Frequently Asked Questions about Coronavirus (COVID-19) for Laboratories

Updated June 13, 2020

Accessing Laboratory Testing

How do clinicians get access to SARS-CoV-2 viral testing?

- Clinicians can access laboratory tests for SARS-CoV-2, the virus that causes COVID-19, through clinical laboratories performing tests authorized or intended to be authorized by the U.S. Food and Drug Administration (FDA) under an Emergency Use Authorization (EUA). Clinicians should consult with the laboratories that routinely perform their diagnostic services to see how best to access SARS-CoV-2 testing.
- Clinicians also can access viral testing through their state public health departments. The Association of Public Health Laboratories (APHL) provides a list of available public health laboratory testing locations.
- For a list of COVID-19 EUAs, see FDA's COVID-19 Emergency Use Authorizations for Medical Devices .

Under what circumstances should laboratories use either a SARS-CoV-2 viral or serology (antibody) test that has received EUA from FDA?

FDA has authorized EUAs for both viral and antibody tests for COVID-19. Viral (nucleic acid and antigen) tests are used to diagnose the presence of SARS-CoV-2 infections. In contrast, antibody tests can detect IgG, IgA, and IgM antibodies from an immune response to SARS-CoV-2.

Whenever possible, laboratories should rely on viral tests to diagnose the presence of SARS-CoV-2 infections. However, a negative result from viral testing does not rule out COVID-19.

Most of the PCR-based tests that use two or more targets are likely to have high specificity (few false positives). However, there is some variation in the stated sensitivity of the different assays, and sensitivity is highly dependent on the stage of the disease. For this reason, negative results should always be interpreted in the context of the exposure history and symptoms of the patient.

Results from antibody testing should not be used to diagnose or exclude SARS-CoV-2 infections or to inform infection status. Negative results from antibody testing do not rule out SARS-CoV-2 infections, particularly for those individuals who have been exposed to the virus and are still within the estimated incubation period. Until the performance characteristics of antibody tests have been evaluated, it is possible that positive results from such testing may be due to past or present infections with a coronavirus other than SARS-CoV-2.

If a laboratory initially uses antibody testing for diagnostic purposes, follow-up testing using a viral test should be performed.

Read: Important Information on the Use of Serological (Antibody) Tests for COVID-19: FDA Letter to Healthcare Providers

More: FDA EUA Authorized Serology Test Performance

Where do laboratories get access to reagents and materials to perform viral testing for SARS-CoV-2?

Public health laboratories can access collection materials for SARS-CoV-2 testing, including swabs and transport media, through the International Reagent Resource (IRR) . The IRR supports state and local public health laboratories, as well as other qualified laboratories participating in public health surveillance and studies, by providing reagents, tools, and information for studying SARS-CoV-2 and other pathogens.

Through IRR, CDC also provides the reagents that public health laboratories use to detect SARS-CoV-2 virus in respiratory specimens. One test for SARS-CoV-2 detection is a CDC-developed real-time reverse transcription polymerase chain reaction (RT-PCR) test that received an EUA from FDA on February 4, 2020, to detect the virus in upper and lower respiratory specimens. IRR also provides several additional commercially produced assays that have received an EUA from FDA to detect SARS-CoV-2 viral RNA in respiratory samples.

Clinical and commercial laboratories conducting SARS-CoV-2 viral testing can acquire test reagents from commercial reagent manufacturers that have received EUA from FDA. Genomic RNA material for validation purposes can be obtained from BEI Resources as indicated below.

Can laboratories use specimen collection devices other than those listed in the manufacturer's instructions or EUA (e.g., swabs) for SARS-CoV-2 testing?

According to FDA, when one entity establishes equivalent performance between parallel testing of the same specimens with the new and original components (including viral transport media [VTM]), and FDA's review of the validation data indicates that it could be applicable to modifications of other tests with an authorized EUA, FDA will post this information on its website so that other laboratories can refer to the validation for their testing. Then, other laboratories do not need to conduct their own bridging study for the same modification. For additional information regarding FDA's policy for modification, see FDA's frequently asked questions website.

Where can I find additional CDC guidance about laboratory testing?

CDC has published the following interim guidelines and updates them regularly:

- Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Persons for Coronavirus Disease 2019 (COVID-19)
- Evaluating and Testing Persons for Coronavirus Disease 2019 (COVID-19)
- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- Laboratory Biosafety and COVID-19: Questions and Answers
- CDC 2019 Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel Instructions for Use

I can't find viral transport media (VTM) for SARS-CoV-2 testing. What are my options?

Public health laboratories can order VTM through IRR, as noted above.

Clinical testing laboratories should acquire VTM from commercial sources.

