# MENINGITIS

Meningitis is infection of the membranes (meninges) that line the brain and the spinal cord.

## Bacterial Meningitis

### Haemophilus Meningitis

### Cause/Epidemiology

*H. influenzae* is a gram-negative coccobacillus shaped bacteria that can be divided into unencapsulated and encapsulated strains. The encapsulated strains are further classified in serotypes A to F (specific antigens on the surface of the microorganism). Of these serotypes; *H. influenzae* serotype b (Hib) is the most pathogenic (able to cause disease).

Before widespread use of *Haemophilus* b conjugate vaccines, this was the most common bacterial meningitis in children aged 2 months to 5 years in industrialized countries. Hib normally colonizes the nasopharynx of <1% of individuals (4-5 % prior to universal vaccination for Hib).

### Clinical Presentation

*Haemophilus* meningitis typically affects infants and children, but can also occur in (usually immunocompromised) adults. Healthy adults are generally not susceptible.
The onset can be sub acute, but is usually sudden; including fever, vomiting, lethargy and meningeal irritation. Infants can present with bulging fontanelles, and older children can present with stiff neck or back. Progressive stupor or coma is common. Occasionally, there is a low-grade fever for several days, with more subtle CNS symptoms. In industrialized countries, Hib most commonly presented as meningitis. Epiglottitis (acute upper airway obstruction of the epiglottis and supraglottic tissues) and bacteraemia (infection in the blood stream) without focus were the next most common presentations. In developing countries, the primary manifestation of Hib disease is lower respiratory tract infection.

Diagnosis may be made through isolation of organisms from blood or cerebrospinal fluid (CSF).

Routine childhood Hib conjugate vaccine has been implemented in most industrialized countries. Immunization is recommended, starting at 2 months of age, followed by additional doses after an interval of 2 months; dosages vary with

vaccine in use. All vaccines require boosters at 12-15 months of age. Immunization is not routinely recommended for children over the age of 5.

## Incubation

Unknown, though probably short, 2-4 days.

## Transmission

Transmission is through droplet spread and direct contact with nasal or throat secretions of infected or colonized persons. The portal of entry is most commonly the nasopharynx. Hib is not communicable following 24 hours of effective antibiotic therapy.

## Infection Prevention and Control Practices

Follow Routine Practices for caring for an adult with *Haemophilus influenza* type B meningitis.

Refer to Routine Practices section 4 and/or the Routine Practices policy #90.00.060 for specific information.

Implement Droplet precautions immediately for a child with *Haemophilus influenza* type B meningitis. Refer to the Management of Communicable Diseases in Personal Care Homes Table for specific disease/microorganism information. Refer to Contact Precautions in the Additional Precautions section 5.

## Occupational Health

Definition of Occupational Exposure

A healthcare worker who has had direct (direct cough, resuscitation, intubation) or indirect contact with discharge from the nose or throat of an infectious person during the infectious period (as long as the organism is present [which may be for a prolonged period even without nasal discharge] up to 24 hours after starting effective antibiotic therapy).

A Healthcare Worker Exposed to *Haemophilus influenzae* Meningitis

- Exposed healthcare workers shall contact Occupational Health/designate for follow-up
- Exposed healthcare workers shall be referred for clinical management which may include chemoprophylaxis (particularly if the exposed healthcare worker has susceptible contacts [children] at home)
- No modification to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with *Haemophilus influenzae* Meningitis

- Physician confirmed diagnosis
- Inform Infection Prevention and Control immediately if suspected or confirmed case
- Healthcare workers shall be referred to Occupational Health/designate for clinical management
- Healthcare worker shall be excluded from work until 24 hours after the start of effective therapy

## Meningococcal Meningitis

### Cause/Epidemiology

*Neisseria meningitidis* is a gram-negative diplococcus shaped bacteria with 13 serogroups (Closely related microorganisms that share common, measurable surface components). Encapsulated strains have the capacity to invade the nasopharyngeal tissue and enter the blood stream, which can then cause meningitis and systemic disease (when the organism is disseminated to all tissues). Strains belonging to groups A, B, C, Y and W-135 are implicated most frequently in systemic disease. Respiratory *Neisseria meningitidis* may be non-typeable and non-pathogenic (not able to cause disease).

*Neisseria meningitidis* normally colonizes the nasopharynx of 5 - 10% of adults who serve as the reservoir for the disease.

Meningococcal disease most often occurs in children younger than 5 years of age; the peak attack rate occurs in the 3 to 5 month old age group. While primarily a disease of young children, meningococcal disease occurs

- Commonly in children and young adults
- In males more than females
- More commonly among newly aggregated adults under crowded living conditions, such as in barracks, dormitories and institutions

An area of high incidence has existed for many years in sub-Saharan regions of mid-Africa, where the disease is usually caused by Group A organisms.
Groups B, C and Y cause the most disease in Canada.
Occurrence is worldwide.

