Centers for Disease Control and Prevention

Mpox

Mpox Home

CDC is updating webpages with the term "mpox" to reduce stigma and other issues associated with prior terminology. This change is aligned with the recent World Health Organization decision.

Autopsy and Handling of Human Remains of Patients with Mpox

Updated January 20, 2023

All post-mortem procedures require adherence to standard precautions with the use of appropriate personal protective equipment (PPE) and facilities with appropriate safety features.

Transfer of Human Remains

Personnel who perform post-mortem care of remains for patients with confirmed or suspected mpox should wear PPE as recommended for healthcare settings. The body should be prepared following routine healthcare facility procedures for cleaning and containing body fluids and then wrapped in a plastic shroud. Wrapping should be done to prevent contamination of the outside of the shroud.

If an autopsy is performed, the shrouded body should be placed on a mortuary stretcher and covered with a clean linen sheet for transportation to the morgue. If the remains go directly to a mortuary, they should be placed in a body bag prior to removal. Dispose of gown and gloves after completing post-mortem care or if they become damaged. People transporting prepared and covered human remains should wear gloves but are not required to wear other PPE.

Protective Equipment and Facility Design for Autopsy

People who transfer remains from a mortuary stretcher onto the autopsy table should wear a gown, gloves, and eye protection. Personnel who perform or assist with the autopsy of patients with confirmed or suspected mpox should wear the following PPE:

- **Protective garments:** Surgical scrub suit, surgical cap, impervious gown with full sleeve coverage, eye and face protection (for example, face shield), shoe covers, and double surgical gloves with an interposed layer of cut-proof synthetic mesh gloves should be used.
- **Respiratory protection:** A NIOSH-approved particulate respirator equipped with N95 filters or higher should be worn. A powered air-purifying respirator (PAPR) with particulate filters is recommended for any procedures that may result in mechanical generation of aerosols (for example, use of oscillating saws). Autopsy personnel who cannot wear tight-fitting respirators because of facial hair or other fit limitations should wear PAPRs.
- **Handling of protective equipment:** PPE should be worn following required don, use, and doff protocols to avoid self-contamination and to mitigate risk of carrying the virus outside the autopsy suite or adjacent anteroom. Prior to removing PPE, the outer gloves and any PPE with obvious contamination should be sprayed or wiped with EPA-registered disinfectant. After removing PPE, discard the PPE in the appropriate laundry or waste receptacle. Reusable PPE (for example, goggles, face shields, and PAPRs) must be thoroughly 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 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. At all times

avoid touching any exposed skin or mucous membranes with hands. Ensure that hand hygiene facilities are readily available at the point of use (for example, at or adjacent to the PPE doffing area).

Before an autopsy begins, the following engineering strategies and facility designs should be considered:

- Air handling systems: Autopsy suites must have adequate air-exchanges per hour, and correct directionality and exhaust of airflow. Autopsy suites should have a minimum of 12 air-exchanges per hour and should be at a negative pressure relative to adjacent passageways and office spaces. Air should not be returned to the building interior, but should be exhausted outdoors, away from areas of human traffic or gathering spaces (for example, off the roof) and other air intake systems. For autopsies, local airflow control (that is, laminar flow systems) can direct aerosols away from personnel; however, this safety feature does not remove the need for appropriate PPE.
- Doors and windows: During autopsy, keep doors and windows to the autopsy suite closed.
- Containment devices: Biosafety cabinets should be available for handling and examining smaller specimens. Oscillating saws should be used with vacuum shrouds to reduce the amount of particulate and droplet aerosols generated. These devices should be used whenever possible to decrease the risk of occupational exposure.

Autopsy Procedures and Specimen Collection

The following safety procedures should be used for autopsies and post-mortem assessment of mpox cases:

- Prevention of percutaneous injury: All sharps should be carefully handled; never recap, bend, or cut needles, and ensure that appropriate sharps containers are available.
- Procedures: Mpox virus can be transmitted through skin-to-skin contact. Additionally, due to viral dissemination to other tissues, organs, and bodily fluids of persons where mpox infection may have contributed to death, the number and extent of procedures should be minimized, both to decrease opportunities for worker risk and the potential for environmental contamination. Perform autopsies only to the extent required to obtain needed information. Omit examinations that generate aerosols and increase the risk of environmental contamination (for example, using oscillating saws to open the skull). If such procedures are necessary and an oscillating saw is used, attach a vacuum shroud to contain aerosols.

