



Report Immediately

Ebola Virus Disease (EVD)

Disease Plan

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Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ EBOLA VIRUS DISEASE CRITICAL CLINICIAN INFORMATION

Clinical Evidence
<p>Signs/Symptoms</p> <ul style="list-style-type: none"> • Fever • Chills • Malaise/Fatigue • Headache • Nausea/Vomiting • Diarrhea • Abdominal Pain • Maculopapular Rash • Uveitis • Hiccups, chest pain, or shortness of breath • Bleeding: blood in stool; petechiae; ecchymoses; and/or mucosal bleeding
<p>Period of Communicability</p> <ul style="list-style-type: none"> • EVD is considered communicable as long as the blood and secretions contain the virus. • Patients who survive continue to shed virus in blood and secretions for weeks to months (Table 1). Ebola Virus RNA has been detected in survivors up to 26 days (breastmilk), 30 days (urine), 40 days (sweat), 284 days (semen), and 10 months (CSF) after illness onset.
<p>Incubation Period</p> <ul style="list-style-type: none"> • 2–21 days, with an average of 8-10 days
<p>Mode of Transmission</p> <ul style="list-style-type: none"> • When an infection occurs in humans, the virus can be spread to others through direct contact (through broken skin or mucous membranes in, for example, the eyes, nose, or mouth) with: <ul style="list-style-type: none"> ○ blood or body fluids (including but not limited to urine, saliva, sweat, feces, vomit, breast milk, and semen) of a person who is sick with or has died from Ebola, ○ objects (like needles and syringes) that have been contaminated with body fluids from a person who is sick with Ebola or the body of a person who has died from Ebola, ○ infected fruit bats or primates (apes and monkeys), and ○ possibly from contact with semen from a man who has recovered from Ebola (for example, by having oral, vaginal, or anal sex).
Laboratory Testing
<p>Type of Lab Test</p> <ul style="list-style-type: none"> • PCR – virus is generally detectable 3-10 days after symptom onset.
<p>Type of Specimens</p> <ul style="list-style-type: none"> • Whole Blood • Specimen collection guidelines are outlined on page 6 of the disease plan
Treatment Recommendations
<p>Type of Treatment</p> <ul style="list-style-type: none"> • Supportive care
<p>Time Period to Treat</p> <ul style="list-style-type: none"> • As symptoms appear
<p>Prophylaxis</p> <ul style="list-style-type: none"> • None

Contact Management

Isolation of Case

- Standard, contact, and droplet precautions are recommended for management of hospitalized patients with known or suspected Ebola virus disease.
- Strict procedures for isolation of patients and their body fluids and excreta must be maintained.
- Institute immediate strict isolation in a private hospital room away from traffic patterns. Entry of nonessential staff and visitors should be restricted.
- It may be prudent to place the patient in a negative-pressure room when available, despite the lack of evidence for natural aerosol transmission between humans, because of the large amount of fluid losses and copious vomiting that may lead to temporary aerosolization of the virus.
- Access to the patient should be limited to a small number of designated staff and family members with specific instructions and training on filovirus infection control and on the use of personal protective equipment. Current guidance from the CDC on personal protective equipment can be found on the CDC website (www.cdc.gov/vhf/ebola/hcp/index.html).

Infection Control Procedures

- See [Appendix A](#) for detailed infection control procedures.
- Utah specific guidelines for handling and packaging Ebola Virus Waste are available at http://health.utah.gov/epi/diseases/ebola/waste_mgmt.pdf.

✓ **WHY IS EBOLA VIRUS DISEASE (EVD) IMPORTANT TO PUBLIC HEALTH?**

Ebola virus disease (EVD) is a rare and deadly viral illness caused by infection with one of the Ebola virus species. In 2014, the World Health Organization (WHO) declared the Ebola outbreak in West Africa a public health emergency of international concern, noting that all nations “should be prepared to detect, investigate, and manage Ebola cases.” The WHO moved to accelerate global coordinated efforts already underway to test, validate, refine and enhance EVD surveillance systems, response plans and operational readiness to address this potential public health threat. While the potential for an EVD outbreak in Utah is low, the basic principles of management of potential EVD cases are essential competencies for all public health and medical practitioners in Utah.

Since 2014, Utah’s local health departments (LHDs), medical facilities, emergency medical services (EMS) and many other partners have worked to enhance preparedness and response capacity for Ebola in the state.

✓ **DISEASE AND EPIDEMIOLOGY**

Clinical Description

Patients with EVD typically have an abrupt onset of symptoms 8 to 10 days after exposure (range 2-21 days). Most cases of Ebola virus disease begin with the abrupt onset of fever and chills, but low-grade fever and malaise may also precede the development of more severe symptoms. Common signs and symptoms include fever, fatigue, headache, vomiting, diarrhea, and loss of appetite. Reports have also described weakness and myalgias in patients infected with EVD.

A diffuse erythematous, nonpruritic maculopapular rash may develop by day five to seven of illness. The rash usually involves the face, neck, trunk, and arms, and can desquamate.

Gastrointestinal signs and symptoms are common, and usually develop within the first few days of illness. These include watery diarrhea, nausea, vomiting, and abdominal pain.

Case data indicates that many patients develop some degree of bleeding during their illness, most commonly manifested as blood in the stool, petechiae, ecchymoses, oozing from venipuncture sites, and/or mucosal bleeding. In the 2014 outbreak, unexplained bleeding was reported in only 18% of patients. Clinically significant hemorrhage may be seen in the terminal phase of illness and in pregnancy.

Individuals can present with signs and symptoms of uveitis (e.g., blurred vision, photophobia, blindness) during the acute phase of illness. In addition, uveitis has been documented during convalescence.

Patients with EVD may also develop hiccups, chest pain, and/or shortness of breath. In addition, conjunctivitis and dark red discoloration of the soft palate are common physical findings.

Those who survive EVD typically begin to improve during the second week of illness. Fatal disease has been characterized by more severe clinical signs and symptoms early during infection with progression to multi-organ failure, septic shock, and death typically occurring in the second week.

The convalescent period of Ebola virus disease is prolonged and can persist for more than two years. Patients may present with weakness, fatigue, insomnia, headache, and failure to regain weight that was lost during illness. Other clinical manifestations include:

- Acute arthralgias, which may result from the formation of antigen-antibody complexes during recovery
- Retro-orbital pain, uveitis, and hearing loss
- Extensive sloughing of skin and hair loss, which may result from virus-induced necrosis of infected sweat glands and other dermal structures.

