

Personal Protective Equipment for Veterinarians

A web based module for the National Veterinary Accreditation Program

Introduction

Welcome to the Personal Protective Equipment (PPE) for Veterinarians module. By completing this module on PPE, you should be able to:

- Know the difference between a surgical mask and an N-95 respirator.
- Describe the differences between OSHA's HAZWOPER (Hazardous Waste Operations and Emergency Response) PPE Levels A, B, C and D.
- Perform a brief risk assessment and select appropriate PPE for that situation.

Completion of this module is estimated to take 50 minutes but will vary depending on your familiarity with the information presented.

Introduction to PPE

Veterinarians work in unique environments. Although the work is safe most of the time, certain situations or exposures can pose a risk to you and your staff or clients. Whether administering vaccinations to small animals, treating large animals in the field, or working in a laboratory—you are faced with potential hazards on a daily basis. Such hazards include:

- Mechanical (e.g., dog bites, needle sticks)
- Chemical (e.g., chemotherapeutic agents, euthanasia solutions), and
- Biological (e.g., zoonotic diseases)
- Physical (e.g., noise, radiation, temperature extremes)

Ideally, hazards should be prevented through safe work practices, administrative, or engineering controls. These measures can not always eliminate occupational hazards, so relying on personal protective equipment (PPE) may be necessary in certain situations. PPE, such as gloves, protective clothing, goggles, and respirators protect veterinarians and employees from exposures to zoonotic diseases and personal injury. Additionally, properly worn PPE is a specific biosecurity step that can help prevent transfer of microorganisms from humans to susceptible animals; thereby minimizing the spread of pathogens in a clinic, between patients, or between farms. However, keep in mind that PPE within a veterinary practice is just one component of an overall infection control and biosecurity program and will not protect against all hazards.

This module will introduce you to the various types of PPE available and situations in which PPE is necessary, primarily focusing on protection from biological hazards. A majority of veterinarians only need to be familiar with the kinds of PPE used in a typical practice setting. However, in animal health emergency responses, veterinarians may be required to implement more sophisticated levels of PPE as part of an animal health emergency response. More information will be provided later in this module about PPE specific to these types of responses.

Types of PPE

Veterinarians utilize various types of PPE in practice on a daily basis. Yet, additional protective measures should be implemented for specific situations or exposures. We will review multiple types of PPE for veterinarians, including those used for [standard precautions] and [expanded precautions], describing the uses of each as it pertains to disease prevention.

[*pop-up explanation*: **Standard precautions** consist of best management practices that should be used daily to minimize infectious disease transmission. This level provides the minimum amount of protection despite the animal species, suspected diagnosis, or presumed infection status. Wearing PPE, such as a lab coat or coveralls, gloves, disposable or rubber boots, surgical masks, and eye protection if dealing with the risk of splash or body spray, are examples of a standard precaution.]

[*pop-up*: **Expanded precautions** (commonly referred to as contact and airborne precautions) are measures taken, in addition to standard precautions, for highly infectious, epidemiologically important, or zoonotic microorganisms. These enhanced measures may be necessary to protect personnel or prevent an outbreak situation. Items include such things as full coverage coveralls, gloves, tight-fitting goggles, and respirators.

Gowns/Smocks/Lab coats

These outer barriers are typically worn in clinical settings to prevent contamination of street clothing but provide only limited protection from injury or exposures to potentially infectious fluids. For instance, smocks can be short-sleeved and waist-length, leaving the arms and legs susceptible to contamination. Additionally, most of these items are relatively thin and are not resistant to fluids. However, these outer layers can contribute to maintaining infection control and preventing disease spread when cleaned or changed daily and not worn outside the clinic or on multiple calls.

In situations where liquid contaminants are of concern such as examining an animal with vomiting or diarrhea, assisting a birth, or performing a necropsy, veterinarians should choose a water-resistant barrier. This barrier will protect the underlying clothing from becoming wet and contaminated.

Coveralls/Overalls

Various kinds of coveralls/overalls are available and provide a range of protection from infectious diseases, chemicals or unknown organisms. The following is a list of options, ranging from standard to expanded levels of protection.

-Cloth (washable) coveralls/overalls: Often worn in typical clinic or field settings, these cover most of the body, but are often short-sleeved or sleeveless (with suspender straps). Therefore, additional covering for the arms may be needed. Clean coveralls should be worn for each animal premises visited or changed between animals of differing health status on the same premises.

The following are examples of expanded levels of protection:

-Tear-resistant coveralls (i.e., Tyvek®): These coveralls are tear-resistant to prevent contamination by particulate matter; however, they are

not water resistant. Such coveralls are typically one-use disposable items and are available in a hooded option as well. Some disposable coveralls allow for ventilation and can be taped to other barrier protectants to form a tighter seal.

- **Chemical-resistant coveralls (i.e., Tychem®)**: These coveralls provide particulate protection and also guard against liquids. Again, these coveralls are typically a one-use disposable item. Unlike the coveralls above, chemical-resistant coveralls are not breathable, and can easily contribute to overheating in certain situations.

- **Other coveralls**: Various types of durable coveralls and body suits are available for emergency responders needing elevated levels of protection. Veterinarians will generally not need these higher levels of protection in an everyday practice environment. However, in an animal health emergency, USDA will provide recommendations for veterinarians to assist with the appropriate selection and use of PPE.

Gloves

Gloves reduce the risk of disease transmission by providing barrier protection for the hands. Selection of the type of gloves depends on the situation.

- **Exam gloves**: Latex is a common choice for examination gloves but is not recommended due to problems with latex allergy. Vinyl or nitrile gloves are alternative choices. Gloves should be changed between examinations of individual animals or animal groups and should be disposed of properly after use to minimize contamination. Examination gloves can easily tear or puncture, so "double" gloving may be appropriate for some circumstances. Note: Disposable gloves have a shelf-life and need to be stored in a cool, dry place; it is a good idea to check the expiration date on boxes of gloves regularly to ensure they are viable.

- **Palpation sleeves**: When working in situations where exposure to liquids or splashing is possible (i.e., necropsy), shoulder-length palpation sleeves in conjunction with disposable gloves may be more suitable than gloves alone.

- **Heavy duty or chemical resistant gloves**: Rubber or neoprene gloves may be needed to provide sufficient protection from some hazards such as performing a field necropsy or handling chemicals like disinfectants or formalin. These gloves are reusable and should be disinfected between uses.

- **Work gloves**: Thick leather or cloth gloves may be worn for mechanical protection. However, they are not water-resistant and can become soaked with potentially contaminated liquids. In these situations, exam gloves should be worn underneath for barrier protection.

- **Cut-resistant gloves (i.e., Kevlar®)**: A cut-resistant glove should be worn on the non-cutting hand during a necropsy or other procedure involving the use of sharp instruments, when such use does not impede the work procedure.

Face/Respiratory Protection Devices

Protecting the eyes, nose and mouth is important to prevent exposure to biological and chemical hazards, such as zoonotic disease agents and chemical vapors. Such protection is available in a variety of products including surgical masks, respirators,

face shields, and goggles. Only NIOSH (National Institute for Occupational Safety and Health) certified respirators and ANSI (American National Standards Institute) approved face shields and goggles should be used. Some of these items may be very familiar in your practice; others may be new, but it is important to understand how various types of respiratory protection can keep you safe.

Disposable Surgical Masks (facemasks)

Surgical masks are used as a physical barrier to protect employees from hazards such as splashes of large droplets of blood or other potentially infective materials (OPIM). Facemasks are cleared by the FDA and are legally marketed in the United States for use in disease prevention. FDA-cleared masks have been tested for their ability to resist blood and body fluids, but they are not designed or certified to prevent the inhalation of small airborne contaminants. Therefore, although surgical masks may offer appropriate protection from diseases transmitted solely via the droplet route, they do not provide adequate protection against airborne contaminants.

