

## 7.4 Ebola Virus Disease

### Etiology

Ebola virus disease (EVD) formerly known as Ebola hemorrhagic fever, is a severe, often fatal illness in humans and nonhuman primates (such as monkeys, gorillas, and chimpanzees). EVD is caused by infection with a virus of the family *Filoviridae*, genus *Ebolavirus*. When infection occurs, symptoms usually begin abruptly. The first *Ebolavirus* species was discovered in 1976 in what is now the Democratic Republic of the Congo near the Ebola River. Since then, outbreaks have appeared sporadically in Africa. There have been no cases reported in North America.

### Case definition

#### Confirmed

A confirmed case can only be done through laboratory testing at the National Microbiology Laboratory.

#### Probable

A probable case is defined as one with clinical evidence of illness and a history within the three weeks before onset of fever with one of the following:

- Travel in a specific area of a country where an outbreak of EVD has recently occurred
- Contact with a suspect, probable or confirmed case of EVD
- Direct contact with blood or other body fluid secretions or excretions of a person or animal with a confirmed or probable case of EVD
- Work in a laboratory or animal facility that handles haemorrhagic fever viruses

### Clinical Presentation

Clinical symptoms of EVD include severe acute viral illness consisting of sudden onset of fever, malaise, myalgia, headache, conjunctival infection, pharyngitis, vomiting, diarrhea that can be bloody, and impaired kidney and/or liver function.

It is often accompanied by a maculopapular or petechial rash that may progress to purpura. Bleeding from the gums, nose, injection sites and gastrointestinal tract occurs in about 50% of patients. Dehydration and significant wasting occur as the disease progresses.

In severe cases, the haemorrhagic diathesis may be accompanied by leucopenia; thrombocytopenia; hepatic, renal and central nervous system involvement; or shock with multi-organ dysfunction.

Some people who get infected with the Ebola virus are able to recover, although, according to the World Health Organization, up to 90% of those infected with EVD will die.

## Diagnosis

EVD is diagnosed based on travel history, symptoms and laboratory testing. Other diseases that should be ruled out before a diagnosis of EVD can be made and include: malaria, typhoid fever, shigellosis, cholera, leptospirosis, plague, rickettsiosis, relapsing fever, meningitis, hepatitis and other viral haemorrhagic fevers.<sup>1</sup>

The Public Health Agency of Canada's (PHAC) National Microbiology Laboratory (NML) will provide direction to the Public Health Laboratory on the testing requirements for EVD.

The Public Health Laboratory (PHL) should be notified of any suspected cases of EVD. The following specimens must be collected and sent to the PHL as soon as possible:

- Blood – Ebola PCR – one full tube whole blood EDTA
- Blood – Ebola Serology – one full tube SST
- Travel history and clinical history must be on the requisition

## Epidemiology

### Occurrence

Typically EVD appears in sporadic outbreaks, but it is likely that sporadic isolated cases occur as well<sup>2</sup>. Since 1976, The World Health Organization (WHO) has reported a total of 2,387 cases including 1,590 associated deaths<sup>3</sup>. Worldwide, cases have been confirmed in the Democratic Republic of the Congo, Gabon, South Sudan, Ivory Coast, Uganda, Republic of the Congo, South Africa, Guinea, and Liberia<sup>4</sup>. A total of 11 EVD outbreaks have occurred since the year 2000<sup>3</sup>. During outbreaks healthcare workers as well as the family and friends of infected individuals were at highest risk. No case of the

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<sup>1</sup> World Health Organization. Ebola Virus Disease.

<sup>2</sup> Centers for Disease Prevention and Control (CDC). (2010) Ebola Hemorrhagic Fever Information Packet.

<sup>3</sup> Canadian Public Health Agency of Canada. (2014). Ebola virus disease-Surveillance.

<sup>4</sup> Ibid.

disease in humans has ever been reported in Canada. EVD has been a national notifiable disease in Canada since the year 2000.

**Reservoir**

In Africa, fruit bats are considered a possible natural host for EVD. Although non-human primates have been a source of infection for humans, they are not thought to be the reservoir but rather an accidental host like human beings. In Africa, infection has been documented through the handling of infected chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead or in the rainforest.

**Transmission**

EVD is introduced into the human population through close contact with the blood, secretions, organs or other body fluids of infected animals. EVD then spreads in the community through human-to-human transmission, with infection resulting from direct contact (through broken skin or mucous membranes) with the blood, respiratory secretions, and other body fluids of infected people, and indirect contact with environments contaminated with such fluids.

Burial ceremonies in which mourners have direct contact with the body of the deceased person can also play a role in the transmission of EVD. Men who have recovered from the disease can still transmit the virus through their semen for up to 7 weeks after recovery from illness.