Public health and clinical laboratories can also create their own VTM if they are unable to order it. In response to VTM shortages, CDC has posted a standard operating procedure to create VTM for laboratories. Saline is also an acceptable transport media for some COVID-19 viral assays, including the CDC EUA. Check the Instructions for Use with the EUA Assay to see which transport media is acceptable.

My facility would like to begin SARS-CoV-2 testing. Do we need a Clinical Laboratory Improvement Amendments (CLIA) certificate? Can my facility be granted a waiver from the CLIA certification requirements so that I can begin testing immediately?

Before conducting SARS-CoV-2 viral testing, a laboratory must be CLIA-certified and meet applicable regulatory requirements. The Centers for Medicare and Medicaid Services (CMS) does not have the authority to grant waivers of exceptions that are not established in a statute or regulation. For additional information, please refer to the FAQs on the CMS website: CMS Coronavirus Information .

What is the CLIA test complexity categorization of SARS-CoV-2 tests that do not have an EUA?

Tests for SARS-CoV-2 that are offered prior to or without an EUA have not been reviewed by FDA, are not FDA-authorized, and have not received a CLIA categorization. Thus, those tests are considered high complexity by default until they receive an EUA or other FDA review that indicates they may be performed as moderate complexity or waived tests. For more information, visit FDA COVID-19 Resources, and navigate to the section titled "General FAQs."

When FDA authorizes emergency use for a SARS-CoV-2 point-of-care test, can that test be used in CLIA certificate-of-waiver facilities?

When the FDA grants an EUA for a point-of-care test, that test is deemed to be CLIA-waived. For the duration of the national emergency declaration for COVID-19, such tests can be performed in any CLIA-certified patient care setting with a certificate of waiver.

How do I apply for a CLIA certificate so that my testing facility can perform SARS-CoV-2 testing?

The federal CLIA program contracts with states to carry out certain oversight and recording functions of the CLIA program. The state in which the laboratory is located processes applications for CLIA certificates. After the laboratory has identified a qualified and certified laboratory director and has provided all required information on the CMS-116 application, a CLIA number will be assigned and the laboratory can begin testing if applicable CLIA requirements have been met. For additional information, please refer to the FAQs on the CMS website: CMS Coronavirus Information.

Are pathologists able to sign out cases remotely during the COVID-19 public health emergency?

CMS has indicated that it will allow laboratories to use temporary testing sites for remote review and reporting of laboratory data, slides, and images if specific criteria are met. Please refer to this CMS Memorandum for additional information.

Can a pooling strategy be used to expand nucleic acid testing for SARS-CoV-2?

In areas with low COVID-19 prevalence, a two-stage specimen pooling approach can help preserve testing reagents and resources. In the first stage, several patients' specimens are combined before extraction, and then tested all at once. If the test comes back negative, then all of those patients can be cleared with one test. If the test comes back positive, then all of those specimens need to be extracted and re-tested individually.

The lower the prevalence of the disease, the larger the optimal pool size can be. A recent study from the Nebraska Public Health Laboratory found that polymerase chain reaction (PCR) tests for SARS-CoV-2 reliably return a positive result when one positive sample is mixed with four negatives. Researchers in Germany and Israel have had similar results.

A pooling strategy is **not efficient** when the prevalence of COVID-19 is high. People with symptoms and people who have been exposed to someone with a confirmed SARS-CoV-2 infection should still be tested individually.

Before using a pooling strategy, the laboratory must have the proper regulatory approvals. If the manufacturer's guidelines and the emergency use authorization (EUA) for that SARS-CoV-2 test do not stipulate pooling, laboratories that use authorized nucleic acid devices can still bridge to alternative components, including extraction methods, PCR instruments, software versions, etc., under Section IV. A. 4. of FDA's Policy for COVID-19 Tests During the Public Health Emergency . These component changes can be achieved through evaluation and verification of the performance of the component with the test, without a new EUA or an amendment to the original EUA. Additional detail and suggested studies are discussed in FDA's policy. The process used for such changes must also comply with Clinical Laboratory Improvement Amendments (CLIA) guidelines.

I cannot obtain the materials I need to perform CDC's test. What should I do?

On June 12, 2020**,** the U.S. Food and Drug Administration approved an amendment to the CDC test's Emergency Use Authorization to allow state public health laboratories and others the flexibility to use the following alternatives:

1. Use a new authorized extraction method performed with the Roche MagNA Pure 24.
2. Use additional extraction reagent options with the already-authorized extraction instruments from Roche and QIAGEN.
3. Use heat treatment to replace the extraction method. However, heat treatment is recommended only if insufficient extraction reagents are available to extract every clinical specimen received. This is because of the potential reduction in test sensitivity. Please note: Laboratories using heat treatment will still need extraction reagents on hand to aid in resolution of any inconclusive or invalid test results obtained for heat-treated specimens and to test lower respiratory specimens.

