

Ordering pathway for Microbiology testing on Adult patients with suspected Meningoencephalitis

Meningitis

Typical presentation may include: fever, headache, neck stiffness, and sometimes altered mental status or seizures

For indications for CT scan prior to LP and empiric treatment recommendations including antibiotics and corticosteroids: Go to bugsanddrugs.org, then select treatment → adult patients → Central nervous system → meningitis

For suspected viral meningitis, IV acyclovir should also be started: For dosing recommendations, go to bugsanddrugs.org, then select treatment → adult patients → Central nervous system → encephalitis

Initial bloodwork for ALL meningitis cases		
Meditech order		Notes
Blood C&S/Yeast –Venipuncture		Obtain ASAP before antibiotics
HIV serology		
CBC with differential		
Electrolytes, Creatinine, Glucose Random		
Initial CSF tests for ALL meningitis cases		
Test	Volume	Meditech order
CSF cell count and diff	>1 mL (tube 1/4)	CSF Panel
CSF protein	>2 mL (tube 3)	
CSF glucose		
CSF lactate		
CSF culture	>1 mL (tube 2)	CSF Fluid C&S
Meningoencephalitis molecular panel*	>1 mL (tube 2)	CSF Viral/Bacteria/ Crypt Panel

*Includes: HSV1/2, VZV, Enterovirus, Parechovirus, *N. meningitidis*, *S. pneumoniae*, *H. influenzae*, *E.coli* K1, *L. monocytogenes*, GBS and *Cryptococcus neoformans/gattii*.

CSF collection instructions:

Visit <https://www.interiorhealth.ca/>, then click on “Information for” → Medical Staff → Clinical Tools & Resources → Laboratory Services Guide → Then view the guidelines for CSF collections under “Non-blood sample collection”

Acute symptom onset: hours to 5 days

- Bacterial meningitis: contact and droplet precautions

If initial CSF testing results are negative, and meningitis is still highly suspected, especially if immunocompromised, consult with Infectious diseases and/or Neurology for further testing recommendations

2 nd line testing (must be approved by ID, neuro or IM)		
Test	Meditech order	Notes
West Nile Virus serology on serum and CSF PCR*; send convalescent serology specimen 1-2 weeks later	West Nile Virus (WNV) Serology and CSF West Nile Virus (WNV) PCR	*Circulates May to Nov only in BC
Lyme serology; If positive, CSF Lyme testing can be ordered	Borrelia (Lyme) Serology	
Direct 16s sequencing on CSF for bacteria	N/A – lab orderable only	Contact medical microbiologist

ID=infectious diseases; IM=internal medicine

Meningitis, continued

Subacute symptom onset: 5 to 30 days OR

Chronic symptom onset: >30 days

- Detailed history required, including any immunocompromise, rashes, travel in past several years, insect or animal bites/exposures, TB exposures, sick contacts, occupational and sexual history
- Infectious and non-infectious diagnoses are possible
- Consult with Infectious diseases and/or Neurology
- **If possible, collect at least 10 to 20 mL of CSF**

Additional initial tests for ALL subacute and chronic cases		
Test	Volume	Meditech order
CSF TB culture	>4 mL	TB/Mycobacteria-Fluid/Aspirate
CSF Fungal culture	>1 mL	Fungus-Fluid/Aspirate
CSF Cryptococcal antigen	>2 mL	Cryptococcal Ag Screen
CSF oligoclonal bands Serum oligoclonal bands	>1 mL	Oligoclonal Banding – CSF and Oligoclonal banding
Syphilis screen (blood)	N/A	Syphilis Screen EIA/RPR

Infectious diseases and/or Neurology will provide guidance to direct further testing recommendations, based on history

2 nd line testing (Based on Infectious diseases and/or neuro consult) NOTE: not an exhaustive list		
Risk factor	Test	Meditech order
Blastomyces exposure based on travel history	Blastomyces serology *Biosafety issue, alert microbiology lab*	Blastomyces Serology
Coccidioides exposure based on travel history	Coccidioides serology *Biosafety issue, alert microbiology lab*	Coccidioides serology
Histoplasma exposure based on travel history	Histoplasma serology *Biosafety issue, alert microbiology lab*	Histoplasma Serology
Lyme suspected based on tick contact, erythema migrans rash, radiculopathy or cranial nerve palsy	Lyme serology on serum If positive, then CSF Lyme testing can be ordered	Borrelia (Lyme) Serology
Syphilis screen positive on serum OR high clinical suspicion	CSF VDRL	Syphilis (Treponema) VDRL CSF
TB exposure	CSF TB PCR	TB/Mycobacteria-Fluid/Aspirate
Possible mosquito exposure from May to October, especially if movement disorder or age >50 years	West Nile Virus serology on serum and CSF*; For high risk cases, send convalescent serology specimen 1-2 weeks later	West Nile Virus (WNV) Serology and CSF West Nile Virus (WNV) PCR

Ordering pathway for Microbiology testing on Adult patients with suspected Meningoencephalitis

Encephalitis/Meningoencephalitis

Typical presentation may include:

altered mental status and/or personality changes, often with fever and headache and sometimes with focal neurologic deficits or seizures, or sign of meningitis such a neck stiffness