According to one study, the wearing of surgical masks provided protection from infection with the SARS (severe acute respiratory syndrome) virus during a 2003 outbreak (*Source*: Seto W, Tsang D, Yung R, et al. Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS). *Lancet* 2003; 361:1519-1520.). Of the 51 healthcare workers in this study, those wearing surgical masks during known SARS exposure were not infected. [*pop-up*: Both SARS and influenza are known to be transmitted primarily through the droplet route but there is evidence that transmission via the airborne route is possible. The relative importance of each of these routes of transmission remains to be determined] Respiratory protection (discussed next) is required to prevent transmission via the airborne route. However, if respirators are not available, use of surgical masks are warranted in light of no protection at all.

Respirators:

Respirators are used to reduce an employee's exposure to airborne contaminants. Most respirators are designed to fit the face and to provide a tight seal between the respirator's edge and the face. A proper seal between the user's face and the respirator forces inhaled air to be pulled through the respirator's filter material and not through gaps in the seal between the face and respirator.

OSHA requires that respirators must be used in the context of a complete respiratory protection program (RPP). This includes a medical evaluation, training, fit testing, and user seal checks to ensure appropriate respirator selection and use.* The elements of a complete RPP are described in detail in 29 CFR 1910.134, or www.osha.gov/SLTC/respiratoryprotection/index.html.

*[*popup*]: A medical evaluation is required prior to wearing a respirator. This involves answering a series of questions to assess your health, use of medications, and work conditions while wearing the respirator. Depending on the responses, a further work-up with a physician may be necessary to assess your pulmonary function or other concerns. Fit-testing ensures the proper fit of a respirator and is

required for respirator use. Additionally, a user seal check must be completed each time you wear a respirator to ensure a proper seal of the respirator against the face. Should you be asked to perform in an incident response by USDA-APHIS, you will receive proper training and fit-testing before being mobilized. More information on animal health emergency responses will be covered later in this module.]

Air purifying respirators can be divided into several types which offer various levels of protection:

-Disposable or Filtering Facepiece Respirators:

This class of respirators offers protection against particulates. The most commonly used filtering facepiece respirator is the "N95." Other NIOSH-certified N-, R-, or P-class respirators (e.g., N99, R95, and P100) provide equivalent or better protection and should be considered instead of N95 respirators if N95s are not available. Some filtering facepiece respirators have an exhalation valve which can reduce breathing resistance, reduce moisture buildup inside the respirator and increase work tolerance and comfort for respirator users. N95 respirators adequately protect against routine particulate exposures that might be encountered in a general veterinary setting.

Please visit the National Institute for Occupational Safety and Health's (NIOSH) website for a complete listing of NIOSH-certified respirators:
http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/

Non-disposable Respirators:

For veterinarians, non-disposable respirators will typically only be needed for incident response situations. **Additionally, in the event veterinarians are asked to respond as part of a task force, training on respirator selection and use will be provided.** However, it will be helpful to you to be familiar with the different types of respirators and their intended uses prior to an emergency response situation.

-Half-face air purifying respirators (APR): These respirators provide passive filtration of air with replaceable filter cartridges designated for specific purposes (e.g., vapors, particulates, etc.). They cover the mouth and nose and need to be used in conjunction with goggles to protect the eyes from exposure. The facepiece can be cleaned, repaired and reused, but the filter cartridges are discarded and replaced when they become unsuitable for further use.

-Full-face APR: These respirators work like the half-face respirators, but they cover the entire face—protecting the eyes as well.

-Powered air purifying respirators (PAPR): A PAPR utilizes a battery-powered blower to pull air through filters that trap particulates (including those containing viruses and bacteria) that may be present, and then moves the filtered air to the wearer's facepiece. PAPRs decrease resistance to breathing and can act as a cooling device, but the batteries and pump add extra weight to the user. **Note: Hooded PAPRs exist that do not require employees to be fit tested in order to use them.**

-Self-contained breathing apparatus (SCBA): This respirator comes equipped with its own air supply to allow for use in high-risk environments. In 2005, veterinarians responding to a chlorine spill from a train wreck in Graniteville, South Carolina were required to implement SCBA respiratory protection (*Source:* R. Gordon Harman).

Please note the level of protection received from a respirator varies greatly between the various kinds of respirators available. For instance, an N95 respirator provides adequate protection from airborne contaminants but cannot protect against vapors. One should consult with an occupational safety and health professional before selecting respiratory protection for specific hazards.

Face Shield

Wearing a face shield can prevent splashes or sprays into the eyes, nose or mouth. Collecting an animal brain for rabies testing would be an appropriate situation in which a face shield should be worn.

Goggles

Goggles should be worn in conjunction with disposable surgical masks or respirators to protect the eyes from splashes or sprays. Disposable and half-face APR respirators do not always work with every type of goggle. Therefore, goggle and respirator combinations should be tested prior to use, to ensure appropriate fit.

Hearing Protection

Veterinarians and their staff can be exposed to high noise levels in their work environments. Barking dogs or squealing pigs can easily exceed established occupational exposure limits. Earplugs or earmuffs should be made available and worn when appropriate to protect hearing.

Headwear

To diminish the chance of contamination and injury, wearing protective headwear is appropriate in certain situations.

-Cap/bonnet: Disposable coverings (i.e., surgical caps) may be helpful in minimizing exposure to particulate matter but do not protect the scalp or neck from absorption or provide splash protection.

-Hoods: Some coveralls come hooded to help protect the neck and head from direct contact with disease organisms.

Footwear

Footwear should be worn that is suitable to the task at hand, minimizing the potential for injury and disease spread. In animal environments, open-toe shoes are not recommended due to the risk of exposure to infectious animal secretions (oral, nasal or fecal), chemical hazards, or physical hazards, such as dropped sharps (e.g., needles or other sharp instruments). Proper selection of footwear can have a significant impact on disease control within your practice and on your clients' farms.

Athletic, casual and dress shoes are generally not water-resistant; therefore, they are not a good choice for environments where fluid contamination is a common concern. Such environments include (but are not limited to) the following:

- Areas which require use of disinfectant footbaths
- Necropsy floor
- On the farm
- Isolation areas of the clinic

Other footwear options for veterinary practices include the following:

-Rubber/synthetic boots: Worn like a regular shoe or boot, these can be worn multiple times. These boots should be cleaned and disinfected between groups of animals with different health status.

-Work boots: Many styles of boots are available for day-to-day work. Some come with reinforced steel-toes or metatarsal guards to give the foot and ankle more protection. Except for the soles, work boots are not always easy to disinfect.

-Overshoes: These products are typically rubber and can be worn over other shoes or boots. Generally they can be cleaned and disinfected for multiple uses unless worn in an unusual, hazardous situation, at which point they should be properly disposed.

-Disposable plastic boots/shoe covers: Worn as a slip-on cover over other shoes or boots to prevent contamination and disease spread. Some covers are appropriate for indoor, dry settings (i.e., surgical suite), while others are available for outdoor environments. These should be disposed of, on-site, after each use to minimize contamination.

Leaded Shielding Items

Most veterinarians are aware of and implement leaded shielding when taking radiographs. It is important to use these items as intended to be properly protected from radiation exposure.

- **Apron-** leaded aprons come in a variety of styles. Ensuring a proper fit (not falling off shoulder, covering exposed body area, etc.) is vital in protecting the individual from radiation exposure.
- **Gloves-** leaded gloves should be worn by individuals restraining animals for x-rays. While they protect from scatter radiation, they do not protect from primary radiation. Therefore, all gloved hands need to be out of the [primary beam] of exposure when the x-ray is taken.
[*pop-up:* The primary beam of exposure is the area within the lighted collimated field (visible on the animal or table).]
- **Thyroid guard-** radiation exposure can damage the thyroid gland. Individuals taking x-rays should wear a thyroid guard around their neck to protect thyroid function.