Causative Agent

Ebola is a filovirus that belongs to the family *Filoviridae*. Filoviruses are single-stranded, negative-sense RNA viruses. Four of the five species of virus in the *Ebolavirus* genus are associated with human disease: Ebola virus (Zaire ebolavirus); Sudan virus (Sudan ebolavirus); Taï Forest virus (Taï Forest ebolavirus, formerly Côte d'Ivoire ebolavirus); and Bundibugyo virus (Bundibugyo ebolavirus). The fifth, Reston virus (Reston ebolavirus), has caused disease in nonhuman primates, but not in humans. All of the known human pathogenic filoviruses are endemic only in sub-Saharan Africa.

Differential Diagnosis

When evaluating a patient for possible EVD, it is important to consider alternative and/or concurrent diagnoses, including infectious and non-infectious disorders. Following an incubation period of 2-21 days (typically 8-10), initial symptoms of EVD are usually systemic and compatible with influenza: fever, myalgias, headache, and sometimes sore throat. The differential diagnosis depends, in part, upon the individual's symptoms, where they have traveled or resided, if they have had close contact with someone who is ill, their vaccination history, and their age and comorbid conditions. Since most patients suspected of possible Ebola virus disease will have travelled to and/or reside in West or Central Africa, the following disorders should be considered:

- **Bacterial:** Typhoid, other enteric fevers, pyelonephritis, pneumonia, sepsis meningococcal disease, invasive streptococcal disease, and leptospirosis
- **Helminthic:** Acute schistosomiasis, Katayama syndrome
- **Protozoal:** Malaria, amebic liver abscess
- **Rickettsial:** Typhus, Q fever, tickborne rickettsioses
- **Viral:** Influenza and other upper respiratory infectious agents, Lassa fever, Marburg virus disease, mononucleosis, measles, Dengue fever, hepatitis A, and acute HIV infection.

Conjunctivitis, petechiae, and a maculopapular rash appear later and are more suggestive of an EVD. It should be noted that these symptoms do not occur until the second week of illness. At this point, a reasonable suspicion of EVD would exist in the presence of a compatible travel history, the absence of a history strongly suggestive of other illnesses, and at least one negative blood smear for malaria. Additionally, it should be noted that individuals with indigenous malaria immunity may have parasitemia but may be symptomatic for other reasons, including Ebola. The additional signs of hemorrhage and shock are strongly suggestive of EVD.

Laboratory Identification

Laboratory diagnosis of Ebola virus infection is made by the detection of viral antigens or RNA in blood or other body fluids like CSF, urine and semen. This can be done using immunoassays or nucleic acid testing.

RT-PCR tests that detect specific RNA sequences have become the standard method of diagnosing Ebola virus disease. Viral RNA is generally detectable in serum by RT-PCR within three days after the onset of symptoms. These tests can be performed for individuals who meet the Centers for Disease Control and Prevention's (CDC) definition of persons under investigation for Ebola (PUIs). For Utah-specific guidance on management of PUIs see http://health.utah.gov/epi/diseases/ebola/Utah_Ebola_PUI_manage.pdf. CDC recommends that Ebola testing be conducted only for persons who meet the [criteria for PUIs](#) and have compatible clinical symptoms that meet clinical and epidemiologic criteria for testing suspect specimens.

Confirmatory testing of EVD should be handled by the CDC. These tests are typically done in a laboratory with higher biosafety level containment. The Utah Public Health Laboratory (UPHL) can arrange for shipping of specimens safely to the CDC. [Click here](#) for instructions. Viremia peaks one week after onset of symptoms, with IgM developing 10 days post onset and IgG developing shortly thereafter.

Specimen Collection/Submission

UDOH Bureau of Epidemiology must be consulted regarding patients suspected of having EVD before any specimens are collected. Specimen collection and transport must be done in a manner to avoid exposure to healthcare workers and others; detailed instructions on how to do this will be available from the UDOH on-call epidemiologist. UPHL can conduct presumptive testing for EVD using the Ebola Zaire Target 1 real-time reverse transcription polymerase chain reaction assay (EZ1 PCR assay). This test is for the presumptive detection of Ebola Zaire virus on specified instruments using whole blood from individuals who meet CDC's definition of persons under investigation for Ebola (PUIs). Report suspect cases to public health (UDOH or LHD) immediately.

Specimens should be taken as soon as possible after a symptomatic patient reports to a healthcare facility and is suspected of having an Ebola exposure. If the first test is negative, a second test should be performed at 72 hours after the onset of symptoms to rule out Ebola. All positive EZ1 assay results must be confirmed by the CDC.

Standard submission of blood to UPHL and CDC for PCR includes collecting two (2) samples of at least 4 mL of whole blood in EDTA blood tubes (lavender/purple top) in accordance to the procedure outlined in the document, "[Submitting Samples to UPHL for Ebola Virus Disease \(EVD\) Testing.](#)"

Specimens collected for EVD testing should be packaged and shipped without attempting to open collection tubes or aliquot specimens. Specimens for shipment should be packaged following the basic triple packaging system which consists of a primary receptacle (a sealable specimen bag) wrapped with absorbent material, secondary receptacle (watertight, leak-proof), and an outer shipping package.

Treatment

There are no Food and Drug Administration (FDA)-approved vaccines or therapeutics available for prevention, postexposure, or treatment for EVD. Clinical management of EVD should focus on supportive care of complications, such as hypovolemia, electrolyte abnormalities, hematologic abnormalities, refractory shock, hypoxia, hemorrhage, septic shock, multiorgan failure, and DIC.

Symptoms of Ebola and complications are treated as they appear. Whenever possible, patients with Ebola virus disease should receive care in designated treatment centers and by clinicians trained to care for such patients. The following basic support interventions, when used early, can significantly improve the chances of survival:

- Providing intravenous fluids and balancing electrolytes (body salts)
- Providing respiratory support through the use of mechanical ventilation (intubation) for patients with progressive respiratory failure
- Using antipyretic agents to decrease fever associated with EVD
- Using antiemetic medications to control nausea and vomiting
- Using anti-motility agents to control diarrhea, and decrease fluid and electrolyte losses
- Evaluating and treating other infections if they occur.

