ENVIRONMENTAL HEALTH AND SAFETY
University of Nebraska-Lincoln

Safe Operating Procedure

(Revised 7/21)

NECROPSY BIOSAFETY

Scope

This SOP provides general biosafety considerations for necropsy of animals used as part of research, diagnostic or teaching activities at UNL, with the intent of minimizing potential for zoonotic infection. However, all necropsy procedures at UNL must meet or exceed the safe practices described in this document.

References

- Centers for Disease Control and Prevention. *Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories.* MMWR 2012;61 (Suppl).
- Baszler, Timothy and Graham, Tanya. 2017. *Veterinary Diagnostic Laboratories and Necropsy*, p 619-646. In Wooley, Dawn P. and Byers, Karen B. (ed), *Biological Safety: Principles and Practices*, Fifth Edition.
- US Department of Agriculture. *General Guidelines for Necropsy*. https://www.aphis.usda.gov/animal_health/lab_info_services/downloads/NecropsyGuideline.pdf

Definitions

Zoonotic disease: A zoonosis is any disease or infection that is naturally transmissible from vertebrate animals to humans.

Containment Considerations

- When a risk assessment has determined that the animal(s) to be necropsied present no risk of exposure to zoonotic or human pathogenic microorganisms, the necropsy may be conducted on the lab bench. However, conducting the necropsy in the aseptic atmosphere of a BSC is recommended.
- At a minimum, necropsies for animals that died from unknown causes or when there is a potential for zoonotic disease exposure should be conducted in accordance with BSL-2 containment principles and practices. In addition, prior to conducting any necropsy procedures, the person conducting the necropsy must review the animal's history to determine if biosafety practice enhancements are recommended based on the likelihood of

Risk Group 3 (RG-3) zoonotic agents (i.e., Anthrax, Q fever, Rabies virus, *Chlamydophila psittaci* (Psittacosis), West Nile Virus, Equine encephalomyelitis viruses, etc.).

- Necropsy of small animals should be conducted within a Class II biosafety cabinet (BSC) when one is available.
- Unessential personnel and others should be limited in the necropsy area.

Exceptions for teaching-related observation of necropsy procedures are allowed when appropriate PPE is provided to the students and they are informed of any possible zoonotic exposure risks.

Personal Protective Equipment Considerations

Always follow facility PPE requirements when conducting animal experiments, necropsy, and biological sample collection procedures. Below are PPE considerations for necropsy.

- A rear-closing gown or coveralls are recommended for any necropsy conducted outside of a BSC. A lab coat is acceptable when working inside of a BSC. The gown should be fluid-resistant or supplemented with a fluid-resistant apron when working with animals of a size that body fluids are present in a quantity that could lead to soak-through of the gown.
- Latex or nitrile gloves must always be worn. Gloves must be changed when damaged or compromised. Consider also using cut-resistant gloves when using sharp instruments.
- Safety glasses are acceptable eye protection when conducting a necropsy within a BSC. A face shield may be indicated for necropsies conducted outside of a BSC based on the zoonotic disease or other hazard exposure risk determination.
- Footwear should cover the toes and top of the foot. Impervious disposable shoe covers, or rubber boots should be worn when working outside of a biosafety cabinet with animals of a size that body fluids are present in a quantity that could spill and soak through street shoes.
- Respiratory protection must be considered when a zoonotic disease or hazardous chemical exposure risk may exist for procedures that may generate biological or chemical aerosols conducted outside of a biosafety cabinet.
    - Use of a respirator must be approved by EHS and users are not allowed to use respiratory protection equipment until they are enrolled in the UNL Respiratory Protection Program (RPP).
    - Persons who perform necropsy procedures are encouraged to contact EHS to enroll in the UNL RPP upon initial assignment to necropsy tasks.
    - Under the UNL RPP, participants must complete annual training and fit testing, and are subject to medical qualification.

- All PPE must be removed before entering clean areas. Disposable PPE must not be washed or otherwise disinfected for the purpose of re-use.
- PPE should be provided for personnel present in the necropsy area, but not directly participating in the necropsy. Observers should wear the same PPE as those conducting the necropsy.

Required PPE for Necropsy with Zoonotic Disease Risk

Area protected	Inside a BSC	Outside a BSC
Body	Lab coat with elastic cuffs or use of Tyvek sleeves	Rear-closing gown or coveralls
Hands	Latex or nitrile gloves (layer over cut resistant based on risk)	Impervious gloves (layer over cut resistant based on risk)
Eyes	Safety glasses with side shields	Safety glasses with side shields and a face shield
Feet	Footwear covers top of foot and toes.	Impervious disposable shoe covers or rubber boots
Nose and Mouth	None	Fluid Resistant mask (RG-2) Respirator (N-95 or equivalent) (RG-3)