All leaded shielding devices should be inspected for damage (holes, tears, bite marks, etc.) on a regular basis. Damaged leaded items do not properly protect from radiation and should be replaced as needed.

Precautions and Limitations of PPE Usage to Consider

While PPE can prevent exposure to aerosols, direct contact, and injections, there are certain precautions and limitations that must be considered.

- Evaluate [proper fit] on a frequent basis
- To prevent exposure and contamination, never eat, drink, smoke, apply cosmetics or lip balm, or handle contact lenses while wearing PPE
- Don (put on) and doff (remove) PPE in the proper order to prevent contamination.
- Wash hands immediately after removing PPE
- Protective clothing and respiratory protection can be insulating, measures should be taken to prevent heat strain.

[*pop-up*: Proper fit is most important with respiratory protection; a user seal check, or ensuring a respirator fits and functions appropriately, must be done each time you wear a respirator to ensure a proper seal. Should you be asked to perform in a task-force situation by USDA-APHIS, you will receive proper fit-testing and instruction on leak-seal testing.]

Maintenance and Storage Guidelines for PPE

Just as certain precautions must be considered, PPE needs to be maintained and properly stored in order to adequately protect you and your staff.

- Specify maintenance and care programs for PPE.
 - Designate a staff member to evaluate PPE periodically, ensure enough PPE is available for all staff, and order replacements when necessary. Developing a [written PPE checklist] for your practice may be helpful. [Link to Veterinary PPE Checklist- See Appendix 1]
 - Never use defective or damaged PPE. Inspect and discard if any of the following are found:
 - Color changes
 - Shrinking
 - Wearing/thinning of material
 - Stretching
 - Cuts, tears, or holes
- Store previously worn and/or possibly contaminated PPE separately from normal clothing and in a well-ventilated area until items can be decontaminated or disposed of properly.
- Store different items of protective clothing and gloves separately, and have them labeled appropriately for easy access.
 - For instance, gather PPE items used for administering chemotherapy to a patient, label it, and keep it in a convenient location. When needed, the items are easily accessible and ready to use. Replace used PPE items so the pack is ready for the next person.
- Store items in accordance with manufacturer's suggestions.
 - For instance, keep disposable gloves in a cool, dry place.

Knowledge Review:

Which of the following must be worn appropriately to be effective but does NOT require fit-testing?

A. Surgical Mask

Answer: Correct! A surgical mask does not require fit testing.

B. N95 Respirator

Answer: That is incorrect. Respirators (except hooded PAPRs) require fit-testing.

C. Half-face air purifying respirator (APR)

Answer: Respirators (except hooded PAPRs) require fit-testing

D. Self-contained breathing apparatus (SCBA)

Answer: That is incorrect. Respirators (except hooded PAPRs) require fit-testing.

Classification of PPE for Emergency Response Activities

The following information is for veterinarians involved in emergency response and *does not* apply to routine veterinary activities. Where OSHA's HAZWOPER (Hazardous Waste Operations and Emergency Response) standard (29 CFR 1910.120) is determined to be applicable, OSHA classifies PPE into four categories based on the hazard involved and the level of protection needed to respond appropriately. The levels range from D, providing the lowest level of protection, to A, the highest level of protection. Should a veterinarian ever be asked to perform in an incident response, USDA-APHIS will provide additional on-site medical, safety, and fit testing for PPE. Descriptions of OSHA's levels for hazardous waste operations and emergency response PPE classifications are as follows:

Level D

Level D PPE provides the lowest level of protection. Level D may be appropriate when no contaminants are present or when no danger from inhalation or contact with hazardous materials exists. OSHA *requires* Level D PPE for employees in most industries. The following is a list of items every clinic should have available for all personnel:

- Coveralls, scrubs or other outer barrier protection
- Boots or shoes appropriate to perform duties
- Disposable gloves
- Hard-hat, when necessary

Example of situation requiring Level D: Dermatophytosis/ringworm outbreak at an animal shelter.

Level C

Level C is the next level of PPE. In order for Level C to be used, one must know the following information:

- The hazard involved
- The concentration of the hazard involved
- Oxygen concentration must be at least 19.5% (*source: OSHA, 1910.120 Appendix B*)

General agreement exists that Level C PPE would be adequate protection for veterinarians against most biological agents, once properly identified (*source: Wenzel J. Awareness-level information for veterinarians on control zones, personal protective equipment, and decontamination. JAVMA 2007; 231: 48-51*).

In addition to the items listed for Level D, OSHA *requires* the following for Level C protection:

- Full-face or half-mask air purifying respirator (APR)
- Hooded chemical-resistant clothing
- Chemical-resistant outer gloves
- Chemical-resistant inner gloves

Emergency response activities where veterinarians are involved will almost never necessitate the use of Level B or A PPE. Although rarely, veterinarians may assist in emergency situations where these expanded levels of protection will need to be used. Familiarity with these items now will expedite learning about them during an actual animal health emergency.

Example of situation requiring Level C PPE: Highly pathogenic avian influenza outbreak.

Level B

Level B requires the highest level of respiratory protection but a lesser level of skin protection.

In addition to the items listed for Level C, OSHA *requires* the following for Level B protection:

- Self-contained breathing apparatus (SCBA)
- Chemical-resistant protection
 - Hooded clothing
 - Outer gloves
 - Inner gloves
 - Steel-toe boots

Example of situation requiring Level B PPE: Nipah virus outbreak.

Level A

Level A PPE provides the highest level of protection and should be selected when the greatest level of skin, respiratory, and eye protection is required. Such situations include the following environments:

- Those with a high concentration of vapors, gases, or particulates
- Those with a high potential for splash or immersion
- Confined, poorly ventilated areas

Level A PPE is also recommended in environments where the hazard is unknown. The conditions emergency responders would face in this environment are unpredictable, and therefore the safest option would be Level A protection.

In addition to the items listed for Level B, OSHA *requires* the following for Level A protection:

- Totally-encapsulating chemical-protective suit with SCBA
- Disposable protective suit, gloves and boots (may be worn over totally-encapsulating suit)
- Chemical-resistant protection
 - Outer gloves
 - Inner gloves
 - Steel-toe boot

Example of situation requiring Level A: large chlorine spill.

Knowledge Review

True or False

OSHA's HAZWOPER PPE levels should be followed for routine veterinary procedures.

Answer: True. That is incorrect. HAZWOPER standards apply only to hazardous waste and emergency response situations.

Answer: False. Correct!

Hazard/Risk Assessment: When will I need PPE? What kinds of PPE will I need?

As required by OSHA, PPE must protect employees from specific hazards they are likely to encounter during their work. Selection of appropriate PPE is a complex process which should take into consideration a variety of factors. The more that is known about the hazards in your workplace, the easier the job of PPE selection becomes.

In order to determine the need for PPE in a situation, one must consider the associated risk. To determine the risk, many questions must be answered. For instance, you are called out to a farm to investigate an illness among a herd of cattle. Start by performing an on-site risk assessment, considering the following factors:

- Physical environment (Clinic, field/farm, laboratory?)
- Identification of hazards (Chemical, biological, etc.)
- Routes of potential exposure (Inhalation, ingestion, etc.)
- Length of exposure to hazards (Minutes, hours, days?)
- Zoonotic potential (Unknown, yes or no?)
- Pathogenicity to humans (Unknown, not pathogenic, low, moderate, high?)
- Stability in the environment (Unknown, unstable, or stable?)
- Communicability to animals (Yes or no?)
- Pathogenicity to animals (Unknown, not pathogenic, low, moderate, high?)
- Treatment options or vaccines available (Yes or no?)
- Training, skills, and experience of the people involved (Novice, Moderate, or expert level of experience?)
- Nature of the tasks to be performed (Routine, atypical?)
- Effects of PPE in relation to heat stress and task duration (Is weather cooperative? Are other environmental factors cooperative?)