Samples should be taken from all major organs when possible. Particular attention and extensive sampling should include tissues demonstrating gross pathology or involvement as suggested by clinical presentation. Autopsy specimens should include:

- Skin (lesions, if present)
- Spleen
- Representative lymph nodes
- Liver
- Lung
- Kidney
- Heart
- GI tract (esophagus, stomach, small and large intestine)
- Adrenals
- Major reproductive organs (testes, ovaries, uterus)
- Brain (see comment above regarding oscillating saws)
- Bone marrow

Place representative tissues in 10% buffered formalin for a minimum of 48 hours and no longer than 2 weeks. Autopsy brain tissues may require additional fixation of up to 4 weeks. After fully fixed, specimens should undergo processing, paraffin-embedding, and routine histopathologic evaluation. Formalin-fixed wet tissues and formalin-fixed, paraffin-embedded tissue blocks should be stored at room temperature.

A second set of representative fragments of tissues listed above should be collected using sterile techniques and placed in sterile 1.5-2 mL screw-capped plastic vials with O-ring, or any tube with a gasket seal (leak-proof) that can be shipped under the required conditions. DO NOT ADD ANY VIRAL TRANSPORT MEDIA. Ideally, specimens should be stored and shipped frozen at -20^{0}C or lower

Disinfection Procedures after Autopsy:

- All non-reusable specimen collection and barrier protection materials should be placed in biohazard bags for handling as medical waste. For more information, see Waste Management
- All reusable equipment should be cleaned and disinfected according to standard laboratory procedures.
- After autopsy, clean and disinfect all surfaces such as counters, faucets, using 0.5% sodium hypochlorite or another EPA-registered disinfectant (such as List Q) in accordance with the manufacturer's instructions.

Monitoring Autopsy Personnel Exposed to Mpox Virus

Infection Control: Healthcare Settings
Guidelines for monitoring healthcare workers who have unprotected exposures to patients with mpox or laboratory specimens from these patients.

PERSONAL PROTECTIVE EQUIPMENT RESOURCES

- Personal Protection Equipment (PPE)
- Sequence for Putting on Personal Protection Equipment (PPE) [2.85MB, 3 pages]; also includes doffing information

OSHA's Respiratory Protection Safety and Health Topics page provides additional information about respiratory protection programs, including training, fit testing , and compliance [14.9 MB, 124 Pages] resources.

Autopsy Specimen Submission to CDC

Formalin-fixed autopsy tissue specimens

Formalin-fixed autopsy tissue specimens can be submitted to CDC's Infectious Diseases Pathology Branch (IDPB) for additional pathologic characterization, and immunohistochemical (IHC) testing for orthopoxviruses. Testing for other infectious etiologies by methods including IHC and polymerase chain reaction (PCR) may also be performed as warranted based on histopathologic findings and clinical and epidemiologic history.

Acceptable sample criteria:

- Formalin-fixed, paraffin-embedded (FFPE) tissue blocks that have been submerged in formalin for ≤2 weeks prior to embedding in paraffin. FFPE tissue blocks are the preferred specimen type for submission to CDC's IDPB.
- For autopsies, formalin-fixed wet tissues that have been submerged in formalin for ≤2 weeks prior to receipt at CDC are also acceptable.

Please contact CDC's Infectious Diseases Pathology Branch (IDPB) (pathology@cdc.gov) for pre-approval and specific submission instructions. **Do not send specimens until pre-approval is provided by pathology@cdc.gov.** For more information, see: Pathologic or Molecular Evaluation of Fixed Tissues for Possible Infectious Etiologies (CDC-10365).

Fresh frozen autopsy tissue specimens

For fresh, frozen autopsy tissue samples, please contact the Poxvirus laboratory (poxviruslab@cdc.gov) for pre-approval and specific submission instructions. Please indicate if the patient was taking tecovirimat (TPOXX).

> For more information on labeling and packaging specimens for transport read Submitting Specimens to CDC Shipping and Packing.

Reminder

Healthcare providers, pathologists, medical examiners, and coroners:

Please first contact your state, tribal, local, or territorial health department for approval of specimen submission to CDC.

Last Reviewed: January 20, 2023