MENINGITIS PROTOCOL

Meningitis is an inflammation of the meninges, the thin lining that surrounds the brain and spinal cord. It can be caused by many bacteria and viruses. Viral infections are the most common cause of meningitis; bacterial infections are the second most common cause. Other rarer causes of meningitis include fungi, parasites, and non-infectious causes, including those related to drugs.

Severity of illness and treatment for meningitis differ depending on the cause. It is therefore important to know the specific cause of meningitis: bacterial meningitis is usually more severe than viral, fungal, or parasitic meningitis.

Implement Droplet Precautions for all suspect meningitis types until a type has been confirmed/diagnosis determined. Not all cases of meningitis require Additional Precautions.

Pediatric:

- Implement Droplet/Contact Precautions until etiology determined.
- If confirmed as **bacterial** in origin, implement Droplet Precautions.
- If confirmed as **viral** in origin, implement Contact Precautions for children who are incontinent or unable to comply with hygiene practice.

Adult: implement Droplet Precautions until *Neisseria meningitidis* ruled out.

Type of Meningitis	Type of Precautions	Duration of Precautions
Etiology unknown – adult	Droplet	Until etiology is determined
Etiology unknown – pediatric	Droplet/Contact	
Haemophilus influenzae type B – adult	Routine Practices	Ongoing
Haemophilus influenzae type B – pediatric	Droplet	Until 24 hours after start of effective therapy
Meningococcal (*Neisseria meningitidis*)	Droplet	Until 24 hours after start of effective therapy
Pneumococcal (*Streptococcus pneumoniae)* – adult	Routine Practices	Ongoing
Pneumococcal (*Streptococcus pneumoniae)* – pediatric	Droplet/Contact	Until 24 hours after start of effective therapy
Viral – adult	Routine Practices	Ongoing
Viral – pediatric	Contact	While incontinent or unable to comply with hygiene practice

BACTERIAL MENINGITIS

1. *HAEMOPHILUS INFLUENZAE TYPE B* (HIB) MENINGITIS

1.1. Cause/Epidemiology

Haemophilus meningitis is caused by *Haemophilus influenzae* serotype b. *H. influenzae* is a gram-negative coccobacillus. *Haemophilus influenzae* type b (Hib) has been identified as one of the three most common causes of bacterial meningitis (the others are *Neisseria meningitidis* and *Streptococcus pneumoniae*).

Risk factors for Hib meningitis include:

- Unimmunized children younger than 4 years of age
- Household contacts of person with Hib disease
- Compromised immune status
  - Immunologic illnesses (e.g., agammaglobulinemia, IgG2 subclass deficiency)
  - Illnesses or treatments that result in immunocompromisation (e.g., neoplasms, AIDS, malnutrition, chemotherapy, radiotherapy, other forms of immunosuppression)
  - Splenic dysfunctions (e.g., sickle cell disease, asplenia, HIV)
- Lack of Hib immunization with conjugate vaccines
- Hib colonization at a vulnerable age.

1.2. Clinical Presentation

Healthy adults are generally not susceptible to Hib meningitis. The onset can be sub-acute but is usually sudden. Initial manifestations of meningitis that follow in more than half of all cases include lethargy, fever (greater than 38.5°C), headache, photophobia, meningismus, irritability, anorexia, nausea, or vomiting. Infants often present with bulging fontanelles, while older children present with stiff neck and back. Disease caused by H. influenzae usually begins in the upper respiratory tract as pharyngitis. Invasive disease usually occurs after the organism enters the bloodstream.

Meningitis is the most common clinical manifestation of invasive Hib disease. The presentation of Hib meningitis may be considerably less severe than either meningococcal or pneumococcal meningitis, leading to misinterpretation of the initial symptoms or discounting of the significance of the somewhat more leisurely progression of illness. In such sub-acute cases, fever, irritability, and drowsiness may be the only reported initial signs and symptoms. These subtle signs may be mistakenly attributed to a preceding bout of otitis media or other form of upper respiratory illness.

Diagnosis is made through isolation of organisms from blood for culture and sensitivity, or lumbar puncture for cerebrospinal fluid (CSF) culture and sensitivity. Immunization with Hib conjugate vaccine is recommended starting at 2 months of age. For the complete immunization schedule, see MB Health Recommended Immunization Schedules. Immunization is not routinely recommended for children over the age of 5.

1.3. Incubation

Unknown; probably 2 – 4 days

1.4. Transmission

Transmission is through droplet spread and direct contact with nasal or throat secretions of infected or colonized persons during the period of infectivity. Transmission may also occur intrapartum though aspiration of amniotic fluid or by contact with genital secretions containing the organism. The portal of entry is most commonly the nasopharynx. Humans are the only known reservoir for Hib. Hib is not communicable after 24 hours of effective antibiotic therapy.

1.5. Infection Prevention and Control Practices

Adult: Follow Routine Practices to care for a patient with *Haemophilus influenzae* type b meningitis

Pediatric: Notify site Infection Control Professional of positive cases and susceptible contacts. Implement Droplet Precautions immediately for *Haemophilus influenzae* type b meningitis. Maintain Droplet Precautions until after 24 hours of effective antimicrobial therapy. See Droplet Precautions in the Additional Precautions section.
Close contact less than 48 months old and who are not immune may require chemoprophylaxis.