Upon completion of this checklist, you should be able to conclude whether or not the situation is one you can safely and effectively resolve. If the hazard is zoonotic, no treatment or vaccines are available, and no one has experience dealing with the agent—asking for assistance before proceeding is warranted. On the other hand, if the hazard is not zoonotic, not communicable to animals, and the people involved are experienced in dealing with such situations—you can likely resolve this situation without further assistance. Again, this risk assessment is meant to serve as a guideline and every situation needs to be evaluated thoroughly on its own.

At first, it might be helpful to manually go through the assessment as a [written checklist]. Over time, you will become familiar enough with the process where a quick mental assessment will be adequate.

[Link to PPE Risk Assessment Checklist- See Appendix 2]

For more information about PPE risk assessments, access the OSHA Standard 1910.120 Appendix B at:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

The next section of this module will describe scenarios you could be faced with in veterinary practice. Within these, brief risk assessments are provided so that you can practice selecting proper PPE to safely approach various situations.

Scenarios—Introduction

By now you have been introduced to various types of personal protective equipment and its appropriate use in a veterinary setting. We have also discussed the various risk factors and their influence on PPE selection and implementation. This section of the module will present some case-based scenarios, allowing you to combine your knowledge of PPE with practical application in the workplace.

Scenario One—Introduction

Dr. Dorr is a small animal veterinarian practicing in Tucson, AZ. One afternoon he is presented with “Patches,” a four-year-old spayed calico cat. She was brought in by the owner for “doing poorly.” Once in the exam room, Dr. Dorr starts discussing the cat’s history with the owner.

Items of note from the history include:

- The cat is an indoor/outdoor cat; she can come and go as she pleases.
- Patches has been known to bring a few “treasures” back home after a good hunting adventure.
- She is up-to-date on her vaccines (rabies, distemper, and leukemia) and her last fecal exam was negative.
- Owner does not remember using a product to prevent flea infestations.
- Patches was acting fine up until about three days ago. Since then, she has become less active, isn’t eating well, and today the owner noticed discharge from her nose and some sneezing.

Dr. Dorr notices the cat looks very lethargic on the examination table. Her eyes are sunken, yet she has significant swelling in the area of the submandibular lymph nodes. She scratches at her ear, and a flea jumps onto the table.

Dr. Dorr has been practicing in Arizona for several years, and it is not uncommon to see plague in cats. Considering Patches’ history, Dr. Dorr is concerned she might have plague.

Scenario One—Risk Assessment

Dr. Dorr quickly recalls what he knows about [plague] [Link to fact sheet for plague: <http://www.cfsph.iastate.edu/Factsheets/pdfs/plague.pdf>] and mentally completes a brief risk assessment:

- Plague is an infectious agent with three routes of transmission
 - Vector (from fleas)
 - Cutaneous (from direct contact with the bacteria, *Yersinia pestis*)
 - Inhalation of organism from environment
- Exposure to this cat could take up to an hour with examination, collection of diagnostic samples and treatment.
- Plague can be disinfected by a number of disinfectants.
- Plague is communicable and zoonotic.
- Depending on the route of infection, treatment can be effective when started early for animals and people.
- Dr. Dorr's clinic is equipped with a functioning isolation facility.
- His staff has the appropriate training and PPE to deal with this cat safely.

Scenario One— Knowledge Review

Given what you know about this case, what items of PPE are appropriate for Dr. Dorr and his staff to wear while caring for this patient?

A. Scrubs or lab coat and disposable gloves.

Answer: That is incorrect. This level of protection is not adequate for dealing with plague in a cat.

B. Surgical mask, disposable gloves, goggles and/or face shield, disposable gown, and disposable shoe covers or plastic boots.

Answer: Correct!

C. SCBA, chemical-resistant suit, boots, and gloves.

Answer: That is incorrect. This level of protection is beyond what is needed to deal with plague in a cat.

D. Fully encapsulated SCBA and chemical-resistant suit, boots, and gloves.

Answer: That is incorrect. This level of protection is beyond what is needed to deal with plague in a cat.

Scenario One—Conclusion

Dr. Dorr explains his concerns to Patches' owner and asks her to leave the cat at the clinic for further work-up. He also explains to the owner that, pending confirmation of plague in the cat, she may need to seek medical treatment because of the zoonotic risk. For now, he urges the owner to check for signs of fleas within the home, and discusses the importance of extermination if fleas are found in the environment.

He and a staff member then don the [appropriate PPE] to examine Patches. [*pop-up*: N95 respirator, gloves, goggles, gown and shoe covers/plastic boots]

His findings include:

- A temperature of 104.5° F
- She has a significant skin tent with sunken eyes, suggesting she is considerably dehydrated.

- Palpation of the swellings below jaw exposes a draining tract with thick, purulent exudate.

Based on these findings, Dr. Dorr prepares samples for submission to the diagnostic laboratory—warning them he suspects plague. He then starts the cat on IV fluids and antibiotics, applies flea treatment to Patches, and informs his staff to follow appropriate isolation protocols for care of the cat. He transfers her to the isolation room. His technician stays behind to disinfect the exam room and hallway to isolation. Dr. Dorr and his technician then remove their PPE, disposing of the gloves, mask, gown and shoe covers in a biohazard bag. His goggles are placed in a disinfectant bath. Finally, he washes his hands.

Should plague be confirmed, the diagnostic lab and Dr. Dorr need to report the case to the State Animal Health Official. Dr. Dorr will contact Patches' owner and recommend she consult with her physician. Dr. Dorr and any exposed staff should consult with their physicians as well.

Scenario Two—Introduction

Dr. Berryman is a veterinarian at a zoo in southeast Colorado. Like most zoos, there is a "barnyard" area that houses many domestic animals including sheep, goats, cattle, horses, and a pig. On her morning rounds through the barn, Dr. Berryman notices that "Petunia," the Hampshire pig, is limping. As she approaches the pen, Dr. Berryman can see Petunia's hocks are inflamed, and there appears to be blisters on at least one of her coronary bands.

From the information given above, Dr. Berryman comes up with the following differential diagnoses:

- Foot-and-mouth disease
- Swine vesicular disease
- Vesicular stomatitis virus
- Vesicular exanthema of swine
- Chemical or thermal burn
- Photosensitization due to consumption of parsley or celery [*pop-up*: Over 30 plants can cause phytophotodermatitis. Skin contact with an affected plant or oral consumption followed by exposure to sunlight will result in severe sunburn and subsequent vesiculation. Several reports of snout or skin lesions in pigs following grazing in parsley fields or eating parsley or celery scraps have been documented].

Scenario Two—Risk Assessment

Considering the differential diagnoses, Dr. Berryman mentally completes a brief risk assessment:

- Four of the six are infectious agents with various modes of transmission possible.
- Of the four agents, none are considered a significant zoonotic risk.
- No evidence exists around or within Petunia's enclosure that suggests a chemical or thermal exposure.

- She confirms with the keepers that there were no changes or unusual ingredients added to Petunia's diet.
- Petunia does not have direct contact with other animals, but her exhibit is in close proximity to a number of different livestock species.
- Although most of the differential diagnoses are not life-threatening for Petunia, some can have significant impact on agriculture.
- The zoo has adequate isolation facilities to house Petunia.
- The zoo staff has the appropriate training and PPE to deal with this situation safely.

Scenario Two—Knowledge Review

Given what you know about his case, what items of PPE are appropriate for Dr. Berryman and her staff to wear while further assessing Petunia?