Test Developers

Where do test developers get the genomic RNA needed to validate test performance for FDA?

- Currently, genomic RNA material can be used for validation purposes in biosafety level 2 laboratories (BSL-2). Genomic RNA material is available through BEI Resources . Registration with BEI Resources is required to request SARS-CoV-2 materials. BEI Resources is prioritizing and fast-tracking all SARS-CoV-2 registrations with a 12- to 72-hour turnaround time for all SARS-CoV-2-related registrations. Please contact BEI Resources at contact@beiresources.org or 1-800 359-7370 for questions.
- Developers are required to sign a material transfer agreement prior to the release of materials.
- All BEI Resources reagents are provided worldwide. There is no cost for the reagents themselves. However, shipping and handling charges may apply.
- Commercial sources also may have this material.
- ***For Public Health Laboratories:*** If a kit to detect the virus (SAR-CoV-2) is needed, contact the International Reagent Resource

What is NIH's BEI Resources Repository?

BEI Resources Repository was established by the National Institute of Allergy and Infectious Diseases at the National Institutes of Health to provide reagents, tools, and information for studying Category A, B, and C priority pathogens, emerging infectious disease agents, non-pathogenic microbes, and other microbiological materials of relevance to the research community including diagnostic developers. Centralizing these functions within BEI Resources facilitates access to these materials by the scientific community and ensures quality control of the reagents.

My facility created a laboratory-developed test (LDT) to detect SARS-CoV-2. We need to have the first five positive and negative specimens confirmed. Can we send these specimens to CDC?

Laboratories using an LDT to detect SARS-CoV-2 should confer with their state public health laboratory for assistance. If the state public health laboratory cannot assist, contact respvirus@cdc.gov.

Serology

Does CDC accept specimens for antibody testing?

CDC is currently performing antibody surveys to understand how COVID-19 has spread in the U.S. population. CDC is not using its antibody tests for diagnostic purposes, and thus is not accepting antibody test requests intended for COVID-19 patient diagnosis.

Will CDC submit its antibody test for an EUA?

Not at this time. CDC is using its antibody test as part of a multi-agency study to evaluate current commercially marketed antibody tests for specificity and sensitivity and to help determine how results from antibody tests could support policymaking. CDC will share information publicly on the recommended use of antibody testing as soon as enough data becomes available.

Should I test for IgG, IgM, or total immunoglobulin?

Currently, there is no identified performance advantage of assays whether they test for IgG, IgM and IgG, or total antibody. Thus, immunoglobulin class should not determine which assay you choose to use. Using an assay that tests for IgM antibodies might be able to detect a more recent infection with SARS-CoV-2, but we do not yet have enough data to confirm this. We need additional data on the immune response to SARS-CoV-2 before we can make evidence-based recommendations about these different assays. Scientists from CDC and elsewhere are investigating how SARS-CoV-2 antibody responses develop over time.

Specimen Handling

How should the laboratory perform a risk assessment to identify and mitigate risks?

All laboratories should perform a site-specific and activity-specific risk assessment to identify and mitigate risks and determine if enhanced biosafety precautions are warranted based on situational needs, such as high testing volumes, and the likelihood to generate infectious droplets and aerosols. Risk assessments and mitigation measures are dependent on the procedures performed, identification of the hazards involved in the process and/or procedures, the competency level of the personnel who perform the procedures, the laboratory equipment and facility, and the resources available.

The risk assessment should identify all potential scenarios of a particular activity that could produce a negative outcome. The risk assessment should prioritize those potential negative outcomes, or risks, based on an evaluation of the likelihood and consequences of each of those identified risks. The risk assessment should determine the most appropriate control measures, and how the system will measure the effectiveness of those control measures.

For additional information, refer to the following:

- Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV)
- Risk Assessment Best Practices
- World Health Organization Laboratory Biosafety Manual, 3rd

Are certified Class II biological safety cabinets (BSCs) required to process suspected or confirmed SARS-CoV-2 specimens? Should laboratory staff put procedures in place to minimize personnel exposure if there is no certified Class II BSC?

For procedures with a high likelihood to generate aerosols or droplets, use either a certified Class II Type A1 or A2 BSC or additional precautions to provide a barrier between the specimen and personnel. Examples of these additional precautions include personal protective equipment (PPE), such as a surgical mask or face shield, or other physical barriers, like a splash shield; centrifuge safety cups; and sealed centrifuge rotors to reduce the risk of exposure to laboratory personnel.

For additional information, refer to the following:

- CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel
- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV)

How should point-of-care testing (POCT) be conducted outside a traditional laboratory?