Several experimental therapies for Ebola have been developed, but have not yet been fully tested for safety or effectiveness. Several investigational vaccines for prevention of Ebola virus infection are in development and are currently being evaluated. Several investigational drugs as well as plasma from recovered Ebola patients have been used to treat patients with Ebola during the current outbreak, but no controlled clinical trials have been conducted to date.

Case Fatality

Mortality rates following development of clinical disease range from 50-90% for EVD. Death usually occurs between 9-10 days after onset of symptoms. If a case lives until day 14, the chance of survival and full recovery increases dramatically.

Reservoir

The natural reservoir host of Ebola viruses remains unknown. However, on the basis of available evidence and the nature of similar viruses, researchers believe that the virus is zoonotic (animal-borne), with bats being the most likely reservoir. Other mammals that can be affected include non-human primates and a small antelope species found in Africa. Once Ebola is established in human populations, person-to-person spread may occur.

Transmission

Epidemics of Ebola virus disease are generally thought to begin when an individual becomes infected through contact with the meat or body fluids of an infected animal like a bat or non-human primate. Once a human has acquired infection with Ebola, transmission may occur from person-to-person through direct contact when that individual becomes symptomatic. Direct physical contact with infectious blood or secretions is thought to be required for transmission. Individuals can become infected through contact with infectious blood or with secretions (such as urine, vomitus, pus, stool (feces), semen, saliva, breast milk, and sweat) from a person who has developed signs or symptoms of illness, or from infected animals. The virus in blood and body fluids can enter another person's

body through broken skin or unprotected mucous membranes in, for example, the eyes, nose, or mouth. Individuals have acquired Ebola through sexual contact. Transmission has also occurred through improper handling of a deceased person with Ebola virus.

Transmission to healthcare workers may occur when appropriate personal protective equipment (PPE) is not available or is not properly used. Bedding or other objects may serve as a source of transmission. Exposure to objects (such as needles) that have been contaminated with infected secretions is another method of transmission. Because of the high case-fatality rate of Ebola, healthcare workers and others caring for patients need special training on how to properly don and doff PPE, manage spills, dispose of waste, and safely deal with the body of a deceased individual.

Ebola virus may be transmitted through contact with contaminated surfaces and objects. The CDC indicates that virus on surfaces may remain infectious from hours to days. There are no reliable data to confirm transmission through exposure to contaminated surfaces, but it is clear that the potential risk can be greatly reduced or eliminated by proper environmental cleaning. Medical equipment that has not been properly cleaned or sterilized has been responsible for the spread of Ebola, and rarely, Ebola has been acquired by laboratory workers while manipulating specimens. Ebola virus can be killed with certain antimicrobial disinfectants, and the Environmental Protection Agency (EPA) has a list of such products that can be used in healthcare settings, institutional settings (schools, office buildings), and residential settings (<https://www.epa.gov/pesticide-registration/list-l-disinfectants-use-against-ebola-virus>).

Human infection with Ebola virus can occur through contact with wild animals (e.g., hunting, butchering, and preparing meat from infected animals) in endemic areas of Africa. There is potential for exposure when entering caves in endemic areas that are highly infested with bats. Only a few species of mammals (for example, humans, monkeys, and apes) have shown the ability to become infected with and spread Ebola virus.

Susceptibility

Anyone not previously infected is susceptible; infection usually confers immunity in survivors.

Incubation Period

The incubation period for EVD ranges from 2-21 days, with an average of 8-10 days.

Period of Communicability

EVD is considered communicable as long as the blood and secretions contain the virus. Patients who survive continue to shed virus in blood and secretions for weeks to months (Appendix B). Infectious Ebola Virus and Ebola Virus RNA has been isolated from seminal fluid up to 82 days and 565 days post clinical disease onset, respectively. Patients should abstain from sexual intercourse for at least three months after infection. After that, contact with semen from male survivors should be avoided until diagnostic RT-PCR for presence of Ebola virus RNA in the semen is negative.

Contaminated bedding and medical equipment may remain infectious for several days.

The virus may remain viable for a variable duration post-mortem, permitting transmission from recently deceased patients.

Epidemiology

The first Ebola virus was discovered in 1976 near the Ebola River in what is now the Democratic Republic of the Congo. Since then, outbreaks have appeared sporadically in Africa. In May 1995, Ebola came to worldwide attention with an outbreak of Ebola virus near the city of Kikwit, Zaire. In 2014, the largest outbreak ever of Ebola occurred. This outbreak was widespread in Guinea, Liberia, and Sierra Leone, which had combined 28,652 cases of suspected, probable, and confirmed EVD resulting in 11,325 deaths (39.5%). Other countries that have had Ebola cases linked to this outbreak include Mali, Nigeria, Senegal, Spain and the United States.

Ebola viruses are primarily found in Africa and a less severe serotype of EVD has been found in the Philippines. The vector is unknown, but infected bats and primates are thought to provide a link for spread to humans. Once established in humans, person-to-person spread may occur through direct contact with blood or other body fluids of an infected person.

It appears that outbreaks of EVD often follow uncommonly dry periods, when rainfall resumes and reaches unusually high levels.

A person may become infected in an area where a virus occurs naturally, and could spread the disease elsewhere through traveling to another area before symptoms begin. Because international travel is now common, outbreaks of viral hemorrhagic fever like EVD are becoming threats in places where they have rarely, or never, been seen before.

PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Immediately notify the UDOH epidemiologist on call or the State Epidemiologist to discuss the situation and obtain authorization to transport a person under investigation for Ebola (PUI) to an Ebola assessment facility if this is deemed necessary. For further guidance, see UDOH website at http://health.utah.gov/epi/diseases/ebola/Utah_Ebola_PUI_manage.pdf.
- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.
- Identify potential sources of transmission that may exist in the U.S. (such as non-human primates [NHPs] or laboratory specimens).
- Identify sources of transmission and geographical areas of risk outside of the U.S.
- Stop transmission from such sources and geographical areas.
- Identify cases as early as possible to prevent transmission to other persons or animals.

- Identify cases and clusters of human illness that may be associated with a bioterrorism incident.

