

Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel

National Association of State Public Health Veterinarians

Veterinary Infection Control Committee
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Preface	1405
I. INTRODUCTION	1405
A. OBJECTIVES	1405
B. BACKGROUND	1405
C. CONSIDERATIONS	1405
II. ZOOBOTIC DISEASE TRANSMISSION	1406
A. SOURCE	1406
B. HOST SUSCEPTIBILITY	1406
C. ROUTES OF TRANSMISSION	1406
1. CONTACT TRANSMISSION	1406
2. AEROSOL TRANSMISSION	1406
3. VECTOR-BORNE TRANSMISSION	1406
III. VETERINARY STANDARD PRECAUTIONS	1406
A. PERSONAL PROTECTIVE ACTIONS AND EQUIPMENT	1406
1. HAND HYGIENE	1406
2. USE OF GLOVES AND SLEEVES	1407
3. FACIAL PROTECTION	1407
4. RESPIRATORY TRACT PROTECTION	1408
5. PROTECTIVE OUTERWEAR	1408
a. <i>Laboratory coats, smocks, aprons, and coveralls</i>	1408
b. <i>Nonsterile gowns</i>	1408
c. <i>Footwear</i>	1408
d. <i>Head covers</i>	1408
6. ANIMAL-RELATED INJURY PREVENTION	1408
B. PROTECTIVE ACTIONS DURING VETERINARY PROCEDURES	1409
1. PATIENT INTAKE	1409
2. EXAMINATION OF ANIMALS	1409
3. INJECTIONS, VENIPUNCTURE, AND ASPIRATION PROCEDURES	1409
a. <i>Needlestick injury prevention</i>	1409
b. <i>Barrier protection</i>	1409
4. DENTISTRY, BRONCHOSCOPY, AND TRANSTRACHEAL WASHES	1409
5. RESUSCITATION	1410
6. OBSTETRICS	1410
7. NECROPSY	1410
8. DIAGNOSTIC SPECIMEN HANDLING	1410
9. WOUND CARE	1410
C. ENVIRONMENTAL INFECTION CONTROL	1410
1. CLEANING AND DISINFECTION OF EQUIPMENT AND ENVIRONMENTAL SURFACES	1410
2. ISOLATION OF ANIMALS WITH INFECTIOUS DISEASES	1410
3. HANDLING OF LAUNDRY	1411
4. DECONTAMINATION AND SPILL RESPONSE	1411
5. VETERINARY MEDICAL WASTE	1411
6. RODENT AND VECTOR CONTROL	1411
7. OTHER ENVIRONMENTAL CONTROLS	1412
IV. EMPLOYEE HEALTH	1412
A. GENERAL	1412
1. EMPLOYEE VACCINATION POLICIES AND RECORD KEEPING	1412
a. <i>Rabies</i>	1412

b. <i>Tetanus</i>	1412
c. <i>Influenza</i>	1412
2. MANAGEMENT AND DOCUMENTATION OF EXPOSURE INCIDENTS	1412
3. STAFF TRAINING AND EDUCATION	1413
B. IMMUNOCOMPROMISED PERSONNEL.....	1413
V. CREATING A WRITTEN INFECTION CONTROL PLAN	1413
A. INFECTION CONTROL PERSONNEL	1413
B. COMMUNICATING AND UPDATING THE INFECTION CONTROL PLAN	1413
1. LEADERSHIP	1413
2. NEW STAFF.....	1413
3. REVIEW AND REVISION.....	1413
4. COMPLIANCE.....	1413
5. AVAILABILITY	1413
VI. REFERENCES.....	1414
Appendices	
1—Zoonotic diseases of importance in the United States, 2010	1418
2—Selected disinfectants used in veterinary practice	1420
3—Model infection control plan for veterinary practices, 2010	1421

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Preface

The VSP outlined in this Compendium are routine infection control practices designed to minimize transmission of zoonotic pathogens from animal patients to veterinary personnel in private practice. The Compendium was first published in 2008¹ in response to a growing recognition of the occupational risks inherent in veterinary practice and the need for infection control guidance for veterinarians.^{2–9} The 2010 document includes an updated model infection control plan that can be adapted to individual practices and updated guidance on the use of personal protective equipment. Although the Compendium focuses largely on personal protective equipment and actions, a multifaceted approach to workplace safety that incorporates environmental engineering control measures, appropriate administrative policies, and personal protective actions is recommended.

I. INTRODUCTION

A. OBJECTIVES:

The objectives of the Compendium are to raise awareness of the scope of zoonotic disease risk in veterinary medicine; address infection control issues specific to veterinary practice; provide practical, science-based veterinary infection control guidance; and provide a model infection control plan for use in individual veterinary facilities.

B. BACKGROUND:

In the 2003 African monkeypox infection outbreak in the United States, 18 of 71 (25.4%) infected individuals were veterinary personnel. This incident highlighted the risk of exposure to exotic zoonotic pathogens and the need for infection control precautions in veterinary medicine.^{10,11} However, zoonotic diseases are occupational hazards faced by veterinary personnel on a daily basis.^{12–15} Approximately 868 of 1,415 (61%) known human pathogens are zoonotic, and approximately 132 of 175 (75%) emerging diseases that affect humans are zoonotic.¹⁶ There are more than 50 zoonotic diseases of importance in the United States (Appendix 1). Documented zoonotic infections in veterinary personnel include the following: salmonellosis,^{17–20} cryptosporidiosis,^{21–26} plague,^{27,28} sporotrichosis,^{29–33} methicillin-resistant *Staphylococcus aureus*,^{34–46} psittacosis,^{47–50} dermatophytosis,^{51,52} leptospirosis,^{53–55} and Q fever.^{56–59}

Veterinary Standard Precautions are guidelines for commonsense infection control practices. They are intended to be used consistently by veterinary personnel—regardless of the clinical presentation or the presumed diagnosis of animals in their care—whenever personnel may be exposed to potentially infectious materials including feces, body fluids, vomitus, exudates, and nonintact skin.

Veterinary Standard Precautions are based on human standard precautions, which are the cornerstone of infection control in human health-care settings.⁶⁰ However, the VSP also include strategies to reduce the potential for animal bites and other trauma that may result in exposure to zoonotic

ABBREVIATIONS

ACIP	Advisory Committee on Immunization Practices
EPA	Environmental Protection Agency
NASPHV	National Association of State Public Health Veterinarians
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
VSP	Veterinary Standard Precautions

pathogens. During their careers, approximately two-thirds of veterinarians report a major animal-related injury resulting in lost work time or hospitalization.^{12,13,61–63} Dog and cat bites, scratches from cats, kicks, and crush injuries account for most occupational injuries among veterinary personnel.^{12,13,61–63} Approximately 3% to 18% of dog bites and 28% to 80% of cat bites become infected, depending on the location of the bite and other factors.⁶⁴ Most infected dog- and cat-bite wounds contain mixed aerobic and anaerobic bacteria. The most commonly isolated aerobes are *Pasteurella multocida* (from cat bites), *Pasteurella canis* (from dog bites), streptococci, staphylococci, *Moraxella* spp, and *Neisseria weaveri*; the most commonly isolated anaerobes are various species of *Fusobacterium*, *Bacteroides*, *Porphyromonas*, and *Prevotella*.⁶⁴ Rarely, bite and scratch wounds may result in serious systemic infections caused by invasive pathogens such as *Capnocytophaga canimorsus*, *Bergeyella zoohelcum*, CDC group NO-1, and *Bartonella* spp.^{64–70}

Needlestick injuries are among the most frequent accidents in the veterinary workplace^{71–73}; the most commonly reported needlestick injury is inadvertent injection of a vaccine.^{12,74,75} In a 1995 survey of 701 veterinarians, accidental self-injection of rabies virus vaccine was reported by 27% of respondents; among large-animal practice respondents, 23% had accidentally self-injected vaccines containing live *Brucella* organisms.¹² Inadvertent self-injection of vaccines, antimicrobials, and anesthetic agents by veterinary personnel may result in adverse events that range from local irritation to serious systemic reactions.^{73,76–78} Additionally, needle punctures sustained during procedures such as fine-needle aspiration are potential sources of zoonotic pathogens.⁷⁹

C. CONSIDERATIONS:

Elimination of all risks associated with zoonotic pathogens in veterinary practice is clearly not possible. This Compendium provides reasonable guidance for minimizing disease and injury among veterinary personnel in clinical settings. Although the VSP are intended to be adaptable to individual practice needs and circumstances, any modifications should adhere to basic principles of infection control and comply with federal, state, and local regulations.