- A. Scrubs or coveralls, gloves, and boots.
Answer: Correct!
- B. Surgical mask, disposable gloves, goggles and/or face shield, disposable gown, and disposable shoe covers or plastic boots.
Answer: That is incorrect. This level of protection is beyond what is needed to deal with Petunia.
- C. SCBA, chemical-resistant suit, boots, and gloves.
Answer: That is incorrect. This level of protection is beyond what is needed to deal with Petunia.
- D. Fully encapsulated SCBA and chemical-resistant suit, boots, and gloves.
Answer: That is incorrect. This level of protection is beyond what is needed to deal with Petunia.

Scenario Two—Conclusion

Thorough examination of Petunia shows she has vesicular lesions on three of her four hooves and one on her dorsal snout. Additionally, her trough is still half-full from her feeding the night before.

Dr. Berryman asks one of the keepers for a garbage bag to temporarily store her coveralls and boots until she can wash them. She also asks for a biohazard bag from the clinic, then disposes her gloves and washes her hands. She grabs another pair of coveralls, disposable plastic boots and gloves, and continues her rounds through the farm area. She wants to check the other animals for lesions similar to Petunia's.

While she's walking past the cattle enclosure, she notices "Daisy," the donkey, is salivating profusely. The other donkey and mini-horses appear to be fine. She quickly glances at the cows, sheep, and goats—no signs of trouble yet. Dr. Berryman decides to examine Daisy up-close and again dons her [PPE] [*pop-up*: coveralls, gloves, and boots]. This time she finds vesicles in the donkey's mouth.

After appropriately disposing of her PPE and washing her hands, Dr. Berryman decides it is best to minimize traffic in the farm area until a diagnosis is confirmed. She asks the barnyard keepers to put up barricades and signs closing the exhibit

from the public. Dr. Berryman calls the State Animal Health Official about her suspicions. She contacts the remaining keepers and zoo administration, informing them of the situation. She and the keepers will meet immediately to discuss proper isolation protocols and care for the animals, pending recommendations from the State Animal Health Official.

Scenario Three—Introduction

Dr. Slayton is a food animal practitioner in northwestern Minnesota. It's mid-August and as he finishes his first call, he receives a voicemail from the office. The Bright farm phoned; one of their cows was found dead in the pasture this morning, and they would like someone to come out right away. Dr. Slayton calls the office to let them know he's on his way to the Bright farm. On his way, he considers the possible causes for this cow's death. At this time of year, differential diagnoses include the following:

- Lightning strike
- Heat stress
- Anthrax
- Toxicosis of some kind
- Acute bovine pulmonary emphysema and edema
- Bovine respiratory syncytial virus (BRSV)
- Bovine viral diarrhea (BVD)

When Dr. Slayton arrives at the farm, he is greeted anxiously by Mr. Bright and his son. On their way out to look at the cow, Dr. Slayton listens to the cattle producer describe what happened. He learns the following information:

- All cows and calves have been on this pasture for about a month; 56 remain in the herd, no others appear to be affected at this time.
- All cows received annual boosters with a killed vaccine last fall at their pregnancy check, including vaccines for BVD, IBR, BRSV, and PI₃.
- It's been a dry summer, and there were not any thunderstorms last night.
- All animals drink from a tank with well-water access, located in the corner of the pasture closest to the barn.
- Although it's been several years, Mr. Bright is concerned because he has had cows die suddenly due to anthrax before.

Scenario Three—Risk Assessment

Once they arrive, Dr. Slayton walks through the pasture and performs a brief mental risk assessment before handling the dead cow:

- No obvious hazards such as toxic plants, old batteries, or other unusual items are noted within the pasture.
- All remaining cattle look fine, some grazing, some resting—no obvious problems noted.
- The dead cow is laterally recumbent, and she has bloody exudate coming from her mouth and rectum.
- Given the weather history, heat stroke is possible but lightning can be ruled out.
- With the vaccination history, BRSV and BVD are less likely and do not pose a disease risk to Dr. Slayton.

- Acute bovine pulmonary emphysema and edema is possible, but is not a disease concern for Dr. Slayton
- Toxicosis is possible, but is likely not a risk to Dr. Slayton.
- Anthrax [link to fact sheet for Antrax: <http://www.cfsph.iastate.edu/Factsheets/pdfs/anthrax.pdf>] is likely and is a significant zoonotic threat. *Bacillus anthracis* has three routes of transmission:
 - Cutaneous (accounts for over 95% of natural infections)
 - Gastrointestinal
 - Inhalational
- Anthrax remains in the environment and is difficult to disinfect, but naturally is not easily communicable within a herd of live animals.
- Prophylactic antibiotics and vaccines against anthrax are effective in both animals and humans.

Scenario Three—Knowledge Review

Considering what you know about this situation, how should Dr. Slayton proceed on the Bright farm?

- A. Dr. Slayton should perform a necropsy immediately.
 Answer: That is incorrect. Suspect anthrax cases should not be necropsied as the exposure of *Bacillus anthracis* to oxygen causes sporulation and the risk for exposure to the veterinarian, other animals and people greatly increases. Dr. Slayton should have Mr. Bright and his son wait for him at the house while he dons PPE and makes a blood smear from the cow.
- B. Dr. Slayton should perform a necropsy after donning the following PPE: surgical mask, disposable gloves, goggles, and/or face shield, coveralls, and disposable plastic boots.
 Answer: That is incorrect. Suspect anthrax cases should not be necropsied as the exposure of *Bacillus anthracis* to oxygen causes sporulation and the risk for exposure to the veterinarian, other animals and people greatly increases. Dr. Slayton should have Mr. Bright and his son wait for him at the house while he dons PPE and makes a blood smear from the cow.
- C. Dr. Slayton should have Mr. Bright and his son wait for him at the house while he dons PPE (surgical mask, disposable gloves, goggles, and/or face shield, coveralls, and disposable plastic boots) and makes a blood smear from the cow.
 Answer: Correct!
- D. Dr. Slayton should contact the State Animal Health Official before proceeding.
 Answer: That is incorrect. While it is important to notify the authorities of a reportable disease like anthrax, a preliminary diagnosis should be attempted. Dr. Slayton should have Mr. Bright and his son wait for him at the house while he dons PPE and makes a blood smear from the cow.

Scenario Three—Conclusion

After making the blood smear and storing it safely in a whirlpack bag, Dr. Slayton removes his PPE and places it in the “dirty” storage container in his truck. He stops

by the house to tell Mr. Bright that he's heading back to the clinic and he will call with results as soon as he can.

Back at the clinic, Dr. Slayton removes the items from his "dirty" storage container. He properly disposes of the mask, gloves, and disposable plastic boots. He places the goggles in a disinfectant bath and loads the coveralls into the washing machine. He then puts on a fresh pair of gloves and stains the blood smear. When he examines the slide under the microscope, this is what he finds:

Dr. Slayton removes the slide from the scope and returns it to the whirlpack bag. He removes and disposes his gloves and then washes his hands. Dr. Slayton calls the State Animal Health Official to report a case of suspected anthrax and request assistance. He then calls Mr. Bright and informs him that, pending recommendations from State authorities, they will likely need to move the other cattle down to the barn or onto another non-contaminated pasture. Additionally, prophylactic antibiotics and vaccinations for the remaining herd are recommended.

Scenario Four—Introduction

Dr. Ackerman is a staff veterinarian for a humane society in rural New York. Last night, the humane society received a call regarding a dog that was "acting strange" near a farm south of town. An animal control officer was able to seize the dog and transport it back to their facility. The dog was wearing a collar with an identification tag, but no license or rabies tag was found. A contact telephone number was found on the identification tag and was recorded by the officer who admitted the dog. Dr. Ackerman observed the dog through its kennel and noted the following:

- The dog is a non-neutered male, mixed breed, weighing about 50 pounds.
- He is pacing slowly within the kennel, and is somewhat ataxic; he does not seem to notice Dr. Ackerman when she tries to get his attention.
- A significant scar is noticeable over the dog's left shoulder/neck area.