Prevention

General Preventive Measures

- Individuals should avoid traveling to areas with known outbreaks of EVD. If travel to such areas is unavoidable, then upon return, the individual should be assessed for exposure to Ebola and begun on active monitoring for symptoms if significant exposure was identified.
- Laboratory workers handling specimens suspected of containing Ebola virus must take appropriate biosafety precautions.
- Persons working with imported NHPs should know the signs of EVD in NHPs, and they should immediately report any cases of suspect or confirmed EVD in NHPs to the UDOH Bureau of Epidemiology.

Preventing Measures within a Healthcare Setting

Precautions are recommended for management of hospitalized patients with known or suspected EVD (See Appendix A). Note that this guidance outlines only those measures that are specific for EVD; additional infection control measures might be warranted if an EVD patient has other conditions or illnesses for which other measures are indicated (e.g., tuberculosis, multi-drug resistant organisms, etc.).

Though these recommendations (Appendix A) focus on the hospital setting, the recommendations for personal protective equipment (PPE) and environmental infection control measures are applicable to any healthcare setting. In this guidance healthcare personnel (HCP) refers to all persons, paid and unpaid, working in healthcare settings who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or aerosols generated during certain medical procedures and indirect patient care.

As information becomes available, these recommendations (Appendix A) will be re-evaluated and updated. Appendix A recommendations are based upon the following considerations:

- High rate of morbidity and mortality among infected patients
- Risk of human-to-human transmission
- Lack of FDA-approved vaccine and therapeutics.

For full details of infection prevention and control recommendations for hospitalized PUIs for Ebola virus disease see <http://www.cdc.gov/vhf/ebola/healthcare-us/hospitals/infection-control.html>.

For decontamination guidance outside of healthcare settings, please see <https://www.cdc.gov/vhf/ebola/prevention/cleaning-us-homes.html>. Utah specific guidelines for handling and packaging waste potentially contaminated by EVD are available at http://health.utah.gov/epi/diseases/ebola/waste_mgmt.pdf.

Information on symptoms of Ebola virus disease, or EVD, infection and modes of transmission, see the [CDC Ebola website](#).

Chemoprophylaxis

There is no known treatment for EVD; only supportive care may be implemented for cases.

Vaccine

No approved vaccines are available to prevent the spread of Ebola virus. However, as a result of the epidemic in West Africa, accelerated paths were developed for vaccine testing and introduction into field use. One promising vaccine is the rVSV-ZEBOV, which was studied in 2015 during the West Africa EVD outbreak. In a trial involving 11,841 people in Guinea, of the 5,837 people who received the vaccine, no Ebola cases were recorded 10 days or more after vaccination, as opposed to 23 cases among those who did not receive the vaccine.

Additional studies are ongoing to provide more data on the safety of the vaccine. In case of Ebola flare-ups prior to approval, access to the vaccine is being made available through a procedure called “compassionate use” that enables use of the vaccine after informed consent through Merck and WHO.

Isolation and Quarantine Requirements

Standard, contact, and droplet precautions are recommended for management of hospitalized patients with known or suspected Ebola virus disease. Strict procedures for isolation of patients and their body fluids and excreta must be maintained. Institute immediate strict isolation in a private hospital room away from traffic patterns. Entry of nonessential staff and visitors should be restricted. Although not required, it may be prudent to place the patient in a negative-pressure room when available, despite the lack of evidence for natural aerosol transmission between humans, because of the large amount of fluid losses and copious vomiting that may lead to temporary aerosolization of the virus. Access to the patient should be limited to a small number of designated staff and family members with specific instructions and training on filovirus infection control and on the use of personal protective equipment. Current guidance from the CDC on personal protective equipment can be found on the CDC website (www.cdc.gov/vhf/ebola/hcp/index.html).

CASE INVESTIGATION

Reporting

Report any illness to public health authorities that meets any of the following criteria:

1. A person for whom a diagnostic test specific for EVD has been ordered
2. A person with ALL of the following findings:
 - Elevated body temperature or subjective fever
 - One or more of the following clinical findings:
 - severe headache
 - muscle pain
 - chills
 - malaise
 - generalized myalgias and arthralgias

- abdominal pain
- anorexia
- nausea
- vomiting
- diarrhea
- unexplained bruising or bleeding
- Some patients have a rash (e.g., petechiae, purpura, ecchymoses), red eyes, hiccups, sore throat, chest pain, difficulty breathing, and difficulty swallowing.
- One or more of the following epidemiological risk factors:
 - Contact with blood or other body fluids of a patient with EVD within the past three weeks
 - Residence in—or travel within the past three weeks to—a EVD affected area
 - Work within the past three weeks in a laboratory that handles EVD specimens
 - Work within the past three weeks in a laboratory that handles bats, rodents, or primates from endemic areas
 - Exposure within the past three weeks to semen from a confirmed acute or convalescent EVD case within 10 weeks of the person’s onset of illness
 - Direct contact with a person with Ebola who has symptoms, or the person’s body fluids, while not wearing appropriate PPE
 - Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while not wearing appropriate PPE or without using standard biosafety precautions
 - Providing direct care to a person showing symptoms of Ebola in a household setting
 - Direct contact with a dead body while not wearing appropriate PPE
 - Contact with Ebola patients in a U.S. facility where another healthcare worker has been diagnosed with Ebola, or breaches in infection control practices have been identified.

Other recommended reporting procedures:

- All cases (suspected or confirmed) of EVD should be reported.
- Reporting should be on-going and routine.
- Reporting should be immediate.

Any suspect or confirmed case of EVD, or of any potential exposure to an agent which could cause EVD, must be reported to the UDOH Bureau of Epidemiology immediately at 1-888-EPI-UTAH.

