

Coronavirus Disease 2019 (COVID-19)

Collection and Submission of Postmortem Specimens from Deceased Persons with Known or Suspected COVID-19, March 2020 (Interim Guidance)

Summary of Changes to the Guidance:

This document is an update to interim guidance as of March 25, 2020 include:

- Recommended upper respiratory tract swab specimens are limited to nasopharyngeal (NP) swab specimens.
- Recognition that COVID-19 testing, authorized by the Food and Drug Administration under an Emergency Use Authorization (EUA), is becoming available in public health and clinical laboratories.
- Considerations for when collection and submission of postmortem specimens might be considered for both known and suspected COVID-19 cases.

CDC guidance for COVID-19 may be adapted by state and local health departments to respond to rapidly changing local circumstances.

Medical examiners, coroners, and pathologists should **immediately** notify their [local](#) or [state](#) health department in the event of the identification of a deceased person with known or suspected COVID-19.

State and local health departments who have identified a deceased known or suspected COVID-19 case can notify CDC's Emergency Operations Center (EOC) at 770-488-7100 for urgent consultation if an autopsy is being considered or submission of autopsy tissue specimens or postmortem swabs to CDC for COVID-19 testing is desired. The EOC will assist local/state health departments to collect, store, and ship specimens appropriately to CDC, including during afterhours or on weekends/holidays.

This interim guidance is based on what is currently known about [coronavirus disease 2019 \(COVID-19\)](#).

Current knowledge suggests that spread from a living person happens with close contact (i.e., within about 6 feet) via respiratory droplets produced when an infected person coughs, sneezes, or talks, similar to how influenza and other respiratory pathogens spread. Recent studies indicate that people who are infected but do not have symptoms likely also play a role in the spread of COVID-19. This route of transmission is not a concern when handling human remains or performing postmortem procedures. It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes, but this is not thought to be the main way the virus spreads. CDC will update this interim guidance as additional information becomes available.

This document provides specific guidance for the collection and submission of postmortem specimens from deceased known or suspected COVID-19 cases. This document also provides recommendations for biosafety and infection control practices during specimen collection and handling, including during autopsy procedures. The guidance can be utilized by medical examiners, coroners, pathologists, other workers involved in providing postmortem care, and local and state health departments. Postmortem activities should be conducted with a focus on avoiding aerosol generating procedures and ensuring that if aerosol generation is likely (e.g., when using an oscillating saw) that appropriate engineering controls and personal protective equipment (PPE) are used. These precautions and the use of [Standard Precautions](#) should ensure that appropriate work practices are used to prevent direct contact with infectious material, percutaneous injury, and hazards related to moving heavy remains and handling embalming chemicals.

Medical examiners, coroners, and other healthcare professionals should use their judgment to determine if a decedent had signs and symptoms compatible with COVID-19 during life and whether postmortem testing should be pursued. Most patients with confirmed COVID-19 have developed fever and/or symptoms of acute respiratory illness (e.g., cough, difficulty breathing). There are epidemiologic factors that may also help guide decisions about COVID-19 testing, such as documented COVID-19 infections in a jurisdiction, known community transmission, contact with a known COVID-19 case, or being a part of a cluster of respiratory illness in a closed setting (e.g., a long-term care facility). Testing for other causes of respiratory illness (e.g., influenza) is strongly encouraged.

Recommended Postmortem Specimens

Recommendations about the type of postmortem specimens to [collect](#) vary based on whether the case of COVID-19 is suspected or confirmed, as well as whether an autopsy is performed.

The following factors should be considered when determining if an autopsy will be performed for a deceased known or suspected COVID-19 case: medicolegal jurisdiction, facility environmental controls, availability of recommended personal protective equipment (PPE), and family and cultural wishes.

