

Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

REPORTING INFORMATION

Class A: Report immediately via telephone the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located.

Reporting Form(s) and/or Mechanism:

- o Immediately via telephone.
- o For local health departments, cases should also be entered into the Ohio Disease Reporting System (ODRS) within 24 hours of the initial telephone report to the Ohio Department of Health (ODH).
- o The Centers for Disease Control and Prevention (CDC) MERS Patient under Investigation (PUI) Form is available for use to assist in local disease investigation. Information collected from the form should be entered into ODRS and sent to ODH.

AGENT

MERS-CoV is a novel virus, representative of a new yet-to-be established species of Coronaviridae in lineage C of the genus beta-coronavirus. Coronaviruses are a large, diverse group of viruses that affect many animal species. Genetic sequence data indicate that this new virus is similar to bat coronaviruses, but not similar to any other coronavirus previously described in humans, including the coronavirus that caused Severe Acute Respiratory Syndrome (SARS).

Case Definition

Patient under Investigation (PUI)

A person who has both clinical features and an epidemiologic risk should be considered a patient under investigation (PUI) based on one of the following scenarios:

- Fever¹ AND pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence) AND EITHER:
 - o History of travel from countries in or near the Arabian Peninsula² within 14 days before symptom onset, OR
 - o Close contact with a symptomatic traveler who developed fever and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula² OR
 - o A member of a cluster of patients with severe acute respiratory illness (e.g., fever¹ and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being evaluated, in consultation with state and local health departments.

OR

 - Fever¹ AND symptoms of respiratory illness (not necessarily pneumonia; e.g. cough, shortness of breath) AND being in a healthcare facility (as a patient, worker, or visitor) within 14 days before symptom onset in a country or territory in or near the Arabian Peninsula² in which recent healthcare-associated cases of MERS have been identified.
- ⁱOR

- Fever¹ OR symptoms of respiratory illness (not necessarily pneumonia; e.g. cough, shortness of breath) AND close contact with a confirmed MERS case while the case was ill.

The above criteria serve as guidance for testing; however, patients should be evaluated and their cases discussed with public health departments on a case-by-case basis if their clinical presentation or exposure history is equivocal (e.g., uncertain history of health care exposure).

Confirmed Case

A confirmed case is a person with laboratory confirmation of MERS-CoV infection. Confirmatory laboratory testing requires a positive PCR on at least two specific genomic targets or a single positive target with sequencing on a second.

Probable Case

A probable case is a PUI with absent or inconclusive laboratory results for MERS-CoV infection who is a close contact of a laboratory-confirmed MERS-CoV case. Examples of laboratory results that may be considered inconclusive include a positive test on a single PCR target, a positive test with an assay that has limited performance data available, or a negative test on an inadequate specimen.

Not a Case

At this time, a case may be excluded as MERS-CoV, if any of the following apply:

- Antibody to MERS-CoV is undetectable in a serum specimen obtained >28 days after onset of illness, OR
- The case was reported on the basis of contact with a person who was excluded subsequently as a case of MERS-CoV disease; then the reported case also is excluded, provided other epidemiologic or laboratory criteria are not present.

Laboratory Criteria for Diagnosis

Confirmatory laboratory testing requires a positive polymerase chain reaction (PCR) on at least two specific genomic targets or a single positive target with sequencing on a second. CDC has provided ODH Laboratory with the capacity needed to conduct testing for MERS-CoV using real-time reverse transcription-PCR assay. ODH Laboratory has the ability to test clinical respiratory, blood, and stool specimens.

Information about the current criteria for laboratory diagnosis of MERS-CoV is available at <http://www.cdc.gov/coronavirus/mers/case-def.html>.

If infection with MERS-CoV is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, please contact ODH.