For indications for CT scan prior to LP: Go to bugsanddrugs.org, then select treatment → adult patients → Central nervous system → meningitis

For empiric treatment recommendations, go to bugsanddrugs.org, then select treatment → adult patients → Central nervous system → encephalitis

- Detailed history required, including any immunocompromise, rashes, travel in past several years, insect or animal bites/exposures, TB exposures, sick contacts, recent infections or vaccines administered, occupational and sexual history
- Consult with Infectious diseases and/or Neurology
- If **Creutzfeldt-Jakob disease** suspected, contact microbiologist on call before performing lumbar puncture to arrange safe testing
- **If possible, collect at least 10 to 20 mL of CSF**

Initial bloodwork for ALL meningoencephalitis cases		
Test	Meditech order	Notes
Blood C&S/Yeast -Venipuncture		Obtain before antibiotics ASAP
CBC with differential		
Syphilis Screen EIA/RPR		
Electrolytes, Creatinine, Glucose Random		
ALT, AST, GGT, LDH		
California Encep Virus serology*		
HIV serology		
West Nile Virus (WNV) Serology*		send convalescent serology specimen 1-2 weeks later
Other testing		
Virus Covid/Flu + Magpix - Nasoph		NP swab specimen
Initial CSF tests for ALL meningoencephalitis cases		
Test	Volume	Meditech order
CSF cell count and diff	>1 mL (tube 1/4)	CSF Panel
CSF protein	>2 mL (tube 3)	
CSF glucose		
CSF lactate		Lactate - CSF
Meningoencephalitis molecular panel**	>1 mL (tube 4)	CSF Viral/ Bacteria/ Crypt Panel
CSF culture	>1 mL (tube 2)	CSF Fluid C&S
CSF Cryptococcal antigen	>2 mL (tube 2)	Cryptococcal Ag Screen
CSF West Nile Virus*	>0.5 mL (tube 2)	CSF West Nile Virus (WNV) PCR

*Arboviruses can circulate mid-April to November in BC if mosquito vectors are present; order only if non-infectious causes of toxic-metabolic encephalopathy are unlikely

**Includes: HSV1/2, VZV, Enterovirus, Parechovirus, *N. meningitidis*, *S. pneumoniae*, *H. influenzae*, *E.coli* K1, *L. monocytogenes*, GBS and *Cryptococcus neoformans/gattii*.

- Infectious diseases and/or Neurology will provide guidance to direct further testing recommendations, based on history.

Encephalitis/Meningoencephalitis, continued

2 nd line testing based on Infectious diseases and/or neuro consultation NOTE: not exhaustive; consider other infections if relevant travel history (eg: malaria, or relevant arboviruses based on local epidemiology)		
Test	Risk factor	Meditech order
CMV CSF PCR Note: positive results may occur due to presence of latently infected cells in CSF; interpret with caution	<ul style="list-style-type: none"> • AIDS, especially with CD4 <50 cell/uL • SOT/HSCT (rare) 	CMV PCR (Adult)
EBV CSF PCR Note: positive results may occur due to presence of latently infected cells in CSF; interpret with caution	<ul style="list-style-type: none"> • Rarely primary EBV complicated by CNS infection • AIDS, SOT/HSCT (rare) 	EBV PCR (Adult)
Fungal culture *Biosafety issue, alert microbiology lab if ordered*	Histoplasma, Blastomyces, or Coccidioides exposure based on travel to endemic areas	Fungus-Fluid/Aspirate
Human herpes virus 6 (HHV-6) CSF PCR Note: positive results may occur due to presence of latently infected cells in CSF; interpret with caution	<ul style="list-style-type: none"> • Rarely primary HHV-6 complicated by CNS infection • SOT/HSCT (rare) 	Human herpesvirus-6 (HHV-6) PCR
JC Virus Progressive multifocal leukoencephalopathy	<ul style="list-style-type: none"> • HIV, especially with CD4 <200 cells/uL • Lympho- or myelo-proliferative diseases • SOT/HSCT • Immunomodulatory therapy • Primary immune disorders 	JC Virus PCR CSF
Lyme serology If positive, then CSF Lyme testing can be ordered	Lyme suspected based on tick contact, erythema migrans rash, radiculopathy or cranial nerve palsy	Borrelia (Lyme) Serology
Lymphocytic choriomeningitis Virus (LCMV) serology and CSF PCR	Exposure to secretions of mice, rats or hamsters	Lymph Choremom Virus serology and PCR
Rabies CSF PCR (also submit nuchal biopsy specimen for PCR)	In BC: bat exposure with possible bite/scratch or saliva exposure into wound or mucous membrane	Rabies Virus PCR
Syphilis CSF (VDRL)	Syphilis screen positive on serum OR high clinical suspicion	Syphilis (Treponema) VDRL CSF
TB culture CSF	TB exposure	TB/Mycobacteria-Fluid/Aspirate
Toxoplasma serology If positive, then CSF PCR testing can be ordered if needed	<ul style="list-style-type: none"> • AIDS (especially CD4<100 cells/uL) when not on appropriate prophylaxis • SOT/HSCT 	Toxoplasma serology

SOT/HSCT = Solid organ transplant/Hematopoietic stem cell transplant