

Meningococcal Disease

Surveillance and Investigation Protocol



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I. ABOUT THE DISEASE

Invasive meningococcal disease is an infection caused by a bacteria called *Neisseria meningitidis*, otherwise known as meningococcus. The disease can be severe and include infections of the brain and its coverings (meningococcal meningitis) and the bloodstream (meningococemia).

The bacteria are spread through the exchange of respiratory secretions. Meningococcal disease can be treated with antibiotics, but quick medical attention is extremely important. To protect the health of the public, the West Virginia Reportable Disease Rule, 64CSR-7 requires reporting of this disease to the local health department **within 24 hours of diagnosis** for timely disease investigation and control.

A. Clinical Presentation

The signs and symptoms of meningococcal disease can vary widely. A person may have either meningococcal meningitis or meningococemia, or both at the same time. The most common symptoms include:

- High fever
- Severe headache
- Difficulty breathing
- Stiff neck and back
- Painful joints and/or sore muscle
- Discomfort looking into bright lights (photophobia)
- Extreme sleepiness, drowsiness and confusion
- Vomiting and/or diarrhea
- Loss of consciousness/seizures
- Rash of red-purple pinpoint spots or larger bruises

In newborns and small infants, the classic findings of fever, headache and neck stiffness may be absent or difficult to detect, and the infant may show only extreme listlessness, irritability, poor feeding and sometimes vomiting. In babies under one year of age, the soft spot on the top of the head (fontanel) may bulge upward.

B. Etiologic Agent

Neisseria meningitidis is a gram-negative diplococcus bacterium that is classified into serogroups based on the polysaccharide capsule. There are 12 antigenically distinct polysaccharide capsules identified, 6 (A, B, C, W, X, Y) of which are associated with invasive disease worldwide. Serogroups B, C, Y cause most of the illness in the U.S. Some strains are non-groupable and do not express a capsule. These strains are commonly associated with asymptomatic nasopharyngeal carriage.

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C. Reservoir

Humans are the only known reservoir of *Neisseria meningitidis*. About 10% of adults and adolescents are asymptomatic nasopharyngeal carriers. Many of these carried strains are nongroupable.

D. Incubation Period

The incubation period is variable, 1-10 days, but usually less than 4 days.

E. Mode of Transmission

Primary mode of transmission is by respiratory droplet or by direct contact with respiratory secretions of infected people.

F. Period of Communicability

An infected person is infectious as long as meningococci are present in nasal and oral secretions or until 24 hours after initiation of effective antibiotic treatment. Communicability is limited. In studies of households with a case of meningococcal disease, only 3%-4% of households had secondary cases (most of which were 1 case).

II. DISEASE PREVENTION AND CONTROL

A. Disease Prevention and Control Objectives

Reduce the risk of secondary cases by early identification and prophylaxis of close contacts to cases.

B. Disease Prevention and Control

Reduce the risk of disease through education to:

- Practice good hand washing and basic hygiene as a primary means of preventing spread of infectious agents.
- Not to share spoons, forks, cups, soft drink cans, sport water bottles, glasses, cigarettes, lipsticks or other items that may be covered with oral or nasal secretions.
- Practice cough etiquette and good hygiene.
- Get age-appropriate vaccination against meningococcal disease.

There are two types of meningococcal vaccines licensed in the United States.

1. Quadrivalent (serogroups A, C, W, Y) meningococcal conjugate (MenACWY) vaccines
2. Serogroup B meningococcal (MenB) vaccines

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In 2020, the Advisory Committee on Immunization Practices (ACIP) recommended the following:

MenACWY vaccination for the following groups

- Routine vaccination for adolescents aged 11 or 12 years, with a booster dose at age 16 years.
- Routine vaccination of persons aged ≥ 2 months at increased risk for meningococcal disease (dosing schedule varies by age and indication, and interval for booster dose varies by age at time of previous vaccination):
 - Persons with certain medical conditions including anatomic or functional asplenia, complement component deficiencies (e.g., C3, C5-C9, properdin, factor H, or factor D), complement inhibitor (e.g., eculizumab [Soliris] or ravulizumab [Ultomiris]) use, or HIV infection.
 - Microbiologists with routine exposure to *Neisseria meningitidis* isolates.
 - Persons at increased risk during an outbreak (e.g., in community or organizational settings, and among men who have sex with men [MSM]).
 - Persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic.
 - Unvaccinated or under-vaccinated first-year college students living in residence halls.
 - Military recruits.
- Booster doses for previously vaccinated persons who become or remain at increased risk.

