BIOSECURITY GENERAL PRINCIPLES

GUIDELINES FOR STAFF AND STUDENTS

Faculty of Veterinary Medicine

University of Veterinary Sciences Brno

SOP No. 1

Motto "Prevention is better than cure"

Modified from:

1. Biosecurity in Animal Production and Veterinary Medicine: From principles to practice. Edited by Jeroen Dewulf and Filip van Immerseel. CABI Publishing, Wallingford, United Kingdom, 2020, ISBN10 1789245680
2. AUSTRALIAN VETERINARY ASSOCIATION GUIDELINES FOR VETERINARY PERSONAL BIOSECURITY, January 2017 (https://www.ava.com.au › siteassets › resources; 21st February 2022)
3. Infection Prevention and Control Best Practices For Small Animal Veterinary Clinics, August 2008 (https://www.wormsandgermsblog.com/files/2008/04/CCAR-Guidelines-Final2.pdf; 21st February 2022)

INTRODUCTION

This document is designed to provide a complete and readily accessible summary of infection prevention and control best practices for clinics, institutes and laboratories is intended to be understandable to FVM staff and students.

1. Infection prevention and control strategies are designed to protect veterinary personnel, students, patients, owners, and the community.
2. Every FVM clinic and institute have a formal biorisk control SOP, and a designated authorised worker to coordinate the program.
3. Some form of surveillance (either passive or active) is practiced by all university facilities. The keys to passive surveillance are to centralize the available data, and a designated authorised worker who compiles and evaluates the data on a regular basis.
4. Routine Practices that are critical to infectious disease prevention and control:

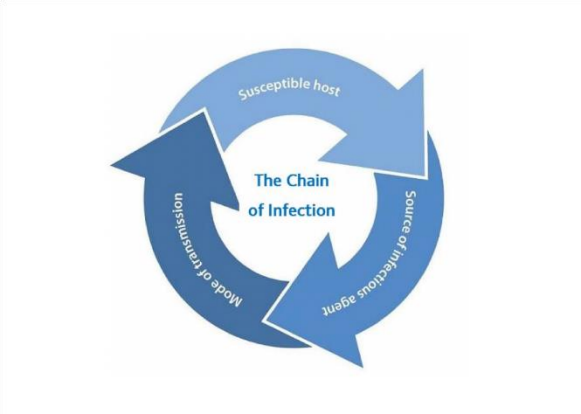
    a. **Hand hygiene, including**:
        i. Handwashing
        ii. Use of alcohol-based hand sanitizers
    b. **Risk reduction strategies, particularly those related to**:
        i. Use of personal protective equipment (PPE)
        ii. Cleaning and disinfection
        iii. Laundry
        iv. Waste management
    c. **Risk assessment of animals and personnel with regard to**:
        i. Disease transmission
        ii. Disease susceptibility
    d. **Education**
        i. Veterinary personnel
        ii. Students
        iii. Animal owners
        iv. Public

5. All surgical procedures cause breaks in the normal defensive barriers of the skin or mucous membranes, and therefore carry an inherent risk of surgical site infection (SSI). Good general infection control practices (e.g. hand hygiene, cleaning and disinfection) are important for prevention of SSIs, but there are also specific infection control measures pertaining to surgery that should be considered.
6. Every university clinic has an isolation area for caring for and housing animals with potentially contagious infectious diseases.
7. Proper wound care is critical to preventing transmission of zoonotic bacteria and multidrug-resistant pathogens, between animals, personnel, students and the environment.
8. Animals from shelters and similar facilities should be considered high risk from an infectious disease standpoint and managed appropriately to prevent transmission of disease.
9. Safety of personnel, students and animal owners should always be a priority. Personnel has taken all necessary precautions to prevent animal-related injuries (e.g. bites, scratches), and all bite wounds should be taken seriously. Proper sharps handling practices should be emphasized to reduce the risk of needle-stick injuries.
10. Education of personnel, students and clients about zoonotic and infectious disease risks and prevention is crucial.

Content

1 THE CHAIN OF TRANSMISSION

Transmission of infection during the provision of health care requires three elements: a source of infectious microorganisms, a susceptible host, and a means of transmission for the microorganism. Prevention of infection in animal health care settings should be directed primarily at interrupting the transmission of microorganisms from source to host, because agent and host factors are typically more difficult to control.



1.1 SOURCE

Animal sources of infectious microorganisms may be animals which are merely colonized by an infectious agent (meaning the pathogen resides in or on the body, but is not associated with any clinical disease or host response), animals in the pre-clinical (incubation) phase of disease, animals with acute disease, animals with chronic disease caused by persistent infection, and animals that are recovering from clinical disease but are still shedding the infectious agent. People can be an important source of zoonotic pathogens, and like animals they may be colonized or infected. Contamination on a person's clothing or body, particularly the hands, can also be a source of infectious microorganisms. Other potential sources include food, water, and an animal's own indigenous microflora, which may be difficult to control. Inanimate objects, including medical equipment, supplies and drugs, animal bedding, environmental surfaces and waste that have been contaminated can also be important sources. Microorganisms to consider include bacteria, viruses, fungi and parasites. In some cases, vectors such as lice, mosquitoes, flies, ticks, fleas, rodents and other vermin can transmit certain pathogens.

1.2 HOST

1.2.1 Decreasing host susceptibility

Decreasing host susceptibility to infection is difficult to achieve in a hospital setting. Regarding patients, the judicious use of antimicrobials, minimizing the use of immunosuppressive agents, avoidance of dietary changes whenever possible, ensuring adequate nutritional intake, adequate pain control, and limiting the use of invasive devices should be considered, as these can all have an impact on host immune function. For hospital personnel, it may not be possible to directly decrease their own susceptibility to infection, but it is important to be aware of those individuals who may have increased susceptibility. These include persons who are immunosuppressed due to disease or medical treatment, or who are being treated with antimicrobial drugs, have open wounds or who are pregnant. Good communication between veterinary personnel, their physicians and clinic administration is important to lessen the risk of zoonotic infection.

1.2.2 Increasing host resistance

Vaccination is currently the main technique used to increase resistance of animals and humans to infection. As noted, no vaccine is 100% effective and there are many infections for which vaccines are unavailable. Factors to consider when developing vaccination recommendations or requirements include the prevalence of a particular disease in the area, risk to healthy and compromised patients, transmissibility of the disease, risk to veterinary personnel, ability to treat the disease, efficacy of vaccination and safety of vaccination. Vaccination can only be maximally effective when it is used in conjunction with other appropriate infection control practices.

1.3 TRANSMISSION

Microorganisms are transmitted in animal health care settings by four main routes: contact, droplet, air-borne and vector-borne transmission. The same microorganism may be transmitted by more than one route.

1.3.1 Contact transmission

is the most important and frequent mode of transmission of health-care associated infections (HAIs). It can be divided into direct and indirect contact transmission.

1.3.1.1 Direct contact transmission

involves direct body surface-to-body surface contact resulting in physical transfer of microorganisms from an infected or colonized animal. For example, two dogs in a waiting room that come into direct contact when they sniff each other may transmit pathogens present in their noses or perineal areas; direct contact of a veterinarian's hands with a wound on an animal may result in transmission of opportunistic pathogens from the normal microflora of the person's hands, or infectious organisms present in the animal's wound, to the patient or the veterinarian, respectively.

1.3.1.2 Indirect contact transmission

is the result of physical transfer of microorganisms from the original animal (or human) source to a new host, without direct contact between the two. This typically involves body surface contact with an inanimate object, environmental surface or the integument of another animal or person that has been transiently contaminated by the original animal (or human) source. For example, handling one animal and then petting another animal without washing one's hands constitute indirect contact between the two animals.

1.3.2 Droplet transmission

is theoretically a form of contact transmission. However, the mechanism of transfer of the pathogen from host to host is quite distinct from either direct or indirect contact transmission. Droplets are generated from the source animal primarily during coughing or sneezing, and during the performance of certain procedures such as suctioning. Transmission occurs when droplets containing microorganisms generated from the source animal are propelled a short distance through the air (usually less than one metre) and deposited on the new host's conjunctiva (i.e. in the eye), nasal mucosa, mouth, or an open wound. For example, a cat with an upper respiratory tract infection can transmit viruses or bacteria to another cat in the waiting room by sneezing on it, particularly if they are face-to-face, even if the animals do not touch each other directly. Because droplets do not remain suspended in the air, special air handling and ventilation are not required to prevent droplet transmission; that is, droplet transmission must not be confused with air-borne transmission. Droplets can also contaminate the surrounding environment and lead to indirect contact transmission.