Table 1. Criteria for Reporting a Case of Ebola Virus Disease to Public Health Authorities

Criterion	Reporting
<i>Clinical Evidence</i>	
Subjective fever or measured temperature $\geq 100.4^{\circ}\text{F}$	N
Severe headache	O
Chills	O
Malaise	O

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Generalized myalgias and arthralgias	O
Abdominal pain	O
Anorexia	O
Vomiting	O
Diarrhea	O
Unexplained hemorrhage (bleeding or bruising not related to injury)	O
Healthcare record contains a diagnosis of EVD	S
Death certificate lists EVD as a cause of death or a significant condition contributing to death	S
Laboratory Evidence	
Detection of EVD viral antigens in blood or tissues by ELISA	S*
EVD viral isolation in cell culture from blood or tissues	S*
Detection of EVD-specific genetic sequence by RT-PCR from blood or tissues	S*
Detection of EVD viral antigens in tissues by immunohistochemistry	S*
Detection of IgM or IgG in blood by ELISA	S*
Epidemiological Evidence	
Contact with blood or other body fluids of a patient with EVD within the past 3 weeks	O
Residence in—or travel within the past three weeks to—a EVD affected area	O
Work within the past 3 weeks in a laboratory that handles EVD specimens	O
Work within the past 3 weeks in a laboratory that handles bats, rodents, or primates from endemic areas	O
Exposure within the past 3 weeks to semen from a confirmed acute or convalescent EVD case within 10 weeks of the person's onset of illness	O
Direct contact with a person with Ebola who has symptoms, or the person's body fluids, while not wearing appropriate PPE	O
Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while not wearing appropriate PPE or without using standard biosafety precautions	O
Providing direct care to a person showing symptoms of Ebola in a household setting	O
Direct contact with a dead body while not wearing appropriate PPE	O
Contact with Ebola patients in a U.S. facility where another healthcare worker has been diagnosed with Ebola, or breaches in infection control practices have been identified	O

Notes:

S = This criterion alone is sufficient to report a case

N = All “N” criteria in the same column—in conjunction with at least one of any “O” criteria in each category (e.g., clinical presentation and laboratory findings) in the same column—are required to report a case. A number following an “N” indicates that this criterion is only required for a specific clinical presentation (see below).

O = At least one of any “O” criteria in each category (e.g., clinical presentation and epidemiologic evidence) —in conjunction with all other “N” criteria—is required to report a case.

* A requisition or order for any of the “S” or “N” laboratory tests is sufficient to meet the reporting criteria.

Case Definition

The CDC case definition for Ebola virus disease is included below. The criteria for laboratory and epidemiologic linkage are modified from a 2010 CSTE position statement regarding viral hemorrhagic fevers and from the CDC epidemiologic risk criteria for EVD:

Persons Under Investigation (PUI)

A person who has consistent signs or symptoms of EVD and risk factors as follows should be considered a PUI:

1. Elevated body temperature or subjective fever or symptoms, including severe headache, fatigue, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage; **AND**
2. An [epidemiologic risk](#) factor within the 21 days before the onset of symptoms.

Epidemiologic Risk Factors

The following CDC epidemiologic risk factors should be considered when evaluating a person for EVD, classifying contacts, or considering public health actions such as monitoring and movement restrictions based on exposure.

1. **High risk** includes any of the following:

In any country

- Percutaneous (e.g., needle stick) or mucous membrane exposure to blood or body fluids (including but not limited to feces, saliva, sweat, urine, vomit, and semen¹) from a person with Ebola who has symptoms
- Direct contact with a person with Ebola who has symptoms, or the person’s body fluids, while not wearing appropriate personal protective equipment (PPE)
- Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while not wearing appropriate PPE or without using standard biosafety precautions
- Providing direct care to a person showing symptoms of Ebola in a household setting.

In countries with widespread transmission or cases in urban settings with uncertain control measures

- Direct contact with a dead body while not wearing appropriate PPE.

2. **Some risk** includes any of the following:

In any country

- Being in close contact² with a person with Ebola who has symptoms while not wearing appropriate PPE (for example, in households, healthcare facilities, or community settings).

In countries with widespread transmission

- Direct contact with a person with Ebola who has symptoms, or the person's body fluids, while wearing appropriate PPE
- Being in the patient-care area of an Ebola treatment unit
- Providing any direct patient care in non-Ebola healthcare settings.

3. **Low (but not zero) risk** includes any of the following:

In any country

- Brief direct contact (such as shaking hands) with a person in the early stages of Ebola, while not wearing appropriate PPE. Early signs can include fever, fatigue, or headache
- Brief proximity with a person with Ebola who has symptoms (such as being in the same room, but not in close contact) while not wearing appropriate PPE
- Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while wearing appropriate PPE and using standard biosafety precautions
- Traveling on an airplane with a person with Ebola who has symptoms and having had no identified *some* or *high* risk exposures.

In countries with widespread transmission, cases in urban settings with uncertain control measures, or former widespread transmission and current, established control measures

- Having been in one of these countries and having had no known exposures.

In any country other than those with widespread transmission

- Direct contact with a person with Ebola who has symptoms, or the person's body fluids, while wearing appropriate PPE
- Being in the patient-care area of an Ebola treatment unit.

4. **No identifiable risk** includes any of the following:

- Laboratory processing of Ebola-containing specimens in a Biosafety Level 4 facility
- Any contact with a person who isn't showing symptoms of Ebola, even if the person had potential exposure to Ebola virus
- Contact with a person with Ebola before the person developed symptoms
- Any potential exposure to Ebola virus that occurred more than 21 days previously
- Having been in a country with Ebola cases, but without widespread transmission, cases in urban settings with uncertain control measures, or former widespread transmission and now established control measures, and not having had any other exposures
- Having stayed on or very close to an airplane or ship (for example, to inspect the outside of the ship or plane or to load or unload supplies) during the entire time that the airplane or ship was in a country with widespread transmission or a country with

cases in urban settings with uncertain control measures, and having had no direct contact with anyone from the community

- Having had laboratory-confirmed Ebola and subsequently been determined by public health authorities to no longer be infectious (e.g., Ebola survivors).

Confirmed Case

Laboratory-confirmed diagnostic evidence of Ebola virus infection.

Laboratory Criteria for Diagnosis

One or more of the following laboratory findings:

- Detection of Ebola viral antigens in blood by ELISA antigen detection
- Ebola viral isolation in cell culture for blood or tissues
- Detection of Ebola viral genes using reverse transcriptase with polymerase chain reaction amplification (RT-PCR) from blood or tissues
- Detection of Ebola viral antigens in tissues by immunohistochemistry.

Criteria for Epidemiologic Linkage

One or more of the following exposures within the three weeks before onset of symptoms:

- Contact with blood or other body fluids of a patient with EVD
- Residence in—or travel to—a EVD affected area
- Work in a laboratory that handles EVD specimens
- Work in a laboratory that handles bats, rodents, or primates from endemic areas
- Exposure to semen from a confirmed acute or convalescent EVD case within 10 weeks of the person’s onset of illness
- Direct contact with a person with Ebola who has symptoms, or the person’s body fluids, while not wearing appropriate PPE
- Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while not wearing appropriate PPE or without using standard biosafety precautions
- Providing direct care to a person showing symptoms of Ebola in a household setting
- Direct contact with a dead body while not wearing appropriate PPE
- Contact with Ebola patients in a U.S. facility where another healthcare worker has been diagnosed with Ebola, or breaches in infection control practices have been identified.

