**Table 1. Main parasitic diseases in HSCT recipients**

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| **Common name of disease** | **Organism** | **Involved sites** | **Diagnostic specimen/technique** | **Prevalence** | **Source/ Transmission (Reservoir/ Vector)** |
| Amebic meningo-encephalitis | *Naegleria fowleri*  *Acanthamoeba* spp.  *Balamuthia mandrillaris* | Brain, disseminated | Direct examination or Giemsa stain of CSF/brain to identify tissue cysts or trophozoites; Culture; NAAT | Rare but deadly | Nasal insufflations of contaminated warm fresh water, poorly chlorinated swimming pools, hot springs, soil |
| Babesiosis | *B. divergens, B. microti,* | Red blood cells | Giemsa-stained thin blood smear, NAAT of whole blood | Different species have specific distribution: *B. divergens* (Europe), *B. microti* (USA) | Tick bites, e.g. *Ixodes scapularis*  Blood transfusion |
| Blastocystosis | *Blastocystis* spp. | Intestine | Direct microscopy of stool, NAAT | Worldwide: one of the most common human parasites: USA, ~23% of the population; developing regions, 40-100% of the population | Eating food contaminated with feces from an infected human or animal |
| Chagas disease | *Trypanosoma cruzi* | Colon, esophagus, heart, nerves, muscle and blood | Serology  Giemsa-stained thin blood smear  NAAT of whole blood or tissue | Central America, South America: 16-18 million | Triatoma/Reduviidae - "Kissing bug" (insect vector feeds at night)  Blood transfusion, infected mother to fetus, oral ingestion, or transplantation |
| Cryptosporidiosis | *Cryptosporidium* spp. | Intestine | Direct microscopy of stool, NAAT | Widespread | Ingestion of oocyst (sporulated), some species are zoonotic (e.g. bovine fecal contamination) |
| Cyclosporiasis | *Cyclospora cayetanensis* | Intestine | Direct microscopy of stool, NAAT | Widespread | Ingestion of oocyst through contaminated food |
| Isosporiasis | *Isospora belli* | Epithelial cells of small intestines | Direct microscopy of stool, NAAT | Worldwide - less common than *Toxoplasma* or *Cryptosporidium* | Fecal-oral route: ingestion of sporulated oocyst |
| Leishmaniasis | *Leishmania* spp. | Visceral (*L. donovani* complex): liver, spleen, bone marrow | Giemsa-stained bone marrow aspirate/biopsy, splenic aspirate, and NAAT | Visceral leishmaniasis: Worldwide | *Phlebotomus* or *Lutzomyia*- bite of several species of phlebotomine sandflies.  Transfusion, transplantation or by sharing contaminated needles or syringes.  Vertical transmission |
| Malaria | *Plasmodium falciparum* (80% of cases), *Plasmodium vivax, Plasmodium ovale, Plasmodium malariae*  *Plasmodium knowlesi* | Red blood cells, liver, CNS | Giemsa-stained thick and thin blood smear,  immunochromatographic assay and NAAT | Tropical - 300 million cases/year | Anopheles mosquito, bites at night  Blood transfusions and organ transplantation |
| Strongyloidiasis | *Strongyloides stercoralis* | Intestine, lung, skin (*larva currens*) | Identification of larvae by direct microscopy of stool, sputum, CSF or duodenal aspirate; Serology | Worldwide, 100 millions persons | Skin penetration by contacting contaminated soil  Auto-infestation |
| Toxoplasmosis | *Toxoplasma gondii* | Eye, brain, heart, liver | Serology  Giemsa stain or NAAT in CSF or tissue | Worldwide: one of the most common human parasites; estimated to infect between 30-50% of the global population. | Ingestion of uncooked/undercooked pork/lamb/goat with *Toxoplasma* bradyzoites, ingestion of raw milk with *Toxoplasma* tachyzoites, ingestion of contaminated water food or soil with oocysts in cat feces |

CFS, cerebrospinal fluid; CNS, central nervous system; NAAT, nucleic acid amplification tests