### Clinical Presentation

Meningococcal meningitis is an acute bacterial disease, characterized by sudden onset with fever, intense headache, nausea and often vomiting, stiff neck and photophobia (light sensitivity). A petechial rash with pink macules or, very rarely, vesicles may be observed. Organisms other than *Neisseria meningitidis* can cause similar rashes. Delirium and coma are common; occasionally fulminating cases exhibit sudden prostration (extreme weakness), ecymoses (multiple small bruises) and shock at onset. Case-fatality rate is usually less than 15%. In fulminating meningococcemia, the death rate remains high despite prompt antibacterial treatment.

The gold standard of diagnosis is recovery of meningococci from a sterile site, primarily cerebrospinal fluid (CSF) or blood. However, the sensitivity of culture, especially in persons who have received antibiotics, is low.

Vaccines containing groups A, C, Y and W-135 meningococcal polysaccharides are available. Polysaccharide vaccines against serogroups A and C are safe and effective in adults and children over 2, but do not elicit long term protection, particularly in children under 5. Meningococcal polysaccharide vaccines are effective for outbreak control and for prevention among high-risk groups, such as travelers to countries where disease is epidemic. As these vaccines are often poorly immunogenic (ability to create antibody) in young children and have limited duration of efficacy, they are not generally used in routine childhood immunization programs.

Meningococcal conjugate vaccines, unlike the polysaccharide vaccines, are effective in infants, children and teenagers. They decrease nasopharyngeal carriage of the bacteria, induce herd immunity and are included in routine childhood immunization programs.

There is no vaccine for serotype B as it is poorly immunogenic.

**Incubation**

Incubation varies from two to 10 days, usually three to four days.

**Transmission**

Transmission occurs through droplet spread and direct contact with nasal or throat secretions of infected or colonized persons. The period of communicability persists until 24 hours of effective antibiotic therapy.

**Infection Prevention and Control Practices**

Implement Droplet Precautions immediately for a resident with meningococcal meningitis. Refer to the Management of Communicable Disease in Personal Care Homes Table for specific disease/microorganism information. Refer to Droplet Precautions in the Additional Precautions section 5.

**Occupational Health**

Definition of Occupational Exposure

A healthcare worker who has had direct contact of their oral mucous membranes with oral or nasopharyngeal secretions of an infectious person

during the period of communicability (7 days before onset of illness and up to 24 hours after the start of effective therapy)

A Healthcare Worker Exposed to Meningococcus

- Exposed healthcare worker shall be referred for clinical management, which may include chemoprophylaxis within 10 days after the most recent exposure
- Exposed healthcare workers shall be referred to Occupational Health/designate for follow-up
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with Meningococcus

- Physician confirmed diagnosis
- Inform Infection Prevention and Control immediately if suspected or confirmed case
- Healthcare workers shall be referred to Occupational Health/designate for clinical management
- Healthcare worker shall be excluded from work until 24 hours after the start of effective therapy

# Pneumococcal Meningitis

## Cause/Epidemiology

*Streptococcus pneumoniae* is a gram-positive diplococcus shaped bacteria found in the upper respiratory tract of healthy persons. Carriage (colonization) is more common in children than adults.

Pneumococcal meningitis is of greater frequency and/or increased severity in the following groups

- Anatomical asplenia (or splenectomy)
- Functional asplenia (e.g., sickle cell disease)
- Extremes of age (less than 2 or 64 years and older)
- Children less than 2 years of age in daycare
- Chronic medical conditions: cardiovascular disease (congestive heart failure, cardiomyopathy)
- Children 2 months to 3 years; in developing countries infants are a highest risk

The elderly, and adults who are immunocompromised or have certain chronic illness, are also at higher risk. Receipt of cochlear implant and basilar fracture causing persistent communication with the nasopharynx are predisposing factors.

## Clinical Presentation

Pneumococcal meningitis has a high case-fatality rate. It can be fulminant and occurs with bacteraemia but not necessarily with any other focus, although there may be otitis media (ear infection) or mastoiditis (infection that spreads from the ear to the mastoid bone of the skull), basilar skull fracture, or pneumonia. *Streptococcus pneumoniae* can also invade the bloodstream directly from the nasopharynx or by aspiration causing pneumonia followed by bloodstream invasion. Onset is usually sudden with high fever, lethargy or coma and signs of meningeal irritation. Diagnosis may be by isolation of organisms from blood or cerebrospinal fluid (CSF).

Pneumococcal conjugate vaccine is recommended for all children under 2 years of those 2-4 years of age and older and those with certain high-risk conditions, such as sickle cell disease, asplenia, heart or lung disease, or cochlear implantation. The vaccine covers the 7 serotypes most often causing pneumococcal meningitis in industrialized countries.