The VSP focus on personal protective equipment and actions; however, comprehensive infection control planning should also include consideration of work-environment control measures such as exposure avoidance (eg, refusal to provide care for species for which a practice is not equipped); engineering controls (eg, convenient placement of sharps containers or providing an employee break room), and administrative controls (eg, employee training).⁸⁰

Employers should demonstrate and promote safe work habits.⁸¹ The cost of implementing these guidelines compares favorably with the potential financial consequences of inadequate infection control, including sick leave or hospitalization of personnel, loss of credibility, and litigation.^{82–85} Training is an essential part of VSP implementation and it is most effective if each employee is made aware of the relevance of infection control policies to their own health and the health of others.

Veterinarians are accessible, expert sources of information regarding zoonotic diseases and should be prepared to inform clients of risks specific to their community.^{86,87} Client education about issues such as the importance of rabies vaccination for animals, internal and external parasite control, and bite prevention will also help protect veterinary staff from exposure to zoonotic diseases.

II. ZONOTIC DISEASE TRANSMISSION

Transmission of pathogens requires 3 elements: a source of the organism, a susceptible host, and a means of transmission between them.⁶⁰ Infection control involves eliminating or isolating the source, reducing host susceptibility, or interrupting transmission of the agent. This is accomplished through the application of engineering and administrative control measures in the work environment and also the use of personal protective equipment.

A. SOURCE:

Animal sources of infection include animals that are clinically ill, those that are subclinically infected, and animals that harbor endogenous microflora that are pathogenic to humans. Environmental sources of infection include contaminated walls, floors, examination tables, scales, cages, bedding, equipment, supplies, feed, soil, and water.

B. HOST SUSCEPTIBILITY:

Human susceptibility to infection varies greatly. Humans may be immune or able to resist colonization by an infectious agent, become transient or persistent asymptomatic carriers, or develop illness. Susceptibility can be affected by various factors, including vaccination status, age, underlying diseases, immunosuppression, pregnancy, and deficiencies or disruptions in the body's primary defense mechanisms.

C. ROUTES OF TRANSMISSION:

Pathogens are transmitted via 3 main routes: contact, aerosol, and vector-borne transmission. Some agents may be transmitted by multiple routes.⁶⁰

1. CONTACT TRANSMISSION

Contact transmission occurs when pathogens from animals or their environments enter a human host through ingestion or through cutaneous, percutaneous, or mucous membrane exposure. Contact transmission may be direct or indirect. Direct transmission may occur during examination, bathing, and general handling of animals or during administration of treatments. Indirect transmission involves contact with a contaminated intermediate—objects such as cages, equipment, and soiled laundry. Direct and indirect transmission most often occur through hand-to-mouth contact.⁶⁰

2. AEROSOL TRANSMISSION

Aerosol transmission occurs when pathogens travel through the air to enter a host. Aerosols may be large droplets that are deposited on the mucous membranes or smaller particles that are inhaled. For most pathogens transmitted by this route, specific data defining risk of infection are limited; in general, risk of aerosol transmission increases with proximity to the source and duration of exposure. Aerosols can contain environmentally persistent pathogens that serve as a source for indirect contact transmission.

Large droplets are created by coughing, sneezing, and vocalization and by procedures such as lancing abscesses and dentistry. Particles that can be inhaled may be generated through procedures such as suction, bronchoscopy, sweeping, vacuuming, and high-pressure spraying. Certain aerosolized pathogens may remain infective over long distances depending on particle size, the nature of the pathogen, and environmental factors.^{60,88} Two zoonotic pathogens known to be transmitted over long distances are *Coxiella burnetii*^{89–91} and *Mycobacterium bovis*.⁹²

3. VECTOR-BORNE TRANSMISSION

Vector-borne transmission occurs when vectors such as mosquitoes, fleas, and ticks transmit pathogens. Animals may bring flea and tick vectors into contact with veterinary personnel. Working in outdoor settings may increase risk of exposure to arthropods.

III. VETERINARY STANDARD PRECAUTIONS

A. PERSONAL PROTECTIVE ACTIONS AND EQUIPMENT:

1. HAND HYGIENE

Consistent, thorough hand hygiene is the single most important measure veterinary personnel can take to reduce the risk of disease transmission.^{93–95} Hand hygiene includes hand washing with soap and water and the use of alcohol-based hand rubs.

Hand washing with soap and running water mechanically removes organic material and reduces the number of transient organisms on the skin. Use of antimicrobial soap kills or inhibits growth of transient and resi-

dent flora.⁹⁶ Either plain soap or antimicrobial products are appropriate for routine use. To reduce the opportunity for cross-contamination, liquid or foam soap products should be selected rather than bar soaps. To prevent creation of a bacterial reservoir, additional soap should not be added to liquid soap dispensers before they are empty (ie, no topping off); once completely empty, refillable dispensers should be first cleaned and dried and then refilled. Moisturizing soaps and lotions can preserve skin integrity and encourage compliance with hand hygiene protocols among veterinary staff. Dry, cracked skin is painful and indicates skin barrier disruption. When hand lotions are required, use of personal containers is recommended over use of shared dispensers to prevent cross-contamination. Staff members who have animal contact should not wear artificial nails and should keep fingernails short.^{93,97} Wearing rings reduces the effectiveness of hand hygiene.⁹³

Alcohol-based hand rubs decontaminate hands by denaturing microbial proteins.⁹⁸ Used properly, they are highly effective against bacteria and enveloped viruses^{93,99–101}; however, they are less effective against some nonenveloped viruses (eg, caliciviruses, feline panleukopenia virus, and canine parvovirus), bacterial spores (eg, *Bacillus anthracis* and *Clostridium difficile*), or protozoal parasites (eg, cryptosporidia).^{93,102,103} The FDA has approved and CDC recommends hand rubs containing 60% to 95% ethyl or isopropyl alcohol for use in health-care settings.⁹³ Hand antiseptics products containing other disinfectants may be susceptible to bacterial overgrowth and have been associated with nosocomial infections.^{104–107}

Although alcohol-based hand rubs are convenient and more likely to be used, they are not effective when organic material is present or hands are visibly soiled. For this reason, hand washing is preferred over the use of hand rubs in veterinary practice whenever running water is available. Hands should be washed between examinations of individual animals or animal groups (eg, litters of puppies or kittens, groups of cattle) and after contact with feces, body fluids, vomitus, exudates, or articles contaminated by these substances.

The recommended technique for hand washing is as follows:

- Wet hands with running water.
- Place soap in palms.
- Rub hands together to make a lather.
- Scrub hands thoroughly for 20 seconds.
- Rinse soap off hands.
- Dry hands with a disposable towel.
- Turn off faucet using the disposable towel as a contact barrier.

The recommended technique for use of hand rubs is as follows:

- Place alcohol-based hand rub in palms.
- Apply to all surfaces of hands.
- Rub hands together until dry.

When running water is not available, the mechanical action of a moist wipe may enhance the effectiveness of an alcohol-based hand rub, especially when hands are visibly soiled. Use of moist wipes alone is not as effective as use of alcohol-based hand rubs or washing hands with soap and running water.⁹³

2. USE OF GLOVES AND SLEEVES

Gloves reduce the risk of pathogen transmission by providing barrier protection.^{108,109} Wearing gloves is not necessary when examining or handling most healthy animals; however, they should be worn when handling exotic species or animals with a suspected infectious disease. Gloves or sleeves should be worn routinely when contact with feces, body fluids, vomitus, exudates, and nonintact skin is likely. They should be worn when performing dental or obstetrical procedures, resuscitations, and necropsies and when handling diagnostic specimens (eg, urine, feces, aspirates, or swabs). Gloves should also be used when cleaning cages, litter boxes, and contaminated equipment and environmental surfaces and when handling dirty laundry.

Gloves should be changed between examinations of individual animals or animal groups, between dirty and clean procedures performed on a single patient, and whenever torn. Gloves should be removed promptly after use, with care to avoid skin contact with the outer glove surface. Disposable gloves should not be washed and reused.^{110,111}

Wearing gloves (including sleeves) is not a substitute for hand washing. Hands should be washed immediately after glove removal because gloves may have undetected microperforations or hands may be contaminated unknowingly during glove removal.^{112,113}

Gloves are available in a variety of materials. Choice of gloves depends on their intended use. If allergic reactions to latex are a concern, acceptable alternatives include nitrile or vinyl gloves. Further information regarding prevention of allergic reactions to natural rubber latex in the workplace is provided by the NIOSH.¹¹⁴

3. FACIAL PROTECTION

Facial protection prevents exposure of mucous membranes of the eyes, nose, and mouth to infectious materials. Facial protection should be used whenever exposures to splashes or sprays are likely to occur (eg when lancing abscesses, flushing wounds, or suctioning and when performing dentistry, obstetrical procedures, or necropsies^{60,82,115}).