If an autopsy is performed for a suspected COVID-19 case, collection of the following postmortem specimens is recommended:

- Postmortem swab specimens for COVID-19 testing:
 - Upper respiratory tract swab: Nasopharyngeal Swab (NP swab)
 - Lower respiratory tract swab: Lung swab from each lung
- Separate swab specimens for testing of other respiratory pathogens and other postmortem testing, as indicated
- Formalin-fixed autopsy tissues from lung, upper airway, and other major organs

If an autopsy is NOT performed for a suspected COVID-19 case, collection of the following postmortem specimens is recommended:

- Postmortem Nasopharyngeal Swab (NP swab) specimen for COVID-19 testing
- Separate NP swab for testing of other respiratory pathogens

If an autopsy is performed for a confirmed COVID-19 case, collection of the following postmortem specimens should be considered:

- Postmortem swab specimens for testing of other respiratory pathogens,
- Other postmortem microbiologic and infectious disease testing, as indicated
- Formalin-fixed autopsy tissues from lung, upper airway, and other major organs

In addition to postmortem specimens, any remaining specimens (e.g., NP swab, sputum, serum, stool) that may have been collected prior to death should be retained. Please refer to [Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Persons for Coronavirus Disease 2019 \(COVID-19\)](#) for more information.

Recommended Biosafety and Infection Control Practices

Collection of Postmortem Nasopharyngeal Swab (NP Swab) Specimens Only

Instructions in this section apply if **only** postmortem NP swabs are being collected from a deceased person with known or suspected COVID-19. **If an autopsy is being performed or aerosol generating procedures (AGPs) are being conducted, instructions in the section Autopsy Procedures should be followed.**

If only a postmortem NP swab is being collected, individuals in the room during specimen collection should be limited to healthcare personnel (HCP) obtaining the specimen. HCP should follow Standard Precautions.

Engineering Control Recommendations for NP Swab Collection:

Since collection of nasopharyngeal swab specimens from deceased persons will not induce coughing or sneezing, a negative pressure room is **not** required if **only** a NP swab is being collected from the decedent. Personnel should adhere to Standard Precautions as described above.

PPE Recommendations for NP Swab Collection:

Since collection of nasopharyngeal swab specimens from deceased persons will not induce coughing or sneezing, NIOSH-certified disposable N-95 respirator or higher is **not** required if **only** a NP swab is being collected from the decedent.

The following PPE should be worn at a minimum:

- Wear nonsterile, nitrile gloves when handling potentially infectious materials.
- If there is a risk of cuts, puncture wounds, or other injuries that break the skin, wear heavy-duty gloves over the nitrile gloves.
- Wear a clean, long-sleeved fluid-resistant or impermeable gown to protect skin and clothing.
- Use a plastic face shield or a face mask and goggles to protect the face, eyes, nose, and mouth from splashes of potentially infectious bodily fluids.

Autopsy Procedures

[Standard Precautions](#), [Contact Precautions](#), and [Airborne Precautions with eye protection \(goggles or a face shield\)](#) should be followed during autopsy. Many of the following procedures are consistent with existing guidelines for safe work practices in the autopsy setting; see [Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories](#).

- AGPs such as use of an oscillating bone saw should be avoided for known or suspected COVID-19 cases. Consider using hand shears as an alternative cutting tool. If an oscillating saw is used, attach a vacuum shroud to contain aerosols.
- Allow only one person to cut at a given time.
- Limit the number of personnel working in the autopsy suite at any given time to the minimum number of people necessary to safely conduct the autopsy.
- Limit the number of personnel working on the human body at any given time.
- Use a biosafety cabinet for the handling and examination of smaller specimens and other containment equipment whenever possible.
- Use caution when handling needles or other sharps, and dispose of contaminated sharps in puncture-proof, labeled, closable sharps containers.
- A logbook including names, dates, and activities of all workers participating in the postmortem and cleaning of the autopsy suite should be kept to assist in future follow up, if necessary. Include custodian staff entering after hours or during the day.

Engineering Control Recommendations for Autopsies:

Autopsies on known or suspected COVID-19 cases should be conducted in Airborne Infection Isolation Rooms (AIIRs). These rooms are at negative pressure to surrounding areas, have a minimum of 6 air changes per hour (ACH) for existing structures and 12 ACH for renovated or new structures, and have air exhausted directly outside or through a HEPA filter. Doors to the room should be kept closed except during entry and egress. If an AIIR is not available, ensure the room is negative pressure with no air recirculation to adjacent spaces. A portable HEPA recirculation unit could be placed in the room to provide further reduction in aerosols. Local airflow control (i.e., laminar flow systems) can be used to direct aerosols away from personnel. If use of an AIIR or HEPA unit is not possible, the procedure should be performed in the most protective environment possible. Air should never be returned to the building interior, but should be exhausted outdoors, away from areas of human traffic or gathering spaces and away from other air intake systems.

