

# A Practical Guidance Document for the Detection of Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV)

## June 2014

### THE HIGHLIGHTS

- MERS-CoV can cause severe respiratory illness with high mortality rates.
- All MERS cases to date have been epidemiologically linked to the Middle East region.
- Respiratory specimens are the samples of choice for the diagnosis of MERS using the CDC's MERS-CoV rRT-PCR assay.
- Testing should be coordinated through local and state public health departments.

### Introduction:

The MERS-CoV virus was first identified in Saudi Arabia as a novel coronavirus in 2012 causing severe respiratory illness in persons in the Middle East. MERS-CoV is highly virulent since about one-third of known infected individuals die from the infection. The virus appears to be most aggressive in people with underlying medical conditions. Most people confirmed to have MERS-CoV infection have developed lower respiratory infections including fever, cough, and shortness of breath. However, the full spectrum of disease is not yet fully understood. In addition to humans, MERS-CoV has been found in camels in several countries including Qatar, Egypt and Saudi Arabia, and in a bat in Saudi Arabia. At this time it is not known whether animals are the source of the virus and if so, how they transmit it to humans. Currently, there is no evidence that the virus spreads easily from person to person. Since April 2012, 95 contact cases have been healthcare personnel, of whom 62 (65%) were reported in April 2014. Seventy (74%) of the healthcare personnel were reported from Saudi Arabia, twenty-three (24%) from the United Arab Emirates, and one each from Philippines and Jordan. The risk that MERS-CoV poses to the U.S. public remains low.

As of May 28, 2014, 636 laboratory-confirmed cases of infection with MERS-CoV have officially been reported to the World Health Organization, including 193 deaths. Ages of those infected range from 2 to 94 yr, and all cases have an epidemiologic link to the Middle East. The CDC recently issued an advisory for travel to countries in or near the Arabian Peninsula (see map) but does not restrict travel to that area or recommend that travelers change their plans because of MERS. This is because most cases of person-to-person spread have occurred in healthcare personnel and other close contacts such as family members and caregivers of patients with MERS-CoV infection.



[www.cdc.gov/CORONAVIRUS/MERS/INDEX.HTML](http://www.cdc.gov/CORONAVIRUS/MERS/INDEX.HTML)

To date two cases of MERS have been reported in the United States. Both of the patients diagnosed with the virus were healthcare personnel who had traveled from Saudi Arabia, where many cases of the virus have been confirmed. Both patients were hospitalized and have now recovered.

### **Who to Test:**

The CDC recommends testing for any travelers from the impacted region (see map, above) with acute lower respiratory symptoms within 14 days of travel, and for people who had close contact with someone diagnosed with MERS-CoV.

Specifically, testing should be limited to patients meeting the following criteria:

- Fever ( $\geq 38^{\circ}\text{C}$ ,  $100.4^{\circ}\text{F}$ ) and pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence) AND EITHER:
  - History of travel from countries in or near the Arabian Peninsula within 14 days before symptom onset; OR 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 Peninsula; OR
  - Is part of a cluster of patients with severe acute respiratory illness (e.g. fever and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being considered in consultation with state and local health departments.
- Close contact with a confirmed or probable case of MERS while the case was ill AND
  - Fever ( $>100^{\circ}\text{F}$ ) or symptoms of respiratory illness within 14 days following the close contact.

### **Specimens and Testing:**

The preferred specimen for the detection of MERS-CoV is a lower respiratory tract specimen. The table below summarizes the specimen requirements for potential MERS-CoV testing. Check with your state public health laboratory for specific instructions and shipping guidelines.

Real-time RT-PCR testing is carried out by state public health laboratories and/or the CDC using the “CDC Novel Coronavirus 2012 Real-time PCR Assay.” The test is available to public health laboratories through Emergency Use Authorization provided by the FDA. There are 3 targets in the assay: NCV.N2 (nucleocapsid protein gene), NCV.N3, (nucleocapsid protein gene) and MCV.upE (region upstream of envelope protein gene). Most state public health laboratories have been provided the primers and probes by CDC and demonstrated competency in performing the test. Clinical laboratories should contact their state public health laboratory to determine if the test is available locally or if it will be performed by the CDC. Timely communication between clinical laboratories and public health laboratories is essential to assure accurate and efficient testing.

Specimen	Optimal Collection Time	Specimen Volume	Shipment Conditions
Lower respiratory (bronchoalveolar lavage, sputum, tracheal aspirate) – <b>preferred specimen</b>	Respiratory specimens should be collected as early as possible after symptom onset	2-3 mL in a sterile leak-proof cup	Refrigerated (4°C) placed on cold packs if shipment will be received within 72 h of collection.  If >72 h, freeze at -70°C and ship on dry ice.
Upper respiratory tract (nasopharyngeal and/or throat swab; nasopharyngeal wash/aspirate; nasal aspirate); collected in viral transport media		Nasopharyngeal and throat swabs can be combined in 2-3 mL of viral transport media	
Serum (RT-PCR testing)	Within 7 days of symptom onset (ideally within 3-4 days)	Adults: 3-5 mL Infants: 0.5-1 mL	
Serum (serologic testing)*	Acute: 1-14 days post onset Convalescent: ≥ 21 days after acute sample	Adults: 3-5 mL Infants: 0.5-1 mL	
Stool (formed or liquid)*	Unknown	2 -5 grams (walnut size)	

\*Currently only available at the CDC.

### **Biosafety:**

Since little is known about MERS transmission, caution must be practiced when handling potentially infectious specimens in the laboratory. Specimens from patients suspected of having MERS-CoV must be handled in a BSL-2 laboratory using standard BSL-2 practices, and specimen manipulation must be performed in a class II biosafety cabinet. Any propagation of MERS-CoV virus or manipulation of MERS-CoV virus cultures must be performed in a BSL-3 laboratory using BSL-3 practices, including a respirator mask and eye protection. Specific MERS-CoV biosafety guidelines can be found here:

<http://www.cdc.gov/coronavirus/mers/guidelines-lab-biosafety.html>.

### **Conclusion:**

Clinical laboratories should contact their state public health laboratory for assistance with collection of specimens and transport of specimens for MERS-CoV testing. The CDC is continues to work with the World Health Organization to better understand the pathogenicity and epidemiology of the virus, how it is spread, ways to prevent spread and the risk it poses to the general public.

Acknowledgements: Brought to you by Mike Pentella, PhD, D(ABMM), Director of Bureau of Laboratory Sciences, William A. Hinton State Laboratory Institute, Jamaica Plain, MA; Melissa Miller, PhD, D(ABMM), Director, Clinical Molecular Microbiology Laboratory, UNC School of Medicine, Chapel Hill, NC; and ASM's Public and Scientific Affairs Board Committee on Laboratory Practices. June, 2014.