The test is authorized for use with the following [clinical specimens](#): upper respiratory specimens, such as nasopharyngeal swabs (NPS) and oropharyngeal swabs (OPS); lower respiratory specimens, such as bronchoalveolar lavage (BAL), bronchial wash (BW), tracheal aspirate (TA), and sputum; serum; and stool. To increase the likelihood of detecting MERS Co-V, it is recommended to collect specimens from multiple sites. Consider lower respiratory tract, serum, and stool specimens a priority for collection and PCR testing. Specimens should

be collected with appropriate infection control precautions (<http://www.cdc.gov/coronavirus/mers/guidelines-lab-biosafety.html>), following CDC guidance for case investigation and specimen collection and according to the manufacturer's instructions for the specimen collection device. "NEGATIVE" test results will be reported through the CDC Laboratory Response Network (LRN) within 24 hours. When a "PRESUMPTIVE POSITIVE" or "EQUIVOCAL" test result is obtained, CDC must be contacted immediately as per the assay protocol, and the result must also be reported to the LRN within 6 hours. Confirmation of a "PRESUMPTIVE POSITIVE" result by CDC is required, however this should not delay the local investigation and response, including the contact investigation.

Case Classification

Confirmed: A confirmed case is a person with laboratory confirmation of MERS-CoV infection irrespective of clinical signs and symptoms. Confirmatory laboratory testing requires a positive PCR on at least two specific genomic targets or a single positive target with sequencing on a second. **Positive test results for another respiratory pathogen should not necessarily preclude testing for MERS-CoV.**

Probable: A probable case is a PUI with absent or inconclusive laboratory results for MERS-CoV infection who is a close contact² of a laboratory-confirmed MERS-CoV case. Examples of laboratory results that may be considered inconclusive include a positive test on a single PCR target, a positive test with an assay that has limited performance data available, or a negative test on an inadequate specimen. Close contact is defined as a) any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact; or b) any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill.

See also:

- CDC MERS-CoV laboratory specimen criteria:
<http://www.cdc.gov/coronavirus/mers/guidelines-clinical-specimens.html>
- CDC MERS-CoV Guidelines for Biosafety:
<http://www.cdc.gov/coronavirus/mers/guidelines-lab-biosafety.html>

SIGNS AND SYMPTOMS

A wide clinical spectrum of MERS-CoV infection has been reported ranging from asymptomatic infection to acute upper respiratory illness, and rapidly progressive pneumonitis, respiratory failure, septic shock and multi-organ failure resulting in death. In general, MERS-CoV begins with a high fever (>100.4°F [$>38.0^{\circ}\text{C}$]). Additionally, in some cases, diarrhea preceded respiratory symptoms. Other early symptoms have included headache, chills, myalgia, nausea/vomiting and diarrhea.

DIAGNOSIS

Patients who meet the criteria for a PUI should also be evaluated for common causes of community-acquired pneumonia (e.g. influenza A and B viruses, respiratory syncytial virus, *Streptococcus pneumoniae*, and *Legionella pneumophila*). This evaluation should be based on clinical presentation and epidemiologic and surveillance information.

Testing for MERS-CoV and other respiratory pathogens can be done simultaneously. Positive results for another respiratory pathogen should not necessarily preclude testing for MERS-CoV.

Clinicians should save any available clinical specimens (e.g. sputum, serum) for additional testing until a specific diagnosis is made. For additional laboratory specimen collection information please refer to:
<http://www.odh.ohio.gov/pdf/IDCM/mersspec.pdf>.

In the presence of person-to-person transmission of MERS-CoV anywhere in the world, healthcare providers should ask all people **hospitalized with chest x-ray-confirmed pneumonia** 3 key screening questions:

1. "Do you have a history of recent travel (within 14 days) to Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Palestinian territories, Qatar, Kingdom of Saudi Arabia (KSA), Syria, the United Arab Emirates (UAE), or Yemen; or close contact with ill persons with a history of travel to such areas?"
2. "Are you employed as a healthcare worker with direct patient contact or work in a laboratory where exposure to MERS-CoV is possible?"