MenB vaccination for the following groups

- Routine vaccination of persons aged ≥ 10 years at increased risk for meningococcal disease (dosing schedule varies by vaccine brand; boosters should be administered at 1 year after primary series completion, then every 2–3 years thereafter):
 - Persons with certain medical conditions, such as anatomic or functional asplenia, complement component deficiencies, or complement inhibitor use.
 - Microbiologists with routine exposure to *N. meningitidis* isolates.
 - Persons at increased risk during an outbreak (e.g., in community or organizational settings, and among MSM).
- Vaccination of adolescents and young adults aged 16–23 years with a 2-dose MenB series on the basis of shared clinical decision-making. The preferred age for MenB vaccination is 16–18 years. Booster doses are not recommended unless the person becomes at increased risk for meningococcal disease.
- Booster doses for previously vaccinated persons who become or remain at increased risk.

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Close contacts of a person with meningococcal disease are at **HIGH RISK** and should receive antibiotics (chemoprophylaxis) to prevent them from getting sick. The following are considered close contacts:

- Household contact including roommates.
- Childcare or preschool contact at any time during 7 days before onset of illness.
- Direct exposure to index patient secretions (kissing, sharing of toothbrush, utensils, cups, etc.) at any time during 7 days before onset of illness.
- Mouth-to-mouth resuscitation, unprotected contact during endotracheal intubation at any time during 7 days before onset of illness to 24 hours after initiation of effective antibiotics.
- Frequently slept in same dwelling as index patient during 7 days before the onset of symptoms.
- Passengers seated directly next to index case during airline flight lasting more than 8 hours or passengers seated within 1 seat in any direction from the index case on a flight of any duration while index case was coughing or vomiting.

Prevention of transmission of *N. meningitidis* in healthcare settings involves:

- Use Standard Precautions.
- Place patients with known or suspected meningococcal disease in droplet precautions.
- Administer appropriate postexposure prophylaxis (PEP) to persons exposed to *N. meningitidis*.
- Exclude potentially infectious healthcare personnel from work.
- For more information, see *Ill. J. Occupational Health* for guidance for healthcare personnel.

C. Prophylaxis and Treatment

It is important that antibiotic treatment start as soon as possible. Ceftriaxone or cefotaxime are recommended first-line agents for empiric treatment of meningococcal disease.

Detection of geographically diverse cases caused by penicillin-resistant and ciprofloxacin-resistant *N. meningitidis* serogroup Y (NmY meningococcal disease) in the United States has implications for treatment and prophylaxis of meningococcal disease.

- Recommended prophylaxis for close contacts of persons with meningococcal disease includes either a 2-day course of rifampin, a single injection of ceftriaxone, or a single dose of ciprofloxacin (table 1) should not be used if fluoroquinolone-resistant strains of Nm have been identified in the community.
- Azithromycin may be considered for prophylaxis in the setting of concern for ciprofloxacin resistance, and challenges exist with rifampin and ceftriaxone use. However, data are limited and minimum inhibitory concentrations at the limit of susceptibility have been detected in some meningococcal isolates tested from a carriage study.

HIGH-RISK EXPOSURE - Chemoprophylaxis IS recommended for close contacts.

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LOW-RISK EXPOSURE – Chemoprophylaxis is NOT recommended for the following:

- Casual contact: no history of direct exposure to patient’s oral secretions
- Indirect contact: only contact is with high-risk contact; no direct contact with case-patient
- Health care personnel without direct exposure to patient’s case oral secretions

OUTBREAK or CLUSTER

- Chemoprophylaxis is recommended for people at high risk (close contacts). For other groups, consult public health.