For viral testing of specimens conducted outside of a traditional clinical laboratory, such as rapid respiratory testing, use Standard Precautions to provide a barrier between the specimen and personnel during specimen manipulation.

For additional information, refer to:

- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)

If laboratory personnel collect blood or respiratory specimens directly from suspected or confirmed COVID-19 patients, what PPE should they wear?

If laboratory personnel have direct contact with suspected or confirmed COVID-19 patients, they should follow recommended PPE for health care providers while in the presence of these patients.

For additional information, refer to:

- Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings
- OSHA 29 CFR 1910.1030 Bloodborne Pathogens Standard

What is the recommended biosafety level for handling suspected or confirmed SARS-CoV-2 patient specimens?

Routine viral testing of patient specimens, such as the following activities, can be handled in a BSL-2 laboratory using Standard Precautions:
• Using automated instruments and analyzers
• Staining and microscopic analysis of fixed smears
• Examination of bacterial cultures
• Pathologic examination and processing of formalin-fixed or otherwise inactivated tissues
• Molecular analysis of extracted nucleic acid preparations
• Final packaging of specimens for transport to diagnostic laboratories for additional testing. Specimens should already be in a sealed, decontaminated primary container
• Using inactivated specimens, such as specimens in nucleic acid extraction buffer
• Electron microscopic studies with glutaraldehyde-fixed grids

For additional information, refer to the following:

- CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel
- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- OSHA 29 CFR 1910.1030 Bloodborne Pathogens Standard

What disinfectant should personnel use to decontaminate work surfaces?

Decontaminate work surfaces and equipment with appropriate disinfectants. Use EPA-registered hospital disinfectants with label claims to be effective against SARS-CoV-2. Follow manufacturer's recommendations for use, such as dilution, contact time, and safe handling.

How should specimens be stored?

Store specimens at 2-8oC for up to 72 hours after collection. If a delay occurs in extraction, store specimens at -70oC or lower. Store extracted nucleic acid samples at -70oC or lower.

For additional information, refer to the following:

- Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings
- CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel

How should laboratory personnel remove biohazardous waste from the laboratory or testing area for decontamination and disposal?

Handle laboratory waste from testing suspected or confirmed COVID-19 patient specimens as all other biohazardous waste in the laboratory. Currently, there is no evidence to suggest that this laboratory waste needs additional packaging or disinfection procedures.

For additional information, refer to the following:

- Biosafety in Microbiological and Biomedical Laboratories (BMBL) (5th edition)

How should personnel transport suspected or confirmed SARS CoV-2 specimens within a facility?

Personnel should adhere to standard procedures associated with other respiratory pathogens, such as seasonal influenza and other human coronaviruses, when they transport specimens within a facility. Personnel should perform site- and activity-specific risk assessments to determine if enhanced biosafety precautions are warranted based on situational needs.

For additional information, refer to the following:

- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV).pdf

What are Standard Precautions?

Standard Precautions are based on the principle that all blood, body fluids, secretions, nonintact skin, mucous membranes, and excretions (except sweat) may contain transmissible infectious agents. Standard Precautions include hand hygiene and the use of personal protective equipment (PPE) such as laboratory coats or gowns, gloves, and eye protection.

For additional information, refer to the following:

- 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings
- CDC Isolation Precautions

What are infectious aerosols and droplets?

Aerosols and droplets containing particles that are <100 µm in diameter are not visible to the naked eye. Laboratory workers may not be aware that such particles can be generated during many laboratory procedures and that these particles could be inhaled or could cross-contaminate work surfaces, materials, and equipment.

Infectious aerosols are small liquid or solid particles suspended in the air that contain infectious agents. They can disperse throughout the laboratory and remain infective over time and distance. These particles are of a size that may be inhaled into the lower respiratory tract (<5 µm in diameter). Examples of organisms transmitted by aerosols include spores of Aspergillus spp., Mycobacterium tuberculosis, rubeola virus (measles), and varicella-zoster virus (chickenpox).

Droplets traditionally are defined as larger infectious particles (>5 µm in diameter) that rapidly fall out of the air, contaminating gloves, the immediate work area, and the mucous membranes of the persons performing the procedure.

Examples of infectious agents that are transmitted via the droplet route include Bordetella pertussis, influenza viruses, adenovirus, Mycoplasma pneumoniae, SARS-associated coronavirus (SARS-CoV), group A streptococcus, and Neisseria meningitidis.

For additional information, refer to the following:

- WHO Laboratory Biosafety Manual, 3rd
- 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings
- CDC Isolation Precautions

What procedures can generate aerosols and droplets?