Dr. Ackerman calls the telephone number recorded by the animal control officer. She introduces herself, describes the dog, and asks if they are missing their pet. "Well yes, Ruger took off two days ago, and we haven't seen him since," says the owner. Dr. Ackerman asks for more information about Ruger, and she learns the following:

- Ruger is about four years old.
- He spends all of his time outdoors and is quite the amateur hunter.
- Several weeks ago the owners remembered hearing a scuffle outside, and then noticed Ruger had a wound on one of his shoulders for a few days.
- He has not received annual boosters in some time, but the owner remembers Ruger getting a rabies vaccine as a puppy.
- They have never been bitten by Ruger, and as far as they know, he has not bitten anyone else.

Scenario Four—Risk Assessment

Given this information, Dr. Ackerman performs a brief mental risk assessment:

- Considering Ruger's history, she feels [rabies] [link to rabies factsheet: <http://www.cfsph.iastate.edu/Factsheets/pdfs/rabies.pdf>] is the most likely cause of his condition.
- Rabies is zoonotic and can be transmitted to people from animals through contact with infected saliva, typically through bites or through open wounds.
- Although vaccines and [post-exposure prophylaxis treatments] are effective, rabies is generally fatal in infected animals and people.
- Ruger cannot easily transmit rabies to other animals in the shelter, but he is isolated which is a standard precaution for incoming animals.
- Fortunately he has not bitten his owners, but Ruger could have potentially bitten someone while he was missing.
- Rabies can be disinfected by a variety of products.
- Dr. Ackerman and all humane society staff are immunized for rabies and are trained to properly respond to "rabies suspect" animals.

[*pop-up*: Public health authorities may recommend that an individual (with possible exposure to rabies) receives post-exposure prophylaxis (PEP) treatment. PEP entails an injection of human rabies immunoglobulin (HRIG) on day 0 and five injections of the human rabies vaccine on day 0, 3, 7, 14 and 28. For those individuals exposed to rabies that have already received pre-exposure vaccinations (such as veterinarians and animal control officers), they do not receive the HRIG dose but receive rabies vaccines on days 0 and 3. This protocol has been effective in preventing clinical rabies in 100% of those individuals that were non-symptomatic prior to initiating the treatment and that properly completed the series.]

Dr. Ackerman calls the owner again and describes why she suspects Ruger has rabies. She also explains the fatal consequences of the disease as most animals die within 2 to 7 days of showing signs, and the risk Ruger poses to other animals and people. Given the likelihood of rabies, she suggests euthanizing Ruger and testing his brain for the rabies virus. The owners are upset, but seem to grasp the severity of the situation and agree to euthanasia.

Scenario Four—Knowledge Review

Dr. Ackerman and her staff restrain Ruger through use of a snare and inject a sedative into one of his hind legs. They are then able to humanely and safely euthanize Ruger without exposing themselves to his saliva. To collect Ruger's head for rabies testing, what PPE should Dr. Ackerman wear?

- A. Surgical mask, disposable gloves, scrubs or coveralls, and boots.

Answer: That is incorrect. This level of protection is not adequate when handling a rabies-suspect animal.

- B. Surgical mask, disposable gloves, goggles and/or face shield, disposable gown, and shoe covers or booties.

Answer: Correct! It would also be ideal for Dr. Ackerman to wear a cut-resistant glove to protect her non-cutting hand while removing the head (in addition to the barrier protection of a latex, vinyl, or nitrile glove).

- C. SCBA, chemical-resistant suit, boots, and gloves.

Answer: That is incorrect. This level of protection is beyond what is needed when handling a rabies-suspect animal.

D. Fully encapsulated SCBA and chemical-resistant suit, boots, and gloves.

Answer: That is incorrect. This level of protection is beyond what is needed when handling rabies-suspect animal.

Scenario Four—Conclusion

After removing the dog's head, Dr. Ackerman properly prepares the sample for submission to the [veterinary diagnostic laboratory] [*pop-up*: Please check with your diagnostic laboratory for instructions on proper submission of rabies-suspect tissues.] Dr. Ackerman then removes her PPE, disposing of the gloves, surgical mask, disposable gown, and shoe covers in a biohazard bag. Her goggles are placed in a disinfectant bath. Finally, she washes her hands. The room and Ruger's kennel are then properly disinfected. Should rabies be confirmed, the diagnostic lab and Dr. Ackerman need to contact the State Animal Health Official and the State public health agency to report the case. Additionally, public health officials will try to locate and contact any individuals that may have come in contact with Ruger while he was missing. Should these people be identified and determined to be exposed, they will need to receive PEP treatment.

At this point, you can see how different cases will impact your selection and use of standard PPE within a practice setting. Next, we will review an animal health emergency situation in which veterinarians need to implement expanded levels of PPE.

Introduction to Incident Responses

In animal health emergencies, an immediate response is necessary to maintain animal and public health. Because these events are often beyond the scope of local and state capabilities, USDA-APHIS may request assistance to help respond to the event. The National Animal Health Emergency Response Corps (NAHERC) was created to mobilize private veterinary resources to fill critical needs during large scale and/or lengthy animal health emergency responses. Many State veterinary response teams have also formed and may be shared with other states through the Emergency Management Assistance Compact. When the size or nature of an emergency event overwhelms a state's capabilities, reserve veterinary personnel can thereby transition easily into the federal/state incident team via the NAHERC. In response to animal health emergencies, personnel are involved in a variety of activities, including surveillance, diagnosis, and disease control and eradication efforts. Therefore, veterinarians may be required to implement more sophisticated, or expanded levels of PPE. This section of the module will review an animal health emergency situation, including the types of PPE worn and the proper use of PPE in these situations. Again, should you be asked to respond by USDA-APHIS, you will receive appropriate training and be fit-tested for a respirator if necessary.

For more information about NAHERC visit:

- http://www.aphis.usda.gov/publications/animal_health/content/printable_version/NAHERC-brochure-Vet7-2007.pdf
- http://www.aphis.usda.gov/lpa/pubs/pub_ahvsreserves.html

Incident Response Scenario

Dr. Brown is a mixed animal practitioner in the southeast United States. Recently, a couple outbreaks of highly pathogenic avian influenza in poultry have occurred in his state, and a joint USDA/State task force has been established under unified command by the State Veterinarian and the APHIS Area Veterinarian in Charge. Dr. Brown is a member of the National Animal Health Emergency Response Corps (NAHERC), and last week he was contacted and asked to activate as a federal resource to assist in response to this avian influenza situation. He has signed his temporary APHIS employment packet at the local Farm Services Administration office and has been given instructions on when and where to report. He makes arrangements with his colleagues and staff because he will be gone for 3 weeks.

Dr. Brown had his medical clearance and respirator fit test earlier in the month in preparation for a possible NAHERC assignment. The next morning, he reports to the nearby incident command post, receives an in-briefing and is assigned to a culling team to depopulate an infected flock about 20 miles from his practice. He is given don and doff training (see below) and provided his PPE. Local law enforcement has established movement control at the boundaries of the quarantine (control) zone around the infected poultry farm. Dr. Brown's team includes animal health technicians to assist with euthanasia and cleaning and disinfection crews to properly remove deceased birds and contaminated debris prior to disinfecting the poultry houses. Upon completion of the tasks, Dr. Brown and his team remove and bag their disposable PPE and leave it at the premises.

