Meningococcal Disease Table of Contents

Meningococcal Disease

Case Definition – **Meningococcal Disease (*Neisseria meningitidis*) – 2015 Case Definition**

Overview

- ***Agent*** – *Neisseria meningitidis* (*N. meningitidis*) is a gram-negative diplococci bacteria. Twelve serogroups of *N. meningitidis* have been confirmed, though almost all invasive disease is caused by serogroups A, B, C, W, X, and Y.
- ***Reservoir*** – Humans are the only natural reservoir. Up to 10% of healthy people may be asymptomatic carriers with nasopharyngeal colonization of *N. meningitidis*.
- ***Occurrence*** – Worldwide in both endemic and epidemic form. In North America the incidence of meningococcal disease is higher during the winter and spring.
- ***Risk Factors –*** Travel to or residency in countries where the disease is epidemic or hyperendemic (i.e., the "meningitis belt" of sub-Saharan Africa or the Kingdom of Saudi Arabia during the annual Hajj and Umrah pilgrimages), exposure during an outbreak, household crowding, active or passive exposure to tobacco smoke, and concurrent upper respiratory tract infections. Those at increased risk include: military groups; individuals living in households with indoor air pollution from cooking fires; individuals with underlying immune dysfunctions (i.e., asplenia, properdin deficiency, and a deficiency of terminal complement components); and persons with HIV infection.
- ***Mode of Transmission –*** Primarily person-to-person through direct contact with respiratory droplets from the nose and throat; requires close contact.
- ***Period of Communicability*** – Generally limited, but a person can pass the infection to others for as long as the bacteria is present in discharges from the nose and mouth. A person is no longer infectious after 24 hours of appropriate antimicrobial treatment. For contact investigations, persons are considered communicable during the 7 days before the onset of symptoms and up to 24 hours after initiation of appropriate antimicrobial treatment.
- ***Incubation Period*** – 3-4 days (range 1-10 days).
- ***Clinical Illness*** – Invasive meningococcal infection usually results in meningitis (~50% of cases), septicemia (35%-40% of cases), or both. Meningococcal meningitis is similar to other forms of acute purulent meningitis, with sudden onset of fever, headache, and stiff neck, often accompanied by other symptoms, such as nausea, vomiting, photophobia (eye sensitivity to light), and altered mental status. *N. meningitidis* can be isolated from the blood in up to 75% of persons with meningococcal meningitis. Meningococcal sepsis (bloodstream infection or meningococcemia) is the most severe form of the infection and occurs without meningitis in about 30% of invasive meningococcal infections. Meningococcal septicemia is associated with a petechial or purpuric rash, hypotension, disseminated intravascular coagulation, and multiorgan failure. Less common presentations of meningococcal disease include bacteremic pneumonia (up to 15%) and focal disease, such as septic arthritis.
- ***Laboratory Testing*** – The gold standard for diagnosis is isolation of *N. meningitidis* from a normally sterile site. Real-time polymerase chain reaction (RT-PCR) detects DNA of *N.*

meningitidis and is confirmatory if detected in blood, cerebrospinal fluid (CSF), or other clinical specimens obtained from a normally sterile site. A Gram stain from a sterile site specimen showing gram-negative diplococci strongly suggests *N. meningitis* but is not confirmatory.

- ***Treatment*** – Empirical therapy with broad-spectrum antibiotics should be promptly initiated when meningococcal disease is suspected, ideally after appropriate cultures are obtained. Once *N. meningitidis* is confirmed, treatment may be continued with cefotaxime, ceftriaxone, penicillin G, or ampicillin (healthcare providers should ascertain susceptibility to penicillin before using penicillin or ampicillin for treatment).
- ***Priority*** - Immediate investigation and implementation of control measures is required.