Pneumococcal polysaccharide vaccine containing 23 of the most common serotypes is recommended for use in persons 65 and older and those 2-64 with immunocomprimising conditions or certain chronic illnesses.

## Incubation

Unknown, probably short 1-4 days.

## Transmission

Transmission is through droplet spread and/or direct and indirect contact with nasal or throat secretions. Person- to-person transmission of the organisms is common, but illness among casual contacts and attendants is infrequent.

## Infection Prevention and Control Practices

Follow Routine Practices for caring for a resident with Pneumococcal meningitis.

Refer to the Routine Practices section 4 and/or the Routine Practices policy # 90.00.060 for specific information.

## Occupational Health

Definition of Occupational Exposure
A healthcare worker who has had direct contact by droplet spread to the mucous membranes of the mouth or indirect contact through articles freshly soiled with respiratory secretions.
Person to person transmissions of the organism is common. Illness among casual contacts and attendants is infrequent.
Pneumococcal meningitis is of greater frequency and/or increased severity if a cerebral spinal fluid (CSF) leak exists.

A Healthcare Worker Exposed to Pneumococcal Meningitis
- Exposed healthcare workers shall be referred to Occupational Health/designate for follow up
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with Pneumococcal Meningitis
- Physician confirmed diagnosis
- Treatment will render persons with susceptible strains non-infectious within 24 to 48 hours. In institutional outbreaks, immunization with the 23-valent vaccine should be carried out unless it is known the type of illness causing disease is not included in the vaccine
- Healthcare workers must stay off work for 24-48 hours post treatment

- Inform Infection Prevention and Control immediately if suspected or confirmed case
- Healthcare workers shall be referred to Occupational Health/designate for clinical management
- Person-to-person contact should be minimized by reducing situations of over crowding and increasing ventilation

# Viral Meningitis

## Cause/Epidemiology

Numerous viruses can cause this syndrome, but half or more of cases have no demonstrable etiology (known cause). In Canada, enteroviruses cause most cases of known etiology, particularly coxsackievirus and echovirus. Meningitis due to enteroviruses can also cause concurrent gastroenteritis. In addition, arboviruses, measles, herpes simplex and Varicella viruses, adenovirus and others are responsible for sporadic cases. Viruses are one cause of 'aseptic meningitis'.

## Clinical Presentation

Viral meningitis/encephalitis is a relatively common but rarely serious syndrome with multiple viral etiologies. It usually appears as a sudden onset of fever, with headache, and other signs and symptoms of meningeal involvement and abnormal cerebrospinal fluid (CSF) findings. A rash resembling rubella characterizes certain types of viral meningitis caused by echoviruses and coxsackie viruses; vesicular and petechial rashes may also occur. Active illness seldom exceeds 10 days. Recovery is usually complete. Gastrointestinal and respiratory symptoms may be associated with infection with enteroviruses.

Various diseases caused by non-viral agents may mimic aseptic meningitis such as inadequately treated pyogenic (fever inducing) meningitis, tuberculosis and cryptococcal meningitis, and post-vaccine reactions including sequelae to measles, mumps, varicella and post-rabies immunization.

## Incubation

Incubation depends on the specific virus, but for enteroviruses, often three to five days.

## Transmission

Transmission depends on the specific virus. Generally respiratory fluids and stool are infectious during the acute stage of infection, although stool may contain virus for several weeks.

## Infection Prevention and Control Practices

Follow Routine Practices for any resident over 6 years of age with viral diarrhea, unless he/she is incontinent and feces cannot be contained, or who contaminate the environment.

Refer to the Routine Practices section 4 and/or the Routine Practices policy # 90.00.060 for specific information.

Implement Contact Precautions for a child under 6 years old or for an adult resident who has incontinence and feces cannot be contained, or for adults who contaminate the environment. Refer to the Management of Communicable Diseases in Personal Care Homes Table for specific disease/microorganism information. Refer to Contact Precautions in the Additional Precautions section 5.

**Occupational Health**

Definition of Occupational Exposure

A healthcare worker who has had direct contact with nasal and throat discharges, respiratory secretions, and in some cases, the feces of infected persons, as well as through droplet spread and insects such as mosquitoes.

A Healthcare Worker Exposed to Viral Meningitis

- Exposed healthcare workers shall be referred to Occupational Health/designate for follow up
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with Viral Meningitis

- Physician confirmed diagnosis
- No specific medicines or antibiotics are used to treat viral meningitis
- Inform Infection Prevention and Control immediately if suspected or confirmed case
- Healthcare workers shall be referred to Occupational Health/designate for clinical management
- Person-to-person contact should be minimized by reducing the situations of over-crowding and by increasing ventilation