Case classification

Suspect: Case meets the clinical and epidemiologic linkage criteria.

Confirmed: Case meets the clinical and laboratory criteria.

Table 2. Criteria to determine whether a case is classified

Criterion	Confirmed	Suspected
Clinical Evidence		
Subjective fever or measured temperature $\geq 100.4^{\circ}\text{F}$	N	N
Severe headache	O	O
Chills	O	O
Malaise	O	O

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Generalized myalgias and arthralgias	<input type="radio"/>	<input type="radio"/>
Abdominal pain	<input type="radio"/>	<input type="radio"/>
Anorexia	<input type="radio"/>	<input type="radio"/>
Vomiting	<input type="radio"/>	<input type="radio"/>
Diarrhea	<input type="radio"/>	<input type="radio"/>
Unexplained hemorrhage (bleeding or bruising not related to injury)	<input type="radio"/>	<input type="radio"/>
Healthcare record contains a diagnosis of EVD	<input type="radio"/>	<input type="radio"/>
Death certificate lists EVD as a cause of death or a significant condition contributing to death	<input type="radio"/>	<input type="radio"/>
Laboratory Evidence		
Detection of EVD viral antigens in blood or tissues by ELISA	<input type="radio"/>	<input type="radio"/>
EVD viral isolation in cell culture from blood or tissues	<input type="radio"/>	<input type="radio"/>
Detection of EVD-specific genetic sequence by RT-PCR from blood or tissues	<input type="radio"/>	<input type="radio"/>
Detection of EVD viral antigens in tissues by immunohistochemistry	<input type="radio"/>	<input type="radio"/>
Detection of IgM or IgG in blood by ELISA	<input type="radio"/>	<input type="radio"/>
Epidemiological Evidence		
Contact with blood or other body fluids of a patient with EVD within the past 3 weeks	<input type="radio"/>	<input type="radio"/>
Residence in—or travel within the past 3 weeks to—a EVD affected area	<input type="radio"/>	<input type="radio"/>
Work within the past 3 weeks in a laboratory that handles EVD specimens	<input type="radio"/>	<input type="radio"/>
Work within the past 3 weeks in a laboratory that handles bats, rodents, or primates from endemic areas	<input type="radio"/>	<input type="radio"/>
Exposure within the past 3 weeks to semen from a confirmed acute or convalescent EVD case within 10 weeks of the person's onset of illness	<input type="radio"/>	<input type="radio"/>
Direct contact with a person with Ebola who has symptoms, or the person's body fluids, while not wearing appropriate PPE	<input type="radio"/>	<input type="radio"/>
Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while not wearing appropriate PPE or without using standard biosafety precautions	<input type="radio"/>	<input type="radio"/>
Providing direct care to a person showing symptoms of Ebola in a household setting	<input type="radio"/>	<input type="radio"/>

Direct contact with a dead body while not wearing appropriate PPE	O	O
Contact with Ebola patients in a U.S. facility where another healthcare worker has been diagnosed with Ebola, or breaches in infection control practices have been identified	O	O

Notes:

S = This criterion alone is sufficient to classify a case

N = All “N” criteria in the same column—in conjunction with at least one of any “O” criteria in each category (e.g., clinical presentation and laboratory findings) in the same column—are required to classify a case. A number following an “N” indicates that this criterion is only required for a specific clinical presentation (see below).

O = At least one of any “O” criteria in each category (e.g., clinical presentation and laboratory findings) in the same column—in conjunction with all other “N” criteria in the same column—is required to classify a case. A number following an “O” indicates that this criterion is only required for a specific clinical presentation (see below).

Case Investigation Process

1. Following immediate notification of the public health, the LHD and UDOH will coordinate investigating any case and gathering the following information:
 - The case’s name, age, address, phone number, status (e.g., hospitalized, at home, deceased), and parent/guardian information, if applicable
 - The name and phone number of the hospital where the case is or was hospitalized
 - The name and phone number of the attending physician
 - The name and phone number of the infection control official at the hospital
 - If the patient was seen by a healthcare provider before hospitalization or seen at more than one hospital, these names and phone numbers.
2. Please complete the Ebola form(s) in UT-NEDSS and include the following information:
 - Record the case’s demographic information.
 - Accurately record clinical information including “Ebola” as the disease being investigated, date of symptom onset, symptoms, whether hospitalized, and hospital and clinician contact information.
 - Include all available diagnostic laboratory test information that is available.
 - Record information relevant to prevention and control. Use the incubation period range for Ebola (2–21 days). Specifically, focus on the period beginning a minimum of two days prior to the case’s onset date, back to no more than 21 days before onset for travel history. Determine the date(s) and geographic area(s) of travel to identify where the patient may have become infected.
 - Include any additional comments regarding the case.
 - If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or healthcare provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.
3. Specimen Collection, Transport, Testing, and Submission for Patients with Suspected Infection with Ebola Virus Disease.

Monitoring and Management of Persons Under Investigation (PUI)

After initial notification, PUIs are to be evaluated in coordination by UDOH and the investigating jurisdiction using the criteria in the epidemiological risk section.

Active monitoring is recommended for people in the low (but not zero) risk category. In these instances, the local public health authority assumes responsibility for establishing regular communication with potentially exposed people, including daily checks to assess for the presence of symptoms and fever, rather than relying solely on individuals to self-monitor and report symptoms if they develop. LHDs will conduct active monitoring activities, and document them in UT-NEDSS.

Direct active monitoring is recommended for people in the high risk and some risk categories, and for some individuals in the low (but not zero) risk category. In these instances, the local public health authorities will directly observe the individual at least once daily to review symptom status and monitor temperature; a second follow-up per day may be conducted by telephone in lieu of a second direct observation. Direct active monitoring will include discussion of plans to work, travel, take public conveyances, or be present in congregate locations.