Quick References / Factsheets

- Fact Sheet: Meningococcal Disease (CDC)
- Meningococcal Disease Outbreak Guidance (CDC)
- Meningococcal: Questions and Answers (IAC)

Forms

- Disease Case Report (CD-1) PDF format Word format
- Record of Investigation of Bacterial Meningitis or Bacteremia Case Report (CD-2M)
- Missouri Outbreak Report Form (MORF)

Notifications

- Contact the District Epidemiologists, or the Missouri Department of Health and Senior Services (MDHSS) – Bureau of Communicable Disease Control and Prevention (BCDCP), phone (573) 751-6113, or for afterhours notification contact the MDHSS – Emergency Response Center (ERC) at (800) 392-0272 (24/7) if a case of meningococcal disease is suspected.
- If a case(s) is associated with a childcare center, BCDCP or the LPHA will contact the MDHSS – Bureau of Environmental Health Services, phone (573) 751-6095, Fax (573) 526-7377 and the Missouri Department of Elementary & Secondary Education (DESE) Office of Childhood/Child Care Compliance, phone (573) 751-2450, Fax (573) 526-5345.
- If a case(s) is associated with a long-term care facility, BCDCP or the LPHA will contact the MDHSS - Section for Long Term Care Regulation, phone (573) 526-8524, Fax (573) 751-8493.
- If a case(s) is associated with a hospital, hospital-based long-term care facility, or ambulatory surgical center, BCDCP or the LPHA will contact the MDHSS - Bureau of Hospital Standards, phone (573) 751-6303, Fax (573) 526-3621.

Reporting Requirements

- Meningococcal disease is a Category 2 (A) disease and shall be reported to the local health authority or to MDHSS within one (1) calendar day of first knowledge or suspicion; for after-hours notification contact the MDHSS – ERC at (800) 392-0272 (24/7).

- Meningococcal disease is a nationally notifiable condition in the standard reporting category. MDHSS reports confirmed cases to the CDC by routine electronic transmission.
- Meningococcal disease reporting includes the following:
  1. For all cases, complete a "Disease Case Report" (CD-1) and a "Record of Investigation of Bacterial Meningitis or Bacteremia Case Report" (CD-2M).
  2. All outbreaks or suspected outbreaks must be reported as soon as possible (by phone, fax, or e-mail) to the District Epidemiologists.
  3. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the District Epidemiologists.

Laboratory Testing and Diagnosis

Meningococcal disease cannot be distinguished from other types of meningitis on the basis of clinical presentation or epidemiologic features alone. Testing is required to confirm the diagnosis. Tests for meningococcal disease include:

- ***Culture:*** Meningococcal disease is typically diagnosed by isolation of *N. meningitidis* from a normally sterile site. However, sensitivity of bacterial culture may be low, particularly when performed after initiation of antibiotic therapy. Cultures of a petechial or purpuric lesion scraping, synovial fluid, and other usually sterile body fluid specimens sometimes are positive and meet confirmatory case classification.
- ***Gram stain:*** A Gram stain from a sterile site specimen showing gram-negative diplococci strongly suggests *N. meningitis* but is not confirmatory.
- ***Polymerase chain reaction (PCR):*** Real-time PCR detects DNA of meningococci in blood, CSF, or other clinical specimens obtained from a normally sterile body site. Although culture remains the criterion standard for diagnosis of meningococcal disease, PCR is useful for detection of *N. meningitidis* from clinical samples, particularly when antibiotic treatment was administered prior to specimen collection. In the U.S, commercially available multiplex PCR assays have excellent sensitivity and specificity for detection of serogroups A, B, C, W, X, and Y.

Note: In addition to the Gram stain, initial test results on CSF including the protein, glucose, and the description of the color and appearance of the CSF should be obtained. The results of these tests can provide some indication of the likely agent pending the culture results.

Note: Initial clinical specimen testing is not provided by the Missouri State Public Health Laboratory (MSPHL). However, clinical laboratories are required to send *N. meningitidis* isolates cultured from a sterile site to the MSPHL for confirmation and serotype identification. Testing is performed at no charge to the submitting laboratory. Please contact the MSPHL Special Bacteriology Unit by phone (573) 751-3334 before submitting *N. meningitidis* isolates. Information on acceptable specimen types, collection, shipment, and testing to be performed by the MSPHL is available at: http://health.mo.gov/lab/specialbacteriology.php.