Table 1. Recommended Chemoprophylaxis Regimens for High-Risk Contacts and People with Invasive Meningococcal Disease

Age of Infant, Child, and Adult	Dose	Duration	Efficacy (%)	Caution
RIFAMPIN^a				
<1 month	5 mg/kg/dose, PO, every 12 H	2 days		Discuss with expert for infants <1 month
≥ 1 month	10 mg/kg/dose (max. 600 mg), PO, every 12 H	2 days	90-95	Can interfere with efficacy of oral contraceptives, seizure meds, and anticoagulants. Can stain soft contact lenses
CEFTRIAXONE				
<15 years	125 mg, IM	Single dose	90-95	Dilute with 1% lidocaine to decrease pain at injection site
≥ 15 years	250 mg, IM	Single dose	90-95	Dilute with 1% lidocaine to decrease pain at injection site
CIPROFLOXACIN^{a,b}				
≥ 1 month	20 mg/kg (max. 500 mg), PO	Single dose	90-95	
AZITHROMYCIN				
	10 mg/kg (max. 500 mg)	Single dose	90	Not recommended routinely; equivalent to Rifampin for eradication of <i>N. meningitidis</i> from nasopharynx

^a Not for pregnant women.

^b Use only if fluoroquinolone-resistant strains of *N. meningitidis* have not been identified in the community.

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Depending on how serious the infection is, people with meningococcal disease may need other treatments, including:

- Breathing support
- Medications to treat low blood pressure
- Surgery to remove dead tissue
- Wound care for parts of the body with damaged skin

III. DISEASE INVESTIGATION

A. Case Detection

Index case: An index case or primary case of meningococcal disease is one that occurs in the absence of previous known close contact with another patient.

Secondary case: A secondary case of meningococcal disease is one that occurs among close contacts of a primary patient >24 hours after onset of illness in the primary patient.

Co-primary cases: Co-primary cases are two or more cases that occur among a group of close contacts with onset of illness separated by ≤ 24 hours.

Close contacts: Close contacts of a patient who has meningococcal disease. For a list of close contacts, see *II. B. Disease Prevention and Control*.

B. Case Definition (2015)

CLINICAL CRITERIA:

Clinical purpura fulminans in the absence of a positive blood culture. Purpura fulminans is a progressive cutaneous hemorrhage and necrosis due to dermal vascular thrombosis and disseminated intravascular coagulation (DIC) caused by *N. meningitidis*.

LABORATORY CRITERIA FOR DIAGNOSIS:

- Gram-negative diplococci, not yet identified, isolated from a normally sterile body site (e.g., blood CSF)
- Detection of *N. meningitidis* antigen
 - In formalin-fixed tissue by immunohistochemistry (IHC); or
 - In CSF by latex agglutination
- Detection of *N. meningitidis*-specific nucleic acid in a specimen obtained from a normally sterile body site (e.g., blood or CSF), using a validated PCR assay; or
- Isolation of *N. meningitidis* from a normally sterile body site or from purpuric lesions

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The diagnosis of invasive meningococcal disease can be made by growing bacteria (culture) from a sample of spinal fluid, blood or other sterile fluids. The spinal fluid is obtained by performing a spinal tap, in which a needle is inserted into an area in the lower back where fluid in the spinal canal is readily accessible. Identification of the type of bacteria responsible is important for selection of correct antibiotics. Sensitivity of a bacterial culture may be low following antibiotic therapy.

A gram stain of a petechial or purpuric scraping, CSF, and buffy coat smear of blood showing gram-negative diplococci can be helpful when suspecting meningococcal disease.

Real-time PCR (rt-PCR) detects meningococcal DNA and is useful in clinical specimens in which the organism may not be detected, such as those who received antimicrobial treatment before cultures were obtained.

Meningococcal serogroup testing is performed by the West Virginia Office of Laboratory Services (WV OLS).

EPIDEMIOLOGIC LINKAGE:

Not applicable for case classification.