1.6. Occupational Health

Contact Occupational and Environmental Safety and Health (OESH) for staff assessment and/or concerns. Occupational and Environmental Safety and Health (OESH)

1.7. References

1.7.1. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. (2007). Centres for Disease Control and Prevention (CDC). Accessed October 30, 2018.

1.7.2. Heymann, David (2015). Control of Communicable Diseases Manual 20th Edition, American Public Health Association.

1.7.3. Invasive Haemophilus influenzae Disease (IHD) Communicable Disease Management Protocol. (2007, October). Manitoba Health Communicable Disease Control Unit. Accessed October 30, 2018.

2. MENINGOCOCCAL MENINGITIS (*NEISSERIA MENINGITIDIS*)

2.1. Cause/Epidemiology

Neisseria meningitidis is one of the most important causes of meningitis because of its potential to cause epidemics.

Neisseria meningitidis is a gram-negative diplococcus with 13 sero-groups, or sub-types. A, B, C, Y, and W135 are the serotypes most frequently implicated in meningitis and can be prevented by immunization.

Meningococcal meningitis is found worldwide, but the largest outbreaks occur in certain parts of sub-Saharan Africa, where the risk is higher during the dry season (December to June).

2.2. Clinical Presentation

The most common symptoms are stiff neck, high fever, sensitivity to light, confusion, headaches, nausea and often vomiting and an altered mental state. Lethargy is frequently reported. Stupor or coma is less common; if coma is present, prognosis is poor. A petechial or purpuric rash is usually found on the trunk, legs, mucous membranes, and conjunctivae. Even when the disease is diagnosed early and adequate therapy instituted, 5 – 10% of patients die, typically within 24 – 48 hours of onset of symptoms.

Diagnosis of meningococcal meningitis is suspected based on clinical presentation, a lumbar puncture showing a purulent spinal fluid and gram negative diplococci on a gram stain. The diagnosis is confirmed by growing the bacteria from a normally sterile site (e.g., blood, CSF, joint, pleural, pericardial fluid, petechial or purpuric lesion).

Several vaccines are available to prevent the disease. Vaccines exist against sero-groups A, C, Y, and W135 in various combinations. Vaccines may not provide adequate protection for 10 to 14 days following injection.

2.3. Incubation

The average incubation period is 4 days, with a range between two and ten days.

2.4. Transmission

Transmission is through droplet spread and direct contact with nasal or throat secretions of infected or colonized persons during the period of infectivity. The portal of entry is most commonly the nasopharynx. The natural reservoir for meningococci is the mucosal surfaces of the nasopharynx and, to a lesser extent, the urogenital tract and anal canal. Approximately 5 to 10% of adults are asymptomatic nasopharyngeal carriers. Rates of up to 25% have been documented in some populations in the absence of any cases of meningococcal disease.

Infectious period is considered to be the seven days before onset of symptoms to 24 hours after the initiation of appropriate antibiotic therapy. A person who is untreated or a carrier can spread the bacteria until meningococci are no longer present in discharge from the nose and mouth.

2.5. Infection Prevention and Control Practices

Notify site Infection Control Professional of positive cases and implement Droplet Precautions immediately for N. meningitidis. On evenings and weekends, frontline staff is to complete the required Clinical Notification of Reportable Diseases and Conditions Form (link), fax to Communicable Diseases Surveillance Unit and notify the Medical Officer of Health.

Droplet Precautions are to be maintained until after 24 hours of effective antimicrobial therapy. See Droplet Precautions in the Additional Precautions section. Close contacts may require chemoprophylaxis.

2.6. Occupational Health

Contact Occupational and Environmental Safety and Health (OESH) for staff assessment and/or concerns. Occupational and Environmental Safety and Health (OESH)

2.7. References

2.7.1. Heymann, David (2015). Control of Communicable Diseases Manual 20th Edition, American Public Health Association.

2.7.2. Invasive Meningococcal Disease Communicable Disease Management Protocol (2011, June). Manitoba Health Communicable Disease Control Unit. Accessed October 30, 2018.Accessed October 30, 2018.

2.7.3. Meningococcal Disease: the pink book, 12th ed., second printing. (2015, July). Atkinson W, Wolfe CS, Hamborsky J, editors; Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. Washington, DC: Public Health Foundation. Accessed October 30, 2018.

3. PNEUMOCOCCAL MENINGITIS

3.1. Cause/Epidemiology

Pneumococcal meningitis is caused by the bacteria *Streptococcus pneumoniae*. The bacteria is the most common cause of meningitis in adults, and the second most common cause of meningitis in children older than age 6. *Streptococcus pneumoniae* is a gram-positive diplococcus found in the upper respiratory tract of healthy persons. Pneumococcal meningitis infection is rare with one or two cases per 100,000 people annually in Canada.