A face shield or goggles worn with a surgical mask provide adequate facial protection during most veterinary procedures that generate potentially infectious sprays and splashes.

4. RESPIRATORY TRACT PROTECTION

Respiratory tract protection is designed to protect the airways of the wearer from infectious agents that are transmitted via inhalation of small particles. Although the need for this type of protection is limited in veterinary medicine, it is appropriate in certain situations, such as during investigations of ill psittacines (avian chlamydiosis), abortion storms in small ruminants (Q fever), unusually high mortality rates among poultry (avian influenza), or respiratory tract disease in *M bovis*-positive herds (bovine tuberculosis).

Disposable particulate respirators often resemble surgical or dust masks, but fit closely to the face and are designed to filter smaller particles (surgical masks are not designed to prevent inhalation of small particles). A variety of inexpensive respirators, such as the commonly used NIOSH-certified N95 respirator that is designed to filter at least 95% of airborne particles, are readily available.¹¹⁶ When respirators are used, voluntary compliance with the OSHA Respiratory Protection Standard (29 CFR 1910.134)¹¹⁷ is recommended. This includes a medical evaluation of the user, annual fit testing of the respirator on the user, and training in proper use. Additional information about respirators and fit testing is provided by the NIOSH and OSHA.^{116,117}

5. PROTECTIVE OUTERWEAR

a. *Laboratory coats, smocks, aprons, and coveralls*

Laboratory coats, smocks, aprons, and coveralls are designed to protect street clothes or scrubs from contamination. They are usually not fluid resistant, so they should not be used in situations where splashing or soaking with potentially infectious liquids is anticipated. Garments should be changed promptly whenever they become visibly soiled or contaminated. Generally, outerwear should be changed and laundered daily. These garments should not be worn outside of the work environment.^{60,118,119}

b. *Nonsterile gowns*

Gowns provide better barrier protection than laboratory coats. Permeable gowns can be used for general care of animals in isolation. Impermeable gowns should be used when exposures to splashes or large quantities of body fluids are anticipated. Disposable gowns should not be reused. Washable fabric gowns may be used repeatedly to care for the same animal in isolation, but should be laundered between contacts with different pa-

tients or whenever soiled. Whenever gowns are worn, gloves should also be used; the outer (contaminated) surface of a gown should only be touched with gloved hands. Gowns and gloves should be removed and placed in the laundry or refuse bin before leaving the animal's environment. Hands should be washed immediately afterwards.⁸²

To avoid cross-contamination, gowns should be removed as follows:

- After unfastening ties, peel the gown from from the shoulders and arms by pulling on the chest surface with gloved hands.
- Remove the gown, avoiding contact between its outer surface and clean surfaces.
- Wrap the gown into a ball while keeping the contaminated surface on the inside; place in a designated receptacle.
- Remove gloves and wash hands.
- If body fluids have soaked through the gown, promptly remove contaminated clothing and wash the skin.

c. *Footwear*

Footwear should be suitable for the specific working conditions (eg, rubber boots for farm work) and should protect personnel from both trauma and exposure to infectious material. Recommendations include shoes or boots with thick soles and closed-toe construction that are impermeable to liquid and easy to clean. Footwear should be cleaned to prevent transfer of infectious material from one environment to another, such as between farm visits and before returning from a field visit to a veterinary facility or home. Disposable shoe covers or booties add an extra level of protection when heavy quantities of infectious materials are present. Promptly remove and dispose of shoe covers and booties when leaving contaminated work areas.

d. *Head covers*

Disposable head covers provide a barrier when gross contamination of the hair and scalp may occur. Disposable head covers should not be reused.

6. ANIMAL-RELATED INJURY PREVENTION

Veterinary personnel should take all necessary precautions to prevent animal-related injuries. Preventive measures include reliance on experienced veterinary personnel rather than owners to restrain animals and the use of physical restraints, bite-resistant gloves, muzzles, and sedation or anesthesia as necessary.¹²⁰ Aggressive tendencies and bite history should be recorded in the patient's record, communicated to personnel, and indicated with signage on cages and enclosures. Veterinary personnel should be trained to remain alert for changes in their patients' behavior, and those working with large animals should have an escape route in mind at all times.^{12,13}

B. PROTECTIVE ACTIONS DURING VETERINARY PROCEDURES:

1. PATIENT INTAKE

Waiting rooms should be a safe environment for clients, animals, and veterinary personnel. Aggressive animals and those that have a potentially communicable disease should be placed directly into an examination or isolation room. Animals with respiratory or gastrointestinal signs or with a history of exposure to a known infectious agent should be brought in through an entrance other than the main entrance.

2. EXAMINATION OF ANIMALS

Animals with potentially infectious diseases should be examined in a dedicated examination or isolation room and should remain there until initial diagnostic procedures and treatments have been performed. Thereafter, the examination room should remain out of service until properly cleaned and disinfected. Every examination room should have a source of running water, a soap dispenser, and paper towels. Alcohol-based hand rubs may be provided for use when hands are not visibly soiled, but should not be relied upon exclusively.

All veterinary personnel should wash their hands between examinations of individual animals or animal groups (eg, litters of puppies or kittens, groups of cattle). Contact with animals suspected of having an infectious disease should be limited to essential personnel. Veterinary personnel should wear protective outerwear and use gloves and other protective equipment appropriate for the situation.

When there is a high index of suspicion of influenza A infection in an animal, veterinary personnel should, at a minimum, wear facial protection during examination. Understanding of zoonotic transmission of influenza A virus is rapidly changing, and the risk for veterinary personnel is undefined. Readers are referred to the NIOSH, CDC, USDA, and AVMA for guidance on recommended protection measures in specific occupational settings.

3. INJECTIONS, VENIPUNCTURE, AND ASPIRATION PROCEDURES

a. *Needlestick injury prevention*

Needlesticks can cause serious injury, especially to fingers. They may result in the inoculation of live vaccines or infective materials and can serve as a portal of entry for pathogens.⁷³

An approved sharps container (puncture- and leak-proof container designed for the safe collection of sharp medical articles for disposal) should be located in every area in which animal care occurs.¹²¹⁻¹²³ A used syringe with the needle attached should be placed in a sharps container after aspiration of body fluids or injections of vaccines containing live organisms. Following most other veterinary procedures, the needle and

syringe may be separated and the needle alone placed in the sharps container. It is safest to use the needle removal device on the sharps container, which allows the needle to drop directly into the container. Alternatively, a forceps may be used to remove an uncapped needle from a syringe; uncapped needles should never be removed from the syringe by hand. Sharps containers should not be overfilled, and sharps should not be transferred from one container to another. Devices that cut needles prior to disposal should not be used because they increase the potential for injury and aerosolization of infectious material.¹²¹

Needle caps should never be removed by mouth. Veterinary staff should not bend needles, pass an uncapped needle to another person, or walk around with uncapped needles. Animal restraint by trained personnel should be employed to minimize needlestick injuries due to animal movement.

Needle recapping should be avoided. However, when it is absolutely necessary to recap a needle as part of a medical procedure or protocol, forceps can be used to replace the cap on the needle or a 1-handed scoop technique may be employed as follows:

- Place the cap on a horizontal surface.
- Hold the syringe with attached needle in 1 hand.
- Use the needle to scoop up the cap without use of the other hand.
- Secure the cap by pushing it against a hard surface.

b. *Barrier protection*

Gloves should be worn during venipuncture of animals suspected of having an infectious disease and when performing soft tissue aspiration procedures. Currently, there are no data indicating that venipuncture of healthy animals constitutes an important risk of exposure to pathogens, and contact with animal blood (except primate blood) has not been reported as a source of occupationally acquired infection. Nevertheless, percutaneous, cutaneous, or mucous membrane exposure to blood and blood products should be avoided.