**Table 2. Recommended treatment for parasitic infections in HSCT recipients**

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| **Parasite** | **Treatment** |
| Free-living amebae:  *Acanthamoeba* spp.,  *Naegleria fowleri*  *Balamuthia mandrilaris* | Optimal treatment regimens remain unknown; combination therapy is essential and should include pentamidine, azoles, sulfonamides, and possibly flucytosine.  Therapy should include amphotericin B; consider intrathecal amphotericin. Combination systemic therapy is essential: consider addition of azoles, rifampin, or other antimicrobial agents.  Combination therapy is essential and should likely include flucytosine, pentamidine, fluconazole, sulfadiazine, macrolides. |
| *Babesia* spp. | Atovaquone (750 mg po bid) plus azithromycin (500-1000 mg po on day 1, then 250-1000 mg/day po) x 7-10 days. Alternative therapy: Clindamycin 600 mg (pediatric: 20-40 mg/kg/day divided) po tid or 1.2 g iv bid plus quinine 650 mg (pediatric: 30 mg/kg/day) po tid (or quinidine iv) to ≥2 weeks beyond clearance of parasitemia (≥6 weeks minimum total treatment). |
| *Blastocystis hominis* | Nitazoxanide (500 mg po bid x 3 days), metronidazole (1.5 g/day po x 10 days), iodoquinol (650 mg po tid x 20 days), or cotrimoxazole (1 tab bid x 7 days). Alternative therapy: Metronidazole 1.5 g x 1 daily x 10 days OR iodoquinol 650 g po tid x 20 days, OR cotrimoxazole (800/160) bid x 7 days |
| *Cryptosporidium* spp*.* | Nitazoxanide (500 mg po bid x 3 days), paromomycin, azithromycin, or combinations of these drugs. |
| *Cyclospora cayetanensis* | Cotrimoxazole (1 tablet po bid x 7-10 days), ciprofloxacin (500 mg po bid x 7 days, then 3 times a week x 2 weeks) or nitazoxanide are potential alternatives in the setting of significant sulfa allergy. |
| *Cystoisospora belli* | Cotrimoxazole (1 tablet po bid x 7-10 days), Ciprofloxacin (500 mg po bid x 7 days), pyrimethamine (50-75 mg/day po) combined with folinic acid (10-25 mg/day po) or nitazoxanide are potential alternatives in the setting of significant sulfa allergy. |
| *Giardia intestinalis* | Tinidazole (2 g po x 1 day), nitazoxanide (500 mg po bid x 3 days), metronidazole (250 mg po tid x 5-7 days), or paromomycin (10 mg/Kg po tid x 5-10 days); refractory disease: metronidazole plus quinacrine (100 mg po tid x 5 days). |
| *Leishmania* *donovani* | Liposomal amphotericin B (4 mg/kg daily on days 1-5, 10, 17, 24, 31 and 38, total dose of 40 mg/kg); consider secondary prophylaxis with intermittent dosing in patients at high-risk for relapse. Alternative therapy: Combination treatment with sodium stibogluconate plus miltefosine or paromomycin, but high toxicity. |
| Microsporidia | Albendazole (400 mg po bid x 2-4 weeks), fumagillin (20 mg po tid). |
| *Plasmodium* spp. | *P. vivax*, *P. malariae*, *P. ovale* and uncomplicated *P. falciparum* infection in chloroquine-susceptible regions: chloroquine phosphate (1 g -600 mg base- po, them 0.5 g in 6 h, then 0.5 g daily x 2 days; total dose 2500 mg)  Uncomplicated *P. falciparum* infection in a chloroquine-resistant region: artemisinin combination therapy (artemether-lumefantrine 4 tablets -80 mg/480 mg- as a single dose, then 4 tablets again after 8 h, then 4 tablets bid x 2 days).  Severe cases of *P. falciparum* infection: intravenous artesunate followed by doxycycline, atovaquone-proguanil or mefloquine |
| *Schistosoma* spp. | Praziquantel 20 mg/kg/dose po bid x 1 day if *S. hematobium* or *S. mansoni*; praziquantel 20 mg/kg po tid x 1 day if *S. japonicum or S. mekongi*. Alternative therapy: Oxamniquine and artemether (anti-malarial). |
| *Strongyloides stercoralis* | Ivermectin (200 µg/kg/day po x 2 days); repeat in 2 weeks (3 mg tablets) (longer for hyperinfection); alternative therapy: Albendazole 400 mg po bid x 10–14 days (longer for hyperinfection); Hyperinfection: Treat until document clearance – then 7-14 days longer. Off-label alternatives if oral therapy not an option: (a) Per rectum ivermectin (b) Subcutaneous ivermectin. |
| *Toxoplasma gondii* | Induction therapy (6 weeks) with pyrimethamine (200 mg po x1 dose, then 75 mg/day po) (plus folinic acid) and sulfadiazine (1 g if <60 kg; 1.5 g if >=60 kg po, q6h) plus folinic acid (10-25 mg/day po).  Alternative induction therapy: Pyrimethamine (same dosing as preferred therapy) plus clindamycin 600 mg iv/po qid OR cotrimoxazole (10 mg/kg TMP-50 mg/kg SMX) iv/po divided BID OR atovaquone 1500 mg po bid plus either pyrimethamine and leucovorin (same dosing as preferred therapy) or sulfadiazine (same dosing as preferred therapy) OR azithromycin 900-1200 mg po daily plus pyrimethamine and leucovorin (same dosing as preferred therapy). |
| *Trypanosoma cruzi* | Benznidazole (5-7 mg/kg/day po bid x 60 days); alternative therapy: Nifurtimox 8-10 mg/kg/day in 3 divided doses x 90 days. |