If the answer to any of the 3 screening questions is "yes," healthcare providers will need to:

1. Institute standard contact and airborne precautions
2. Notify the local health department
3. Consider MERS-CoV testing

EPIDEMIOLGY

Source

First identified and reported to cause severe acute respiratory illness in September 2012, MERS-CoV has caused infections worldwide, with 26 countries reporting cases to date. As of November 27, 2015, 1,621 laboratory-confirmed cases of MERS-CoV infection have been reported to and confirmed by WHO, including at least 584 (36%) deaths. The majority of cases (~85%) have been reported from KSA. All reported cases have been directly or indirectly linked through travel or residence to nine countries: KSA, UAE, Qatar, Jordan, Oman, Kuwait, Yemen, Lebanon, and Iran. In the United States (US), nationwide surveillance for MERS-CoV has been ongoing since 2012, and as of June 5, 2015, 45 states have submitted specimens to CDC or conducted their own testing for MERS-CoV based on CDC criteria available in their current form at <http://www.cdc.gov/coronavirus/mers/case-def.html>.

Occurrence

Nosocomial outbreaks with transmission to healthcare personnel highlight the importance of infection control procedures. Recent data suggest that mild respiratory illness might be part of the clinical spectrum of MERS-CoV infection, and presentations might not initially include respiratory symptoms. In addition, patients with comorbidities or immunosuppression might be at increased risk for infection, severe disease, or both.

Mode of Transmission

MERS-CoV, like other coronaviruses, is thought to spread from an infected person's respiratory secretions, such as through coughing. However, the precise ways the virus spreads are not currently well understood.

Person-to-person spread of MERS-CoV, usually after close contact, such as caring for or living with an infected person, has been well documented. Infected people have spread MERS-CoV to others in healthcare settings, such as hospitals. Researchers studying MERS have not seen any ongoing spreading of MERS-CoV in the community.

Period of Communicability

Patients can shed the virus after resolution of symptoms, but the duration of infectivity is unknown. Patients are not contagious during the incubation period. Asymptomatic cases might not be contagious.

Incubation Period

As a result of investigations, incubation periods for MERS-CoV may range from 2 to 14 days (median 5 days).

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Healthcare providers/Local Health Departments should continue to routinely ask about travel history and healthcare facility exposure and consider a diagnosis of MERS-CoV infection in persons who meet the criteria for patient under investigation (PUI), which has been revised to remove considerations of recently being in a Korean healthcare facility and is available at <http://www.cdc.gov/coronavirus/mers/case-def.html>. Please fax to ODH ORBIT (614) 564-2456, and ODH will transmit the information to CDC.

Treatment

No vaccine or specific treatment for MERS-CoV infection is available; care is supportive. WHO has posted guidance for clinical management of MERS patients at http://www.who.int/csr/disease/coronavirus_infections/InterimGuidance_ClinicalManagement_NovelCoronavirus_11Feb13u.pdf?ua=1.

Isolation

CDC recommends healthcare providers should adhere to recommended infection control measures, including standard, contact, and airborne precautions while managing patients in healthcare settings who are PUIs or confirmed cases of MERS-CoV infection. Updated guidance on MERS-CoV infection control in healthcare settings is available at <http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html>.

Ill people who are being evaluated for MERS-CoV infection and do not require hospitalization for medical reasons may be cared for and isolated in their home. Isolation is defined as the separation or restriction of activities of an ill person with a contagious disease from those who are well. Guidance on the evaluation of patients for MERS-CoV infection, clinical specimen collection and testing, infection control, and home care and isolation measures is available on the CDC MERS website at <http://www.cdc.gov/coronavirus/mers/index.html>.

In addition to CDC guidelines above, the World Health Organization (WHO) has added droplet precautions. WHO notes, it is not always possible to identify patients with MERS-CoV early because some have mild or unusual symptoms. For

this reason, it is important that health-care workers apply standard precautions consistently with all patients – regardless of their diagnosis – in all work practices all the time.