1.3.3 Airborne transmission

occurs by dissemination of either airborne droplet nuclei (5 µm or smaller, about 2-3 times the size of most bacterial pathogens) from partly-evaporated droplets containing microorganisms, or dust particles containing the infectious agent. Microorganisms carried in this manner remain suspended in the air for long periods of time and can be dispersed widely by air currents. They may be inhaled by another host within the same room, or they may reach hosts over a longer distance from the source, depending on environmental factors. Airborne transmission of pathogens in veterinary clinics is very rare.

1.3.4 Vector-borne transmission

occurs when vectors such as mosquitoes, flies, ticks, fleas, rats, and other vermin transmit microorganisms. Some act as simple mechanical vectors, comparable to indirect contact transmission, whereas others acquire and transmit microorganisms by biting. It is important to have control measures in place to reduce or eliminate the presence of such vectors in veterinary clinics.

2 HIERARCHY OF INFECTION CONTROL MEASURES

The coordinated efforts of occupational health and safety groups and building engineers have created a framework in human medicine that includes three levels of infection control: engineering controls, administrative controls and personal protective measures. These levels of control can easily be applied to veterinary practices as well.

2.1 Engineering controls

are built into the **design of a facilities** (e.g. room design, room layout, sink placement, heating ventilation and air conditioning systems, dressing room, ….). It is important for infection prevention and control professionals to be involved in the design and planning of new facilities. They can also help to plan and design improvements which may be incorporated into an existing facility. Engineering controls include logical design of clinics to facilitate use of routine infection control measures such as hand washing, proper cleaning, and separation of

animals of different species and different infectious disease risks. All new building or renovation plans need to be evaluated from an infection control perspective.

2.2 Administrative controls

include protocols for hand hygiene, immunization of animals and staff, protocols for managing animals and staff during an infectious disease outbreak, and protocols for caring for animals with zoonotic infections.

2.3 Personal protective equipment (PPE)

although very important, is the least desirable way to control infectious hazards because it does not eliminate them - it merely contains the hazard. Nonetheless, the inherent risk of exposure to microbial pathogens in veterinary clinics means that proper use of PPE is a critical component of a complete infection control program. Effective use of PPE is dependent on appropriate education and compliance of all staff. Personal protective equipment should be considered a last line of defence for hazards that cannot be overcome with other preventative measures.

3 SURVEILLANCE

Surveillance is a key component of any biorisk control program. Effective infection control is impossible without surveillance, and some form of surveillance should be practiced by all university facilities. Many clinical aspects of surveillance are easy, inexpensive and can be readily incorporated into day-to-day veterinary practice.

3.1 PASSIVE SURVEILLANCE

In the absence of an ongoing infectious disease outbreak, passive infectious disease surveillance is likely adequate for most clinics. Passive surveillance is practical, cost-effective and can be performed in any clinic and institute. It involves analysis of data that are already available (e.g. clinical examination, laboratory results, bacterial culture and susceptibility results, results of other kinds of infectious disease testing) to determine elements such as endemic disease rates, antimicrobial susceptibility patterns and trends, and changes in disease patterns. An example of passive surveillance would be monitoring the surgical site infection rate following all surgical procedures and specific surgical procedures (e.g. spays, neuters). Monitoring of bacterial culture and susceptibility testing can provide information regarding possible outbreaks of hospital associated infections (HAIs), as well as information to guide empirical antimicrobial therapy. Routine recording of animals with specific syndromes such as vomiting, diarrhoea, coughing or sneezing is another simple means of providing information that can help in the prevention and early detection of outbreaks, and can help to identify index cases should a hospital outbreak occur. Post-discharge surveillance is more problematic, but is very important for conditions such as SSIs, as many such infections do not develop until after the animal is discharged from the hospital. Post-discharge surveillance can consist of direct examination of the patient during a recheck appointment, evaluation of readmission data or simple telephone or mail contact with owners. The keys to passive surveillance are to centralize the available data, and to have a designated infection control practitioner (ICP) who is responsible for compiling and evaluating this data on a regular basis. Simply collecting the data or even entering it in a spreadsheet is of no value unless someone looks at it. This is particularly important in large clinics or hospitals where multiple veterinarians may have patients with similar infections but do not communicate this to others, and therefore the start of an outbreak can be missed. If an outbreak is identified, then a plan can be formulated and implemented in order to stop the spread of disease. This plan may or may not include additional active surveillance to identify additional cases.

3.2 ACTIVE SURVEILLANCE

Active surveillance involves gathering data specifically for infection control purposes. As a result, it is usually more expensive and time consuming but usually provides the highest quality data. This is rarely needed in university veterinary clinics and is typically reserved for large facilities with increased infection control threats and personnel available to direct such testing, or during a specific outbreak investigation. An example of active surveillance is collection of nasal and rectal swabs from all animals being admitted to a hospital, whether or not they have signs of infection, to screen for methicillin-resistant *Staphylococcus aureus*, ESBL positive *E. coli* and agents of nosocomial infections.

4 ROUTINE PRACTICES

Veterinary standard precautions are used for all clinical situations involving patient care and contact with an animal's blood, body substances, non-intact skin and mucous membranes. They are work practices that ensure a basic level of infection prevention and control. Transmission-based precautions are additional precautions that are adopted when standard precautions alone cannot control the risk of exposure or transmission. They are targeted at the route of transmission of the infectious agent to address possible transmission through physical contact, droplets and inhalation of airborne pathogens. The range of precautions include hand hygiene, use of personal protective equipment, safe use and disposal of sharps, routine environmental cleaning and spills management, reprocessing of reusable equipment and instruments, aseptic non-touch technique, waste management and appropriate handling of linen.

Routine practices include:

- **Hand hygiene**
- **Risk reduction strategies** through use of personal protective equipment (PPE), cleaning and disinfection of the environment and equipment, laundry management, waste management, safe sharps handling, patient placement, and healthy workplace practices
- **Risk assessment related to animal clinical signs**, including screening for syndromes that might indicate the presence of infectious disease (e.g. fever, coughing/sneezing, diarrhea, abnormal excretions/secretions), and use of risk assessment to guide control practices
- **Education of veterinary personnel, students and owners**

4.1 HAND HYGIENE

Hand hygiene is the responsibility of all individuals involved in health care. Effective hand hygiene kills or removes microorganisms on the skin while maintaining hand health and skin integrity (i.e. prevents chapping and cracking of skin). Sterilization of the hands is not the goal of routine hand hygiene - the objective is to reduce the number of microorganisms on the hands, particularly the number of microorganisms that are part of the transient microflora of the skin, as these include the majority of opportunistic pathogens on the hands. These transient microbes may be picked up by contact with a patient, another person, contaminated equipment, or the environment. There are two methods of removing/killing microorganisms on hands: washing with soap and running water or using an alcohol-based hand sanitizer.

4.1.1 Alcohol-based hand sanitizers

Alcohol-based hand sanitizers/rubs are, with some exceptions, the preferred method for decontaminating hands that are not visibly soiled. They have superior ability to kill microorganisms on the skin than even hand washing with antibacterial soap, can quickly be applied, are less likely to cause skin damage, and can be made readily available at almost any point of care. Use of non-alcohol-based waterless hand sanitizers in healthcare settings is not recommended.

Alcohol-based hand sanitizers should contain 70-90% alcohol. Use of products containing emollients helps to reduce skin damage which can otherwise occur with frequent use of hand sanitizers. Products containing alcohol and chlorhexidine are also available. Chlorhexidine provides some residual antimicrobial action on the hands after use, but it is unclear whether or not these combinations provide any true benefit in clinical settings. They may be more useful as alternatives to traditional surgical scrubbing techniques.

Alcohol-based hand sanitizers are not effective against certain pathogens, including bacterial spores (e.g. clostridial spores) and *Cryptosporidium* spp. Nonetheless, alcohol-based hand sanitizers may be useful even if alcohol-resistant pathogens like mycobacteria, *Clostridioides difficile* are present. The improved hand hygiene compliance seen with alcohol-based hand sanitizers and their efficacy against other pathogens are important aspects of infection control. Routine use of these products has not resulted in detectable increases in *C. difficile* infection rates in human hospitals. However, if hands are potentially contaminated by one of these organisms, hand washing with soap and running water should be performed if possible. Although even antimicrobial soaps are similarly ineffective against these pathogens directly, the physical process and mechanical action of hand washing can decrease the number of these organisms on the hands. Alcohol is also not as effective against non-enveloped viruses (e.g. canine parvovirus, feline panleukopenia virus) as it is against most other microbes. As for clostridial pathogens, hand washing with soap and running water is likely more effective, and should be used whenever possible when these pathogens are involved.

