



# Bacterial Meningitis

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*For meningitis NOT caused by **Listeria**, **Group A or B Streptococcus**, **Streptococcus pneumoniae**, **Haemophilus influenzae**, or **Neisseria meningitides**; for these, see specific disease plans. For meningitis with no identified pathogen, see “Aseptic meningitis.” For meningitis caused by viruses, see “Viral meningitis.”*

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## Disease Plan

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Last updated: 07/17/2018, by Akanksha Acharya.

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

## ✓ CRITICAL CLINICAL INFORMATION

Note: For meningitis **NOT** caused by *Listeria*, **Group A or B Streptococcus**, *Streptococcus pneumoniae*, *Haemophilus influenzae*, or *Neisseria meningitides*.

Clinical Evidence
Signs/Symptoms <ul style="list-style-type: none"><li>• Fever</li><li>• Stiff neck</li><li>• Headache</li><li>• Altered mental state</li><li>• Photophobia</li></ul>
Period of Communicability <ul style="list-style-type: none"><li>• For organisms covered in this plan, infections are generally opportunistic and not communicable.</li></ul>
Incubation Period <ul style="list-style-type: none"><li>• Variable, dependent on the causative organism.</li></ul>
Mode of Transmission <ul style="list-style-type: none"><li>• Generally opportunistic bacterial infections of normal enteric and skin flora</li></ul>
Laboratory Testing
Type of Lab Test/Timing of Specimen Collection <ul style="list-style-type: none"><li>• Lumbar puncture along with blood culture</li><li>• CSF should be analyzed for:<ul style="list-style-type: none"><li>○ Cell counts</li><li>○ Glucose and protein concentration</li><li>○ Gram stain and bacterial culture</li></ul></li></ul>
Treatment Recommendations
<ul style="list-style-type: none"><li>• Immediate antibiotics and supportive care</li><li>• Antibiotic regiment should be considered for:<ol style="list-style-type: none"><li>1. Effectiveness against the infecting bacteria</li><li>2. Ability to enter the CSF through the blood brain barrier</li><li>3. Pharmacodynamics</li></ol></li><li>• Treatment and duration should be tailored once infecting organism is known.</li></ul>
Contact Management
Quarantine of Contacts <ul style="list-style-type: none"><li>• None</li></ul> Chemoprophylaxis <ul style="list-style-type: none"><li>• None</li></ul>
Infection Control Procedures
<ul style="list-style-type: none"><li>• Standard precautions</li></ul>

## ✓ WHY IS MENINGITIS IMPORTANT TO PUBLIC HEALTH?

Bacterial meningitis is a serious disease caused by inflammation of the membranes of the brain and spinal cord (“meninges”). Urgent clinical care is necessary for people with bacterial meningitis, because death can occur in as little as a few hours without treatment. While some bacteria that cause meningitis require urgent public health response to stop their spread (*Listeria*, Group A or B streptococcal disease, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*), this disease plan focuses on meningitis due to opportunistic bacterial infections.

Approximately 4,000 cases of bacterial meningitis, resulting in 500 deaths, occur in the U.S. every year. Bacterial meningitis infection can also result in permanent disabilities, like brain damage and hearing loss.

## ✓ DISEASE AND EPIDEMIOLOGY

### Clinical Description

Meningitis includes an abrupt onset of a severe headache, stiff neck (nuchal rigidity), and fever. Most individuals with bacterial meningitis become seriously ill and are hospitalized. Meningitis also often presents with photophobia and a change in mental status.

### Causative Agent

Many organisms can cause meningitis. Among the most common are *E. coli* and other enteric bacteria such as *Enterococcus*, *Klebsiella* and *Enterobacter* species, as well as *Staphylococcus* species including methicillin-resistant *Staphylococcus aureus* (MRSA).

### Differential Diagnosis

The differential diagnosis includes all of the bacterial causes of meningitis listed above, along with *H. influenzae*, *S. pneumoniae*, Group A and B strep, *Listeria* species, *Neisseria meningitidis*, viruses, parasites (such as *Babesia*, *Acanthamoeba*, *Naegleria*, *Trypanosoma cruzi* and *Toxoplasma*) and fungi (such as *Cryptococcus*, *Histoplasma*, and *Blastomyces*).

### Laboratory Identification

Cerebrospinal fluid culture is preferred; however, a blood culture can be used if cerebrospinal fluid cannot be obtained. All of these pathogens are easily cultivated in culture.

**Utah Public Health Laboratory (UPHL):** May be able to assist a clinical laboratory with isolate confirmation, but does not require submission of the listed organisms (other than *H. influenzae*, *Listeria*, *Legionella*, and *N. meningitidis*).

## **Treatment**

The treatment of meningitis differs depending on the infection type, severity, and individual patient, but generally consists of immediate antibiotic therapy and supportive care.

## **Case Fatality**

The fatality rate varies with organism, the age of the patient, and underlying comorbidities. Fatality rate can be very high in the very young, very old, immunosuppressed, or those with comorbidities, such as influenza.

## **Reservoir**

Many of these organisms are part of the normal enteric or skin flora. With the exception of MRSA, most of the bacterial infections covered in this plan are considered opportunistic, and will be identified in individuals with other health issues.