Droplet precautions should be added to the standard precautions when providing care to all patients with symptoms of acute respiratory infection. Contact precautions and eye protection should be added when caring for probable or confirmed cases of MERS-CoV infection. Airborne precautions should be applied when performing aerosol generating procedures.

Reference: http://www.who.int/csr/don/2014_05_05_mers/en/

Contacts

Investigation

As part of investigation of confirmed cases, in consultation with a state or local health department, a person who develops fever or symptoms of respiratory illness within 14 days following close¹ contact with a confirmed case of MERS while the case was ill should be evaluated for MERS-CoV infection.

Other contacts of the ill person, such as community contacts or contacts on conveyances (e.g., airplane, bus), may be considered for evaluation in consultation with state and local health departments.

Evaluation and management of close contacts of a [PUI](#) should be discussed with state and local health departments. Close contacts of a PUI should monitor themselves for fever and respiratory illness and seek medical attention if they become ill within 14 days after contact; healthcare providers should consider the possibility of MERS in these contacts.

CDC does not recommend the quarantine of asymptomatic individuals who have had exposure to MERS-CoV; however, asymptomatic contacts are advised to monitor their health (i.e. measure temperature twice daily) and respiratory symptoms) for at least 14 days after the last possible contact with an infected person. During this time, in the absence of both fever and respiratory symptoms, persons who may have been exposed to MERS-CoV patients need not limit their activities outside the home and should not be excluded from work, school, out-of-home child care, church or other public areas.

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1. Fever may not be present in some patients, such as those who are very young, elderly, immunosuppressed, or taking certain medications. Clinical judgement should be used to guide testing of patients in such situations.
 2. Countries considered in the Arabian Peninsula and neighboring include: Bahrain; Iraq; Iran; Israel, the West Bank and Gaza; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; Syria; the United Arab Emirates (UAE); and Yemen.

Close contact is defined as a) being within approximately 6 feet (2 meters) or within the room or care area for a prolonged period of time (e.g., healthcare personnel, household members) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection—see Infection Prevention and Control Recommendations(<http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html>)); or b) having direct contact with infectious secretions (e.g., being coughed on) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection—see Infection Prevention and Control Recommendations (<http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html>)). Data to inform the definition of close contact are limited. At this time, brief interactions, such as walking by a person, are considered low risk and do not constitute close contact.

They should immediately seek medical attention if they develop symptoms such as fever, respiratory symptoms (including coughing and shortness of breath), or diarrhea.

Close contacts of a confirmed case who are ill and do not require hospitalization for medical reasons may, in consultation with the state and local health department, be cared for and isolated in their home while being evaluated for MERS-CoV infection.

Contacts with no apparent symptoms who test positive by PCR, especially in respiratory specimens or serum, likely pose a low but not no risk of transmission. LHDs should contact ODH to discuss home isolation, home quarantine or other measures for close contacts, patients who test positive, and to discuss criteria for discontinuing these measures.

Additional Resources

CDC Interim Infection Prevention and Control Recommendations for Hospitalized Patients with Middle East Respiratory Syndrome Coronavirus (MERS-CoV). Available at: <http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html>.

United States Food and Drug Administration. (2013). Fact Sheet for Health Care Professionals: Interpreting CDC Novel Coronavirus 2012 Real-time RT-PCR Assay Test Results. Available at: <http://www.fda.gov/MedicalDevices/Safety/EmergencySituations/ucm355530.htm>.

WHO guidelines for investigation of cases of human infection with Middle East Respiratory Syndrome Coronavirus (MERS-CoV). (July 2013). Available at: http://www.who.int/csr/disease/coronavirus_infections/MERS_CoV_investigation_guideline_Jul13.pdf.

Fact Sheet Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

Q: What is MERS?

A: Middle East Respiratory Syndrome (MERS) is a viral respiratory illness that is caused by a [coronavirus](#) called "Middle East Respiratory Syndrome Coronavirus" (MERS-CoV).

Q: What is MERS-CoV?

A: MERS-CoV is a beta [coronavirus](#). It was first reported in 2012 in Saudi Arabia. MERS-CoV used to be called "novel coronavirus," or "nCoV".