Health-care workers have frequently been infected while treating patients with suspected or confirmed EVD. This occurred through close contact with patients when infection control precautions were not strictly practiced.

**Incubation Period**

Symptoms can begin 2 to 21 days after exposure, although 8 to 10 days is most common.

**Communicability**

Risk during the incubation period is considered low. Infectivity increases with the stages of illness and remains infectious as long as the blood and secretions contain the virus. Risk is highest during the later stage of the illness when the patient is vomiting, having diarrhea or hemorrhaging and during the preparation of the body for burial.<sup>5</sup>

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<sup>5</sup> Heymann, D. (2008). Ebola-Marburg Viral.

## Control Measures

### Management of Case

Hands must be washed according to the four moments.<sup>6</sup> The four moments are:

- Before initial patient/patient environment contact
- Before aseptic procedure
- After body fluid exposure
- After contact with the patient and the patient's environment

Contact and Droplet Precautions are required for the care of a patient with EVD. Airborne Precautions are required for aerosol-generating medical procedures (AGMPs).<sup>7</sup>

Strategies to reduce aerosol generation should also be implemented when aerosol-generating medical procedures are necessary on patients with EVD and include:

- Aerosol-generating medical procedures should be limited to those that are medically necessary
- Aerosol-generating medical procedures should be anticipated and planned for
- Appropriate patient sedation should be used
- The number of personnel in the room should be limited to those required to perform the aerosol-generating medical procedure
- Aerosol-generating medical procedures should be performed in airborne infection isolation rooms whenever feasible
- Appropriate ventilation (e.g., level of air filtration and direction of air flow) should be maintained
- Single rooms (with the door closed and away from high-risk patients), should be used in settings where airborne infection isolation rooms are unavailable
- Respirators should be worn by all personnel in the room during the procedure

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<sup>6</sup> Public Health Agency of Canada. Hand Hygiene Practices in Healthcare Settings.

<sup>7</sup> Public Health Agency of Canada. Routine Practices and Additional Precautions.

- Closed endotracheal suction systems should be used wherever possible

**Investigation**

- Obtain a travel history
- Rule out other diseases (listed under diagnosis)

**Treatment**

There is no effective antiviral treatment for EVD infections. Treatment is supportive, and is directed at maintaining renal function and electrolyte balance, and at combatting hemorrhage and shock.

**Immunization**

There is no vaccine available.

**Exclusion**

Precautions should remain in place until symptoms resolve.

**Management of Contacts**

Contact tracing must begin immediately after identification of a confirmed or probable case.

**Exclusion**

A contact of a probable or confirmed case with symptoms must be followed as a possible case until EVD is ruled out.

**Management of Outbreaks**

An outbreak management team should be established to address infection prevention and control measures.

**Education and Preventive Measures**

Health professionals in Canada are advised to be vigilant for the recognition, reporting and prompt investigation of patients with symptoms of EVD and other similar diseases that can cause viral haemorrhagic fevers. Other preventative measures include:

- Avoid contact with any medical equipment, such as needles, contaminated with blood or bodily fluids
- Avoid direct contact with blood, saliva, vomit, urine and other bodily fluids of people with EVD or unknown illnesses
- Avoid direct contact with bodies of people who died of EVD or unknown illnesses
- Practice strict infection control measures

- This includes isolating infected individuals and using personal protective equipment (gowns, masks, goggles and gloves)
- Properly use and disinfect instruments and equipment used to treat or care for patients
- Avoid close contact with wild animals and avoid handling wild meat
  - Avoid potential carriers, both live and dead, since both can spread the virus; potential carriers of the virus include:
- Chimpanzees, gorillas, monkeys, forest antelope, pigs porcupines and fruit bats
- Know the symptoms of EVD virus disease and see a health care provider if concerned
  - Seek medical attention immediately if a fever and any other symptoms arise during or after travel to an affected region
  - Inform the health care provider that travel occurred to a region where EVD was present

## Reporting Requirements and Procedures

- The laboratory (hospital or public health laboratory) report case/s to the attending physician, the Chief Medical Officer of Health and the Medical Officers of Health (MOH)
- MOH office will notify, as required, local physicians, nurse practitioners, environmental health officers, community health nurses, communicable disease control nurses (CDCNs) and Infection control practitioners (ICP), in the particular region as required for follow-up and case investigation
- The CDCN in collaboration with the ICP (if necessary) will collect case details
- The CDCN will enter the case details into the electronic reporting system and utilize the Canadian Network of Public Health Intelligence (CNPHI) tool for alerts or outbreak summaries

## Provincial Disease Control

- Reports all suspect or probable cases of EVD immediately to the Public Health Agency of Canada through its 24-hour emergency line: 1-866-262-8433.

## References

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