Many routine laboratory procedures can potentially generate aerosols and droplets that are often undetectable. The following laboratory procedures have been associated with the generation of infectious aerosols and droplets: centrifugation, pipetting, vortexing, mixing, shaking, sonicating, removing caps, decanting liquids, preparing smears, flaming slides, aliquoting and loading specimens, loading syringes, manipulating needles, syringes or sharps, aspirating and transferring blood and body fluids, subculturing blood culture bottles, spilling specimens, and cleaning up spills.

For additional information, refer to the following:

- Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories
- Biosafety in Microbiological and Biomedical Laboratories, 5th Ed.
- Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV)

Can the pneumatic tube system be used to transport patient specimens from suspected or confirmed COVID-19 patients?

It depends on the type of specimen being transported:

- CDC recommends that respiratory specimens from patients with suspected or confirmed COVID-19 should not be transported through pneumatic tubes. At this time, this recommendation only applies to suspected or confirmed COVID-19 respiratory specimens. Examples of respiratory specimens include nasopharyngeal (NP) and oropharyngeal (OP) swabs, nasal mid-turbinate (NMT) swabs, tracheal and lower respiratory tract aspirates, bronchoalveolar lavage (BAL) specimens, and sputum.
- Based on currently available data, other types of specimens, such as blood, urine, and feces, are still acceptable to transport through pneumatic tubes.

Facilities should ensure that all personnel who transport specimens via pneumatic tubes are trained in safe handling practices, specimen management, and spill decontamination procedures.

Each facility should also evaluate its risks and determine the most appropriate biosafety measures and practices to implement.

For additional information, refer to the following:

- Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories MMWR, Supplement / Vol. 61 January 6, 2012

How should decentralized and point-of-care (POC) testing for COVID-19 diagnostic purposes be conducted outside of a traditional laboratory?

Testing sites that operate a POC diagnostic instrument must have a current Clinical Laboratory Improvement Amendments of 1988 (CLIA) certificate. During the COVID-19 public health emergency, the Centers for Medicare & Medicaid Services (CMS) will permit a laboratory to extend its existing Certificate of Waiver to operate a temporary COVID-19 testing site in an off-site location (e.g., long-term care or correctional facilities). The temporary COVID-19 testing site is only permitted to perform waived tests, consistent with the laboratory's existing CLIA certificate, and must be under the direction of the existing laboratory director.

Laboratories should consider the following when using POC instruments for COVID-19 diagnostic purposes:

- Use the instrument in a location that has a current CLIA certificate.
- Perform a site-specific and activity-specific risk assessment to identify and mitigate safety risks.
- Train staff on the proper use of the instrument and ways to minimize their risk of exposure.
- Follow Standard Precautions when handling clinical specimens, including hand hygiene and the use of PPE, such as laboratory coats or gowns, gloves, and eye protection. If needed, additional precautions can be used, such as a surgical mask or face shield, or other physical barriers, such as a splash shield to work behind.
- When using patient swabs, minimize contamination of the swab stick and wrapper by widely opening the wrapper before placing the swab back into the wrapper.
- Change gloves after adding patient specimens to the instrument.
- Decontaminate the instrument after each run by using an EPA-approved disinfectant for SARS-CoV-2 and following the manufacturer's recommendations for use, including dilution, contact time, and safe handling.

For additional information, refer to:

- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- Fact Sheet: Guidance – Proposed Use of Point-of-Care (POC) Testing Platforms for SARS-CoV-2 (COVID-19)

What safety issues are there with PrimeStore® Molecular Transport Medium (MTM) when used with SARS-CoV-2 testing platforms?

PrimeStore® MTM transport media contains guanidine thiocyanate, which produces a dangerous chemical reaction that releases cyanide gas when exposed to bleach (sodium hypochlorite). The PrimeStore® MTM transport media being provided by state health departments is currently labeled at the bulk box level, but individual vials lack labels to warn users of the reactive ingredient.

Do NOT use PrimeStore® MTM with any Real-Time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) platforms that include a disinfecting step that uses bleach (e.g., Panther® Hologic, Panther Fusion® Systems).

In addition to its reactivity, PrimeStore® MTM may be harmful by inhalation, in contact with skin, and if swallowed. Wear appropriate personal protective equipment (PPE) as required by your laboratory protocols, including laboratory coat, safety glasses, and gloves. Dispose of product content and container in accordance with all local, regional, national, and international regulations. Untreated waste should not be disposed into the sewer unless fully compliant with all applicable requirements. See the Material Safety Data Sheet for disposal information.

For more information, see the Longhorn PrimeStore® Molecular Transport Medium Fact Sheet .

What safety issues can occur when using a mixture of A549 and Mv 1 Lu cell lines (also referred to as A549/Mv 1 Lu mix or R-Mix™) for culturing respiratory viruses?