Technique:

1. Remove all hand and arm jewellery.
2. Ensure hands are visibly clean (if soiled, follow hand washing steps).
3. Apply between 1 to 2 full pumps or a 2-3 cm diameter pool of the product onto one palm.
4. Spread the product over all surfaces of hands, concentrating on finger tips, between fingers, back of the hands, and base of the thumbs. These are the most commonly missed areas.
5. Rub hands until product is dry. This will take a minimum of 15 to 20 seconds if sufficient product is used.
6. Hands must be fully dry before touching the patient or patient's environment/equipment for the hand rub to be effective, and to eliminate the rare risk of flammability in the presence of an oxygen-enriched environment, as may occur in the presence of gas anesthetic machines.

4.1.2 Hand washing

Most transient bacteria present on the hands are removed during the mechanical action of washing, rinsing and drying hands. Hand washing with soap and running water must be performed when hands are visibly soiled. If running water is not available, use moistened towelettes to remove all visible dirt and debris, followed by an alcohol-based hand rub.

Bar soaps are not acceptable in veterinary practice settings because of the potential for indirect transmission of pathogens from one person to another. Instead, liquid or foam soap should be used:

- Soap should be dispensed in a disposable pump dispenser
- Soap containers should not be refilled without being disinfected, since there is a risk of contamination
- Antibacterial soaps should be used in critical care areas such as ICU, and in other areas where invasive procedures are performed.

Technique:

1. Remove all hand and arm jewelery.
2. Wet hands with warm (not hot) water. Hot water is hard on the skin, and will lead to dryness and additional skin damage.
3. Apply liquid or foam soap.
4. Vigorously lather all surfaces of hands for a minimum of 15 seconds. This is the minimum amount of time required for mechanical removal of transient bacteria. Pay particular attention to finger tips, between fingers, backs of the hands and base of the thumbs. These are the most commonly missed areas. A simple way many people time their hand-washing is by singing "Happy Birthday".
5. Using a rubbing motion, thoroughly rinse soap from hands under warm running water. Residual soap can lead to dryness and cracking of skin.
6. Dry hands thoroughly by blotting hands gently with a paper towel. Rubbing vigorously with paper towels can damage the skin.
7. Turn off taps with paper towel to avoid recontamination of your hands

WHEN HAND HYGIENE SHOULD BE PERFORMED

- Before and after contact with a patient
- Especially before performing invasive procedures
- Contact with or the physical examination of an animal
- Undertaking venipuncture or giving an injection.
- Before and after contact with items in the patient's environment (cleaning cages, equipment or bedding)
- After any contact with or any activity involving the body fluids of a patient
- Undertaking venipuncture or giving an injection
- Before putting on and especially after taking off gloves
- Before eating food
- After personal body functions, such as using the toilet or blowing one's nose

FACTORS THAT INFLUENCE THE EFFECTIVENESS OF HAND HYGIENE

- **Condition of the skin**: Intact skin is easier to clean than skin that is chapped, cracked, cut, abraded or otherwise inflamed. Intact skin is the first line of defence against bacteria.
- **Finger nails**: Natural nails more than 3-4 mm long are difficult to clean, can pierce gloves and harbour more microorganisms than short nails. Artificial nails or nail enhancements (including nail polish) should not be worn by anyone involved directly in-patient care, as they have been implicated in the transfer of microorganisms in human medicine.
- **Jewellery**: Jewellery is very hard to clean, and physically protects bacteria and viruses from the antiseptic action of alcohol-based hand sanitizers and the mechanical cleaning action of soap and running water. Rings and bracelets should not be worn during patient contact. Rings, in particular, increase the number of microorganisms present on hands and increase the risk of tears in gloves.

4.1.3 Skin care

Careful attention to skin care is an essential part of the hand hygiene program. Products used for hygiene should be “hand-friendly” – for example, alcohol-based hand sanitizers containing emollients are available, which can help reduce the drying effect of the alcohol. If skin integrity is an issue, the individual should consult his or her physician. Skin lotions can help maintain the health and integrity of the skin, but it is important to use a skin lotion that does not interfere with glove integrity. Petroleum-based lotion formulations can weaken latex gloves and increase permeability. Lotions that contain petroleum or other oil emollients should only be used at the end of the work day. If lotions are used during the work day, select a water-based product.

Repeated handwashing and wearing of gloves can cause irritation or sensitivity, leading to irritant or allergic contact dermatitis. This can be minimized by early intervention, including assessment of handwashing technique, the use of suitable individual-use hand creams and appropriate selection of gloves (e.g. low protein, powder-free latex gloves).
To minimize the chapping of hands, use warm water and pat hands dry rather than rub them. Cuts and abrasions should be covered by water-resistant occlusive dressings that should be changed as necessary. Veterinary personnel who have skin problems, such as exudative lesions, dermatophytosis or weeping dermatitis should seek medical advice and should be removed from direct patient care until the condition resolves.

Figure 1. Handwash. (Source WHO)

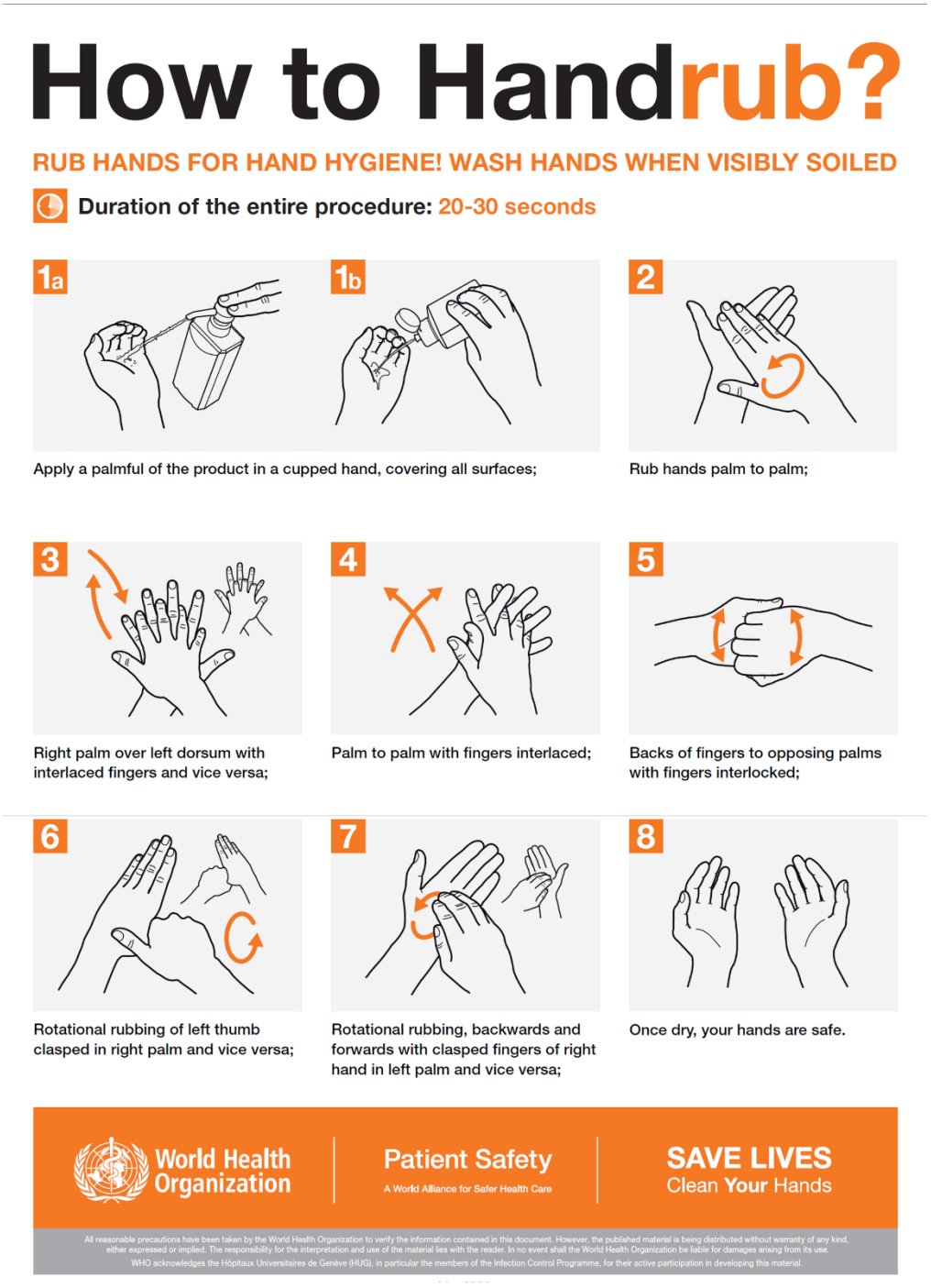


Figure 2. Handrub. (Source WHO)