C. Case Classification

Suspected

- Clinical purpura fulminans in the absence of a positive blood culture; or
- Gram-negative diplococci, not yet identified, isolated from a normally sterile body site (e.g., blood or CSF)

Probable

- Detection of *N. meningitidis* antigen in formalin-fixed tissue by immunohistochemistry (IHC); or CSF by latex agglutination

Confirmed

- Detection of *N. meningitidis*-specific nucleic acid in a specimen obtained from a normally sterile body site (e.g., blood or CSF), using a validated PCR assay; or
- Isolation of *N. meningitidis* from a normally sterile body site (e.g., blood or CSF, or less commonly, synovial, pleural, or pericardial fluid); or from purpuric lesions.

D. Reporting Timeframe to Public Health

Report cases of invasive meningococcal disease to the LHD within 24 hours of diagnosis.

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E. Outbreak Recognition

An outbreak is an unusual increase of disease caused by a single serogroup above the expected number of cases.

Outbreaks have occurred in communities and institutions, including childcare centers, schools, colleges, and military recruit camps. In recent years, several outbreaks of serogroup B meningococcal disease have been reported on U.S. college campuses, including a prolonged outbreak in Ohio (2008-2010).

In May 2022, Florida reported a large outbreak of serogroup C meningococcal disease (SCMD) among gay, bisexual, and other men who have sex with men (MSM), and a cluster of serogroup B meningococcal disease among college and university students.

An organization-based outbreak of SCMD is defined as the occurrence of 3 or more confirmed or probable cases of SCMD during a period of ≤ 3 months in persons who have a common affiliation but no close contact per 100,000 persons.

A community-based outbreak of SCMD is defined as the occurrence of 3 or more confirmed or probable cases during a period of ≤ 3 months among persons residing in the same area who are not close contacts of each other and who do not share a common affiliation, with a primary attack rate of at least 10 cases per 100,000 population.

Outbreak response requires detailed epidemiologic (contact tracing) and laboratory (serogrouping) investigation. If the outbreak strain is a vaccine strain, vaccination of at-risk population should be considered.

F. Healthcare Provider Responsibilities

1. Report all suspected cases of invasive meningococcal disease within 24 hours of diagnosis to the local health department (LHD).
2. Healthcare providers should ascertain susceptibility of meningococcal isolates to penicillin before using penicillin or ampicillin for treatment.
3. Clinicians and public health staff should consider antimicrobial susceptibility testing (AST) on meningococcal isolates to inform prophylaxis decisions if their area has reported a case of meningococcal disease caused by ciprofloxacin-resistant strains within the past 2 years.
4. Request the laboratory to submit isolates of *N. meningitidis* to the WV OLS immediately for serogrouping. OLS may be accessed as follows:
 - Phone: 304-558-3530
 - Web: <https://dhr.wv.gov/ols/labs/Pages/Bacteriology.aspx>

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- Mailing address: 167 11th Ave.
South Charleston, West Virginia 25303
5. For facilities that do not have electronic laboratory reporting (ELR) capability, submit a laboratory report by faxing a copy of the report to the LHD.
 6. Immediately notify infection control and institute control measures for invasive meningococcal disease.
 - The patient must be placed under droplet precautions until 24 hours have passed after initiation of effective antimicrobial therapy.
 - For prevention of transmission of *N. meningitidis* in healthcare settings, see *II. B Disease Prevention and Control*.
 7. Provide prophylaxis for all close contacts. Antimicrobial susceptibility testing should not delay the initiation of prophylaxis. Contact the LHD if assistance is needed.
 8. Complete the provider section of the West Virginia Electronic Disease Surveillance System (WVEDSS) Meningococcal Disease Case Report Form and submit the completed form to the LHD. The form is found at <https://oeps.wv.gov/meningococcal/Documents/lhd/meningococcal.pdf>