If symptoms develop in persons under active or direct monitoring, UDOH Management and Transport of Persons Under Investigation (PUIs) for Ebola Virus Disease (EVD) plan will be implemented. This plan can be found at:

http://health.utah.gov/epi/diseases/ebola/Utah_Ebola_PUI_manage.pdf. Full guidance on PUI monitoring can be found [here](#).

Public activity, travel, and quarantine restrictions are to be made on a case-by-case in compliance with applicable laws and regulations.

Outbreaks

One case of Ebola in Utah is considered an outbreak. A source of infection, such as travel to a geographical region where a known outbreak of Ebola is occurring, should be sought, and applicable preventive or control measures should be instituted.

Identifying Case Contacts

Identify all other potentially exposed case contracts through the [Ebola Contact Tracing Form](#).

Contacts should be evaluated as new potential PUI's and individual risk status should be assigned on the risk factors outlined in the "Epidemiological Risk Factors" section. Monitoring and quarantine should follow the procedures outlines for Ebola PUIs above.

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✓ **VERSION CONTROL**

Updated July 2017. Added Critical Clinician Information section. Updated Transmission section to include more information on personal protective equipment and disinfecting. Updated Period of Communicability to include more information about diagnostic testing on male semen. Updated Public Health Responsibility to include information on UDOH authorization for transporting a person under investigation. Updated Prevention under General Preventive Measures to include information regarding assessment/active monitoring for returning travelers. Updated Specimen Collection Submission to include information about exposure to healthcare workers during specimen collection and transport of EVD suspected patients.

Updated May 2016. Updated general format of document. Updated sections: Importance to Public Health, Clinical Manifestations, Differential Diagnosis, Laboratory Identification, Treatment, Transmission, Isolation and Quarantine, Reporting, Case Definition, Epidemiologic Risk Factors, References, UT-NEDSS Minimum/Required Fields, and Appendix.

✓ UT-NEDSS MINIMUM/REQUIRED FIELDS BY TAB

Demographic

- First Name
- Last Name
- Date of Birth
- County
- Birth Gender
- Race
- City
- Street Name
- Zip Code
- Ethnicity
- Area Code
- Phone Number
- Date first reported to public health

Clinical

- Disease
- Date Diagnosed
- Hospitalized
- Died
- Date of Death
- Onset Date
- Clinical Presentation:
 - Subjective fever or measured temperature $\geq 100.4^{\circ}\text{F}$
 - Severe headache
 - Chills
 - Malaise
 - Generalized myalgias or arthralgias
 - Abdominal pain
 - Anorexia
 - Vomiting
 - Diarrhea
 - Unexplained hemorrhage (bleeding or bruising not related to injury)

Laboratory

- Test Type
- Organism
- Result Value
- Test Result
- Lab Test Date
- Specimen sent to state lab
- Specimen source

Contacts

- Contact type
- Disposition

Epidemiological

- Occupation
- Imported from

Investigation

- Ebola Exposure Assessment*
 - Risk level
 - Monitoring method to be used
 - Public and travel restrictions to be imposed
 - Type of travel
 - What countries was the case in?
 - Purpose of case's travel
 - Citizenship status
 - Date of entry to the U.S.
 - Date of last possible exposure
 - Does the patient plan on traveling outside of Utah during monitoring period?
 - Detail location and dates of intended travel
- Ebola Case Form*
 - Contact with blood or other body fluids of a patient with EVD in the past 3 weeks
 - Residence in – or travel within the past 3 weeks – to a EVD affected area
 - Work within the past 3 weeks in a laboratory that handles EVD specimens
 - Work within the past 3 weeks in a laboratory that handles bats, rodents, or primates from endemic areas
 - Exposure within the past 3 weeks to semen from a confirmed acute or convalescent EVD case within 10 weeks of the person's onset of illness
 - Direct contact with a person with Ebola who has symptoms, or the person's body fluids, while not wearing appropriate PPE
 - Laboratory processing of blood or body fluids from a person with Ebola who has symptoms while not wearing appropriate PPE or without using standard biosafety precautions
 - Providing direct care to a person showing symptoms of Ebola in a household setting
 - Direct contact with a dead body while not wearing appropriate PPE
 - Contact with Ebola patients in a U.S. facility where another healthcare worker has been diagnosed with Ebola, or breaches in infection control practices have been identified
 - Are the symptoms appropriate for this disease?

Reporting

- Reporting agency name

Administrative

- LHD/State case status
- Event Name

✓ **APPENDIX A**

Key Components of Infection Prevention and Control Recommendations for Hospitalized Patients Under Investigation (PUIs) for Ebola Virus Disease (EVD) in U.S. Hospitals

Component	Recommendation	Comments
Patient Placement	<ul style="list-style-type: none"> • Single patient room (containing a private bathroom) with the door closed • Facilities should maintain a log of all people entering the patient's room 	<ul style="list-style-type: none"> • Consider posting personnel at the patient's door to ensure appropriate and consistent use of PPE by all people entering the patient room
Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> • Guidance on Personal Protective Equipment (PPE) To Be Used By Healthcare Workers during Management of Patients with Confirmed Ebola or Persons under Investigation (PUIs) for Ebola who are Clinically Unstable or Have Bleeding, Vomiting, or Diarrhea in U.S. Hospitals, Including Procedures for Donning and Doffing PPE 	
Patient Care Equipment	<ul style="list-style-type: none"> • Dedicated medical equipment (preferably disposable, when possible) should be used for the provision of patient care • All non-dedicated, non-disposable medical equipment used for patient care should be cleaned and disinfected according to manufacturer's instructions and hospital policies 	
Patient Care Considerations	<ul style="list-style-type: none"> • Limit the use of needles and other sharps as much as possible • Phlebotomy, procedures, and laboratory testing should be limited to the minimum necessary for essential diagnostic evaluation and medical care <p>All needles and sharps should be handled with extreme care and disposed in puncture-proof, sealed containers</p>	
Aerosol Generating Procedures	<ul style="list-style-type: none"> • Avoid Aerosol Generating Procedures (AGPs) for patients with EVD • If performing AGPs, use a combination of measures to 	<ul style="list-style-type: none"> • Although there are limited data available to definitively define a list of AGPs, procedures that are usually included are Bilevel Positive Airway