4.2 RISK REDUCTION STRATEGIES

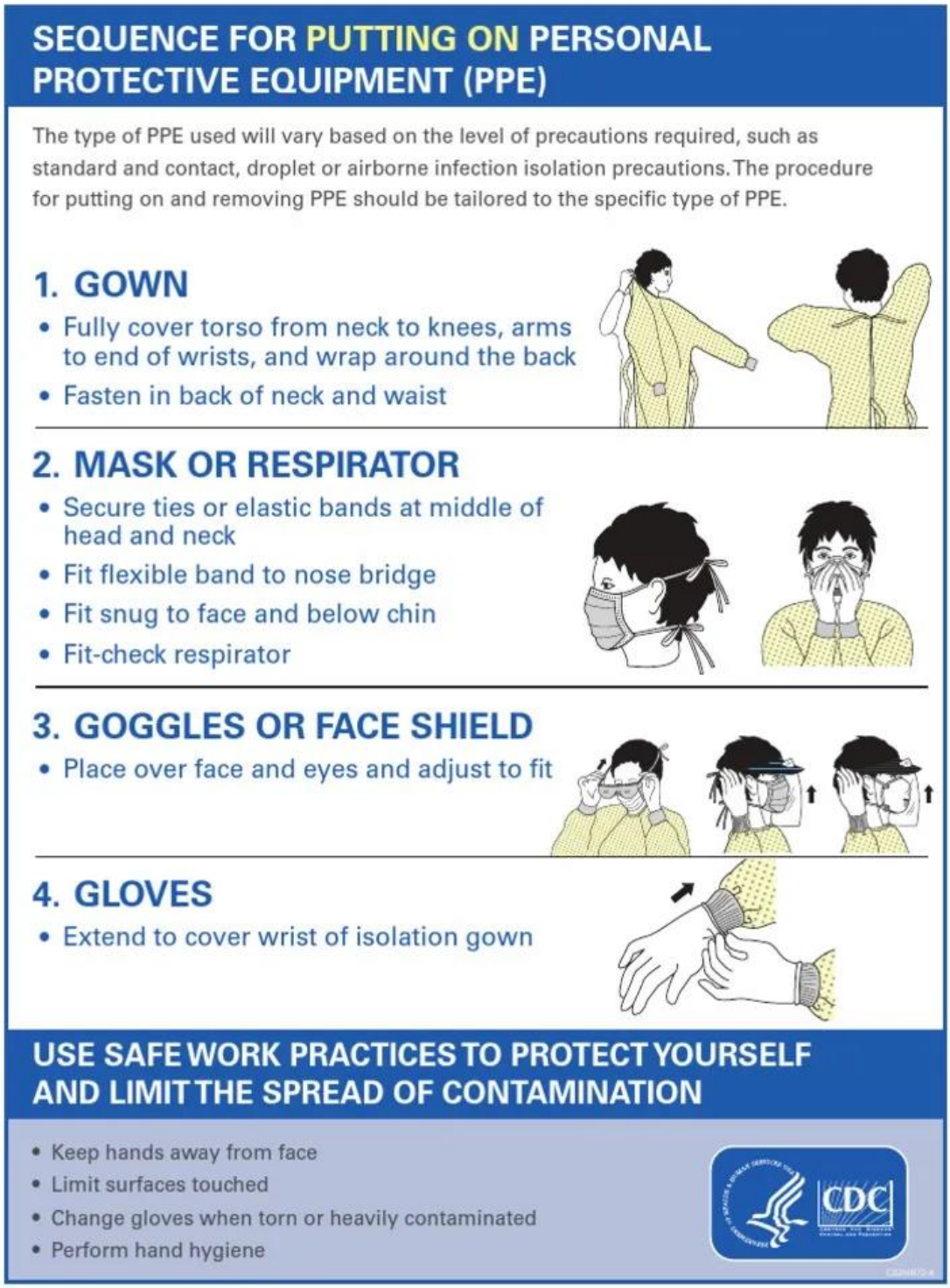
4.2.1 Personal protective equipment (PPE)

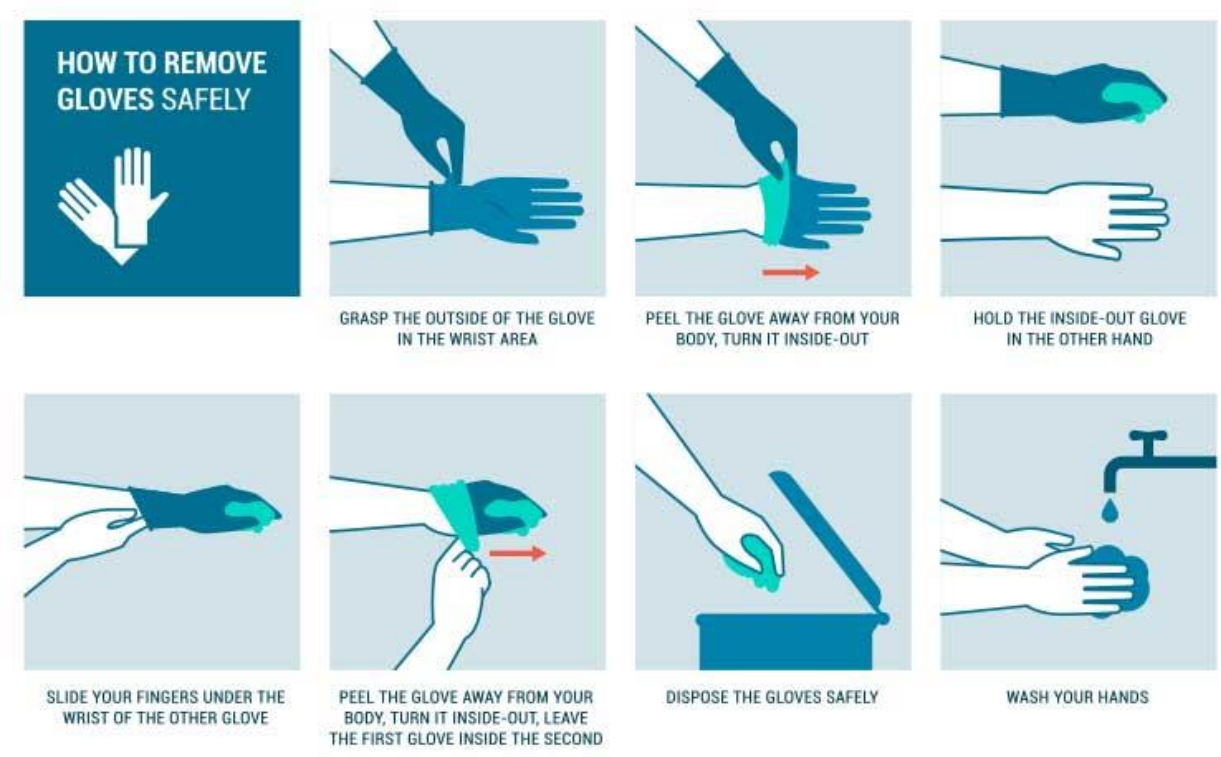
Personal protective equipment (PPE) is an important routine infection control tool. PPE use for standard precautions is designed to reduce the risk of contamination of personal clothing, reduce contamination of skin and mucous membranes and reduce the transmission of pathogens between patients by the veterinary personnel.
Standard precautions should be adopted as standard work practice in all clinical situations, including any contact with animals and their environment:

- always perform hand hygiene
- cover cuts
- wear gloves for contact with blood/body substances, non-intact skin and mucous membranes
- protect clothing if there is a likelihood of contamination or splashes of blood or body substances
- protect mucous membranes if there is a risk of splashes of blood or body substances to the eyes or face.

Personal protective outerwear is used to protect veterinary personnel and to reduce the risk of pathogen transmission by clothing to patients, owners, veterinary personnel and the public.
Protective outerwear should be worn whenever there may be contact with an animal or when working in the clinical environment (including cleaning).
Staff must be provided with PPE in an appropriate selection of sizes to ensure proper fit. Clients should be provided with PPE in situations when they are assisting the veterinarian and there is an infection risk.

Figures 3 and 4 documented sequences for putting on and removing PPE (Source CDC)





https://www.ausmed.com.au/cpd/articles/donning-doffing-ppe

Use of personal protective equipment does not eliminate the need for appropriate environmental engineering controls, such as hazard removal and separation of patient areas from staff rooms.

Personal protective outerwear is used to protect veterinary personnel and to reduce the risk of pathogen transmission by clothing to patients, owners, veterinary personnel and the public. Protective outerwear should be worm whenever there may be contact with an animal or when working in the clinical environment (including cleaning).

Street clothes should always be covered by protective outerwear, such as a lab coat, when working in the clinic.

4.2.1.1 Lab coats

Lab coats are meant to protect clothing from contamination, but generally they are not fluid resistant, so they should not be used in situations where splashing or soaking with potentially infectious liquids is anticipated. These garments should be changed promptly whenever they become visibly soiled or contaminated with body fluids, and at the end of each day. Lab coats worn in the clinic should not be worn outside of the work environment. Lab coats worn when handling patients with potentially infectious diseases should be laundered after each use, because it is almost impossible to remove, store/hang and reuse a contaminated lab coat without contaminating hands, clothing or the environment.