Procedural Considerations

- Like the approach taken with bloodborne pathogens, all necropsies should be approached with “universal precautions.” That is, all specimens should be handled and treated as though they were known to present risk of zoonotic disease exposure.
- No eating, drinking, grooming, or other activities that are a means of exposure are permitted in necropsy areas.
- A risk assessment may determine that vaccination or medical surveillance is warranted for certain zoonotic diseases. These may include, rabies virus, *Mycobacterium tuberculosis*, Q fever (*Coxiella burnettii*), *Francisella tularensis*, etc. Vaccinations shall be in accordance with current CDC guidelines and updated as guidelines change. Medical surveillance may include regular testing or simply self-monitoring for symptoms of disease. Vaccination and medical surveillance may also be requirements of Institutional Biosafety Committee protocol approval. Employees shall also be informed that risk of exposure is greater if their immune systems are compromised or suppressed.
- Avoid recapping needles. If necessary, use one-handed scoop technique or a mechanical device to assist with recapping.
- Tools should be used to the extent feasible to manipulate tissues to avoid cut hazards (i.e., forceps).

- Hand tools are preferred to power tools. Use of power tools should be reserved only when there are no other alternatives. Use of power tools must be treated as an aerosol-generating activity.
- Transport unfixed tissues in leak-proof containers.

Potentially Infectious Aerosols

Manipulation of infectious tissue during necropsy of carcasses with suspected zoonotic agents can result in both airborne particles in a size (<5 μm) that floats on air currents for extended periods and can subsequently reach the lungs and small-droplet particles (>5 μm) that settle more quickly. Typical bacterial cells and spores range from 0.3 to 10 μm, fungal spores range from 2-5 μm and viruses range from 0.02 to 0.3 μm.

Contamination may occur from a variety of sources including fluid-aspirating hoses, spraying the carcass, operation of oscillating saws, and scraping dried blood from surfaces during cleanup. These airborne particles stay within the necropsy area and can result in subsequent contact with mouth and eyes, through inhalation or ingestion, and can contaminate inanimate surfaces such as computers, telephones, and camera equipment.

Disinfection and Disposal Considerations

- Necropsy areas and tools must be disinfected at the end of each work shift. The disinfectant must be approved for such use and used in accordance with label directions, including but not limited to recommended contact time.
- Remove solid chunks of tissue, hair, etc. prior to applying disinfectant. Remove in a manner that avoids production of aerosols.
- Avoid high-pressure washing of surfaces until after the disinfectant has remained in contact with surfaces for the prescribed contact time.
- Carcasses and tissues from necropsy of animals with known or suspected zoonotic agents must be incinerated or autoclaved.
    - Carcasses and large pieces of tissue ***must*** be incinerated.
    - Small pieces of tissue can be autoclaved. Autoclave sterilization phase cycle settings must be at least 121°C and 15 psi for 60 minutes.
- Carcasses free from known or suspected zoonoses may be sent for rendering.
- Contaminated, reusable PPE must not be removed from the necropsy area unless sealed in a sturdy bag. PPE known to be used with animals harboring a zoonotic agent should be autoclaved, if feasible; chemically disinfected if autoclaving is not feasible. When zoonoses are not likely, standard washing in detergent and warm or hot water is adequate. Laundering should not be conducted at home or at a Laundromat.
- Always wash hands thoroughly with soap and water after removing PPE and before exiting the necropsy area.

Select Agent Considerations

Identification of a regulated select agent or toxin from a specimen must be reported to the appropriate federal agency (APHIS or CDC) within 7 days after identification by the laboratory that confirms the agent. However, confirmatory identification of any of the following human or animal select agent pathogens requires immediate (i.e., within 24 hours) notification to the appropriate federal agency:

- *Bacillus anthracis*
- *Bacillus cereus* Biovar *anthracis*
- Botulinum neurotoxins
- Botulinum neurotoxin producing species of *Clostridium*
- *Burkholderia mallei*
- *Burkholderia pseudomallei*
- Ebola virus
- Foot-and-mouth disease virus
- *Francisella tularensis*
- Marburg virus
- Rinderpest virus
- Variola major virus (Smallpox virus)
- Variola minor virus (Alastrim)
- *Yersinia pestis*

Listed above are only those select agents requiring **immediate** notification to the appropriate federal agency. For a complete list of select agents, refer to Federal Select Agent Program (selectagents.gov). See also EHS SOP, ***Select Agents and Toxins – Clinical and/or Diagnostic Laboratory Activities***, for additional information.

Suspected Exposures and Occupational Injuries/Illnesses

Seek immediate medical attention for any known or suspected cut or wound, or other potential exposure to infectious agents or aerosols incurred during the necropsy procedure. Procedures are described in the EHS SOPs, ***On-the-Job and Student Injuries*** and ***Spill and Exposure Response for Biohazardous Materials***.

Suspected or known occupational exposures to a select agent, even in the context of a diagnostic/clinical laboratory, may be considered a "**release**" and therefore reportable to APHIS/CDC. **ALL** such situations must be reported to EHS immediately.

If a select agent is not suspected at the time of exposure, but later confirmed, contact EHS immediately if the necropsy or subsequent specimen handling may have resulted in an occupational exposure.