PPE Recommendations for Autopsies:

The following PPE should be worn during autopsy procedures:

- Double surgical gloves interposed with a layer of cut-proof synthetic mesh gloves
- Fluid-resistant or impermeable gown
- Waterproof apron
- Goggles or face shield
- NIOSH-certified disposable N-95 respirator or higher
 - Powered, air-purifying respirators (PAPRs) with HEPA filters may provide increased worker comfort during extended autopsy procedures.
 - When respirators are necessary to protect workers, employers must implement a comprehensive respiratory protection program in accordance with the OSHA Respiratory Protection standard (29 CFR 1910.134 [↗](#)) that includes medical exams, fit-testing, and training.

Surgical scrubs, shoe covers, and surgical cap should be used per routine protocols. **Doff (take off) PPE** [↗](#) carefully to avoid contaminating yourself and before leaving the autopsy suite or adjacent anteroom.

After removing PPE, discard the PPE in the appropriate laundry or waste receptacle. Reusable PPE (e.g., goggles, face shields, and PAPRs) must be cleaned and disinfected according to the manufacturer's recommendations before reuse. Immediately after doffing PPE, wash hands with soap and water for 20 seconds. If hands are not visibly dirty and soap and water are not available, an alcohol-based hand sanitizer that contains 60%-95% alcohol may be used. However, if hands are visibly dirty, always wash hands with soap and water before using alcohol-based hand sanitizer. Avoid touching the face with gloved or unwashed hands. Ensure that hand hygiene facilities are readily available at the point of use (e.g., at or adjacent to the PPE doffing area).

If the PPE supply is low, see [Strategies for Optimizing the Supply of PPE](#).

Additional safety and health guidance is available for workers handling deceased known or suspected COVID-19 cases at the [Occupational Safety and Health Administration \(OSHA\), COVID-19 website](#) [↗](#).

Collection of Postmortem Specimens

Implementing proper biosafety and infection control practices is critical when collecting specimens. Please refer to [Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 \(COVID-19\)](#) for additional information.

Collection of Postmortem Swab Specimens for COVID-19 Testing

For suspected COVID-19 cases, CDC recommends collecting and testing postmortem nasopharyngeal swabs (NP swabs) and if an autopsy is performed, lower respiratory specimens (lung swabs). If the diagnosis of COVID-19 was established before death, collection of these specimens for COVID-19 testing may not be necessary. Medical examiners, coroners, and pathologists should work with their local or state health department to determine capacity for testing postmortem swab specimens.

Use only synthetic fiber swabs with plastic shafts. Do not use calcium alginate swabs or swabs with wooden shafts, as they may contain substances that inactivate some viruses and inhibit PCR testing. Place swabs immediately into sterile tubes containing 2-3 ml of viral transport media. NP and lung swab specimens should be kept in separate vials. Refrigerate specimen at 2-8°C and ship overnight to CDC on ice pack.

Upper Respiratory Tract Specimen Collection: Nasopharyngeal Swab (NP swab)

- Insert a swab into the nostril parallel to the palate. Leave the swab in place for a few seconds to absorb secretions. Swab both nasopharyngeal areas with the same swab.

Lower respiratory tract Specimen Collection: Lung swabs

- Collect one swab from each lung (left and right). Options for lung swab collection include the following, and may depend on the institution's standard practices or type of autopsy procedure (e.g., full or in-situ autopsy)
 - During the internal exam, after the heart-lung block is removed, insert one swab as far down into the tracheobronchial tree as possible on either side (left and right)

- o First wipe the surface of each lung with an iodine-containing disinfectant clean and dry the surface; then use a sterile scalpel to cut a slit of the lung and insert the swab to collect sample on either side.

Storage of Postmortem Swab Specimens

Store specimens at 2-8°C for up to 72 hours after collection. If a delay in testing or shipping is expected, store specimens at -70°C or below.