<p>(AGPs)</p>	<p>reduce exposures from AGPs when performed on patient with EVD</p> <ul style="list-style-type: none"> • Visitors should not be present during AGPs • Limiting the number of HCP present during the procedure to only those essential for patient care and support • Conduct the procedures in a private room and ideally in an Airborne Infection Isolation Room (AIIR) when feasible; room doors should be kept closed during the procedure except when entering or leaving the room, and entry and exit should be minimized during and shortly after the procedure • HCP should wear appropriate PPE during AGPs • Conduct environmental surface cleaning following procedures (see section below on environmental infection control) 	<p>Pressure (BiPAP), bronchoscopy, sputum induction, intubation and extubation, and open suctioning of airways</p> <ul style="list-style-type: none"> • Because of the potential risk to individuals reprocessing reusable respirators, disposable filtering face piece respirators are preferred
<p>Hand Hygiene</p>	<ul style="list-style-type: none"> • HCP should perform hand hygiene frequently, including before and after all patient contact, contact with potentially infectious material, and before putting on and upon removal of PPE, including gloves • Healthcare facilities should ensure that supplies for performing hand hygiene are available 	<ul style="list-style-type: none"> • Hand hygiene in healthcare settings can be performed by washing with soap and water or using alcohol-based hand rubs; if hands are visibly soiled, use soap and water, not alcohol-based hand rubs
<p>Environmental Infection Control</p>	<ul style="list-style-type: none"> • Hospital Guidance 	<ul style="list-style-type: none"> • Hospital Guidance
<p>Safe Injection Practices</p>	<ul style="list-style-type: none"> • Facilities should follow safe injection practices as specified under Standard Precautions 	<ul style="list-style-type: none"> • Any injection equipment or parenteral medication container that enters the patient treatment area should be dedicated to that patient and disposed of at the point of use
<p>Duration of Infection Control Precautions</p>	<ul style="list-style-type: none"> • Duration of precautions should be determined on a case-by-case basis, in conjunction with local, state, and federal health authorities 	<ul style="list-style-type: none"> • Factors that should be considered include, but are not limited to, presence of symptoms related to EVD, date symptoms resolved, other conditions that would require specific precautions (tuberculosis, <i>Clostridium difficile</i>) and available laboratory information

<p>Monitoring and Management of Potentially Exposed Personnel</p>	<ul style="list-style-type: none">• Facilities should develop policies for monitoring and management of potentially exposed HCP• Facilities should develop sick leave policies for HCP that are non-punitive, flexible and consistent with public health guidance:<ul style="list-style-type: none">○ Ensure that all HCP, including staff who are not directly employed by the healthcare facility but provide essential daily services, are aware of the sick leave policies• People with percutaneous or mucocutaneous exposures to blood, body fluids, secretions, or excretions from a PUI should:<ul style="list-style-type: none">○ Stop working and immediately wash the affected skin surfaces with soap and water; mucous membranes (conjunctiva) should be irrigated with copious amounts of water or eyewash solution○ Immediately contact occupational health/supervisor for assessment and access to postexposure management services for all appropriate pathogens (Human Immunodeficiency Virus, Hepatitis C, etc.)• HCP who develop sudden onset of fever, fatigue, intense weakness or muscle pains, vomiting, diarrhea, or any signs of hemorrhage should:<ul style="list-style-type: none">○ Not report to work or should immediately stop working○ Notify their supervisor○ Seek prompt medical evaluation and testing○ Notify local and state health departments○ Comply with work exclusion until they are deemed no longer infectious to others• Asymptomatic HCP who had an unprotected exposure (not wearing recommended PPE at the time of patient contact or through direct contact to blood or body fluids) to a patient with EVD:	
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	<ul style="list-style-type: none"> ○ Should receive medical evaluation and follow-up care including fever monitoring twice daily for 21 days after the last known exposure ○ Hospitals should consider policies ensuring twice daily contact with exposed personnel to discuss potential symptoms and document fever checks 	
<p><i>Monitoring, Management, and Training of Visitors</i></p>	<ul style="list-style-type: none"> • Avoid entry of visitors into the patient's room: <ul style="list-style-type: none"> ○ Exceptions may be considered on a case by case basis for those who are essential for the patient's wellbeing • Establish procedures for monitoring managing and training visitors • Visits should be scheduled and controlled to allow for: <ul style="list-style-type: none"> ○ Screening for EVD (fever and other symptoms) before entering or upon arrival to the hospital ○ Evaluating risk to the health of the visitor and ability to comply with precautions. ○ Providing instruction, before entry into the patient care area on hand hygiene, limiting surfaces touched, and use of PPE according to the current facility policy while in the patient's room ○ Visitor movement within the facility should be restricted to the patient care area and an immediately adjacent waiting area 	<ul style="list-style-type: none"> • Visitors who have been in contact with the patient with EVD before and during hospitalization are a possible source of EVD for other patients, visitors, and staff

✓ Appendix B

Longest time from illness onset that Ebola virus RNA or infectious virus was detected in clinical specimens after illness onset, days (CDC, 2016)

Anatomic compartment	Body fluid(s) or tissue(s)	Ebola virus RNA detected by RT-PCR or viral antigens detected by other assays	Infectious Ebola virus recovered
Eye	Aqueous humor	98 days by RT-PCR	98 days by virus isolation
	Conjunctivae	28 days by RT-PCR	
	Tears	6 days by RT-PCR	
Central nervous system	Cerebrospinal fluid	Approximately 10 months by RT-PCR	Approximately 10 months by virus isolation
Testes	Seminal fluid	284 days by RT-PCR	82 days by virus isolation
Breast	Breast milk	26 days by RT-PCR	15 days by virus isolation
Urinary tract	Urine	30 days by RT-PCR	26 days by virus isolation
Genito-urinary tract	Vagina	33 days by RT-PCR	No published data
Joints	Synovial fluid	No animal model data, very limited EVD patient data, unknown	
Gastrointestinal tract	Rectal swab	29 days by RT-PCR	
	Saliva	8 days by RT-PCR	
	Vomit	Unknown	8 days by virus culture
	Feces	25 days by RT-PCR	
Other	Sweat	40 days by RT-PCR	
	Skin	6 days by RT-PCR	
	Amniotic fluid	22 days by RT-PCR [20]; >38 days by RT-PCR (onset date not provided)	No published data
	Placenta	22 days by RT-PCR; >38 days by RT-PCR (onset date not provided)	
	Cord blood	>38 days by RT-PCR (onset date not provided)	