SCRUBS (surgical clothing)

Scrubs are often worn in veterinary clinics as a form of basic personal protective equipment. They have the advantage of being durable and easy to clean, and their use prevents contamination and soiling of the street clothes that personnel wear outside the clinic. Clinic scrubs should not be worn outside the clinic. They should not be taken home by personnel to be washed, rather they should be washed on-site, with another clinic laundry. Scrubs should be washed at the end of each day and whenever they become visibly soiled.

Protective outerwear, including scrubs, should not be worn outside the clinic.

Designated scrubs should always be worn during surgery – these scrubs should not be worn during other procedures or when handling patients. Scrubs worn for surgery should be covered with a lab coat outside of the surgical suite.

4.2.1.2 Non-sterile gowns

Gowns provide more coverage for barrier protection than lab coats, and are typically used for handling animals with suspected or confirmed infectious diseases, that are housed in isolation. Permeable gowns can be used for general care of patients in isolation. Impermeable (i.e. waterproof) gowns should be used to provide greater protection when splashes or large quantities of body fluids are present or anticipated. Disposable gowns should not be reused, and reusable fabric gowns should be laundered after each use, because hanging/storing and reusing contaminated gowns inevitably leads to contamination of hands, clothing or the environment. Gloves should be worn whenever gowns are worn. Gowns (and gloves) should be removed and placed in the trash or laundry bin before leaving the animal's environment, and hands should be washed immediately afterwards.

Personnel should learn to remove gowns properly, in such a way as to avoid contaminating themselves and the environment (Figure 5). The outer (contaminated) surface of a gown should only be touched with gloves.

1. After unfastening or breaking the ties, peel the gown from the shoulders and arms by pulling on the chest surface while hands are still gloved.
2. Ball up the gown for disposal while keeping the contaminated surface on the inside.
3. Remove gloves and wash hands.
4. If body fluids soaked through the gown, promptly remove the contaminated underlying clothing and wash the skin.

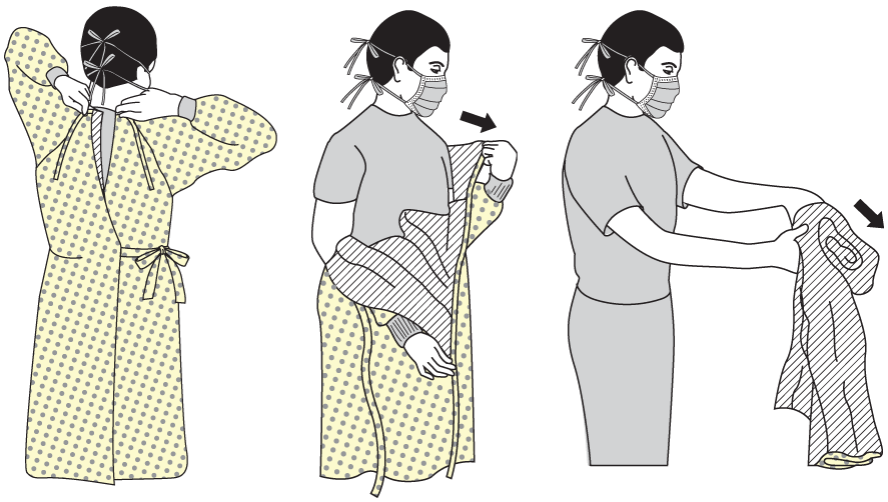


Figure 5. How to remove a gown (source - https://connect.springerpub.com/content/book/978-0-8261-4422-5/back-matter/bmatter3, 10th December 2021)

All gowns should be used only once, then discarded or laundered.

4.2.1.3 Gloves

Gloves reduce the risk of pathogen transmission by providing barrier protection. They should be worn when contact with blood, body fluids, secretions, excretions and mucous membranes is possible. Gloves should also be worn when cleaning cages and environmental surfaces, as well as when doing laundry if gross contamination of items is present.

- Gloves should be removed promptly after use, avoiding contact between skin and the outer glove surface.
- Gloved hands should not be used to touch surfaces that will be touched by people with non-gloved hands.
- Care should be taken to avoid contamination of personal item such as telephones, pens and pagers.

- Hands should be washed or an alcohol-based hand sanitizer should be used immediately after glove removal. It is a common misconception that using disposable gloves negates the need for hand hygiene. Gloves do not provide complete protection against hand contamination, therefore hand hygiene immediately after removing gloves is essential.
- Disposable gloves should not be washed and reused.

Gloves are NOT a substitute for proper hand hygiene.

Figure 6. Correct use gloves

(Source: https://www.yourglovesource.com/blogs/glove-knowledgebase/43943233-how-to-put-on-nitrile-and-latex-gloves)

Change gloves and perform hand hygiene when:

- Moving from contaminated areas to clean areas on the same animal
- Moving from dirty to clean procedures on the same animal
- After contact with large amounts of blood and/or body fluids
- Between individual animals

Gloves come in a variety of materials. The choice of glove material depends on their intended use. Latex gloves are commonly used, but if latex allergies are a concern, acceptable alternatives include nitrile or vinyl gloves. Latex gloves will decompose and lose their integrity when exposed to many chemicals. If exposure to chemicals such as disinfectants is expected (e.g. when cleaning and disinfecting cages), disposable nitrile gloves or heavier, reusable rubber gloves (e.g. common dishwashing gloves) can be used. Reusable gloves must also be disinfected at the end of each task.

4.2.1.4 Face protection

Face protection prevents exposure of the mucous membranes of the eyes, nose and mouth to infectious materials. Face protection typically includes a nose-and-mouth mask (e.g. surgical mask) and goggles, or a full-face shield, which should be used whenever exposure to splashes or sprays is likely to occur, including dental procedures, nebulization, and wound lavage.

4.2.1.5 Respiratory protection

Respiratory protection is designed to protect the respiratory tract from zoonotic infectious diseases transmitted through the air. The need for this type of protection is limited in veterinary medicine because there are few relevant airborne or aerosol zoonotic pathogens in companion animals, in most regions. The N95 rated disposable particulate respirator is a mask that is inexpensive, readily available, easy to use and provides adequate respiratory protection in most situations. However, people need to be fit-tested to ensure proper placement and fitting of N95 masks. Special N95 masks are required for people with beards. Surgical masks are not a replacement for N95 masks.

4.2.1.6 Footwear

Closed toed footwear must be worn at all times to reduce the risk of injury from dropped equipment (e.g. scalpels, needles), scratches from being stepped on by dogs, and to protect the feet from contact with potentially infectious substances (e.g. feces, discharges and other body fluids). Designated footwear or disposable shoe covers are required in areas where infectious materials are expected to be present on the floor, in order to prevent their spread to other areas. This is particularly important in veterinary clinics because patients, and sometimes the personnel working with them, often have very close contact with the floor, unlike human hospitals. Designated footwear or disposable shoe covers may be required for patients with infectious diseases that are kept on the floor (e.g. in a large dog run) or that may contaminate the floor around their kennel (e.g. an animal with severe diarrhoea). Such footwear must be removed as the person leaves the contaminated area, and should be immediately disposed of in the garbage (if disposable), or left at the entrance of the contaminated area on the "dirty" side.

In university clinics, it is important to prevent the spread of infectious materials present on the floor, as patients and personnel often have very close contact with the floor.

Footwear in field visits

Footwear, such as boots, are a common form of transmission of potential pathogens from one farm to another, and can act as fomites for the transmission of zoonotic diseases to humans.
Washable rubber boots are recommended when conducting field visits. All visible soil should be removed by scrubbing with a brush and water when leaving each property. If leather boots are worn on farm they should be cleaned of all visible contaminating material (faeces, dirt, blood, and other body substances) before leaving the property and washed with a suitable disinfectant. The onus is on the veterinarian to justify the use of footwear other than washable rubber boots for field visits.
For farm visits involving potentially infectious material washable rubber boots must be worn and cleaned with water and scrubbing brush, then disinfected with a suitable disinfectant solution.

4.2.2 Cleaning and disinfection

Cleaning and disinfection are two separate tasks. Cleaning involves the removal of visible organic matter with soap or detergent, whereas disinfection involves the application of a chemical or other procedure in order to kill the remaining microbes that cannot be adequately removed by cleaning. Cleaning is essential because the survival time of many infectious agents outside the host is prolonged by the presence of organic matter, and organic matter also decreases the effectiveness of disinfectants. Depending on the level of disinfection used, disinfection kills or prevents the growth of many or most pathogens.
Equipment should be cleaned and disinfected according to its intended use, the manufacturer's recommendations, and practice policy. Equipment must be cleaned before sterilization or disinfection. Surfaces where animals are housed, examined, or treated should be made of non-porous, sealed, easy-to-clean materials to facilitate cleaning and disinfection and minimize infection transmission.
Personnel whose duties include cleaning and disinfection of equipment and different hospital areas should be trained regarding how to safely handle and use the products available in the clinic.