Q: Is MERS-CoV the same as the SARS virus?

A: No, MERS-CoV is different from other coronaviruses that have been found to infect people. It is not the same coronavirus that caused Severe Acute Respiratory Syndrome (SARS) in 2003. However, like SARS, MERS-CoV has caused severe acute respiratory illness and pneumonia in many reported cases. CDC is still learning about MERS.

Q: What are the symptoms of MERS?

A: Most people who got infected with MERS-CoV developed severe acute respiratory illness with symptoms of fever, cough, and shortness of breath. About one-third of them died. Some people were reported as having a mild respiratory illness.

Q: Does MERS-CoV spread from person-to-person?

A: MERS-CoV has been shown to spread between people who are in close contact. Transmission from infected patients to healthcare personnel has also been observed. Clusters of household cases in several countries are being investigated.

Q: Has anyone in the United States gotten infected?

A: So far, there have been two reports of United States patients getting infected with MERS-CoV.

Q: Can I still travel to countries in the Arabian Peninsula or neighboring countries where MERS-CoV cases have occurred?

A: Yes. The current CDC travel notice is a Alert Level 2 Follow Enhanced Precautions which advises travelers to countries in or near the Arabian Peninsula to:

- Wash your hands often with soap and water. If soap and water are not available, use an alcohol-based hand sanitizer.
- Avoid touching your eyes, nose, and mouth. Germs spread this way.
- Avoid close contact with sick people.

The World Health Organization considers people with diabetes, kidney failure, chronic lung disease, and/or weakened immune systems to be at high risk for severe disease from MERS and recommends that people with any of these conditions take additional precautions:

- Avoid contact with camels.
- Do not drink raw camel milk or raw camel urine.
- Do not eat undercooked meat, particularly camel meat.

At this time, CDC does not recommend that travelers change their plans because of MERS. Most instances of person-to-person spread of MERS have occurred in healthcare workers and other close contacts (such as family members and care

givers) of people sick with MERS. Discuss travel plans with your doctor if you have concerns.

For the most current CDC information, see CDC's travel notice: [MERS in the Arabian Peninsula](#) and [MERS in the Republic of Korea, Watch- Level 1 Travel Notice](#).

Q: What if I recently traveled to countries in the Arabian Peninsula or neighboring countries and got sick?

A: If you develop a fever and symptoms of lower respiratory illness, such as cough or shortness of breath, within 14 days after traveling from countries in the Arabian Peninsula or neighboring countries, you should see your healthcare provider and mention your recent travel. Countries in the Arabian Peninsula include Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Palestinian territories, Oman, Qatar, KSA, Syria, UAE, and Yemen.

Q: How can I help protect myself?

A: ODH advises that people follow these tips to help prevent respiratory illnesses:

- Wash your hands often with soap and water for 20 seconds, and help young children do the same. If soap and water are not available, use an alcohol-based hand sanitizer.
- Cover your nose and mouth with a tissue when you cough or sneeze then throw the tissue in the trash.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Avoid close contact, such as kissing, sharing cups, or sharing eating utensils, with sick people.
- Clean and disinfect frequently touched surfaces, such as toys and doorknobs.

Q: Is there a vaccine?

A: No, but CDC is discussing with partners the possibility of developing one.

Q: What are the treatments?

A: There are no specific treatments for illnesses caused by MERS-CoV. Medical care is supportive and to help relieve symptoms.

Q: Is there a lab test?

A: Lab tests (polymerase chain reaction or PCR) for MERS-CoV are available at ODH Lab, CDC, and some international labs. Otherwise, MERS-CoV tests are not routinely available. There are a limited number of commercial tests available, but these are not FDA-approved.

Q: What should healthcare providers and health departments do?

A: For recommendations and guidance on the case definitions; infection control, including personal protective equipment guidance; case investigation; and specimen collection and shipment, see [Interim Guidance for Health Professionals](#).