Conducting the Investigation

1. **Verify the diagnosis**. Contact the physician, hospital and/or laboratory as needed to obtain demographic, clinical and laboratory information required to verify the individual meets the case definition. Determine what antibiotics were given and when they were started. It is critically important that *N. meningitidis* isolates are submitted to the MSPHL for all confirmed cases of meningococcal disease. Collect and record the information requested on the Record of Investigation of Bacterial Meningitis or Bacteremia Case Report Form (CD-2M).
2. **Identify potential sources of exposure.** Contact the case or their proxy and ask about potential exposures to *N. meningitidis* during the 1-10 days before onset of illness, including:
   - Contact with a case, exposure during an outbreak, or association with a high-risk setting (college dorm, military, or other group setting/institution; social activities such as clubbing, etc.).
   - Travel outside the U.S. or contact with a recent arrival (e.g., international adoptee).
3. **Review surveillance data.** Determine whether there have been other cases in the same geographic area or institution. When cases are related by person, place, or time, efforts should be made to identify a common source.
4. **Identify exposed close contacts and potential settings for transmission.** Identify all high-risk contacts, which include close contacts who may have been exposed to the respiratory aerosols of a case and anyone directly exposed to the case's oral secretions (e.g., through kissing, sharing toothbrushes or eating utensils, mouth-to-mouth resuscitation, unprotected contact during endotracheal intubation, etc.) during the communicable period (the 7 days before onset of symptoms to 24 hours after initiation of effective antimicrobial therapy).
5. **Provide information regarding prevention of meningococcal disease.** Efforts should be made to promote meningococcal disease awareness to high-risk contacts, medical providers, and the public as needed to reduce the risk of infection.
6. **Post-exposure prophylaxis of exposed contacts.** Refer to the **Post-Exposure Prophylaxis** information in the **Control Measures** section of this document for guidance.

Control Measures (General Setting)

Pre-exposure Vaccination. In the U.S., there are meningococcal conjugate vaccines available that protect against serogroups A, C, W, and Y and separate meningococcal vaccines that protect against serogroup B. These vaccines have specific recommendations for routine use and use among persons specifically at increased risk. Meningococcal vaccines are also used during an outbreak for outbreak control. The vaccine recommended (conjugate versus meningococcal B) will depend on the serogroup causing the outbreak. Information on the meningococcal vaccination schedule, use, contraindications, and precautions is available at: Meningococcal Vaccine Information Statements and the Centers for Disease Control and Prevention, *Epidemiology and Prevention of Vaccine-Preventable Diseases* (PinkBook).

Treatment. Because of the risks of severe morbidity and death, effective antibiotics should be administered promptly to patients suspected of having meningococcal disease. Multiple antimicrobial agents are effective against *N. meningitidis*. Empirical therapy for suspected

meningococcal disease should include an extended-spectrum cephalosporin, such as cefotaxime or ceftriaxone. If antimicrobial agents other than ceftriaxone or cefotaxime are used for treatment of meningococcal disease, eradication of nasopharyngeal carriage with rifampin or ciprofloxacin is recommended prior to discharge from the hospital. See American Academy of Pediatrics *Red Book* for treatment recommendations. There is no indication to treat persons who are asymptomatic nasopharyngeal carriers.

Post-exposure Prophylaxis. Regardless of immunization status, high-risk close contacts of persons with invasive meningococcal disease should promptly receive antimicrobial chemoprophylaxis because they are at increased risk of infection. Risk of secondary disease among close contacts is highest during the first few days after exposure, which requires that chemoprophylaxis be administered as soon as possible (ideally within 24 hours of diagnosis of the primary case). If given more than 14 days after the onset of disease, chemoprophylaxis is probably of limited or no benefit. Oropharyngeal or nasopharyngeal cultures of close contacts are not useful in determining the need for chemoprophylaxis.

The antibiotics recommended for chemoprophylaxis against meningococcal disease include rifampin, ciprofloxacin, and ceftriaxone. The appropriate antimicrobial, dosing, and duration of use varies on age and other factors. See 2021 Red Book pgs. 523-524 or the CDC's Prevention and Control of Meningococcal Disease for recommended chemoprophylaxis regimens for protection against meningococcal disease. The following are risk categories for the evaluation of contacts.