## **Transmission**

As many healthy people are colonized by these bacteria, person-to-person transmission is not usually implicated in the spread of these diseases. Bacterial meningitis can also be healthcare associated, developing after head trauma, or invasive procedures like neurosurgery.

## **Susceptibility**

Infants under two months of age are at highest risk of developing bacterial meningitis. Other high risk groups include the elderly, immunocompromised, and those with accompanying comorbidities.

## **Incubation Period**

Dependent upon infection type and individual patient.

## **Period of Communicability**

These diseases are generally not communicable.

## **Epidemiology**

Generally, 75% of all bacterial meningitis cases are caused by *Streptococcus pneumoniae*, *Haemophilus influenzae*, or *Neisseria meningitidis*. The causative agents causing bacterial meningitis tend to vary with age.

- 0-4 weeks of age:
  - Group B strep
  - *E. coli*
  - *Listeria monocytogenes*
  - *Strep pneumoniae*
- 1-3 months:
  - *E. coli*
  - *Listeria monocytogenes*
  - *Neisseria meningitidis*
  - Group B strep
  - *Strep pneumoniae*

- 3 months to 50 years:
  - *Neisseria meningitidis*
  - *Strep pneumoniae*
- > 50 years:
  - *Listeria monocytogenes*
  - *Strep pneumoniae*
- Not age related
  - Enterobacteriaceae
  - *Staphylococcus aureus*

## ✓ PUBLIC HEALTH CONTROL MEASURES

### Public Health Responsibility

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.

### Prevention

While it is difficult to totally prevent this group of illnesses (the vaccine-preventable infections are all listed individually), typical infection control measures such as handwashing and respiratory etiquette are important to contain their spread.

### Chemoprophylaxis

None

### Vaccine

For this group of diseases, no vaccines are available.

### Isolation and Quarantine Requirements

**Isolation:** None

**Hospital:** Standard precautions

**Quarantine:** None

## ✓ CASE INVESTIGATION

### Reporting

All cases of bacterial meningitis are reportable.

### Case Definition

#### Clinical Description

Bacterial meningitis manifests most commonly with fever, headache, and a stiff neck; the disease may progress rapidly to shock and death. However, other manifestations may be observed.

#### Laboratory Criteria

- *Confirmed*: Isolation of a bacterial species from the cerebrospinal fluid
- *Probable*: Isolation of a bacterial species from the blood or other sterile site (but not the CSF)
- *Suspect*: Identification of a pathogen in the CSF by antigen testing or identification of organisms in the CSF via gram stain

#### Case Classification

*Confirmed*: a clinically compatible case that has laboratory confirmed status

### Case Investigation Process

- The investigation process for the following organisms requires additional information. If meningitis is due to one of these organisms, please refer to that disease plan for the correct process:
  - *H. influenza*
  - *S. pneumoniae*
  - Group A or B strep
  - *Listeria*
  - *Neisseria meningitidis*
- Fill out a morbidity form.

### Outbreaks

Generally, not applicable for the organisms covered in this plan, because they rarely spread from person-to-person. However, an outbreak is defined as two (2) or more epidemiologically linked cases of the same organism in unrelated people occurring at a hospital, school, or childcare facility in a 30-day period. Outbreaks may warrant additional investigation and should be reported to public health.

### Identifying Case Contacts

None

### Case Contact Management

None

## ✓ REFERENCES

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Yale University; Department of Laboratory Medicine.

## ✓ **VERSION CONTROL**

Updated May 2017 – Added “Critical Clinical Information,” “Why is Meningitis Important to Public Health,” “Version Control,” and “UT-NEDSS Minimum/Required Fields by Tab” sections. Added more information to “Treatment,” “Reservoir,” “Transmission,” “Prevention” and “Outbreaks” sections. Updated “Clinical Description,” “Differential Diagnosis,” “Laboratory Identification,” “Case Fatality,” “Susceptibility” and “References.”

Updated May 2018 – Added “Electronic Laboratory Reporting Processing Rules.”



## ✓ UT-NEDSS Minimum/Required Fields by Tab

### Demographic

- Last Name
- First Name
- State
- County
- Date of Birth
- Area Code
- Phone Number
- Birth Gender
- Ethnicity
- Race

### Clinical

- Date Diagnosed
- Date of Death

- Died
- Disease
- Onset Date

### Laboratory

- Organism
- Specimen Source

### Reporting

- Date first reported to public health

### Administrative

- Outbreak Associated
- Outbreak Name
- State case Status

## ✓ Electronic Laboratory Reporting Processing Rules

### Meningitis, Bacterial Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

#### Test-Specific Rules

*Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.*

Test Type	Test Result	Create a New Event	Update an Existing Event
All test types*	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes

\*Any bacteria identified in cerebral spinal fluid would create a Meningitis, Bacterial CMR

#### Whitelist Rules

*Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.*

**Meningitis, Bacterial Morbidity Whitelist Rule:** If the specimen collection date of the laboratory result is 60 days or less after the event date, the laboratory result should be added to the morbidity event.

**Meningitis, Bacterial Contact Whitelist Rule:** Never added to a contact.

#### Graylist Rule

*We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.*

**Meningitis, Bacterial Graylist Rule:** If the specimen collection date of the laboratory result is 30 days before to 7 days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

#### Other Electronic Laboratory Processing Rules

- If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.