Collection of Postmortem Specimens for Other Routine Testing

Separate postmortem specimens (e.g., NP or lung swabs) should be collected for routine testing of respiratory pathogens at either clinical or public health labs. Note that clinical laboratories should NOT attempt viral isolation from specimens collected from known or suspected COVID-19 cases.

Other postmortem specimen collection and evaluations should be directed by the decedent's clinical and exposure history, scene investigation, and gross autopsy findings, and may include routine bacterial cultures, toxicology, and other studies as indicated.

Collection of Fixed Autopsy Tissue Specimens

The preferred specimens would be a minimum of eight blocks and fixed tissue specimens representing samples from the respiratory sites listed below in addition to specimens from major organs (including liver, spleen, kidney, heart, GI tract) and any other tissues showing significant gross pathology.

The recommended respiratory sites include:

1. Trachea (proximal and distal)
2. Central (hilar) lung with segmental bronchi, right and left primary bronchi
3. Representative pulmonary parenchyma from right and left lung

Viral antigens and nucleic acid may be focal or sparsely distributed in patients with respiratory viral infections and are most frequently detected in respiratory epithelium of large airways. For example, larger airways (particularly primary and segmental bronchi) have the highest yield for detection of respiratory viruses by molecular testing and immunohistochemistry (IHC) staining. Performance of specific immunohistochemical, molecular, or other assays will be determined using clinical and epidemiologic information provided by the submitter and the histopathologic features identified in the submitted tissue specimens.

Collection of tissue samples roughly 4-5 mm in thickness (i.e., sample would fit in a tissue cassette) is recommended for optimal fixation. The volume of formalin used to fix tissues should be 10x the volume of tissue. Place tissue in 10% buffered formalin for three days (72 hours) for optimal fixation.

Safely Preparing the Specimens for Shipment

After collecting and properly securing and labeling specimens in primary containers with the appropriate media/solution, they must be transferred from the autopsy suite in a safe manner to laboratory staff who can process them for shipping.

1. Within the autopsy suite, primary containers should be placed into a larger secondary container.
2. If possible, the secondary container should then be placed into a resealable plastic bag that was not in the autopsy suite when the specimens were collected.
3. The resealable plastic bag should then be placed into a biological specimen bag with absorbent material; and then can be transferred outside of the autopsy suite.
 - a. Workers receiving the biological specimen bag outside the autopsy suite or anteroom should wear disposable nitrile gloves.

Submission of Specimens for Testing

Submission of Postmortem Swab Specimens for COVID-19 Testing

Medical examiners, coroners, and other healthcare professionals should work with their state and local health departments to coordinate testing through public health laboratories. In addition, COVID-19 testing, authorized by the Food and Drug Administration under an Emergency Use Authorization (EUA), is becoming available in clinical laboratories. State and local health departments can contact CDC's Emergency Operations Center (EOC) at 770-488-7100 for assistance with obtaining, storing, and shipping appropriate specimens to CDC for testing, including after hours or on weekends or holidays, if testing of postmortem swab specimens is not available in their public health laboratory.

This section applies to submission of postmortem NP swab and lung swabs

- Store specimens at 2-8°C for up to 72 hours after collection and ship overnight to CDC on ice pack. If a delay in testing or shipping is expected, store specimens at -70°C or below and ship overnight to CDC on dry ice.
- Label each specimen container with the patient's ID number (e.g., medical record number), unique specimen ID (e.g., laboratory requisition number), specimen type (e.g., serum) and the date the sample was collected.
- Complete a [CDC Form 50.34](#) for each specimen submitted.
- In the upper left box of the form provide the following: (1) for *test requested* select "Respiratory virus molecular detection (non-influenza) CDC-10401" and (2) for *At CDC, bring to the attention of* enter "Stephen Lindstrom: COVID-19 PUI – Autopsy specimens".

Postmortem swab specimens from known or suspected COVID-19 cases must be packaged, shipped, and transported according to the current edition of the [International Air Transport Association \(IATA\) Dangerous Goods Regulations](#) [✉](#). Additional useful and detailed information on packing, shipping, and transporting specimens can be found at [Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus 2019 \(COVID-19\)](#).