4. DENTISTRY, BRONCHOSCOPY, AND TRANSTRACHEAL WASHES

Dental procedures, bronchoscopy, and transtracheal washes can generate splashes or sprays that are potentially infectious. Veterinary personnel performing these procedures and anyone in range of direct splashes or sprays should wear protective outerwear, gloves, and facial protection.¹²⁴ In 1 study¹²⁵ in humans, irrigation of the oral cavity with a 0.12% chlorhexidine solution significantly decreased bacterial aerosolization during dental procedures. This benefit may be applicable to veterinary medicine settings¹²⁶; however, chlorhexidine solution can cause ototoxicosis in cats.¹²⁷

5. RESUSCITATION

The urgent nature of resuscitation increases the likelihood that breaches in infection control will occur. Barrier precautions, such as use of gloves and facial protection, should be implemented to prevent exposure to zoonotic infectious agents that may be present. Never blow into the nose or mouth of an animal or into an endotracheal tube; instead, intubate the animal and use a manual resuscitator, anesthesia machine, or ventilator.

6. OBSTETRICS

Common zoonotic agents, including *Bruceella* spp, *C burnetti*, and *Listeria monocytogenes*, may be found in high concentrations in the birthing fluids of aborting or parturient animals and in stillborn fetuses. Gloves, sleeves, facial protection, and impermeable protective outerwear should be used as needed to prevent exposures to potentially infective materials. Never attempt to resuscitate a nonrespiring neonate by blowing directly into its nose or mouth.

7. NECROPSY

Necropsy is a high-risk procedure because of potential contact with infectious agents in body fluids and aerosols and on contaminated sharps. Nonessential persons should not be present during necropsy procedures. Veterinary personnel should routinely wear gloves, facial protection, and impermeable protective outerwear. In addition, cut-proof gloves should be used to prevent sharps-associated injuries. Respiratory tract protection (eg, use of an N95 respirator) should be employed when band saws or other power equipment is used.

8. DIAGNOSTIC SPECIMEN HANDLING

Eating and drinking must not be allowed in the laboratory. Feces, urine, vomitus, aspirates, and swabs should be handled as though they contain infectious organisms. Protective outerwear and disposable gloves should be worn when handling these specimens. Discard gloves and wash hands before touching clean items (eg, medical records or telephones). Specimens to be shipped for diagnostic testing must be packaged and labeled according to International Air Transport Association regulations.¹²⁸

9. WOUND CARE

Wound infections and abscesses can be caused by many zoonotic pathogens.¹²⁹ Veterinary personnel should wear protective outerwear and gloves for debridement, treatment, and bandaging of wounds; facial protection should be worn when lancing abscesses and lavaging wounds. Hands should be washed thoroughly after gloves are discarded. Used bandage materials and equipment such as bandage scissors should be considered infectious and handled accordingly.

C. ENVIRONMENTAL INFECTION CONTROL:

1. CLEANING AND DISINFECTION OF EQUIPMENT AND SURFACES

Routine cleaning and disinfection are important for environmental control of pathogens.

Equipment and surfaces must be cleaned with water and detergent before they are disinfected because adherent organic material decreases the effectiveness of most disinfectants.^{98,130} An EPA-registered disinfectant should be used according to label instructions, with attention to proper dilution and contact time. Quaternary ammonium compounds have been the most common type of disinfectant used on environmental surfaces in veterinary practice; now there are also hydrogen peroxide-based oxidizing agents available that are effective against a wide range of veterinary microbes (Appendix 2). Personnel engaged in cleaning and disinfection should be trained in safe practices and provided with necessary safety equipment according to the products' material safety data sheets, which should be easily accessible.

Equipment and surfaces should be cleaned and disinfected between uses or whenever visibly soiled. Special attention should be paid to surface areas with high contact rates (eg, door knobs, cage latches, faucet handles, and sinks).³⁹ Surfaces in areas where animals are housed, examined, or treated should be made of nonporous, easily cleaned materials. Generation of dust that may contain pathogens can be minimized by use of central vacuum units, wet mopping, dust mopping, or electrostatic sweeping. Surfaces may be lightly sprayed with water prior to mopping or sweeping. Use of facial protection and control of splatter can minimize exposure to aerosols generated by brushing during cleaning activities. Use of high-pressure sprayers and similar devices that can disseminate infectious particles should be avoided.

Routine dishwashing of food and water bowls is sufficient for most hospitalized patients.⁶⁰ The use of disposable dishes should be considered for animals in isolation. Toys, litter boxes, and other miscellaneous items should be discarded or cleaned and disinfected between patient uses. Litter boxes should be cleaned or disposed of at least daily by a nonpregnant staff member. Clean items should be kept separate from dirty items.

A written checklist, which specifies the frequency of cleaning, disinfection procedures, products to be used, and the staff responsible, should be developed for each area of the facility (eg, waiting room, examination rooms, treatment area, surgery, and kennels).

2. ISOLATION OF ANIMALS WITH INFECTIOUS DISEASES

Animals with potentially communicable diseases should be examined, cared for, and housed in designated isolation rooms (small animals) or areas (large animals) to protect other patients and veterinary personnel. Isolation procedures should be prominently posted.⁸² Isolation rooms or areas should be identified with signage, access should be limited, and a sign-in sheet should be used.

Only the equipment and materials needed for the care and treatment of the patient should be kept in the isolation room or area, and isolation supplies should not be removed for use elsewhere. Whenever possible, use of disposable articles such as bowls, litter pans, and gowns is recommended. Equipment that must be removed from the isolation area should be disassembled, cleaned, and disinfected prior to removal. Potentially contaminated materials should be bagged before transport within the practice and disinfected or disposed of according to their level of hazard.^{82,131}

Limited data are available regarding the effectiveness of shoe covers, footbaths, and foot mats for infection control in private veterinary practice. Because footbaths and foot mats are difficult to use properly, especially in small animal settings, disposable shoe or boot coverings should be considered for use in isolation rooms. When disposable footwear coverings are used, personnel should be trained to use, remove, and dispose of them properly. Footbaths and foot mats may be more practical and effective in large animal settings.¹³²⁻¹³⁴ It is important to remove organic material from shoes or boots prior to using a foot bath or mat (because most disinfectants are inactivated in the presence of organic material) and to allow adequate contact time, as recommended on the disinfectant label. Footbaths and foot mats should be placed at the exit of an isolation room or large animal area and should be changed daily or when visibly dirty.

3. HANDLING OF LAUNDRY

Although soiled laundry may be contaminated with pathogens, the risk of disease transmission is negligible if soiled items are handled correctly.¹³⁵ Personnel should check for sharps before items are laundered. Gloves and protective outerwear should be worn when handling soiled laundry. Bedding and other laundry should be machine washed with standard laundry detergent and machine dried at the highest temperature suitable for the material. Laundry should not be considered clean until it is completely machine dried.⁵ To prevent cross-contamination, separate storage and transport bins should be used for clean and dirty laundry. If soiled clothing is laundered at home, it should be transported in a sealed plastic bag and put directly into a washing machine.

4. DECONTAMINATION AND SPILL RESPONSE

Spills and splashes of vomitus, body fluids, or potentially infective substances should be immediately contained with absorbent material (eg, paper towels, sawdust, or cat litter). Personnel should wear gloves and other appropriate protective equipment before beginning the cleanup. The spilled fluids and absorbent material should be picked up and sealed in a leak-proof plastic bag, and the area should be cleaned and sprayed with disinfectant. An EPA-

registered disinfectant should be used according to label instructions, with attention to proper dilution and contact time. Animals and people who are not involved in the cleanup should be kept away from the area until disinfection is completed.¹³⁵

5. VETERINARY MEDICAL WASTE

Medical waste is defined and regulated at the state level by multiple agencies. Veterinary medical waste may include sharps, tissues, contaminated materials, and dead animals. Medical waste should be handled with care and should be packaged so that it does not spill or leak. Sharps must be placed in rigid puncture- and leak-resistant containers that can be permanently sealed. Regulated medical waste that has not been decontaminated prior to disposal should be labeled with the universal biohazard symbol.^{123,131,136,137} The AVMA recommends voluntary compliance with the OSHA Bloodborne Pathogen Standard (29 CFR 1910.130)¹³⁸ regarding medical waste, although the standard generally applies only to occupational exposures to human blood (unless the animal blood is used for research and is known to be infected with HIV or hepatitis B virus).¹³⁹ For further guidance, consult local or state health departments, state environmental protection agencies, and municipal governments. Additional information regarding state regulations is available from the EPA.¹⁴⁰

6. RODENT AND VECTOR CONTROL

Many important zoonotic pathogens are transmitted by arthropod vectors. Field veterinarians have the greatest risk for exposure to vectors and should use repellents and protective clothing.