High Risk Contacts: chemoprophylaxis is recommended for the following:

- Household contacts;
- Persons who slept in same dwelling as index patient during the 7 days before onset of illness to 24 hours after initiation of effective antimicrobial therapy;
- Child care or preschool contacts at any time during the 7 days before onset of illness to 24 hours after initiation of effective antimicrobial therapy;
- Persons with direct exposure to the case's oral/respiratory secretions (e.g. kissing, sharing toothbrush, eating utensils, or drinking from the same cup/bottle, etc.);
- Following mouth-to-mouth resuscitation or unprotected contact during endotracheal intubation at any time from 7 days before onset of illness to 24 hours after initiation of effective antimicrobial therapy;
- Passengers seated directly next to the index case during airline flights lasting more than 8 hours (gate to gate), or passengers seated within one seat in any direction from an index case on a flight of any duration if the index case was coughing or vomiting during the flight.

Low Risk Contacts: chemoprophylaxis not recommended for the following:

- Casual contact: no history of direct exposure to index patient's oral secretions (eg, school or work);

- Indirect contact: only contact is with a high-risk contact, no direct contact with the index patient;
- Health care personnel without direct, unprotected exposure to patient's oral/respiratory secretions.

Note: Chemoprophylaxis is not recommended for the following:

- Contacts of an asymptomatic high risk contact;
- Contacts whose only exposure occurred 24 hours after the case after the case has started an antibiotic effective at reducing nasopharyngeal carriage of *N. meningitidis*, such as ciprofloxacin, ceftriaxone, and rifampin;
- Contacts of patients with evidence of *N. meningitidis* isolated from non-sterile sites only such as oropharyngeal swab, endotracheal secretions, or conjunctival swab.

Control Measures (Outbreak)

Outbreaks of meningococcal disease are rare in the U.S. In fact, only about 1 in 20 cases are related to outbreaks. However, outbreaks are unpredictable and the outcomes can be devastating to affected communities and organizations. In certain outbreaks, CDC recommends additional control measures such as the expanding the use of antimicrobial chemoprophylaxis and vaccination against meningococcal disease to help stop the disease from spreading. A suspected outbreak of meningococcal disease is a high priority situation that requires an immediate response including, but not limited to, the implementation of additional control measures specific to the population affected. Guidance for the investigation and response to meningococcal disease outbreaks is available in CDC's Guidance for the Evaluation and Public Health Management of Suspected Outbreaks of Meningococcal Disease.

Resources

1. American Academy of Pediatrics. *Meningococcal Infections*. In: Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, eds. *Red Book: 2021 Report of the Committee on Infectious Diseases*. 32nd ed. Itasca, IL: American Academy of Pediatrics 2021: 519-532.
2. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases, Meningococcal Disease. Hall E., Wodi A.P., Hamborsky J., et al., eds. 14th ed. Washington, D.C. Public Health Foundation, 2021: 207-224.http://www.cdc.gov/vaccines/pubs/pinkbook/mening.html (4/23).
3. Centers for Disease Control and Prevention, National Notifiable Diseases Surveillance System (NNDSS) and Case Definitions. https://ndc.services.cdc.gov/case-definitions/meningococcal-disease-2015/ (4/23).

4. American Public Health Association. *Meningitis.* In: Heymann DL (ed), *Control of Communicable Diseases Manual*. 21st ed. Washington, D.C. American Public Health Association, 2022: 418-432.
5. Centers for Disease Control and Prevention, Meningococcal Vaccination. https://www.cdc.gov/vaccines/vpd/mening/index.html (4/23).
6. Centers for Disease Control and Prevention, *Chapter 8: Meningococcal Disease, Manual for the Surveillance of Vaccine-Preventable Diseases*, Atlanta, GA, 2008. http://www.cdc.gov/vaccines/pubs/surv-manual/chpt08-mening.html (4/23).
7. Centers for Disease Conrol and Prevention, Guidance for the Evaluation and Public Health Management of Suspected Outbreaks of Meningococcal Disease. Version 2.0, September 28, 2019. http://www.cdc.gov/meningococcal/downloads/meningococcal-outbreak-guidance.pdf (4/23).