Submission of Fixed Autopsy Tissue Specimens

CDC's Infectious Diseases Pathology Branch (IDPB) can receive fixed autopsy tissue specimens from known or suspected COVID-19 cases. IDPB will perform histopathologic evaluation; testing for COVID-19, as well as other respiratory viral pathogens (e.g., influenza); and bacterial and other infections, as indicated.

Paraffin-embedded tissue blocks

In general, this is the preferred specimen and is especially important to submit in cases where tissues have been in formalin for a significant time. Prolonged fixation (>2 weeks) may interfere with some immunohistochemical and molecular diagnostic assays.

Wet tissue

If available, we highly recommend that unprocessed tissues in 10% neutral buffered formalin be submitted in addition to paraffin blocks.

Requirements for submitting fixed tissues to CDC

- A. Contact CDC's Infectious Diseases Pathology Branch at pathology@cdc.gov who will provide a pre-populated [CDC Form 50.34](#) for your convenience. Include in the email:**
 1. A brief clinical history
 2. A description of gross or histopathologic findings in the tissues to be submitted
- B. After you receive email approval from CDC:**
 1. Electronically fill, save, and print both pages of the [CDC Form 50.34](#).
 2. In the upper left box of the form, Select Test Order Code CDC-10365 ("Pathologic Evaluation of Tissues for Possible Infectious Etiologies")
 3. Enter "COVID-19" and provide any applicable CDC and State NCOV Case ID numbers in the Comments section on Page 2 of the CDC 50.34 form.
 4. In addition to the CDC 50.34 form, enclose the following in the specimen submission package:
 1. Surgical pathology, autopsy report (preliminary is acceptable), or both


2. Relevant clinical notes, including admission History and Physical (H&P), discharge summary, if applicable

C. Mailing/Contact Info:




1. Formalin-fixed wet tissues and/or formalin-fixed paraffin-embedded tissue blocks should be shipped in suitable packaging **at ambient temperature. Do not freeze fixed tissues.**
2. Ship to: Dr. Sherif Zaki, CDC, IDPB, 1600 Clifton Rd NE, MS: H18-SB, Atlanta, GA 30329-4027
3. Send tracking number to pathology@cdc.gov
4. Tel: 404-639-3132, Fax: 404-639-3043, Email: pathology@cdc.gov


Cleaning and Waste Disposal Recommendations

The following are general guidelines for cleaning and waste disposal following an autopsy of a decedent with confirmed or suspected COVID-19. Current evidence suggests that novel coronavirus may remain viable for hours to days on surfaces made from a variety of materials.


Routine cleaning and disinfection procedures (e.g., using cleaners and water to pre-clean surfaces prior to applying Environmental Protection Agency (EPA)-approved disinfectant [products with emerging viral pathogens claims](#) ) that are expected to be effective against COVID-19 based on data for harder to kill viruses in these settings.

After an autopsy of a decedent with confirmed or suspected COVID-19, the following recommendations apply for the autopsy room (and anteroom if applicable):




- Keep ventilation systems active while cleaning is conducted; before cleaning, wait 24 hours in a non-healthcare setting, or if you know the air changes per hour of the room or area in a healthcare setting, follow the [recommended wait time](#) before cleaning.
- Wear disposable gloves recommended by the manufacturer of the cleaner or disinfectant while cleaning and when handling cleaning or disinfecting solutions.
 - Dispose of gloves if they become damaged or soiled and when cleaning is completed, as described below. Never wash or reuse gloves.
- Use eye protection, such as a faceshield or goggles, if splashing of water, cleaner/disinfectant, or other fluids, is expected.
- Wear a clean, long-sleeved fluid-resistant gown to protect skin and clothing.
- Wear a NIOSH-certified disposable N-95 respirator or higher if you need to clean the room or area in less than 24 hours or the appropriate wait time as defined in the table above cannot be met.
- Additional PPE may be required to protect workers against potential hazards associated with the cleaning and disinfectant products used and in accordance with the label instructions.
- If PPE is in low supply, consider having workers who performed autopsies conduct the cleaning and sanitizing of the area.
- When respirators are necessary to protect workers, employers must implement a comprehensive respiratory protection program in accordance with the OSHA Respiratory Protection standard ([29 CFR 1910.134](#) ) that includes medical exams, fit-testing, and training.
- Ensure workers are trained on OSHA's Hazard Communication standard, [29 CFR 1910.1200](#) , to communicate with workers about the hazardous chemicals used in the workplace.
- Use disinfectant [products with EPA-approved emerging viral pathogens claims](#)  that are expected to be effective against COVID-19 based on data for harder to kill viruses. Follow the manufacturer's instructions for all cleaning and disinfection products (e.g., concentration, application method and contact time, etc.).
 - Clean the surface first, and then apply the disinfectant as instructed on the disinfectant manufacturer's label. Ensure adequate contact time for effective disinfection.
 - Adhere to any safety precautions or other label recommendations as directed (e.g., allowing adequate ventilation in confined areas and proper disposal of unused product or used containers).
 - Avoid using product application methods that cause splashing or generate aerosols.
 - Cleaning activities should be supervised and inspected periodically to ensure correct procedures are followed.
- Do not use compressed air and/or water under pressure for cleaning, or any other methods that can cause splashing or might re-aerosolize infectious material.