Control Zones

Internationally recognized zones are established in animal disease control efforts. These zones were utilized in the effort to eradicate Foot and Mouth Disease during the United Kingdom's outbreak of 2001 and again in 2007. These include:

- Infected Zone- Area where disease is known to occur or area that cannot be confirmed as free of disease; otherwise referred to as the "hot" zone.
- Buffer Zone- Area established to protect the health status of animals in a disease-free zone from those in a zone of a different animal health status.
 - The buffer zone may include a vaccination zone, an animal-free zone, or a sentinel zone to further enhance efforts to control infection.
- Surveillance Zone- Area established within, and along the border of, a disease-free zone separating disease-free from infected animals.

Buffer and surveillance zones could otherwise be referred to as "warm" zones.

- Disease-free Zone- Area in which the absence of the disease under consideration has been demonstrated; otherwise referred to as the "cold" zone.

Implementing these control zones will effectively aid animal health emergency responders in eradicating avian influenza from this farm and surrounding area.

Donning/Doffing Guidelines

Once briefed on the status of the outbreak within the barns and the control zones, incident response members are given their assignments. Because avian influenza is potentially zoonotic, appropriate PPE must be worn by those responding to this

event. Therefore, Dr. Brown and his incident team members must receive medical clearance and respirator fit-testing. Procedures that cover the assembling of PPE on the user are part of the “donning” process, while procedures that cover the removal of PPE are part of the “doffing” process.

Guidelines for Donning and Doffing during an emergency response:

In the event you are asked to assist in an emergency response like Dr. Brown, you will receive instruction on proper donning and doffing techniques. The following are some general guidelines to follow:

- Inspect PPE to ensure all required safety features and devices have been incorporated or provided (e.g., ensure your APR respirator has a filter in place).
- Inspect PPE for damage before, during, and after each use (e.g., ensure your chemical-resistant suit has not been torn).
- Learn specific doffing and [decontamination] procedures to prevent spread of contamination from the work area to yourself, your doffing assistant, and others.

[*pop-up*: Decontamination refers to the removal of a substance from people and equipment in order to prevent adverse health effects such as the spread of disease. Various levels of decontamination exist, from simple hand-washing to the disinfection of a vehicle. Depending on the type of emergency situation you are involved with, you will be instructed on proper decontamination for that particular response.]

Example of Donning and Doffing (*source: AgERT notes*).

Level C protection is adequate for most biological exposures that could potentially occur in an animal health emergency, including an avian influenza outbreak; therefore, the donning and doffing process for Level C PPE will be described below. Safe and effective donning and doffing of Level C or higher PPE requires assistance, and the buddy system should always be used when involved in a response where Level A, B, or C PPE is being worn. (*source: Wenzel, 2007*)

Donning

Donning occurs in the cold or disease-free zone, prior to entry into the contaminated areas, or in this case, the poultry barns. Dr. Brown and his partner will assist each other with dressing into their PPE.

Each responder should have the following equipment:

- Chemical-resistant, hooded suit
- Air purifying respirator (APR)
- Chemical-resistant boots
- Three pairs of gloves
 - Inner (disposable)
 - Middle (chemical resistant)
 - Outer (rubber butyl)

The following steps should be followed when donning C Level PPE:

Step 1) Pull on chemical-resistant suit

Comment [tk1]: Three pairs of gloves now makes sense when considering the items from level D are needed in addition to those in level C. . .

Comment [TAN2]: This is very confusing. In the lists of PPE required for Levels A-C, there is no mention of three

- Step 2) Step into chemical-resistant boots
Step 3) Put on the APR and adjust the straps
Step 4) Conduct an APR leak-seal test*

The following describes leak-seal testing for an APR:

- Place face into APR and slide straps over head
- Place hand over the opening on the exhalation valve on the facepiece
- Exhale strongly one time; air should escape from the contact area between the sides of the face, forehead, and the facepiece.
- Inhale with hands over the inhalation valves and hold for five seconds (when fitting properly, facepiece should collapse on face and remain collapsed for the duration of this step).

If proper fit cannot be achieved, do not enter an area where protection is needed.

To comply with Occupational Safety and Health Administration (OSHA) regulations, all respirators require a [medical evaluation] and training for the individual wearing the respirator prior to use. In addition, all respirators require [fit-testing], with the exception of hooded PAPRs.

[*pop-up*: A Medical evaluation is required to determine an employee's fitness to wear a respirator. This involves answering a series of questions to assess your health, use of medications, and work conditions while wearing the respirator. A further work-up with your physician may be needed to assess your pulmonary function or other concerns.]

[*pop-up*: Fit-testing ensures proper selection of a respirator. Additionally, a leak-seal test must be completed each time you wear a respirator to ensure a proper fit. Should you be asked to participate in an incident response by USDA-APHIS, you will receive instruction on proper fit-testing]

Step 5) Pull on the hood

Step 6) With a team member, tape-seal team-member's suit:

- Place chemical-resistant tape on partner's suit/boot junctions (tape should be centered at the junction between the boot and suit) for both boots.
- Place tape around the facepiece, completely sealing the respirator to the suit. Be sure to cover the area under the chin as well [*pop-up explanation*: Tear off a 10 to 12-inch strip of tape. At each end, fold a tab approximately two inches long. Tear a three-inch strip of tape and place the sticky side to the center of the longer strip (sticky side). Place this "bowtie" under the chin, half on the suit and half on the facepiece. Tear four more pieces, each approximately four inches long and fold a tab at one end. Put two strips on each side of the bowtie, tab down, overlapping, and leaving the top open. Place another strip of tape across the top (half on the facepiece and half on the hood) of the facepiece so it looks like a ridge cap).
- Place chemical-resistant tape along the zipper of team member's suit, attaching the top to the bowtie and taping down the zipper.

Step 7) Put on inner gloves, middle gloves, then outer gloves.

Step 8) Place chemical-resistant tape on team member's suit/glove junctions.

Step 9) Reverse roles and repeat the procedure.

Step 10) Although optional, when going into an environment where tissue sample or evidence collection will be needed, it is helpful to prepare collection equipment prior to donning gloves and respirator. For instance, when preparing to collect blood from an animal while donned in PPE, placing pre-labeled blood tubes in a sealed container will allow for easy access. Additionally, the more time saved with preparation before entering into the infected zone, the more efficient one can be while performing the necessary tasks.

Please note: Wearing PPE can create worker hazards such as heat stress, physical and psychological stress, and impaired vision, movement, and communication. When involved in an incident response, your time in PPE will be limited to keep you safe. Additionally, you should be aware of your physical abilities and overall health when engaged in activities requiring PPE.

Once properly donned in PPE, Dr. Brown and his team will be allowed to enter into the infected zone and perform their duties.

Doffing

Doffing occurs in the cold zone, after team members have completed their current task and decontamination procedures. The following describes the process for doffing:

Step 1) Remove all chemical-resistant tape from the suit, including gloves, boots, facepiece, and zipper. Dispose of tape in provided containers.

Step 2) Remove the outer and middle layers of gloves.

Step 3) Unzip the protective suit.

Step 4) Reach inside the hood and roll it back, touching only the inside of the suit. This step is easiest with the assistance of a team member.

Step 5) Pull the suit off the shoulders (turning it inside out) to ensure any residual contamination is kept away from the body.

Step 6) Sitting on a stool or other support, remove boots and place in a designated container.

Step 7) Peel the protective suit down from head to toe and step out of the suit.

Step 8) Remove the APR and inner gloves.

Step 9) Dispose of gloves and suit in containers provided; place APR in designated container.

It is important to note that if PPE is handled inappropriately, even at lower levels, contamination of equipment may occur. Therefore, care needs to be taken to prevent contamination during doffing procedures.

Depending on the scope of the emergency and the availability of responders, this donning and doffing process may occur repeatedly during each animal health emergency response. In fact, some responses could take weeks, if not months, to fully resolve. Therefore, task incident response members may participate for multiple shifts, possibly days at a time.

Knowledge Review:

In order to safely and effectively don and doff personal protective equipment, which level of PPE requires assistance from another team member?