It has been shown that Mv 1 Lu cells can support low level replication of SARS-CoV, which could result in the inadvertent growth of SARS-CoV-2. Therefore, CDC recommends that laboratories **discontinue the use** of the A549/Mv 1 Lu mix (R-Mix™) or any other mixture containing Mv 1 Lu cell lines.

Based on recent publications, (Severe Acute Respiratory Syndrome Coronavirus 2 from Patient with Coronavirus Disease, United States), A549 and MDCK cells lines (which make up R-Mix Too™) do not support SARS-CoV-2 replication. As a result, R-Mix Too™ may be considered for use as an alternative for R-Mix™.

For additional information, see

SARS-associated Coronavirus Replication in Cell Lines

Severe Acute Respiratory Syndrome Coronavirus 2 from Patient with Coronavirus Disease, United States

Specimen Packing and Shipping

Do people packing patient specimens, isolates or cultures for transport need to be trained and competent?

For transporting patient specimens, cultures or isolates, personnel must be trained in the proper safety, packing, and shipping regulations for Division 6.2, UN 3373 Biological Substance, Category B in accordance with the current edition of the International Air Transport Association (IATA) Dangerous Goods Regulations (DGR). Personnel should be trained in a manner that corresponds to their function-specific responsibilities.

For additional information, refer to the following:

- Guidance on regulations for the transport of infectious substances 2019 – 2020

What specific packaging should personnel use when shipping suspected or confirmed SARS-CoV-2 patient specimens, isolates or cultures?

Pack and ship suspected or confirmed SARS-CoV-2 patient specimens, cultures or isolates as UN 3373 Biological Substance, Category B, in accordance with the current edition of the International Air Transport Association (IATA) Dangerous Goods Regulations (DGR):

1. A leakproof primary container.
2. A leakproof, watertight secondary packaging with absorbent material.
3. A rigid outer packaging to protect the specimens during shipment.

For additional information, refer to the following:

- IATA Dangerous Goods Regulations Packaging Instruction 650
- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV)

At what temperature should specimens be shipped?

Specimens should be shipped at 2-8oC with ice packs. If the specimen is frozen, ship overnight on dry ice. The primary receptacle and the secondary packaging should maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost. Packages containing dry ice should be designed and constructed so as to prevent the buildup of pressure and to allow the release of gas that could rupture the packaging.

For additional information, refer to the following:

- CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel
- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)

What information is required on the outer package for shipment of specimens with ice packs? –

A: Ensure the outer package has been properly marked and labeled with the following:

1. Hazard labeled with UN Identification Number already on label – UN 3373
2. Biological Substance, Category B
3. Shipper's name, address, and phone number
4. Receiver's name, address, and phone number
5. Name and phone number of a responsible person is optional if it is on the airway bill

For additional information, refer to the following:

- Guidance on regulations for the transport of infectious substances 2019 – 2020
    - Dangerous Goods Documentation
    - Click on "Infectious substances" and there is an option to download the packing instructions.
- Labels for UN 3373
    - When using cold pack – Include the name and telephone number of the person who will be available during normal business hours who knows the content of the shipment (can be someone at CDC). Place the label on one side of the box and cover the label completely with clear tape (do not tape just the edges of the label).
- Schematic for packaging, UN 3373 Category B

What information is required on the outer packages for shipment of specimens with dry ice?

Ensure the outer package has been properly marked and labeled with the following:

1. Hazard labeled with UN Identification Number already on label – UN 3373
2. Biological Substance, Category B
3. Hazard Labeled with UN Identification Number- UN 1845
4. Dry Ice along with the net weight (kg) of the dry ice
5. Shipper's name and address
6. Receiver's name and address
7. Name and phone number of a responsible person.

For additional information, refer to the following:

- Guidance on regulations for the transport of infectious substances 2019 – 2020
- IATA Dangerous Goods Regulations Packaging Instruction 650
    - Packing Instructions 650 for UN 3373
    - Click on "Infectious substances" and there is an option to download the packing instructions.
- Labels for UN 3373
    - When using dry ice – Include the name and telephone number of the person who will be available during normal business hours who knows the content of the shipment (can be someone at CDC). Place the label on one side of the box and cover the label completely with clear tape (do not tape just the edges of the label).
- Schematic for packaging, UN 3373 Category B

What information is required on an overpack if used for specimen shipment?

The overpack should be marked in accordance with the packing instructions required for the outer package:

1. Hazard labeled with UN Identification Number already on the label – UN 3373
2. Biological Substance, Category B
3. Shipper's name, address, and phone number
4. Receiver's name, address, and phone number
5. Package Orientation Label
6. Marked with the word "Overpack"
7. Name and phone number of a responsible person is optional if it is on the airway bill

For additional information, refer to the following:
• IATA Dangerous Goods Regulations Packaging Instruction 650
• Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)

Is a shipper's declaration required? What documentation is required for shipment? What if specimens are shipped on dry ice?

