within 96 hours of exposure • When passive immunization is not possible, some experts recommend prophylaxis with acyclovir 20 mg/kg body weight/dose (maximum dose 800 mg), administered QID for 7 days, beginning 7–10 days after exposure	Primary Post-Exposure Prophylaxis Indicated for: • Patients with substantial exposure to varicella or zoster with no verified history of varicella or zoster or who are seronegative for VZV on a sensitive, specific antibody assay or who lack evidence of vaccination. Many experts limit this recommendation to varicella or zoster-exposed HIV-infected children who are considered to be severely immunocompromised, (i.e., in CDC Immunologic Category 3), especially if also classified as CDC Clinical Category C[a] and experiencing a high HIV RNA plasma viral load **(BIII)**. • Some experts start acyclovir at first appearance of rash. **Note:** To obtain VariZIG, contact FFF Enterprises at 1-800-843-7477 or http://www.fffenterprises.com. [a] CDC. Revised classification system for human immunodeficiency virus infection in children less than 13 years of age. Official authorized addenda: human immunodeficiency virus infection codes and official guidelines for coding and reporting ICD-9-CM. *MMWR Morb Mortal Wkly Rep*. 1994;43:1-19. Available at http://www.cdc.gov/mmwr/PDF/rr/rr4312.pdf.
Secondary Prophylaxis	N/A	N/A	There is no indication for secondary prophylaxis

Dosing Recommendations for Preventing and Treating Varicella-Zoster Virus (page 2 of 2)

Indication	First Choice	Alternative	Comments/Special Issues
Treatment	Chickenpox *Children with No or Moderate Immune Suppression (CDC Immunologic Categories 1 and 2) and Mild Varicella Disease:* • Acyclovir 20 mg/kg body weight/dose by mouth (max 800 mg/dose) QID for 7–10 days and until no new lesions for 48 hours *Children with Severe Immune Suppression (CDC Immunologic Category 3):* • Acyclovir 10 mg/kg body weight 500 mg/m^2/dose IV every 8 hours for 7–10 days and until no new lesions for 48 hours Zoster *Children with Uncomplicated Zoster:* • Acyclovir 20 mg/kg body weight/dose (max 800 mg/dose) by mouth QID for 7–10 days. *Children with Severe Immunosuppression (CDC Immunologic Category 3), Trigeminal or Sacral Nerve Involvement, Extensive Multidermatomal, or Disseminated Zoster:* • Acyclovir 10 mg/kg body weight/dose IV every 8 hours until cutaneous lesions and visceral disease are clearly resolving, then can switch to acyclovir by mouth to complete a 10- to 14-day course *Children with Progressive Outer Retinal Necrosis:* • Ganciclovir 5 mg/kg body weight/dose IV every 12 hours, **plus** • foscarnet 90 mg/kg body weight/dose IV) every 12 hours, **plus** • ganciclovir 2 mg/0.05 mL intravitreal twice weekly and/or foscarnet 1.2 mg/0.05 mL intravitreal twice weekly *Children with ARN:* • Acyclovir 10–15 mg/kg body weight/dose IV every 8 hours daily for 10–14 days, **followed by** Oral valacyclovir 1 g/dose TID for 4–6 weeks (for children old enough to receive adult dose). Alternative oral acyclovir dose: 20 mg/kg body weight/dose QID for 4–6 weeks	Patients Unresponsive to Acyclovir: • Foscarnet (40–60 mg/kg body weight/dose IV every 8 hours) for 7-10 days or until no new lesions have appeared for 48 hours	In children ≥1 year of age, some experts base IV acyclovir dosing on body surface area (500 mg/m^2 body surface area/dose IV every 8 hours) instead of body weight. Valacyclovir is approved for use in adults and adolescents with zoster at 1 g/dose by mouth TID for 7 days; the same dose has been used for varicella infections. Data on dosing in children are limited and there is no pediatric preparation, although 500 mg capsules can be extemporaneously compounded to make a suspension to administer 20 mg/kg body weight/dose (maximum dose 1 g) given TID (see prescribing information). Famciclovir is approved for use in adults and adolescents with zoster at 500 mg/dose by mouth TID for 7 days; the same dose has been used for varicella infections. There is no pediatric preparation and data on dosing in children are limited; can be used by adolescents able to receive adult dosing. Involvement of an ophthalmologist with experience in managing herpes zoster ophthalmicus and its complications in children is strongly recommended when ocular involvement is evident. Optimal management of PORN has not been defined.

Key to Acronyms: ARN = acute retinal necrosis; CDC = Centers for Diseases Control and Prevention; IM = intramuscular; IU = international units; IV = intravenous; IVIG = intravenous immunoglobulin; PORN = progressive outer retinal necrosis; QID = four times a day; TID = three times daily; VariZIG = varicella zoster immune globulin; VZV = varicella zoster virus