A. A only

Answer: That is incorrect. Assistance is required for A, B, and C levels of PPE.

B. A and B

Answer: That is incorrect. Assistance is required for A, B, and C levels of PPE.

C. A, B, and C

Answer: Correct!

D. A, B, C, and D

Answer: That is incorrect. Assistance is required for A, B, and C levels of PPE.

Conclusion

Veterinarians often work in unusual circumstances that require PPE to safely complete the task at hand. Throughout this module, you have been exposed to various aspects of PPE in a practice setting. We reviewed numerous items of PPE and their purposes, from basic to expanded levels of protection. You were also introduced to scenarios and given a template for performing a risk assessment which will provide guidance for selecting and implementing PPE in your practice. A majority of veterinarians may never participate in an incident response. However, should you be involved, this module also introduced you to the level of PPE necessary when responding to an animal health emergency.

Resources/Web links

Throughout this module you were provided with additional resources and links for more information. For your convenience, that information is repeated here for your reference.

- Anthrax fact sheet:
<http://www.cfsph.iastate.edu/Factsheets/pdfs/anthrax.pdf>
- Centers for Disease Control and Prevention
"Interim Guidance for Protection of Persons Involved in U.S. Avian Influenza Outbreak Disease Control and Eradication Activities"
<http://www.cdc.gov/flu/avian/professional/protect-guid.htm>
- National Animal Health Emergency Response Corps:
<http://www.aphis.usda.gov/vs/ep/naherc/>
- National Institute for Occupational Safety and Health certified respirators:
http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/
- Occupational Safety and Health Administration: <http://www.osha.gov>
- OSHA Personal Protective Equipment site:
<http://www.osha.gov/SLTC/personalprotectiveequipment/index.html>
- Occupational Safety and Health Standard 1910.120/Hazardous waste operations and emergency response:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9765

- Plague fact sheet: <http://www.cfsph.iastate.edu/Factsheets/pdfs/plague.pdf>
- Rabies fact sheet: <http://www.cfsph.iastate.edu/Factsheets/pdfs/rabies.pdf>

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Appendix 1

Checklist for Veterinary PPE Kit

Adapted from "*Veterinary Guide to Personal Protective Equipment*," compiled by the Rocky Mountain Regional Center of Excellence for Biodefense and Emerging Infectious Diseases

Most of the following items can be purchased at your local hardware store. With a little pre-organization all these items can be packed into an easily accessible kit:

- Clean bag for inside the vehicle
 - 1 gallon sealable plastic bag for holding labels
 - 1 "clean" tote/container for holding clean items
 - 1 trash bag
 - 1 can of disinfectant spray
 - 1 roll duct tape
 - 2 pairs of disposable gloves
 - 1 pair of rubber boots
 - 1 sanitizing hand gel

- Clean bag for "clean" container
 - 1 gallon sealable plastic bag - labeled "clean container"
 - 1 sanitizing hand gel
 - 1 hooded tear-resistant disposable suit
 - 1 surgical bonnet if suit does not have hood
 - 2 pairs disposable gloves
 - 1 N95 respirator (preferred!) or surgical mask
 - 1 roll duct tape

- Dirty bag for "dirty" container
 - 1 gallon sealable plastic bag - labeled "dirty container"
 - 6 trash bags
 - 1 can disinfectant spray
 - 1 roll duct tape
 - 1 sanitizing hand gel

- Tote and/or box for sampling

Disinfecting supplies

- Sprayer (garden) 1-2 gallon
- 2 cans disinfectant spray
- 3 sanitizing hand gels
- Foot bath (make sure the large totes fit in it!)
- Broad-spectrum disinfectant. Please see disinfectant's MSDS sheet for PPE needs.

Containers and containment supplies

- 2 large tote containers, same size with lids (make sure your sprayer fits!)

- Tote or closed box for samples
- 1 roll heavy duty trash bags
- 1 box each gallon & pint sealable plastic bags

Personal protective equipment

- Hooded tear-resistant disposable suit
- Surgical bonnet (if suit not hooded)
- N95 respirator (preferred!) or surgical mask
- Inner boots either plastic or rubber
- Outer boots
- Goggles (indirect vented)
- Coveralls
- Disposable gloves
- 3 rolls duct tape

Sampling supplies

- National Veterinary Services Laboratory (Ames, IA) diagnostic sampling kit:
 - Includes styrofoam cooler, ice packs, pressure-treated bag, labeling stickers, and submission form
 - NVSL kits can be acquired by calling (515) 663-7530.
- Miscellaneous sampling supplies are needed from your clinic and should be organized in pint or quart zip lock bags.
 - Red top, purple top and green top blood tubes
 - Vacutainer® holder and needles (if available)
 - Various needles and syringes
 - Medium or large Whirl-Paks®
 - Fecal cups (can use as sharps container)
 - Sterile swabs & cultures
 - Formalin
 - BHI broth (brain heart infusion)
 - TBTB broth (tris buffered tryptose broth)
 - Trash bag to carry supplies out
 - Permanent markers and pens for labeling

Office supplies

- Permanent markers
- Pens
- Notebook
- Metal clipboard
- Diagnostic forms
- Quarantine orders and instruction pack
- Telephone list laminated
- Sample submission guide for zoonoses form (laminated)

Personal items/miscellaneous

- Thermometer and stethoscope (if not available at farm)
- Hand sanitizer gel
- Flashlight

- Extra cell phone battery
- Electrolyte replacement drinks
- Bottled water (case)
- Energy bars
- First aid kit with eye wash
- Extra clothing (pending weather conditions)
- Silicon spray for boots

Appendix 2

Personal Protective Equipment for Veterinarians Risk Assessment Checklist

In order to determine the appropriate PPE for various animal disease situations, veterinarians and their staff need to assess the associated risk. The following is a list of factors that veterinarians should consider. Although this list is not exhaustive, it is appropriate for most situations in veterinary practice.

- Physical environment
 - Clinic
 - Field/farm
 - Laboratory
- Identification of hazards or suspect hazards (CBRNE)
 - Chemical (C)
 - Biological (B)
 - Radiological (R)
 - Nuclear (N)
 - Explosive (E)
- Route(s) of potential exposure
 - Aerosol/inhalation
 - Ingestion
 - Direct contact
 - Fomite
 - Vector/injection
- Length of exposure to hazard(s)
 - Minutes
 - Hours
 - Days
- Stability of hazard in environment
 - Unknown
 - Unstable (normal environmental conditions destroy it)
 - Stable (can survive in organic material for days, weeks, years)
- Zoonotic potential
 - Unknown
 - Yes
 - No
- Pathogenicity to humans
 - Unknown
 - Not pathogenic
 - Low
 - Moderate
 - High

- Communicability to animals
 - Unknown
 - Yes
 - No
- Pathogenicity to animals
 - Unknown
 - Not pathogenic
 - Low
 - Moderate
 - High
- Treatment options/available vaccines for animals
 - Yes
 - No
- Treatment options/available vaccines for people
 - Yes
 - No
- Training, skills, and experience of the people involved
 - Novice level
 - Moderate level of experience
 - Expert
- Nature of the tasks to be performed
 - Routine
 - Atypical
- Effects of PPE in relation to heat stress and task duration
 - Is weather cooperative?
 - Yes
 - No
 - Are other environmental factors cooperative?
 - Yes
 - No

Upon completion of this checklist, you should be able to conclude whether or not the situation is one you can safely and effectively resolve. If the hazard is zoonotic, no treatment or vaccines are available, and no one has experience dealing with the agent—asking for assistance before proceeding is warranted. On the other hand, if the hazard is not zoonotic, not communicable to animals, and the people involved are experienced in dealing with such situations—you can likely resolve this situation without further assistance. Again, this risk assessment is meant to serve as a guideline and every situation needs to be evaluated thoroughly on its own.

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