A shipper's declaration is not required for UN 3373 Biological Substances, Category B shipped samples. If an Air Waybill is used, the "Nature and Quantity of Goods" box should show "UN 3373 Biological Substance, Category B" along with the number of packages. If specimens are shipped on dry ice, include UN 1845, Dry Ice, 9, along with the net weight of the dry ice. See IATA PI 650 for additional information.

For additional information, refer to the following:

- Guidance on regulations for the transport of infectious substances 2019 – 2020
- IATA Dangerous Goods Regulations Packaging Instruction 650

Is a Responsible Person required on the shipping paperwork?

Yes, a Responsible Person should be listed on the air waybill or Shipper's Declaration (if applicable).

For additional information, refer to the following:

- Guidance on regulations for the transport of infectious substances 2019 – 2020
- IATA Dangerous Goods Regulations Packaging Instruction 650

Once packaging of the samples is complete should staff members decontaminate the work area?

Decontaminate work surfaces and equipment with appropriate disinfectants. Use EPA-registered hospital disinfectants with label claims to be effective against SARS-CoV-2. Follow manufacturer's recommendations for use, such as dilution, contact time, and safe handling.

For additional information, refer to the following:

- Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus 2019 (COVID-19) in Healthcare Settings
- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)

Specimen Types

Are stool specimens appropriate for SARS-CoV-2 viral testing?

Stool specimens do not have Emergency Use Authorization (EUA) approval and thus are not acceptable for SARS-CoV-2 viral testing. Although data are limited, they indicate that stool might not be an appropriate specimen. Stool specimens are less sensitive than respiratory specimens, and SARS-CoV-2 RNA is often detected later during COVID-19 illness. Therefore, testing stool early in illness could potentially lead to false negative SARS-CoV-2 viral test results. Also, even though viral tests have detected SARS-CoV-2 RNA in stool (i.e., a positive test), infectious virus has only been confirmed very rarely, if at all in samples. In other words, a positive SARS-CoV-2 test does not necessarily mean a patient is currently infected and can infect others.

Anatomic Pathology

What are the anatomic pathology best practices to prevent COVID-19 exposure while performing procedures and processing specimens?

Manual processing of fresh unfixed specimens, including frozen sections, should be conducted in a manner that provides a barrier between the specimen and personnel during specimen manipulation. In addition, protect the mucous membranes of the eyes, nose, and mouth during procedures that are likely to generate **splashes, sprays, droplets, and aerosols.** Examples of these barriers include:

- Performing tissue dissection in a certified Class II A1 or A2 biological safety cabinet (BSC) if available
- Working behind a splash shield
- Using combinations of PPE, such as:
  - surgical mask with attached eye shield
  - surgical mask and goggles
  - mask and a face shield that fully cover the front and sides of the face
  - double gloves or mesh cut-resistant gloves
  - surgical scrubs, shoe covers, full gown, plastic apron, and hair covering
  - N95 respirators or powered air-purifying respirators (PAPRs) (the use of respiratory protection requires fit testing and appropriate training)

What precautions should clinical and non-clinical support staff take when handling specimen containers that may be contaminated with blood and body fluids?

All laboratories should perform a site- and activity-specific risk assessment and follow Standard Precautions when handling specimen containers and paper requisitions that could have been contaminated by tissue and fluid specimens. This risk assessment may suggest use of some of these mitigation strategies:

- Use face shields and/or work behind a splash guard whenever possible.
- Store human specimens in closed containers that can be decontaminated before moving them to a secure area.

Place specimen containers in closed and clearly labeled plastic bins until pick-up and disposal according to your institutional waste management policies.

What are the biosafety recommendations for performing frozen sectioning on confirmed and suspected COVID-19 patient specimens?

Avoid frozen sectioning from confirmed COVID-19 patients whenever possible. Talk with the relevant clinical and surgical teams about the clinical necessity and benefit of frozen sectioning and consider appropriate alternatives for suspected and confirmed COVID-19 cases. When frozen sectioning is unavoidable, the following are recommended, if possible:

- Receive specimens in an area apart from administrative staff
- Consider using a cryostat that has a downdraft and other safety features.
- Use cryostats in a closed room that has inward directional (negative) airflow vented directly to the outside or recirculated through a HEPA filter to avoid contaminating the rest of the surgical pathology suite.
- Provide grossing rooms with inward directional air flow.
- Reduce the number of operators to a minimum.
- Wear appropriate PPE, including but not limited to:
  - Fluid-resistant disposable double gloves and gown,
  - Fluid-resistant disposable apron,
  - Eye protection (face shield or goggles), and
  - N95 respirator or fluid-resistant surgical mask.
- Do not use freezing sprays; they are not recommended by the manufacturers of cryostat instrumentation.
- Wear cut-resistant, stainless steel mesh gloves during disassembly, cleaning, and disinfection of microtome knives.
- Collect accumulated instrument shavings and discard them as biohazardous waste.
- Follow local standard decontamination procedures of the cryostat and other surfaces. Ultraviolet lights are not a substitute for terminal cleaning of the instrument.