4.2.2.1 Cleaning

Cleaning entails the removal of all forms of organic matter (e.g. feces, urine, blood, food, dirt etc.) from a surface. Recommended cleaning procedures for common environmental surfaces are shown in Table 3.

- Ensure all areas are well ventilated during cleaning.
- After cleaning, allow all surfaces to dry completely.

Cleaning must always be done before a disinfectant is used.

Removing loose, dry debris from surfaces:

- Avoid generating airborne dust that may contain pathogens by:
    - using a vacuum cleaner equipped with a HEPA filter
    - The filter helps to prevent aerosolization of pathogens such as ringworm. For this reason, vacuums without HEPA filters should not be used for cleaning in patient-contact areas.
    - lightly spraying surfaces with water prior to mopping or sweeping
    - using an electrostatic wipe

- using a wet mop

• Exposure to aerosols generated by brushes during cleaning can be minimized by taking certain precautions, such as wearing a face mask and containing spatter if the brush or surface is damp. A surgical nose-and-mouth mask will provide some protection against droplet spatter, but not against finer particles and dry dust that can become suspended in the air. A properly-fitted N95 face mask can provide this level of protection. Removing sticky, wet or dried-on organic material from surfaces:
• This kind of debris should be removed using a detergent or soap and a brush or cloth, as necessary.
• During cleaning, it is the mechanical action and surfactant properties of the soap that are important, not necessarily its antimicrobial activity.
• Avoid the use of pressure washers, particularly those that produce more that 120 psi of pressure. This amount of pressure may cause aerosolization of pathogens, and pressure washing may even damage surfaces, thus making them harder to disinfect properly. A home garden hose sprayer usually produces less than 120 psi of pressure, and would therefore be relatively safe to use in a small animal kennel area.

Gloves should be worn when cleaning and disinfecting, and hands should be washed after finishing any cleaning activity.

4.2.2.2 Disinfection

Disinfection can only be maximally effective if it is preceded by thorough cleaning. Some pathogens (e.g. clostridial spores) are highly resistant to disinfection, therefore cleaning in these cases is particularly crucial in order to mechanically remove the organisms.
• Ensure all areas are well ventilated during disinfection
• Gloves should be worn when handling disinfectants, but latex gloves will decompose and lose their integrity when exposed to many chemicals. For small jobs, disposable nitrile gloves should be used instead. For large jobs, heavier rubber gloves (e.g. common dishwashing gloves) can be used, but reusable gloves of this type must also be disinfected at the end of each task.
• Use of protective eye goggles is also recommended when handling disinfectants due to the splash risk.
• Always apply the selected disinfectant according to the product label, with particular attention to:
- appropriate dilution
- required contact time

• If patients or personnel may have direct skin contact with the surface, or if the disinfectant used may damage a particular surface, the disinfectant may need to be rinsed off with clean water after an appropriate amount of time has elapsed.
• After disinfection, allow all surfaces to dry completely.

Cleaning and disinfection of equipment and environmental surfaces

Proper cleaning of environmental surfaces, including work areas and equipment, prevents the transmission of zoonotic pathogens. Environmental surfaces and equipment should be cleaned between uses or whenever visibly soiled. Surfaces where animals are housed, examined, or treated should be made of non-porous, easily cleanable materials. Surfaces should be cleaned to remove gross contamination before disinfection because organic material decreases the effectiveness of most disinfectants. When cleaning, avoid generating dust and aerosols that may contain pathogens by using central vacuum units, wet mopping, dust mopping, or electrostatic sweeping. Surfaces may be lightly sprayed with water prior to mopping or sweeping. Areas to be cleaned should be appropriately ventilated.
Clean items should be kept separate from dirty items. Gloves should be worn when cleaning equipment, animal cages (including such items as food bowls and toys that have been in cages), and surfaces. Clean and disinfect equipment according to its intended use, the manufacturer's recommendations, and practice policy. Equipment must be cleaned before sterilization or chemical or thermal disinfection. Exposure to droplets generated by brushes during cleaning can be minimized by implementing preventive work practices, such as wearing facial protection and gown or plastic apron, and containing splatter (e.g. by immersing items in water).Normal dishwashing of food and water bowls is adequate for hospitalized patients with infectious diseases, although disposable dishes might be considered for animals hospitalized in isolation. Toys, litter boxes, and other miscellaneous items should be discarded or cleaned and disinfected between patients. Litter boxes should be cleaned or disposed of at least daily by a non-pregnant staff member. Hands should be washed after finishing a cleaning activity.To ensure effectiveness, disinfectants should be used according to manufacturers' instructions,

with particular regard to proper dilution and contacts time. Personnel engaged in cleaning should be trained in safe practices and should be provided necessary safety equipment according to the product's safety data sheet**. <u>An overview of the effectiveness of disinfectants on selected agents is summarized in the Appendix 1.</u>**

4.2.3 Specific procedures

4.2.3.1 Single-use vs reusable equipment

Single-use equipment (e.g. hypodermic needles) should not be re-sterilized or disinfected for re-use. Such items should be properly disposed of immediately after initial use. In veterinary medicine, some equipment that is considered single-use in human healthcare is reused because the cost of some items makes it impractical to discard them after a single use. There is little to no objective information on how to disinfect or re-sterilize such equipment, and how often this can be done without compromising the integrity of item. The level of disinfection required should be evaluated as for multi-use equipment (below). Items should be carefully inspected prior to each use, and replaced if there is evidence of damage that may impair the function of the equipment or subsequent cleaning and disinfection.

Multi-use equipment must be properly cleaned and disinfected between each patient. There are three categories of multi-use equipment used on patients: critical, semi-critical and non-critical. Each category defines how instruments must be cleaned and disinfected to prevent transmission of infectious agents.

In veterinary medicine, exceptions to the level of processing required are typically made for some pieces of semi-critical equipment that come in contact with tissues or mucous membranes which are normally considered non-sterile, such as those of the upper respiratory or gastrointestinal tracts. If a transmissible infectious disease is not suspected in the patient, and the subsequent patient is not significantly immunocompromised, thorough cleaning and low-level disinfection is likely adequate in these cases. However, if an infectious disease is suspected or the subsequent patient is immunocompromised, then cleaning and high-level disinfection or sterilization are recommended in order to prevent disease transmission. For example, a rectal thermometer should undergo cleaning and low-level disinfection between every patient, but if used on a diarrheic animal it should undergo high-level disinfection or be discarded and replaced.

Food and water bowls of patients with infectious diseases should be cleaned and disinfected separately, but careful selection of the disinfectant used is required because only some disinfectants are approved for use on surfaces that come in contact with food. Otherwise disposable dishes can be considered for these animals. Cleaning alone (with regular dish soap) is adequate for food and water bowls from other patients. Toys, litter boxes, and other miscellaneous items should be cleaned and disinfected between patients, or discarded if they are not amenable to proper cleaning and disinfection. Gloves should be worn when handling items from patients carrying zoonotic pathogens or any items that are visibly soiled. Litter boxes should be cleaned out at least daily, and completely emptied and disinfected between patients. Ideally, litter boxes should not be handled by pregnant women, however if daily cleaning and disinfection are performed properly, the risks are minimized.

4.2.3.2 Disinfectant selection

There is no "standard" disinfection program that can be used in all veterinary clinics, as clinic environment, surfaces, caseload, general practices and other factors influence disinfectant choices. Selection of a disinfectant for a particular purpose should consider the product's spectrum of activity, susceptibility to inactivation by organic matter, potential pathogens in the environment, compatibility with soaps and detergents, toxicity for personnel and animals, contact time required, residual activity, corrosiveness, environmental effects and cost.