Integrated pest management is the recommended approach to control rodents and vectors in veterinary medical buildings. Integrated pest management is a comprehensive approach to pest control that is based on an understanding of the life cycle and ecology of the pest. Pest populations are controlled largely by creating inhospitable environments; by removing the air, moisture, food, or shelter that pests need to survive; or by blocking access to buildings.^{141,142} Pesticides and rodent traps may be used as part of a comprehensive plan that includes environmental control measures as follows:

- Sealing of potential entry and exit points into buildings with caulk, steel wool, or metal lath.
- Storage of food and garbage in metal or thick-plastic containers with tight lids.
- Disposal of food waste promptly.
- Elimination of potential rodent nesting sites (eg, clutter).
- Remove sources of standing water (eg, empty buckets, tires, and clogged gutters) to reduce potential mosquito breeding sites.
- Installation and maintenance of window screens to prevent entry of insects and rodents.

Additional measures may be warranted for control of specific pests. For example, bats should be excluded from hospital barns and veterinary medical facilities. Facility managers may wish to contact a pest control company for additional guidance.

7. OTHER ENVIRONMENTAL CONTROLS

It is important to provide a staff break room or area for eating and drinking. Such activities should be prohibited in the laboratory, treatment room, and other patient care and housing areas. Separate, appropriately labeled refrigerators should be used for human food, animal food, and biologics. Dishware for human use should be washed and stored away from animal-care areas.

IV. EMPLOYEE HEALTH

A. GENERAL:

Veterinary practice managers should promote infection control as part of a comprehensive employee health program. Senior management support is essential for staff compliance with policies and procedures.⁸¹

In addition to maintaining up-to-date emergency contact information, veterinary practices should maintain staff records including vaccinations and rabies virus antibody titers, a log of work-related injuries and illnesses, and reports of exposures to infectious organisms.¹⁴³ These records should be collected on a voluntary basis and confidentially maintained. Employees should inform their supervisor of changes in health status, such as pregnancy, that may affect work assignments. Veterinary personnel should be aware that if they become ill, they should inform their health-care provider that their work duties involve animal contact.⁸⁰

1. EMPLOYEE VACCINATION POLICIES AND RECORD KEEPING

a. Rabies

Veterinary personnel who have contact with animals should receive preexposure rabies vaccination and antibody titer checks in accordance with ACIP recommendations.^{144,145} Preexposure vaccination against rabies does not eliminate the need for appropriate treatment following a known rabies virus exposure. It does, however, simplify the rabies postexposure treatment, and it may provide protection in cases of unrecognized rabies exposure or when postexposure treatment is delayed.¹⁴⁴ The rabies preexposure prophylaxis and titer testing recommendations and rabies postexposure prophylaxis guidance for veterinary personnel in rabies enzootic areas are as follows¹⁴⁴:

- Preexposure rabies prophylaxis—rabies vaccinations are given IM on days 0, 7, and either 21 or 28.
- Serologic testing—Rabies titers should be assessed every 2 years by use of a rapid fluorescent foci inhibition test.

- Rabies booster vaccination—A single booster rabies vaccination is given when the rabies titer is less than 1:5 as determined via the rapid fluorescent foci inhibition test method.
- Postexposure rabies prophylaxis for preexposure-vaccinated personnel—Following rabies exposure, 2 rabies vaccinations are given on days 0 and 3; no human rabies immune globulin is given, and no serum titer test is performed.

b. Tetanus

Veterinary personnel should receive a routine tetanus vaccination every 10 years in accordance with ACIP recommendations.¹⁴⁶ Additionally, if a person has a wound that is contaminated with dirt, feces, or saliva; a puncture wound; an avulsion; or wounds resulting from missiles, crushing, burns, or frostbite and if it has been > 5 years since that individual last received a tetanus booster vaccination, a single dose of Tdap (tetanus, diphtheria, and pertussis) or Td (tetanus and diphtheria) should be administered.¹⁴⁶

c. Influenza

Veterinary personnel, especially those working with poultry or swine, are encouraged to receive the currently recommended influenza vaccine or vaccines.¹⁴⁷⁻¹⁴⁹ Current guidance is available from the ACIP.¹⁵⁰ This is to prevent human-to-animal transmission of human influenza viruses and to minimize the potential for dual infection of an animal (or a person) with a human and a zoonotic influenza virus that could result in a new strain of influenza.¹⁵¹⁻¹⁵⁴

2. MANAGEMENT AND DOCUMENTATION OF EXPOSURE INCIDENTS

Practice managers should encourage reporting, investigation, and documentation of bites, injuries, and potential zoonotic pathogen exposures.¹⁵⁵ Information about mandatory reporting of incidents is available at local and state health departments. Incidents should be recorded on forms such as OSHA form 300 or 301.^{156,157} Practice managers should consult with the US Department of Labor to determine which forms are most appropriate for their practices. In general, the information collected should include details as follows:

- Date, time, and location of the incident.
- Name of person injured or exposed.
- Vaccination status of injured employee.
- Names of other persons present.
- Description of the incident.
- Whether or not a health-care provider was consulted.
- Status of the animal involved (vaccination status, clinical condition, and any diagnostic test results).

- Documentation of any report to public health authorities.
- Plans for follow-up.

First aid should be readily available, and personnel should be trained to recognize and respond to emergency situations. Incident response procedures should be displayed prominently.

3. STAFF TRAINING AND EDUCATION

Staff training and education are essential components of an effective employee health program. Training should have defined objectives, and there should be some means of measuring the effectiveness of the training.¹⁵⁸ Staff training at the beginning of employment should emphasize infection control practices, the potential for zoonotic disease exposure, hazards associated with work duties, and injury prevention. It should also include instruction in animal handling, restraint, and behavioral cue recognition. Additional in-service training should be provided at least annually and as recommendations or policies change. Staff participation in training should be documented.

B. IMMUNOCOMPROMISED PERSONNEL:

Personnel with a weakened immune system due to disease or medication and pregnant women are more susceptible to infection with zoonotic agents and more likely to develop serious complications from zoonotic infections.¹⁵⁹ Occupational activities associated with a higher risk of exposure to zoonotic pathogens include processing of laboratory samples and care of certain high-risk animals.¹⁶⁰ High-risk animals include those that are young, parturient, unvaccinated, stray or feral, fed raw meat diets, or housed in crowded conditions (eg, shelters); animals with internal or external parasites; wildlife; reptiles and amphibians; and exotic or non-native species.¹⁶⁰

Although data regarding the risks of zoonotic infection for HIV-infected persons employed in veterinary settings are limited, there are none that justify their exclusion from the veterinary workplace.¹⁶¹ Risk of exposure to zoonotic pathogens in the workplace can be mitigated with appropriate infection control measures.

During pregnancy, physiologic suppression of cell-mediated immunity occurs and increases a woman's susceptibility to certain infectious diseases, such as toxoplasmosis, lymphocytic choriomeningitis, brucellosis, listeriosis, and psittacosis.¹⁶² Vertical transmission of certain zoonotic agents may result in miscarriage, stillbirth, premature birth, or congenital anomalies.

Employees with immune dysfunction should discuss their health status with the practice manager so appropriate workplace accommodations can be made. It may be advisable to consult the employee's health-care provider or an infection control, public health, or occupational health specialist.¹⁶³ Confidential information must not be disclosed to others or be accessible to others.

Employers must abide by state and federal laws that protect pregnant women and persons with disabilities.

V. CREATING A WRITTEN INFECTION CONTROL PLAN

Veterinary practices should have a written infection control plan. Effective infection control plans should be specific to the facility and practice type, be flexible so that new issues can be addressed easily and new knowledge incorporated, provide explicit and well-organized guidance, clearly describe the infection control responsibilities of staff members, and provide contact information, resources, and references (eg, reportable disease list, public health contacts, local rabies codes and environmental health regulations, OSHA requirements, and client education materials). A model infection control plan that can be tailored to individual practice needs is available in electronic format from the NASPHV¹⁶⁴ (Appendix 3).

A. INFECTION CONTROL PERSONNEL:

Staff members should be designated for development and implementation of infection control policies, monitoring compliance, maintenance of records, and management of workplace exposures and injury incidents. All veterinary personnel are responsible for supporting and carrying out the activities outlined in the plan.

B. COMMUNICATING AND UPDATING THE INFECTION CONTROL PLAN:

1. LEADERSHIP

Senior and managerial personnel should set the standard for infection control practices and emphasize the importance of infection control in daily activities.

2. NEW STAFF

New staff members should be given a copy of the infection control plan. Detailed training on the practice's infection control policies and procedures, employee vaccination recommendations, and incident reporting should be provided. Receipt of the plan and training should be documented for each employee.