G. Laboratory Responsibilities

1. Immediately notify the physician and infection control practitioner of a positive test result for *N. meningitidis* from a normally sterile site.
2. Forward isolates cultured from normally sterile sites to WV Office of Lab Services for serogrouping. OLS will forward isolates and specimens to the Centers for Disease Control and Prevention (CDC). OLS may be accessed as follows:
 - Phone: 304-558-3530
 - Web: <https://dhhr.wv.gov/ols/labs/Pages/Bacteriology.aspx>
 - Mailing address: 167 11th Ave.
South Charleston, West Virginia 25303
3. Many reference and hospital laboratories in West Virginia report via ELR to the WVEDSS. For hospital laboratories that do not report via ELR, call and fax a copy of the positive test result of *N. meningitidis* to your local health department within 24 hours of detection. For reference laboratories, please notify the West Virginia Division of Infectious Disease Epidemiology (DIDE) at 304-558-5358 ext. 2.
4. For WV OLS: Submit all meningococcal isolates to CDC for AST and whole genome sequencing.

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H. Local Health Responsibilities

1. Educate the public about meningococcal disease, especially its transmission.
2. Educate providers and laboratories to report confirmed, probable, and suspect cases of invasive meningococcal disease within 24 hours to the LHD to enhance case detection, manage close contacts, identify outbreaks, and facilitate community education.
3. Educate the public and healthcare providers about meningococcal vaccine and its indications.
4. Inform laboratories to submit *all* invasive meningococcal isolates cultured from normally sterile sites to the WV OLS for serogrouping to determine if circulating strains are vaccine-preventable.
5. Educate providers about prophylaxis for high-risk contacts (close contact).
6. Upon receipt of a report of invasive meningococcal disease:
 - a. Investigate the case. Verify that the reported patient meets the case definition. Meningococcus cultured from a non-sterile site (throat, sputum, etc.) does not need to be reported.
 - b. Assure that isolates and specimens are forwarded to the WV OLS for serogrouping.
 - c. Identify all close contacts.
 - d. Recommend chemoprophylaxis for contacts of invasive meningococcal disease.
 - e. Alert close contacts (family, daycare, nursery school, etc.) to watch for early signs of illness, especially fever.
 - f. Enter reports of invasive meningococcal disease in WVEDSS. Document disease outcome, prophylaxis, vaccinations and results of laboratory tests including AST.

I. State Health Responsibilities

1. Review laboratory reports submitted in WVEDSS and assign to appropriate local health jurisdiction for investigation.
2. Remind healthcare providers, laboratories, and local health to submit meningococcal isolates and specimens to WV OLS.
3. Review case investigations submitted in WVEDSS and notify CDC (through electronic case report submission to National Notifiable Disease Surveillance System (NNDSS) in a timely manner. The DIDE VPD Program staff should also complete the *Enhanced Meningococcal Disease Supplemental Form* and submit to CDC as directed.
4. Provide technical guidance on surveillance, investigation, control measures and prevention of invasive meningococcal disease.
5. Assist local health jurisdictions in the prompt identification and management of close contacts.
6. In the event of an outbreak or cluster of cases:
 - a. Identify local health needs.
 - b. Support public health response.
 - c. Notify public health partners, *i. e.*, LHD, OLS, CDC, Bureau for Public Health (BPH) through the State Epidemiologist and OEPS Director, etc.
7. Report any suspected meningococcal treatment or prophylaxis failures to CDC.

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8. [Complete a supplemental case report form](#) for cases with isolates determined to be β -lactamase screen-positive or ciprofloxacin-resistant; forms can be submitted to CDC via secure email (meningnet@cdc.gov) or FTP site
9. Update information sheets and protocol as new information becomes available.

J. Occupational Health

N. meningitidis can be transmitted person-to-person through unprotected direct contact with the respiratory secretions or saliva of a person with clinical disease, such as meningitis or bacteremia. Exposures in healthcare may include mucous membrane contact with infectious secretions from close, face-to-face contact during activities such as mouth-to-mouth resuscitation, endotracheal tube placement or management, or open airway suctioning while not wearing or correctly using recommended personal protective equipment (PPE).