4.2.3.3 Maintenance of endoscopes

Proper cleaning and maintenance of endoscopes are important to prolonging the useful life of the instrument, but cleaning and disinfection are also important from an infectious disease control aspect. Endoscopes are semi-critical equipment, and as such require high level disinfection when used in humans. In veterinary medicine, high level disinfection is required prior to use in relatively sterile areas (e.g. urinary tract), but thorough low level disinfections is considered adequate for use in non-sterile areas (e.g. gastrointestinal tract, upper respiratory tract) if a transmissible infectious disease was not suspected in the previous patient and the subsequent patient is not significantly immunocompromised. Manufacturers typically provide detailed reprocessing (cleaning and disinfection) instructions for their instruments, which should be readily available as a reference for staff members responsible for the care of endoscopes. If the endoscope was purchased second hand and the reprocessing

instructions were not provided, it is important to contact the manufacturer to obtain a copy. Some general guidelines regarding endoscope maintenance include:

• Endoscopes must be meticulously cleaned immediately after every use. Endoscopes typically have several moving or detachable parts and small channels in which moisture, debris and discharge can become trapped. Cleaning must be performed as soon as possible in order to prevent debris from drying onto surfaces, as this can make the debris considerably harder to remove. Prior cleaning is crucial to effective disinfection.
• All instrument and suction channels must be thoroughly cleaned after each use, even if the channels were not used during the procedure. Failure to clean these channels is a common error which can result in accumulation of debris, bacteria and biofilms within the instrument. Not only does this pose risk of disease transmission to subsequent patients, but it can also confound sample collection and culture.
• Rinsing and drying of the endoscope are also critical to proper maintenance. Failure to rinse off detergents or disinfectants can lead to significant irritation of the tissues of the next patient.
• Chemical sterilants (e.g. glutaraldehyde) are typically used for high-level disinfection or sterilization of endoscopes, as most cannot be steam-sterilized (autoclaved). Consult the manufacturer's instructions regarding what methods can be safely used for any particular endoscope. If a chemical sterilant is used, a timer should be used to measure the exact contact time – too short a time may result in an inadequate microbial killing, while too long a time may result in damage to the instrument.

4.2.3.4 Maintenance of clippers

Use of good-quality clippers and maintenance of clipper blades are of great importance. Improper clipper use or maintenance can result in skin trauma, with subsequent risk for infection, or transmission of opportunistic pathogens between patients.
Following routine use of clippers on areas of unbroken skin and non-infectious animals, basic cleaning with a stiff brush to remove visible dirt and hair from the blade is likely adequate. More thorough cleaning and disinfection of the blade, as described below, should be done periodically as well, depending on how often the clippers are used.
Clippers should be thoroughly cleaned and disinfected after every use on an animal with a potentially transmissible infection (e.g. an animal with diarrhea), on any area where the skin or hair is significantly contaminated with feces, urine, blood or other body fluids, and before and after use on an area where the skin is broken (especially if there is evidence of skin infection). First, a stiff brush should be used to remove visible dirt and hair from the blade, and a soapy, wet cloth used to remove any visible debris from the body of the clippers. The clipper blades can then be sterilized using a chemical sterilant (e.g. glutaraldehyde) or by autoclaving. The body of the clippers can be sterilized using hydrogen peroxide vapour or ethylene oxide (if available). Otherwise, after removing all visible debris, thorough manual wiping with a cloth wetted with a standard disinfectant solution should be performed, paying particular attention to the small crevices of the device and allowing for adequate contact time with the disinfectant.
Refer to the clipper's instruction manual to determine what degree of contact with liquid the clippers can safely withstand.

4.2.4 Laundry

Although single-use, disposable items are ideal from an infectious disease control aspect, such items can also produce tremendous waste. Laundry is therefore a very important component of infectious disease control in the clinic setting. Although soiled linens are a potential source of microorganisms, with appropriate hygienic handling, storage and processing of clean and soiled linens, the risk of disease transmission from these items can be reduced to an almost negligible level.
Linens and special clothing used in veterinary clinics (e.g. cage blankets, towels, surgical drapes, surgical gowns, scrubs, lab coats) can be an important means of transporting pathogens from one area to another within the clinic, and to areas outside the clinic. As a result, clinic clothing (e.g. scrubs, lab coats) should always be washed on-site or sent to a commercial laundry facility that is equipped to handle laundry from medical/veterinary facilities.
This helps to prevent transmission of pathogens to family members, family pets and the general population.
Personnel should change into clinic clothes at the beginning of their shift and back into street clothes at the end of their shift. Clinics should have appropriate laundry facilities or laundry services to accommodate the need to change clothing daily, or more frequently if required.
Microbial numbers on soiled linens (e.g. towels, blankets) and clothing are significantly reduced by dilution and

during the mechanical action of washing and rinsing. Linens used in veterinary clinics should be laundered together using detergent, and dried in a hot air dryer to promote killing of microorganisms.

4.2.4.1 Washing and drying

• Use of normal machine washing with a commercial laundry detergent and machine drying are sufficient to greatly reduce the numbers of most significant infectious pathogens from most soiled linens.
• If laundry is washed in cold water, an appropriate cold-water detergent must be used according to label directions.
• It should not be assumed that hot water washing will disinfect or sterilize items. High temperature (> 71.1ºC) washing can significantly reduce bacterial numbers, but standard household washing machines do not typically reach this temperature, even if the hot water setting is used.
• The heat and drying effects of tumble drying are a critical step in the laundering process, and account for a large proportion of the decrease in bacterial counts achieved. Therefore, laundry should not be considered clean until it has also been dried completely, ideally using the highest heat possible.

- Line-drying linens outdoors may have the advantage of also exposing the surface of the fabrics to ultraviolet (UV) light, if they are hung to dry in the sun. However, it would be difficult to expose all surfaces to sunlight, and thick fabrics, items made of multiple fabric layers and those containing seams may protect bacteria from UV exposure. Also, the antimicrobial action of the high heat of tumble drying is lost if linens are line-dried, therefore tumble drying is recommended, especially for any materials that may have been contaminated with a transmissible infectious pathogen.

4.2.4.2 Laundry from infectious cases

• Laundry from potentially infectious cases should be treated separately from other laundry.
• Linens should be collected in a separate linen bag and washed and dried separately.
• For linens with gross contamination of a potentially infectious nature (e.g. feces from a diarrheic animal, discharge from an infected wound, urine from an animal with a urinary tract infection), as much organic material as possible should be removed by hand (using gloves and disposable tissue or paper towel, as described above). The items should then be pre-soaked in bleach solution (9 parts water: 1 part household bleach) for 10-15 minutes prior to machine washing.
• Bleach should also be added to the household detergent in the washing machine as per label instructions.

Protection of personnel

Personnel need to protect themselves from potential transmission of pathogens from soiled linens by wearing appropriate personal protective equipment (e.g. gloves, gown, apron) when handling soiled linens. Personnel should wash their hands whenever gloves are changed or removed, or if they come in contact with soiled linens while not wearing gloves. Hand hygiene stations should be available in laundry area.

Commercial laundry facilities

A company which specializes handling laundry from veterinary facilities can be used if it is not possible for laundry to be cleaned on-site. *Specific data are given in the SOPs of FVM clinics, institutes and laboratories.*

4.2.5 Waste management

Veterinary biomedical waste is a potential source of both zoonotic and non-zoonotic infectious pathogens. Therefore, it is important to handle all such waste appropriately.
Biomedical waste typically includes sharps, tissues (anatomic waste), highly contaminated (e.g. blood-soaked) materials, and dead animals. Although it is beyond the scope of these guidelines to describe veterinary biomedical waste management in detail, the following basic information may be helpful:
• Used sharps are considered biomedical waste and should be disposed of in accordance with regulations from municipal and provincial/territorial authorities. Use approved, puncture-resistant sharps disposal containers to remove, store and dispose of used sharps such as needles, blades, razors and other items capable of causing punctures.
• Non-anatomical waste saturated or dripping with blood (e.g. blood-soaked lap sponges and gauze) are also best disposed of as biomedical waste.
• Liquid waste such as chest fluid, abdominal fluid, irrigating solutions, suctioned fluids, excretions and secretions usually may be poured carefully down a toilet or any drain connected to a sanitary sewer or septic tank. Provincial and territorial regulations may dictate the maximum volume of blood or body fluids that is permitted to be

poured into the sanitary sewer. If there is likely to be splashes or sprays during this disposal process, appropriate personal protective equipment should be worn.

• All other waste, such as general office waste and non-sharp medical equipment, may be disposed of in the regular waste stream, and requires no special treatment other than containment during disposal and removal. Waste should be contained in a leak-proof container or bag that can be discarded with the waste (e.g. a plastic garbage bag).

Urine and feces are not considered biomedical waste, nor is disposable equipment that has come in contact with an infectious animal (e.g. examination gloves, gowns, bandage materials that are not saturated with blood). Nonetheless, some of these materials may pose a risk to clinic personnel, patients and waste disposal personnel in terms of their potential to transmit infectious pathogens. Therefore, additional precautions should be taken to minimize contamination of the clinic environment and the risks to people and animals from potentially infectious waste. These may include double-bagging of materials from isolation areas, and keeping waste cans covered to prevent access by curious animals and to prevent spillage if a waste can is knocked over. If contamination of the inside of a waste can occurs (e.g. due to a tear in a garbage bag), the container should be thoroughly disinfected after emptying. *Specific data are given in the SOPs of FVM clinics, institutes and laboratories.*

4.3 RISK ASSESSMENT OF ANIMALS AND PERSONNEL

4.3.1 Patient care and handling

4.3.1.1 Isolation facilities

Every university veterinary clinic should have a dedicated isolation area for caring for and housing animals with potentially contagious infectious diseases. The size and structure of the isolation facility varies with aspects such as clinic size, types of animal species treated and diseases that are endemic to the area. A proper isolation area should allow for complete physical separation of potentially infectious cases, and have areas for performing routine procedures such as bandage changes, thereby reducing the risk of direct or indirect infection of other hospitalized animals or clinic personnel. Ideally, isolation facilities should be in a low traffic location within the clinic.