3. REVIEW AND REVISION

A designated staff person should update the infection control plan when new information becomes available or when clinical practices change. Revisions should be communicated to all staff members. The infection control plan should be reviewed at least annually at staff meetings.

4. COMPLIANCE

Supervisors should ensure that infection control policies and protocols are carried out consistently and correctly and that corrective measures and employee retraining are instituted when deficiencies are identified.

5. AVAILABILITY

Copies of the infection control plan and resource documents should be kept at locations that are readily accessible to all staff, including reception, administration, animal care, and housekeeping personnel.

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Appendix 1

Zoonotic diseases of importance in the United States, 2010.

Disease	Agent	Means of transmission to humans	Most common species associated with transmission to humans ^{165,166}	Nationally notifiable human (H) or animal (A) cases	Severe or prolonged infection usually associated with immunosuppression	Deaths in humans reported
Acariasis (mange)	<i>Sarcoptes scabiei</i> , <i>Notoedres cati</i> , and other species of mites	Contact	Dogs, cats, horses, goats, sheep, swine, birds	No	No	No
Anthrax	<i>Bacillus anthracis</i>	Contact, aerosol, vector	Cattle, sheep, goats, horses	H, A	No	Yes
Avian influenza	Highly pathogenic avian influenza viruses	Contact, aerosol	Poultry, pet birds	H, A	No	Yes
Babesiosis	<i>Babesia microti</i> and other species	Vector	Cattle, rodents	A	Yes	Yes
Baylisascariasis	<i>Baylisascaris procyonis</i>	Contact	Raccoons	No	No	Yes
<i>Bordetella bronchiseptica</i> infection	<i>Bordetella bronchiseptica</i>	Aerosol	Dogs, pigs, rabbits, guinea pigs	No	Yes	No
Brucellosis	<i>Brucella melitensis</i> , <i>Brucella abortus</i> , <i>Brucella suis</i> , <i>Brucella canis</i>	Contact, aerosol	Goats, cattle, swine, dogs, horses	H, A	No	Yes
Campylobacteriosis	<i>Campylobacter jejuni</i> , <i>Campylobacter fetus</i> , <i>Campylobacter coli</i>	Contact	Cattle, sheep, goats, pigs, dogs, cats, birds, mink, ferrets, hamsters	No	No	Rare
<i>Capnocytophaga canimorsus</i> infection	<i>Capnocytophaga canimorsus</i> , <i>Capnocytophaga cynodegmi</i>	Contact	Dogs, cats	No	Yes	Yes
Cat scratch disease	<i>Bartonella henselae</i>	Contact	Cats	No	Yes	Rare
Chlamydiosis (mammalian)	<i>Chlamydomydia abortus</i> , <i>Chlamydomydia felis</i>	Aerosol, contact	Sheep, goats, llamas, cats, cattle	No	No	Yes
Contagious pustular dermatitis (orf or contagious ecthyma)	Parapoxvirus	Contact	Sheep, goats	No	No	No
Cryptococcosis	<i>Cryptococcus neoforms</i>	Aerosol	Pigeons, other birds	No	Yes	Yes
Cryptosporidiosis	<i>Cryptosporidium parvum</i>	Contact	Cattle (typically calves)	H	Yes	Yes
Dermatophilosis	<i>Dermatophilus congolensis</i>	Contact, vector	Goats, sheep, cattle, horses	No	No	No
Dermatophytosis (ringworm)	<i>Microsporium</i> spp, <i>Trichophyton</i> spp, <i>Epidermophyton</i> spp	Contact	Cats, dogs, cattle, goats, sheep, horses, rabbits, rodents	No	Yes	No
<i>Dipylidium</i> infection (tapeworm)	<i>Dipylidium caninum</i>	Vector	Dogs, cats	No	No	No
<i>Escherichia coli</i> O157:H7 infection	<i>Escherichia coli</i> O157:H7	Contact	Cattle, goats, sheep, deer	No	No	Yes
Echinococcosis	<i>Echinococcus granulosus</i> , <i>Echinococcus multilocularis</i>	Contact	Dogs, cats, wild canids	A	No	Yes
Ehrlichiosis or anaplasmosis	<i>Ehrlichia</i> and <i>Anaplasma</i> spp	Vector	Deer, rodents, horses, dogs	H	Yes	Yes
Equine encephalomyelitis	Togaviridae (eastern, western, and Venezuelan equine encephalomyelitis viruses)	Vector	Birds, horses	H, A	No	Yes
Erysipeloid	<i>Erysipelothrix rhusiopathiae</i>	Contact	Pigs, fish, crustaceans, mollusks	No	No	Yes
Giardiasis	<i>Giardia intestinalis</i> (<i>Giardia lamblia</i>)	Contact	Thought to be highly species specific and rarely transmitted from animals to humans	H	Yes	No
Hantaviral diseases	Hantaviruses	Aerosol	Rodents	H	No	Yes
Herpes B virus infection	Cercopithecine herpesvirus 1	Contact	Macaque monkeys	No	No	Yes
Influenza A	Influenza A virus	Contact, aerosol	Poultry, swine, ferrets	H, A	No	Yes
Larval migrans: cutaneous (hookworm)	<i>Ancylostoma</i> spp	Contact	Dogs, cats	No	No	Rare
Larval migrans: visceral, ocular, neurologic (roundworm)	<i>Toxocara canis</i> , <i>Toxocara cati</i>	Contact	Dogs, cats	No	No	Rare

Appendix 1 (continued)

Zoonotic diseases of importance in the United States, 2010.

Disease	Agent	Means of transmission to humans	Most common species associated with transmission to humans ^{165,166}	Nationally notifiable human (H) or animal (A) cases	Severe or prolonged infection usually associated with immunosuppression	Deaths in humans reported
Leishmaniasis	<i>Leishmania</i> spp	Vector	Dogs, wild canids	A	No	Yes
Leptospirosis	<i>Leptospira</i> spp	Contact, aerosol	Rodents, pigs, cattle, sheep, goats, horses, dogs	A	No	Yes
Listeriosis	<i>Listeria monocytogenes</i>	Contact	Cattle, sheep, goats, pigs, birds, dogs, cats	H	Yes	Yes
Lyme disease	<i>Borrelia burgdorferi</i>	Vector	Small rodents, wild mammals	H	No	No
Lymphocytic choriomeningitis	Arenavirus (lymphocytic choriomeningitis virus)	Contact, aerosol	Mice, hamsters, guinea pigs	No	Yes	Yes
Monkeypox	Orthopoxvirus	Contact, aerosol	Nonhuman primates, rodents	A	No	Yes
Mycobacteriosis (nontuberculous)	<i>Mycobacterium avium</i> complex, <i>Mycobacterium marinum</i>	Aerosol, contact	Poultry, birds, aquarium fish, reptiles	No	Yes	Yes
Pasteurellosis	<i>Pasteurella multocida</i> and other species	Contact	Dogs, cats, rabbits, rodents	No	Yes	No
Plague	<i>Yersinia pestis</i>	Vector, contact, aerosol	Rodents, cats, rabbits	H, A	No	Yes
Psittacosis (human) or avian chlamydiosis (birds)	<i>Chlamydophila psittaci</i>	Aerosol, contact	Pet birds, poultry	H, A	Yes	Yes
Q fever	<i>Coxiella burnetii</i>	Contact, aerosol, vector	Goats, sheep, cattle, rodents, rabbits, dogs, cats	H, A	No	Yes
Rabies	Lyssavirus	Contact	Cats, dogs, cattle and other domestic animals; wild carnivores; raccoons; bats; skunks; foxes	H, A	No	Yes
Rat bite fever	<i>Streptobacillus moniliformis</i> , <i>Spirillum minus</i>	Contact	Rodents	No	Yes	Yes
<i>Rhodococcus equi</i> infection	<i>Rhodococcus equi</i>	Aerosol, contact	Horses	No	Yes	Yes
Rocky Mountain spotted fever	<i>Rickettsia rickettsii</i>	Vector	Dogs, rabbits, rodents	H	No	Yes
Salmonellosis	<i>Salmonella</i> spp	Contact	Reptiles, amphibians, poultry, horses, swine, cattle, pocket pets, many species of mammals and birds	H	Yes	Yes
Sporotrichosis	<i>Sporothrix schenckii</i>	Contact	Cats, dogs, horses	No	Yes	Rare
Staphylococcosis	<i>Staphylococcus</i> spp	Contact	Dogs, cats, horses	H (vancomycin-resistant <i>Staphylococcus aureus</i>)	Yes	Yes (some forms)
Streptococcosis	<i>Streptococcus</i> spp	Contact, aerosol	Swine, fish, other mammals	H (some forms)	No	Yes (some forms)
Toxoplasmosis	<i>Toxoplasma gondii</i>	Contact	Cats	No	Yes	Yes
Trichuriasis (whipworm infection)	<i>Trichuris suis</i> , <i>Trichuris trichiura</i> , <i>Trichuris vulpis</i>	Contact	Dogs, swine	No	No	Rare
Tuberculosis, bovine	<i>Mycobacterium bovis</i>	Aerosol, contact	Cattle, swine, sheep, goats	H, A	No	Yes
Tularemia	<i>Francisella tularensis</i>	Vector, contact, aerosol	Rabbits, pocket pets, wild aquatic rodents, sheep, cats, horses, dogs	H, A	No	Yes
Vesicular stomatitis	Vesicular stomatitis virus	Vector, contact, aerosol	Horses, cattle, swine, sheep, goats	A	No	No
West Nile fever	West Nile virus	Vector	Wild birds	H, A	No	Yes
Yersiniosis	<i>Yersinia enterocolitica</i>	Contact	Swine, many species of mammals and birds	No	No	No

Data regarding nationally reportable diseases were obtained from the CDC's nationally notifiable infectious diseases list, the World Organization for Animal Health (OIE) notifiable animal diseases list, and the USDA APHIS reportable diseases list.¹⁶⁷⁻¹⁶⁹ Cases may also be notifiable at the state level; state veterinarians or state public health veterinarians should be consulted for current listings of reportable diseases in specific areas.

Continued on next page.

Appendix 2

Selected disinfectants used in veterinary practice.

Characteristics of Selected Disinfectants								
Disinfectant Category	Alcohols	Aldehydes	Biguanides	Halogens: Hypochlorites	Halogens: Iodine Compounds	Oxidizing Agents	Phenols	Quaternary Ammonium Compounds (QAC)
Sample Trade Names	Ethyl alcohol Isopropyl alcohol	Formaldehyde Glutaraldehyde	Chlorhexigline Nolvasan [?] Virosan [?]	Bleach	Betadyne [?] Providone [?]	Hydrogen peroxide Peracetic acid Virkon S [?] Oxy-Sept 333 [?]	One-Stroke Environ [?] Pheno-Tek II [?] Tek-Trol [?]	Roccal [?] DiQuat [?] D-256 [?]
Mechanism of Action	•Precipitates proteins •Denatures lipids	•Denatures proteins •Alkylates nucleic acids	•Alters membrane permeability	•Denatures proteins	•Denatures proteins	•Denature proteins and lipids	• Denatures proteins • Alters cell wall permeability	• Denatures proteins • Binds phospholipids of cell membrane
Advantages	•Fast acting •Leaves no residue	•Broad spectrum	•Broad spectrum	•Broad spectrum •Short contact time •Inexpensive	•Stable in storage •Relatively safe	•Broad spectrum	• Good efficacy with organic material • Non-corrosive • Stable in storage	• Stable in storage • Non-irritating to skin • Effective at high temperatures and high pH (9-10)
Disadvantages	•Rapid evaporation •Flammable	•Carcinogenic •Mucous membranes and tissue irritation •Only use in well ventilated areas	•Only functions in limited pH range (5-7) •Toxic to fish (environmental concern)	•Inactivated by sunlight •Requires frequent application •Corrodes metals •Mucous membrane and tissue irritation	•Inactivated by QACs •Requires frequent application •Corrosive •Stains clothes and treated surfaces	•Damaging to some metals	• Can cause skin and eye irritation	
Precautions	Flammable	Carcinogenic		Never mix with acids; toxic chlorine gas will be released			May be toxic to animals, especially cats and pigs	
Vegetative Bacteria	Effective	Effective	Effective	Effective	Effective	Effective	Effective	YES—Gram Positive Limited—Gram Negative
Mycobacteria	Effective	Effective	Variable	Effective	Limited	Effective	Variable	Variable
Enveloped Viruses	Effective	Effective	Limited	Effective	Effective	Effective	Effective	Variable
Non-enveloped Viruses	Variable	Effective	Limited	Effective	Limited	Effective	Variable	Not Effective
Spores	Not Effective	Effective	Not Effective	Variable	Limited	Variable	Not Effective	Not Effective
Fungi	Effective	Effective	Limited	Effective	Effective	Variable	Variable	Variable
Efficacy with Organic Matter	Reduced	Reduced	?	Rapidly reduced	Rapidly reduced	Variable	Effective	Inactivated
Efficacy with Hard Water	?	Reduced	?	Effective	?	?	Effective	Inactivated
Efficacy with Soap/Detergents	?	Reduced	Inactivated	Inactivated	Effective	?	Effective	Inactivated

DISCLAIMER: The use of trade names does not in any way signify endorsement of a particular product.

For additional product names, please consult the most recent Compendium of Veterinary Products.

ADAPTED FROM: Linton AH, Hugo WB, Russel AD. Disinfection in Veterinary and Farm Practice. 1987. Blackwell Scientific Publications; Oxford, England; Quinn PJ, Markey BK. Disinfection and Disease Prevention in Veterinary Medicine, In: Block SS, ed., Disinfection, Sterilization and Preservation. 5th edition. 2001. Lippincott, Williams and Wilkins: Philadelphia.

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Appendix 3

Model Infection Control Plan for Veterinary Practices, 2010 National Association of State Public Health Veterinarians (NASPHV) Veterinary Infection Control Committee (VICC)

This plan should be adapted to your practice in keeping with local, state, and federal regulations. A modifiable electronic version is available on the NASPHV website (www.nasphv.org). Please refer to the full Compendium of Veterinary Standard Precautions for complete information and guidance (also available at www.nasphv.org).

Clinic:
Date of Plan Adoption:
Date of Next Review:
Infection Control Officer:

This plan will be followed as part of our practice's routine procedures. The plan will be reviewed at least annually and as part of new employee training.

PERSONAL PROTECTIVE ACTIONS AND EQUIPMENT

Hand hygiene: Wash hands before and after each patient encounter and after contact with feces, body fluids, vomitus, exudates, or articles contaminated by these substances. Wash hands before eating, drinking, or smoking; after using the toilet; after cleaning animal cages or animal-care areas; and whenever hands are visibly soiled. Alcohol-based rubs may be used if hands are not visibly soiled, but hand washing with soap and running water is preferred. Keep fingernails short. Do not wear artificial nails or hand jewelry when handling animals. Keep hand-washing supplies stocked at all times.

Staff responsible:

Correct hand-washing procedure:

- Wet hands with running water
- Place soap in palms
- Rub hands together to make a lather
- Scrub hands thoroughly for 20 seconds
- Rinse soap off hands
- Dry hands with disposable towel
- Turn off faucet using the disposable towel to avoid hand contact

Correct use of hand rubs:

- Place alcohol-based hand rub in palms
- Apply to all surfaces of hands
- Rub hands together until dry

Use of gloves and sleeves: Gloves are not necessary when examining or handling healthy animals. Wear gloves or sleeves when touching feces, body fluids, vomitus, exudates, and nonintact skin. Wear gloves for dentistry, resuscitations, necropsies, and obstetrical procedures; when cleaning cages, litter boxes, and contaminated environmental surfaces and equipment; when handling dirty laundry; when handling diagnostic specimens (eg, urine, feces, aspirates, or swabs); and when handling an animal with a suspected infectious disease. Change gloves between examination of individual animals or animal groups (eg, a litter of puppies) and between dirty and clean procedures performed on the same patient. Gloves should be removed promptly and disposed of after use. Disposable gloves should not be washed and reused. Hands should be washed immediately after glove removal.

Facial protection: Wear facial protection whenever splashes or sprays are likely to occur. Use a face shield, or goggles worn with a surgical mask. Wear facial protection for the following procedures: lancing abscesses, flushing wounds, dentistry, nebulization, suctioning, lavage, obstetrical procedures, and necropsies.

Protective outerwear: Wear a protective outer garment such as a lab coat, smock, nonsterile gown, or coveralls when attending animals and when conducting cleaning chores. Outerwear should be changed and laundered daily. These should also be changed whenever soiled, after handling an animal with a known or suspected infectious disease, after working in an isolation room, and after performing a necropsy or other high-risk procedure. Impermeable outerwear should be worn during obstetric procedures and necropsies and whenever substantial splashes or large quantities of body fluids may be encountered. Shoes or boots should have thick soles and closed toes and be impermeable to water and easily cleaned. Disposable shoe covers should be worn when heavy quantities of infectious materials are present or expected. Promptly remove and dispose of shoe covers and booties when leaving contaminated work areas. Clean shoes or boots between farm visits. Keep clean outer garments available at all times.

Staff responsible:

Animal-related injury prevention: Take precautions to prevent bites and other injuries. Identify aggressive animals and alert clinic staff. Use physical restraints, muzzles, bite-resistant gloves, and sedation or anesthesia in accordance with practice policies. Plan an escape route when handling large animals. Do not rely on owners or untrained staff for animal restraint.

- If there is concern for personal safety, notify:
• When injuries occur, wash wounds with soap and water, then immediately report incident to: (infection control officer)
- If medical attention is needed contact: (health-care provider)
- Bite incidents will be reported to: (public health agency) as required by law. Telephone number:

PROTECTIVE ACTIONS DURING VETERINARY PROCEDURES

Intake: Avoid bringing aggressive or potentially infectious animals in through the reception area; place these animals directly in an examination or isolation room. If they must come through the main entrance, carry the animal or place it on a gurney so that it can be taken directly into the designated room.

Examination of animals: Wear appropriate protective outerwear and wash hands before and after examination of individual animals or animal groups (eg, a litter of puppies). Wear facial protection if a zoonotic respiratory tract disease is suspected. Potentially infectious animals will be examined in a designated examination room and remain there until diagnostic procedures and treatments have been performed.

Injections, venipuncture, and aspiration procedures: Wear gloves while performing venipuncture on animals suspected of having an infectious disease and when performing soft tissue aspirations.

Needlestick injury prevention: Do not bend needles, pass an uncapped needle to another person, or walk around with uncapped needles. Do not remove an uncapped needle from the syringe by hand or place a needle cap in the mouth. Do not recap needles except in instances when required as part of a medical procedure or protocol. Dispose of all sharps in designated containers. After injection of live vaccines or aspiration of body fluids, dispose of used syringes with needles attached in a sharps container. Otherwise, remove the needle by use of forceps or the needle removal device on the sharps container and then throw the syringe away in the trash. Do not transfer sharps from one container to another. Replace sharps containers before they are completely full.

Staff responsible:

Dental procedures: Wear protective outerwear, gloves, and facial protection when performing dental procedures or when in range of splashes or sprays (such as when monitoring anesthesia).

Resuscitation: Wear gloves and facial protection. Use a manual resuscitator, anesthesia machine, or ventilator to resuscitate animals. Do not blow directly into the mouth, nose, or endotracheal tube of the animal.

Obstetrics: Wear gloves or shoulder-length sleeves, facial protection, and impermeable outerwear. Do not blow directly into the nose or mouth of a nonrespiring neonate.

Necropsy: Wear cut-resistant gloves, facial protection, and impermeable outerwear. Only necessary personnel are allowed in the vicinity of the procedure. Wear a respirator when using a band saw or other power equipment. If an animal is suspected of having a notifiable infectious or a foreign animal disease, consult with the State Veterinarian before proceeding with a necropsy. Contact information for State Veterinarian's office:

Continued on next page.

Appendix 3 (continued)

Diagnostic specimen handling: Wear protective outerwear and gloves. Discard gloves and wash hands before touching clean items (eg, medical records, telephone). Eating and drinking are not allowed in the laboratory.

Wound care and abscesses: Wear protective outerwear and gloves for debridement, treatment, and bandaging of wounds. Facial protection should also be used when lancing abscesses or lavaging wounds.

ENVIRONMENTAL INFECTION CONTROL

Isolation of infectious animals: Animals with a contagious or zoonotic disease will be housed in isolation as soon as possible. Clearly mark the room or cage to indicate the patient's status and describe additional precautions. Keep only the equipment needed for the care and treatment of the patient in the isolation room, including dedicated cleaning supplies. Disassemble and thoroughly clean and disinfect any equipment that must be taken out of the room. Discard gloves after use. Leave reusable personal protective equipment (eg, gown, mask) in the isolation room. Clean and disinfect or discard protective equipment between patients and whenever contaminated by body fluids. Place potentially contaminated materials in a bag before removal from the isolation room. Limit access to the isolation room. Keep a sign-in log of all people (including owners or other nonemployees) having contact with an animal in isolation.

Staff responsible:

Cleaning and disinfection of equipment and environmental surfaces: Wear gloves when cleaning and disinfecting. Wash hands afterwards. First, clean surfaces and equipment to remove organic matter, and then use a disinfectant according to manufacturer's instructions. Clean and disinfect animal cages, toys, and food and water bowls between uses and whenever visibly soiled. Clean litter boxes once a day. Use the checklist for each area of the facility (eg, waiting room, examination rooms, treatment area, and kennels) that specifies the frequency of cleaning, disinfection procedures, products to be used, and staff responsible.

Handling laundry: Wear gloves when handling soiled laundry. Wash animal bedding and other laundry with standard laundry detergent and completely machine dry. Use separate storage and transport bins for clean and dirty laundry.

Decontamination and spill response: Immediately spray spills or splashes of body fluids, vomitus, feces, or other potentially infectious substance with disinfectant and contain it with absorbent material (eg, paper towels, sawdust, or cat litter). Put on gloves and protective outerwear (including shoe covers if the spill is large and may be stepped in) before beginning the clean-up. Pick up the material, seal it in a leak-proof plastic bag, and clean and disinfect the area. Keep clients, patients, and employees away from the spill area until disinfection is completed.

Veterinary medical waste: *Insert here your local and state ordinances regulating disposal of animal waste, pathology waste, animal carcasses, bedding, sharps, and biologics. Refer to the US Environmental Protection Agency website for guidance: www.epa.gov/epawaste/laws-regs/state/index.htm.*

Rodent and vector control: Seal entry portals, eliminate clutter and sources of standing water, keep animal food in closed metal or thick plastic covered containers, and dispose of food waste properly to keep the facility free of rodents, mosquitoes, and other arthropods.

Other environmental controls: There are designated areas for eating, drinking, smoking, application of make-up, and similar activities. These activities should not occur in animal-care areas or in the laboratory. Do not keep food or drink for human consumption in the same refrigerator as food for animals, biologics, or laboratory specimens. Dishes for human use should be washed and stored away from animal-care and animal food preparation areas.

EMPLOYEE HEALTH

Infection control and employee health management: The following personnel are responsible for development and maintenance of the practice's infection control policies, record keeping, and management of workplace exposure and injury incidents.

Staff responsible:

Record keeping: Current emergency contact information will be maintained for each employee. Records will be maintained on vaccinations, rabies virus antibody titers, and exposure and injury incidents. Report and record changes in health status (eg, pregnancy) that may affect work duties.

Preexposure rabies vaccination: All staff with animal contact must be vaccinated against rabies, followed by periodic titer checks and rabies vaccine boosters, in accordance with the recommendations of the Advisory Committee on Immunization Practices (CDC, 2008).

Tetanus vaccination: Tetanus immunizations must be up-to-date. Report and record puncture wounds, animal bites, and other animal-related trauma. Consult a health-care provider regarding the need for a tetanus booster.

Influenza vaccination: Unless contraindicated, veterinary personnel are encouraged to receive the current seasonal influenza vaccine. Refer to the CDC website for guidance (www.cdc.gov).

Documenting and reporting exposure incidents: Report incidents that result in injury or potential exposure to an infectious agent to:

The following information will be collected for each exposure incident: date, time, location, person(s) injured or exposed, vaccination status of injured person(s), other persons present, description of the incident, whether health-care providers and public health authorities were consulted, the status of any animals involved (eg, vaccination history, clinical condition, and diagnostic information), first aid provided, and plans for follow-up.

Staff training and education: Infection control training and education will be documented in the employee health record.

Pregnant and immunocompromised personnel: Pregnant and immunocompromised employees are at increased risk from zoonotic diseases. Inform: _____ if you are concerned about your work responsibilities, so that accommodations may be made. Consultation between the supervising veterinarian and a health-care provider may be needed.

The following information is attached to the Infection Control Plan:

- Emergency services telephone numbers—fire, police, sheriff, animal control, poison control, etc
- Reportable or notifiable veterinary diseases and where to report
- State Department of Agriculture or Board of Animal Health contact information and regulations
- State and local public health contacts for consultation on zoonotic diseases
- Public Health Laboratory services and contact information
- Environmental Protection Agency (EPA)-registered disinfectants
- Occupational Safety and Health Administration (OSHA) regulations
- Animal waste disposal and biohazard regulations
- Rabies regulations
- Animal control and exotic animal regulations and contacts
- Other useful resources