- Gross contamination and liquids should be collected with absorbent materials, such as towels, by staff conducting the autopsy wearing designated PPE. Gross contamination and liquids should then be disposed of as described below:
 - Use of tongs and other utensils can minimize the need for personal contact with soiled absorbent materials.
 - Large areas contaminated with body fluids should be treated with disinfectant following removal of the fluid with absorbent material. The area should then be cleaned and given a final disinfection.
 - Small amounts of liquid waste (e.g., body fluids) can be flushed or washed down ordinary sanitary drains without special procedures.
 - Hard, nonporous surfaces may then be cleaned and disinfected as described above.
- Follow standard operating procedures for the containment and disposal of used PPE and regulated medical waste. State and local governments should be consulted for appropriate disposal decisions.
- Dispose of human tissues according to routine procedures for pathological waste.
- Clean and disinfect or autoclave non-disposable instruments using routine procedures, taking appropriate precautions with sharp objects.
- Materials or clothing that will be laundered can be removed from the autopsy suite (or anteroom, if applicable) in a sturdy, leak-proof biohazard bag that is tied shut and not reopened. These materials should then be sent for laundering according to routine procedures.
- Wash reusable, non-laundable items (e.g., aprons) with detergent solution on the warmest setting possible, rinse with water, decontaminate using disinfectant, and allow items to dry completely before next use.
- Keep camera, telephones, computer keyboards, and other items that remain in the autopsy suite (or anteroom, if applicable) as clean as possible, but treat as if they are contaminated and handle with gloves. Wipe the items after use with appropriate Environmental Protection Agency (EPA)-approved disinfectant [products with emerging viral pathogens claims](#)  that are expected to be effective against COVID-19. If being removed from the autopsy suite, ensure complete decontamination with appropriate disinfectant according to the manufacturer's recommendations prior to removal and reuse.
- When cleaning is complete and PPE has been removed, wash hands immediately with soap and water for 20 seconds. If hands are not visibly dirty and soap and water are not available, an alcohol-based hand sanitizer that contains 60%-95% alcohol may be used. However, if hands are visibly dirty, always wash hands with soap and water before using alcohol-based hand sanitizer. Avoid touching the face with gloved or unwashed hands. Ensure that hand hygiene facilities are readily available at the point of use (e.g., at or adjacent to the PPE doffing area).

Transportation of Human Remains

Follow standard routine procedures when transporting the body after specimens have been collected and the body has been bagged. Disinfect the outside of the bag with a [product with EPA-approved emerging viral pathogens claims](#)  expected to be effective against COVID-19 applied according to the manufacturer's recommendations. Wear disposable nitrile gloves when handling the body bag.

Additional Resources:

- [CDC Guidelines for Safe Work Practices in Human and Animal Diagnostic Laboratories](#) 
- [OSHA COVID-19 Guidance](#) 
- [WHO Guidance on regulations for the transport of infectious substances 2017–2018](#) 
- [CDC Tools for Protecting Healthcare Personnel](#)
- [CDC Environmental Infection Control Guidelines](#)
- [CDC Medical Examiners, Coroners, and Biologic Terrorism](#)
- [COVID-19 and Funerals](#)