For additional information, refer to the following:

- Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19)
- Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories

What chemical treatments inactivate SARS-CoV-2 in tissues during histopathology processing?

Human tissues submitted for permanent pathologic examination typically undergo several processing steps with chemicals that have been shown to inactivate coronaviruses:

- Studies with SARS-CoV-1 and MERS-CoV have shown that virus inactivation for these coronaviruses occurs in a time-dependent fashion with both formalin fixation and temperatures of 56°C or above.
- Alcohol at 70% concentration or higher has been shown to inactivate the virus and tissue processing typically includes a series of alcohol dehydration steps that use 70% to 100% alcohol prior to paraffin embedding.
- In addition, the final step of applying a glass or plastic coverslip to the slide provides an additional barrier between the personnel and the tissue.

For additional information, refer to the following:

Inactivation of the coronavirus that induces severe acute respiratory syndrome, SARS-CoV

Inactivation and safety testing of Middle East Respiratory Syndrome Coronavirus

Practical Guide to Specimen Handling in Surgical Pathology

Coronavirus disinfection in histopathology

NSH-COVID-19: Novel Coronavirus Resources

Does a grossing station that draws air and fumes toward the rear of the unit offer the same protection as a biosafety cabinet?

No. Grossing stations pull formalin fumes away from the person who is doing the dissecting. In general, grossing stations are not as effective as biosafety cabinets at protecting the user from exposure to biological agents.

For additional resources related to biological safety cabinets, refer to:

- Fundamentals of Working Safely in a Biological Safety Cabinet provides free training CEU
- Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition Section III_ Biological Safety Cabinets (page 292).

Ordering Supplies (For Public Health Laboratories)

What Is CDC's International Reagent Resource (IRR)?

The International Reagent Resource (IRR) was established by CDC more than 10 years ago. It provides registered users with reagents, tools, and information for studying and detecting influenza virus and other pathogens, including SARS-CoV-2. IRR is primarily a resource used for procuring pathogen test components and assembling, qualifying, and distributing these kits for use in CDC-directed public health activities. This resource supports detection and characterization of pathogens, which will aid in informing interventions. By centralizing these functions within IRR, access to and use of these materials in the scientific and public health community is monitored and quality control of the reagents is assured.

To support health departments during the COVID-19 pandemic, IRR has expanded to provide more products needed for viral testing, including numerous commercially produced Emergency Use Authorization (EUA) assays. IRR is managed under a CDC contract by American Type Culture Collection (ATCC).

What supplies are being distributed by IRR for COVID-19 testing?

The expanded catalog of COVID-19 diagnostic supplies includes:

- **Extraction kits**, to isolate the viral genetic material (RNA)
- **Test kits**, to determine the presence of SARS-CoV-2
  Click here for more information about CDC's test kits
- **DISCONTINUED: Sample collection kits**, to swab via the nasopharynx, suggest nose, and/or throat **(See below to learn more about the process for ordering swabs.)**

Where can I find a complete product list of items for SARS-CoV-2 testing?

A comprehensive list of all viral testing supplies available through IRR is provided on the IRR website. New reagents may be added to the IRR catalog as the emergency response progresses.

What is the new process for swab ordering?

Starting April 30, 2020, FEMA is assuming responsibility for the production and distribution of LR-1, Flock Swabs. States can reach out to their federal testing contact. The federal government will work with states who are on pace to exceed their testing goals for the month to meet increased testing demand. Learn more here.

Ordering Supplies (For Clinical Laboratories)

Can I register my lab or hospital with IRR?

CDC limits IRR registration and SARS-CoV-2 diagnostic reagent distribution to U.S. state and local public health laboratories validated to perform SARS-CoV-2 viral testing. During the SARS-CoV-2 pandemic, CDC will defer the decision to authorize new laboratories to the corresponding state public health laboratory.

How do I obtain reagents for the CDC EUA real-time RT-PCR assay for SARS-CoV-2?

Clinical laboratories can purchase reagents for the CDC EUA real-time RT-PCR primers and probes from Integrated DNA Technologies (IDT) or Biosearch Technologies. CDC has posted a list of approved reagents and acceptable lots on the CDC COVID-19 website. Clinical laboratories also can purchase commercially developed viral tests with an EUA from the manufacturer.

Page last reviewed: June 10, 2020
Content source: National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases