



Middle East Respiratory Syndrome Coronavirus (MERS-CoV) Testing at Washington State Public Health Laboratories

Since April 2012, MERS-CoV has caused severe respiratory illnesses. As of June 2015, 1179 laboratory-confirmed cases including at least 442 deaths had been reported to the World Health Organization (WHO). All cases have occurred in or been linked to the Middle East, including the current cluster of illness in the Republic of Korea. In the US, there have been only 2 imported cases, both diagnosed in May 2014. The virus can spread from person to person and has caused outbreaks in healthcare settings. Approximately 30% of cases have been fatal, and 20% of cases have occurred in healthcare workers. The information below addresses laboratory testing.

Testing at Washington State Public Health Laboratories (PHL)

All testing must be discussed with and approved by [local health](#) before submission to PHL.

PHL will test specimens from patients who meet the criteria for [Patient Under Investigation](#) (PUI). The criteria are:

- A. Fever AND pneumonia or acute respiratory distress syndrome (based on clinical or radiologic evidence) AND EITHER:
 - A 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
 - A history of being in a healthcare facility (as a patient, worker, or visitor) in the Republic of Korea within 14 days before symptom onset, OR
 - A member 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 evaluated, in consultation with state and local health departments in the US.
- B. Fever AND symptoms of respiratory illness (not necessarily pneumonia; e.g., cough, shortness of breath) AND
 - A history of being in a healthcare facility (as a patient, worker, or visitor) within 14 days before symptom onset in a country in or near the Arabian Peninsula in which recent healthcare-associated cases of MERS have been identified.
- C. Fever 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.

Laboratory Testing

PHL use a PCR assay from Centers for Disease Control and Prevention (CDC) to detect MERS-CoV in respiratory and serum specimens with confirmatory testing performed at CDC.

Use appropriate infection control precautions when collecting respiratory tract and serum specimens. Collect and submit specimens from two or more sites, such as respiratory tract and

serum. Lower respiratory samples may include bronchoalveolar lavage, tracheal aspirate, pleural fluid, and sputum; upper respiratory samples include nasopharyngeal and oropharyngeal swabs. Lower respiratory tract specimens are preferred over upper. CDC provides MERS testing guidance at: <http://www.cdc.gov/coronavirus/mers/guidelines-clinical-specimens.html>

Holding and Shipping Temperatures:

Refrigerate all specimens at 2-8°C up to 72 hours and ship cold; if exceeding 72 hours holding time, freeze at -70°C and ship on dry ice.

Lower Respiratory Tract:

- **Bronchoalveolar lavage, tracheal aspirate, pleural fluid**
Collect 2-3 mL in a sterile, leak-proof, screw-cap sputum cup or sterile dry container.
- **Sputum**
Have the patient rinse the mouth with water and then expectorate deep cough sputum directly into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

Upper Respiratory Tract:

- **Nasopharyngeal and oropharyngeal swabs (NP/OP swabs)**
Use only synthetic fiber swabs with plastic shafts. Calcium alginate swabs or wooden shafted swabs may inhibit PCR tests. Place swabs immediately into sterile tube containing 2-3 mL viral transport media. NP/OP specimens should be combined, placing both swabs in the same vial.
 - **Nasopharyngeal swabs** -- Insert a swab in the nostril parallel to the palate. Leave in place for a few seconds to absorb secretions. Swab both nasal areas.
 - **Oropharyngeal swab** -- Swab the posterior pharynx, avoiding the tongue.
- **Nasal aspirate**
Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum cup or sterile dry container.

Serum:

- **PHL can perform PCR for detection of the virus on serum.** Serum for PCR testing should be collected during the first week after symptom onset, preferably within 3-4 days after symptom onset.
 - **Adults and children:** Collect 1 tube (5-10 mL) whole blood in a serum separator tube. Serum separator tubes should be stored upright for at least 30 minutes, and then centrifuged at 1000–1300 relative centrifugal force (RCF) for 10 minutes before removing the serum and placing it in a separate sterile tube for shipping (such as a cryovial). The minimum amount of serum required for testing is 200 µL.
 - **Infants:** A minimum of 1 mL of whole blood is needed for testing of pediatric patients. Collect a minimum of 1 mL whole blood in a serum separator tube and process as above.

- **Serologic testing for MERS antibodies is currently available only at CDC upon request and approval.** Please consult with DOH Office of Communicable Disease Epidemiology for ideal timing of specimen collection for serologic testing. In general, for serologic testing, collect serum during acute symptoms, preferably the first week after onset of illness, and again ≥ 3 weeks later.
 - **Adults, children and infants:** Collect and process as above. Note, if both MERS-CoV serology and rRT-PCR tests are planned, the minimum amount of serum required is 400 μL (200 μL for each test).

Shipping:

Specimens from suspected MERS-CoV cases shipped within the United States must be packaged, shipped, and transported in accordance with regulations from the US Department of Transportation (USDOT). Packaging procedures can be found in the USDOT document entitled, *Transporting Infectious Substances Safely* at:

http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_54AC1BCBF0DFBE298024C4C700569893C2582700/filename/Transporting_Infectious_Substances_brochure.pdf

- Specimens should be stored and shipped at the temperatures indicated above.
- Package all specimens to prevent breakage and spillage.
 - The primary container (containing specimen) must be leak-proof and sealed securely with either tape or Parafilm® and placed in a zip-sealing, leak-proof bag with enough absorbent material to capture the contents of the primary container. Each requisition form should be attached to the outside of the zip-sealing bag containing the primary container.
 - Multiple primary containers (each in a zip-sealing bag with requisition slip attached) may be placed in a secondary leak-proof container.
 - The secondary container is placed in an outer certified box. The outer box must be labeled with the bioterrorism agent category level of the specimen. Clinical specimens for MERS-CoV testing are category B.
- When shipping frozen specimens use a combination of dry ice and frozen gel ice-packs, not wet ice, to maintain temperature over several days.

Avoid Shipping Problems:

- Do not place any dry ice in the primary container or secondary container, foam envelopes, ziplock bags, cryovial boxes, or hermetically sealed containers.
- Do not place primary containers sideways or upside down in zip-sealing bags.
- Do not place any paperwork in the zip-sealing bags, so as not to damage the paperwork.
- Do not use biohazard autoclave bags to prepack materials due their inadequate sealing.

Note that PHL require that all clinical specimens have **two** patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. The form should also include the date of collection and date of illness onset. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date. Each specimen sent to PHL must be accompanied by a separate completed PHL virology form:

<http://www.doh.wa.gov/Portals/1/Documents/5230/302-017-SerVirHIV.pdf>. Along with the patient and submitter names, be sure to include the date of collection and date of illness onset on the form.