Brief, non-face-to-face contact, such as standing in the doorway of a patient's room, cleaning a patient's room, delivering a medication or food tray, starting an IV, or performing a routine physical exam, is generally not considered an exposure. Unprotected direct contact with the respiratory secretions or saliva of a person colonized with *N. meningitidis*, without clinical disease, is not considered an exposure.

To minimize risk for transmission of infectious diseases pending laboratory confirmation, the Healthcare Infection Control Practices Advisory Committee (HICPAC) recommends empiric transmission-based precautions based on the patient's clinical presentation in addition to standard precautions. Precautions include:

- Droplet precautions for first 24 hours of antimicrobial treatment of the patient.
- Mask and face protection when there is risk of exposure to aerosolized secretions.

For exposed healthcare personnel:

- Administer antimicrobial prophylaxis regardless of vaccination status.
- For those with invasive meningococcal disease, exclude from work until 24 hours after start of effective antimicrobial therapy.
- For those who only have nasopharyngeal carriage of *N. meningitidis*, work restrictions are not necessary.

IV. DISEASE SURVEILLANCE

A. Public Health Significance

N. meningitidis resides in the human nasopharynx and can be habitual components of the microbial flora in the buccal mucosa, anus, urethra, urogenital mucosa and dental plaque. Pharyngeal carriage can range from 8-25% of the population.

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Relationship between asymptomatic carrier and development of invasive meningococcal disease is not completely known. Often humoral immune response is enough to prevent the spread of the organism and the occurrence of invasive disease. However, if humoral response is not adequate (due to lack of bactericidal antibodies) the bacteria can get into the bloodstream and circumvent immunologic response by several virulence factors.

Repeated occurrence of carrier status, even not protective against subsequent new carriage can elicit a cross-protection against invasive disease.

Invasive meningococcal disease is alarming to the general public and healthcare providers alike because of the potential for fulminant disease and death in previously healthy individuals. Responding to cases places heavy demands on clinical and public health disease control services. *N. meningitidis* causes both endemic and epidemic disease, primarily meningitis and meningococemia. It is the leading cause of bacterial meningitis in children and young adults in the United States, with an estimated 1,400-2,800 cases each year. Ten to fourteen percent of cases are fatal. Sequelae associated with meningococcal disease occur in up to 20% of survivors and include hearing loss, neurologic disability, digit or limb amputations, and skin scarring. In addition, patients may experience subtle long-term neurologic deficits, such as impaired school performance, behavioral problems, and attention deficit disorder.

Incidence of meningococcal disease peaks in late winter to early spring. Attack rates are highest among children 3-12 months of age and then steadily decline among older age groups. The highest peak attack rate occurs in children younger than 1 year of age followed by adolescents 15 to 18 years of age. College students who live in dormitories have a higher rate of disease compared with individuals who are the same age and are not attending college. In May 2022, Florida reported a large outbreak of meningococcal disease among gay, bisexual, MSM.

Persons who have certain medical conditions are at increased risk for developing meningococcal infection—persons with complement deficiency; persons with anatomic or functional asplenia; and selected research, clinical, laboratory or industrial workers who may be exposed to *N. meningitidis* aerosols.

B. Disease Surveillance Objectives

1. To determine the incidence of meningococcal disease in West Virginia;
2. To detect trends in patient characteristics, antibiotic resistance, and serogroup specific incidence of disease;
3. To identify cases and close contacts promptly;
4. To promptly identify clusters and outbreaks of invasive meningococcal disease to initiate

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appropriate prevention and control measures.

5. To provide data for evaluation of preventive measures for close contacts to prevent further spread of disease.

C. Surveillance Indicators

1. Proportion of meningococcal cases with complete information (age and event date).
2. Number of confirmed cases.
3. Proportion of meningococcal cases with complete vaccine history (with/without manufacturer name).
4. Proportion of meningococcal cases with serogroup testing.
5. Proportion of cases with known outcome.
6. Proportion of meningococcal cases reported in a timely manner.
7. Proportion of meningococcal cases with timely initiation of control measures.
8. Proportion of cases with isolates submitted to CDC.
9. Percent of isolates shipped to CDC during assigned submission schedule.

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