

TABLE 165-2 INFECTIOUS CAUSES OF CHRONIC MENINGITIS (CONTINUED)

Causative Agent	CSF Formula	Helpful Diagnostic Tests	Risk Factors and Systemic Manifestations
Rare Bacterial Causes			
Leptospirosis (occasionally if left untreated may last 3–4 weeks)			
Fungal Causes			
<i>Cryptococcus neoformans</i>	Mononuclear cells; count not elevated in some patients with AIDS	India ink or fungal wet mount of CSF (budding yeast); blood and urine cultures; antigen detection in CSF	AIDS and immune suppression; pigeon exposure; skin and other organ involvement due to disseminated infection
<i>Coccidioides immitis</i>	Mononuclear cells (sometimes 10–20% eosinophils); often low glucose	Antibody detection in CSF and serum	Exposure history—southwestern U.S.; increased virulence in dark-skinned races
<i>Candida</i> sp.	Polymorphonuclear or mononuclear	Fungal stain and culture of CSF	IV drug abuse; post surgery; prolonged IV therapy; disseminated candidiasis
<i>Histoplasma capsulatum</i>	Mononuclear cells; low glucose	Fungal stain and culture of large volumes of CSF; antigen detection in CSF, serum, and urine; antibody detection in serum, CSF	Exposure history—Ohio and central Mississippi River Valley; AIDS; mucosal lesions
<i>Blastomyces dermatitidis</i>	Mononuclear cells	Fungal stain and culture of CSF; biopsy and culture of skin, lung lesions; antibody detection in serum	Midwestern and southeastern U.S.; usually systemic infection; abscesses, draining sinus, ulcers
<i>Aspergillus</i> sp.	Mononuclear or polymorphonuclear	CSF culture	Sinusitis; granulocytopenia or immunosuppression
<i>Sporothrix schenckii</i>	Mononuclear cells	Antibody detection in CSF and serum; CSF culture	Traumatic inoculation; IV drug use; ulcerated skin lesion
Rare Fungal Causes			
<i>Xylohypha</i> (formerly <i>Cladosporium</i>) <i>trichoides</i> and other dark-walled (dematiaceous) fungi such as <i>Curvularia</i> , <i>Drechslera</i> ; <i>Mucor</i> , and, after water aspiration, <i>Pseudallescheria boydii</i> , iatrogenic <i>Exserohilum rostratum</i> infection following spinal blocks			
Protozoal Causes			
<i>Toxoplasma gondii</i>	Mononuclear cells	Biopsy or response to empirical therapy in clinically appropriate context (including presence of antibody in serum)	Usually with intracerebral abscesses; common in HIV-seropositive patients
Trypanosomiasis <i>Trypanosoma gambiense</i> , <i>T. rhodesiense</i>	Mononuclear cells, elevated protein	Elevated CSF IgM; identification of trypanosomes in CSF and blood smear	Endemic in Africa; chancre, lymphadenopathy; prominent sleep disorder
Rare Protozoal Causes			
<i>Acanthamoeba</i> sp. causing granulomatous amebic encephalitis and meningoencephalitis in immunocompromised and debilitated individuals. <i>Balamuthia mandrillaris</i> causing chronic meningoencephalitis in immunocompetent hosts.			
Helminthic Causes			
Cysticercosis (infection with cysts of <i>Taenia solium</i>)	Mononuclear cells; may have eosinophils; glucose level may be low	Indirect hemagglutination assay in CSF; ELISA immunoblotting in serum	Usually with multiple cysts in basal meninges and hydrocephalus; cerebral cysts, muscle calcification
<i>Gnathostoma spinigerum</i>	Eosinophils, mononuclear cells	Peripheral eosinophilia	History of eating raw fish; common in Thailand and Japan; subarachnoid hemorrhage; painful radiculopathy
<i>Angiostrongylus cantonensis</i>	Eosinophils, mononuclear cells	Recovery of worms from CSF	History of eating raw shellfish; common in tropical Pacific regions; often benign
<i>Baylisascaris procyonis</i> (raccoon ascarid)	Eosinophils, mononuclear cells		Infection follows accidental ingestion of <i>B. procyonis</i> eggs from raccoon feces; fatal meningoencephalitis
Rare Helminthic Causes			
<i>Trichinella spiralis</i> (trichinosis); <i>Fasciola hepatica</i> (liver fluke), <i>Echinococcus</i> cysts; <i>Schistosoma</i> sp. The former may produce a lymphocytic pleocytosis whereas the latter two may produce an eosinophilic response in CSF associated with cerebral cysts (<i>Echinococcus</i>) or granulomatous lesions of brain or spinal cord			
Viral Causes			
Mumps	Mononuclear cells	Antibody in serum	No prior mumps or immunization; may produce meningoencephalitis; may persist for 3–4 weeks
Lymphocytic choriomeningitis	Mononuclear cells	Antibody in serum	Contact with rodents or their excreta; may persist for 3–4 weeks
Echovirus	Mononuclear cells; may have low glucose	Virus isolation from CSF	Congenital hypogammaglobulinemia; history of recurrent meningitis
HIV (acute retroviral syndrome)	Mononuclear cells	p24 antigen in serum and CSF; high level of HIV viremia.	HIV risk factors; rash, fever, lymphadenopathy; lymphopenia in peripheral blood; syndrome may persist long enough to be considered as “chronic meningitis”; or chronic meningitis may develop in later stages (AIDS) due to HIV
Herpes simplex (HSV)	Mononuclear cells	PCR for HSV, CMV DNA; CSF antibody for HSV, EBV	Recurrent meningitis due to HSV-2 (rarely HSV-1) often associated with genital recurrences; EBV associated with myeloradiculopathy, CMV with polyradiculopathy

Abbreviations: AFB, acid-fast bacillus; CMV, cytomegalovirus; CSF, cerebrospinal fluid; CT, computed tomography; EBV, Epstein-Barr virus; ELISA, enzyme-linked immunosorbent assay; EM, electron microscopy; FTA, fluorescent treponemal antibody absorption test; HSV, herpes simplex virus; MHA-TP, microhemagglutination assay—*T. pallidum*; MRI, magnetic resonance imaging; PAS, periodic acid–Schiff; PCR, polymerase chain reaction; RPR, rapid plasma reagin test; TB, tuberculosis; VDRL, Venereal Disease Research Laboratories test.