TABLE 245e-7 PARASITES FREQUENTLY ASSOCIATED WITH EOSINOPHILIA[a]

Parasite	Comment
Tapeworms (Cestodes)	
Echinococcus granulosus	When hydatid cyst leaks
Taenia solium	During muscle encystation and in cerebrospinal fluid with neurocysticercosis
Flukes (Trematodes)	
Paragonimus spp.	Uniformly high in acute stage
Fasciola hepatica	May be high in acute stage
Clonorchis (Opisthorchis) sinensis	Variable
Schistosoma mansoni	50% of infected travelers
S. haematobium	25% of infected travelers
S. japonicum	Up to 6000/μL in acute infection
Roundworms	
Ascaris lumbricoides	During larval migration
Hookworm species	During larval migration
Strongyloides stercoralis	Profound during migration and early years of infection
Trichinella spiralis	Up to 7000/μL
Filarial species[b]	Varies but can reach 5000–8000/μL
Toxocara spp.	>3000/μL
Ancylostoma braziliense	With extensive cutaneous eruption
Gnathostoma spinigerum	In visceral larva migrans and eosinophilic meningitis
Angiostrongylus cantonensis	In eosinophilic meningitis
A. costaricensis	During larval migration in mesenteric vessels

[a]Virtually every helminth has been associated with eosinophilia. This table includes both common and uncommon parasites that frequently elicit eosinophilia during infection. [b]*Wuchereria bancrofti, Brugia* spp., *Loa loa*, and *Onchocerca volvulus*.

TABLE 245e-8 SEROLOGIC AND MOLECULAR TESTS FOR PARASITIC INFECTIONS[a]

Parasite, Infection	Antibody	Antigen or DNA/RNA
Tapeworms		
Echinococcosis	WB, EIA	
Cysticercosis	WB	
Flukes		
Paragonimiasis	WB, EIA[b]	
Schistosomiasis	EIA, WB	
Fascioliasis	EIA[b]	
Roundworms		
Strongyloidiasis	EIA	
Trichinellosis	EIA	
Toxocariasis	EIA	
Filariasis	EIA[c]	RAPID[c]
Protozoans		
Amebiasis	EIA	EIA,[b] RAPID,[b] PCR
Giardiasis		EIA,[b] RAPID,[b] DFA, PCR
Cryptosporidiosis		EIA,[b] DFA, RAPID,[b] PCR
Malaria (all species)	IIF[d]	RAPID, PCR
Babesiosis	IIF	PCR
Chagas' disease	IIF, EIA	PCR
Leishmaniasis	IIF, EIA	PCR[b]
Toxoplasmosis	IIF, EIA (IgM)[e]	PCR[b]
Microsporidiosis		PCR
Cyclosporiasis		PCR
Acanthamebiasis		DFA, PCR
Naegleriasis		DFA, PCR
Balamuthiasis		DFA

[a]Unless otherwise noted, all tests are available at the CDC. [b]Research or commercial laboratories only. [c]Available at the NIH (301-496-5398) and commercially. [d]Of limited use for management of acute disease. [e]Determination of infection within the last 3 months may require additional tests by a research laboratory.

Note: DFA, direct fluorescent antibody; EIA, enzyme immunoassay; IIF, indirect immunofluorescence; PCR, polymerase chain reaction; RAPID, rapid immunographic assay; WB, western blot. Most antigen and antibody parasite detection kits are available commercially. Most PCRs listed are now available at the CDC and in commercial or research laboratories. Contact the CDC (404-718-4100).

abnormal urine sediment in an African immigrant certainly raises the possibility of schistosomiasis, and anemia and thrombocytopenia in a febrile traveler or immigrant are among the hallmarks of malaria. CT and MRI also contribute to the diagnosis of infections with many tissue parasites and have become invaluable adjuncts in the diagnosis of neurocysticercosis and cerebral toxoplasmosis.

ANTIBODY AND ANTIGEN DETECTION

Useful antibody assays for many of the important tissue parasites are available; most of those listed in Table 245e-8 can be obtained from the Centers for Disease Control and Prevention (CDC) in Atlanta. The results of serologic tests not listed in the tables should be interpreted with caution.

The value of antibody assays is limited by several factors. For example, the preparation of thick and thin blood smears remains the procedure of choice for the diagnosis of malaria in individual patients because diagnostic titers to plasmodia develop slowly and do not differentiate species—a critical step in patient management. Filarial antigens cross-react with those from other nematodes; as in assays for antibody to most parasites, the presence of antibody in the filarial assay fails to distinguish between past and current infection. Despite these specific limitations, the restricted geographic distribution of many tropical parasites increases the diagnostic usefulness of both the presence and the absence of antibody in travelers from industrialized countries. In contrast, a large proportion of the world's population has been exposed to *Toxoplasma gondii*, and the presence of IgG antibody to *T. gondii* does not constitute proof of active disease.

Fewer antibody assays are available for the diagnosis of infection with intestinal parasites. *E. histolytica* is the major exception. Sensitive, specific serologic tests are invaluable in the diagnosis of amebiasis. Commercial kits for the detection of antigen by enzyme-linked immunosorbent assay or of whole organisms by fluorescent antibody assay are now available for several protozoan parasites (Table 245e-8).

MOLECULAR TECHNIQUES

DNA hybridization with probes that are repeated many times in the genome of a specific parasite and amplification of a specific DNA fragment by PCR have now been established as useful techniques for the diagnosis of several protozoan infections (Table 245e-8). Although PCR is very sensitive, it is an adjunct to conventional techniques for parasite detection and should be requested only when microscopic and immunodiagnostic procedures fail to establish the probable diagnosis. For example, only multiple negative blood smears or the failure to identify the infecting species justifies PCR for the diagnosis or proper management of malaria. In addition to PCR of anticoagulated blood, the CDC (*www.cdc.gov/dpdx/*) and several commercial laboratories now perform PCRs for detection of certain specific parasites in stool samples, biopsy specimens, and bronchoalveolar lavage fluid (Table 245e-8). Although PCRs are now used primarily for the detection of protozoans, active research efforts are likely to establish their feasibility for the detection of several helminths.