3.2. Clinical Presentation

Most cases of pneumococcal meningitis are in children under two years of age, elderly adults, and people with the following risk factors:

- Asplenia
- Suppression of immune system from cancer therapy, organ transplants, AIDS, or steroid treatment
- Chronic heart, lung, or kidney disease
- Diabetes
- Alcoholism or liver disease
- Smoking, second hand smoke
- Skull fractures, head surgery, or skull malformation
- Cochlear implants.

The clinical presentation of pneumococcal meningitis frequently does not involve classic symptoms, diagnosis often proves difficult, seizures are common, and multiple interventions are often necessary. Mortality is high (7.7 – 17.0% in developed countries and 36 – 48% in those less developed), and neurological sequelae frequent (30 – 49% in developed countries). Brain damage and/or deafness occur in two out of every ten cases.

Diagnosis is made through isolation of organisms from blood for culture and sensitivity, or lumbar puncture for CSF culture and sensitivity.

- Early treatment of pneumonia and ear infections caused by pneumococcus may decrease the risk of meningitis. There are also two effective vaccines available to prevent pneumococcal infection. The following people should be vaccinated, according to current recommendations at http://www.gov.mb.ca/health/publichealth/cdc/div/docs/schedule_not.pdf
- Children
- Everyone over age 65
- People at high risk for pneumonia.

3.3. Incubation

The incubation period may vary, but typically 1 – 3 days.

3.4. Transmission

Pneumococcal bacteria are carried in the back of the nose and throat, often without causing illness. Transmission is through droplet spread and contact with nasal or throat secretions of infected or colonized persons during the period of infectivity. *S. pneumoniae* is a human pathogen. The reservoir for pneumococci is presumably the nasopharynx of asymptomatic human carriers. Person-to- person transmission of pneumococcal bacteria is possible, but would generally result in colonization of the nasopharynx, rather than disease. Pneumococcal meningitis is not considered transmissible to others.

3.5. Infection Prevention and Control Practices

Adult: Follow Routine Practices for caring for a patient with pneumococcal meningitis. See the Routine Practices section and/or the Routine Practices policy for specific information.
Pediatric: Notify site Infection Control Professional of positive cases implement Droplet/Contact Precautions and maintain until after 24 hours of effective antimicrobial therapy. See Droplet/Contact Precautions in the Additional Precautions section.

3.6. Occupational Health

Contact Occupational and Environmental Safety and Health (OESH) for staff assessment and/or concerns. Occupational and Environmental Safety and Health (OESH)

3.7. References

3.7.1. Heymann, David. (2015). Control of Communicable Diseases Manual 20th Edition, American Public Health Association.

4. VIRAL MENINGITIS

4.1. Cause/Epidemiology

Viral meningitis can be caused by a variety of viruses and is more common than bacterial meningitis.

Gastrointestinal viruses such as Coxsackie and echoviruses are the most common causes of viral meningitis. Cases occur most often in the summer and autumn months.

Herpes can occasionally cause viral meningitis. The Herpes Simplex virus is wide spread and infection may be associated with cold sores.
Vector-borne viruses such as West Nile can also cause viral meningitis.

4.2. Clinical Presentation

Viral meningitis can be very debilitating, but is generally less serious than bacterial meningitis, and rarely fatal. Viral meningitis is not usually associated with septicemia. The illness is usually mild and clears up in about a week. Because the symptoms of viral meningitis are similar to those of bacterial meningitis, which is usually more severe and can be fatal, diagnosis should first exclude bacterial meningitis. Diagnosis of viral meningitis is usually done by laboratory tests of a patient's spinal fluid. Symptoms are fever, headache, stiff neck, and tiredness. Rash, sore throat, and vomiting can also occur.

4.3. Incubation

The incubation period is dependent on the specific causative organism and can be up to three weeks.

4.4. Transmission

Although the viruses which cause these diseases tend to be highly infectious because the viruses are shed in respiratory secretions and/or feces, they rarely cause detectable cross infection resulting in meningitis. This is because most contacts will have a mild respiratory infection and will not have meningitis. Viruses can be transmitted by the fecal-oral route through direct or indirect contact, or the respiratory route.

4.5. Infection Prevention and Control Practices

Follow Routine Practices for any patient 6 years of age and older with viral diarrhea, unless he/she is incontinent and feces cannot be contained, or who contaminate the environment. See the Routine Practices section and/or the Routine Practices policy for specific information.

Notify site Infection Control Professional of positive cases and implement Contact Precautions for a child under 6 years old or for an adult patient who has incontinence and feces cannot be contained, or for adults who contaminate the environment. See Contact Precautions in the Additional Precautions section. See the Microorganism, Infectious Disease Table for additional specific disease/ microorganism information. See the Clinical Presentation and Empiric Precautions Table for additional clinical presentations information.

4.6. Occupational Health

Contact Occupational and Environmental Safety and Health (OESH) for staff assessment and/or concerns.

4.7. References

4.7.1. Heymann, David. (2015). Control of Communicable Diseases Manual 20th Edition, American Public Health Association.

Specific Disease Protocol Contacts:

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