Every veterinary clinic should have an isolation area for caring for and housing animals with potentially contagious infectious diseases.

If an isolation area was not included in the original physical design of the clinic, a potential alternative in some cases may be to convert an examination room into a dedicated isolation room. The room selected should be in the area of the lowest human and animal traffic possible. The room should be easy to clean and disinfect and emptied of all non-essential equipment. This type of room conversion can be difficult to do effectively depending on the design and layout of the clinic and the room itself. The feasibility of using such a room for isolation of infectious animals must be assessed on a facility-by-facility basis.

Ventilation should be designed such that movement of air from the isolation room to other areas of the clinic is prevented (i.e. the room should be vented to the outdoors). If this is not readily possible, a HEPA air filtration system should be used for the air leaving the isolation room.

Only the equipment and materials needed for the care and treatment of the individual animal should be kept in the isolation room. This may include items such as a designated stethoscope, thermometer, grooming supplies, leash, and muzzle. Supplies of items that will be used on subsequent isolation patients (e.g. packages of bandage material, boxes of needles and syringes) should not be kept in the isolation area. All items entering an occupied isolation area should be considered infectious and disposed of or disinfected after discharge of the patient. Items should not be removed from the room except for disposal. Use of disposable articles can minimize the need to take soiled items out of the isolation room.

When the isolation room is in use by an animal with a potentially contagious infectious disease:

• Prominent signage should indicate that the animal may be infectious and should outline any additional precautions that need to be taken in addition to routine isolation protocols.

• Access to the isolation room should be limited to the minimum number of essential personnel necessary to provide appropriate patient care.

1. PERSONAL PROTECTIVE EQUIPMENT AND WASTE IN ISOLATION

All personnel entering an isolation area housing a potentially infectious animal, regardless of whether they plan on having direct contact with the animal, must wear appropriate personal protective clothing. At a minimum, this consists of a clean lab coat or similar item of outerwear that is only worn in the isolation area and disposable

examination gloves. Depending on the diagnosis and the mode of transmission of the disease, shoe covers, masks and eye protection may be required when handling an animal in isolation.

• Gloves should be discarded after a single use. Hands must be washed immediately after gloves are removed.

• Similarly, gowns should be discarded (if disposable) after a single use. Reusable gowns and lab coats used in isolation should be laundered after a single use. Storing/hanging and reusing a contaminated gown or lab coat inevitably leads to contamination of hands, clothing and the environment. Therefore, when removed, these items should immediately be placed in the isolation room garbage or laundry bag.

• Eye/nose/mouth protection may be re-used with the same animal if they are not visibly soiled and can be consistently removed without contamination of the inside of the eye wear/mask or the immediate environment. Nose and mouth masks should only be reused by the same person. If the eyewear or mask becomes contaminated with body fluids such as urine or feces, it should be replaced with a clean article.

Designated personal protective equipment must remain in the isolation room. Contaminated items and waste alike should be bagged prior to being removed from the isolation area. Articles should then immediately be either discarded or taken to the appropriate area for additional cleaning and disinfection.

Waste from an isolation room should be treated as potentially infectious. *Specific data are given in the SOPs of FVM clinics, institutes and laboratories.*

2. PATIENTS IN ISOLATION

Dogs that are housed in isolation should not be walked nor allowed to urinate or defecate in public areas or areas used by other animals. If a dedicated area for walking is not available and the dog needs to be taken out of the primary isolation area to urinate and defecate, a separate run should be designated for each dog in isolation (i.e. if there is more than one animal in isolation, they cannot all use the same run). The run selected should be as far as possible from runs being used by other animals. The dog should be moved directly to the run by personnel wearing appropriate personal protective clothing. Moving the animal through other areas of the clinic should be avoided as much as possible. Carrying the dog or transporting it on a gurney is ideal in order to minimize the risk of contamination of the floor and clinic environment. The designated run should be prominently labelled and disinfected daily.

If a patient being housed in isolation absolutely must be taken elsewhere in the clinic for essential procedures such as radiographs or surgery, if at all possible this should be done the end of the day, or during a time where there is the least animal and personnel movement in the clinic.

• Appropriate personal protective equipment should be worn by all personnel involved with the procedure.

• Other animals should be kept out of the procedure area.

• The procedure area should be thoroughly cleaned and disinfected as soon as the procedure is completed. *Specific data are given in the SOPs of FVM clinics.*

3. FOOTBATHS AND FOOTMATS

Footbaths or footmats are used to decrease (but do not eliminate) microbiological contamination of footwear. Footbaths are shallow containers containing a disinfectant solution. Footmats are spongy commercial mats covered with a durable, easy-to-clean material that can be saturated with disinfectant. Footmats can increase compliance because they are easier to use, but they are more expensive and more difficult to maintain than footbaths. Data regarding the need for and efficacy of footbaths and footmats are very limited, and there is essentially no information relating to small animal clinics specifically. It has been shown that footbaths can reduce bacterial contamination of footwear in large animal clinic settings. Although other sources of contamination have been shown to be more significant in infection transmission, footwear and floor surfaces cannot be overlooked in an infection control program in a small animal clinic, because patients so often have extensive direct contact with the floor.

Possible problems with footbath or footmat use must also be considered. Footbath or footmat use is almost invariably accompanied by spillage of disinfectant solution; this can create a slipping hazard on smooth floor surfaces, which are typically present in small animal clinics. Certain disinfectants can also damage floor surfaces with prolonged contact.

Footbaths or footmats should be considered when personnel will be walking on a surface that could potentially be more contaminated than the general floor environment, and where spread of this contamination might pose a risk to patients or personnel. The most likely area where footbaths or footmats could be useful would be at the exit of an animal housing area (e.g. dog run) that contains a potentially infectious case, and where clinic personnel will be walking in and out of the potentially contaminated area. The need for routine use of footbaths or footmats in isolation areas where animals are confined in cages is questionable. If footbaths or footmats are used, selection of an appropriate disinfectant is important. The disinfectant should be effective against the specific pathogen(s)

of concern, stable in solution, and effective with a relatively short contact time. Oxidizing agents such as accelerated/stabilized hydrogen peroxide and peroxygen disinfectants are ideal. The solution should be changed daily, or sooner if gross contamination of the bath/mat occurs.

Maintaining proper concentrations of active disinfectants in footbaths and footmats is essential for proper performance.

Specific data are given in the SOPs of FVM clinics.

4. WOUNDS AND BANDAGES

Wound infections can be caused by many bacterial pathogens, some of which can be transmitted between animals or between animals and people. One example is methicillin-resistant *Staphylococcus aureus* (MRSA), which can infect both people and animals, but there are a variety of other pathogens that are of concern. This includes both multidrug resistant (e.g. *S. aureus*, *S. pseudintermedius*, enterococci) and susceptible bacteria. Wounds provide a prime site for invasion of opportunistic bacteria such as these. Even wounds that are not known to be infected should be protected from contamination by veterinary personnel and from the environment to reduce the risk of secondary infection.

• Sterile gloves should be worn for debridement, treatment and bandaging of deep wounds and those involving vital structures. Clean, non-sterile examination gloves are adequate for these procedures if the wound is more superficial.

• Bandages must be kept dry to prevent bacterial strike-though. This means keeping the outside of the bandage as dry as possible, and also including sufficient absorbent material in the bandage itself to prevent discharge from the wound from soaking through the bandage. If the outside of a bandage appears wet, it should be changed.

• Used bandage materials should be considered infectious. Such materials should be placed directly in the garbage and not on the floor, examination table or any other surface. The risk of contamination and spread of any pathogen is likely higher for wounds with a large amount of discharge.

• Wound treatments and bandage changes should be performed in an area that is easily disinfected (e.g. on an examination table). Wound irrigation and lavage should be performed in such a way that the fluid used is contained (e.g. in a sink or tub, or with disposable absorbent material). Bandages should NOT be changed in the kennel/ward area where there is a higher risk of cross-contamination of other patients.

• Hands should be washed thoroughly after changing a bandage. Equipment used for bandage changes (e.g. bandage scissors) should be disinfected between uses.

Wound infections can be caused by many bacterial pathogens, some of which can be transmitted between animals or between animals and people. Wounds provide a prime site for invasion of opportunistic bacteria.

Animals with known MRSA or multi-resistant bacterial wound infections are likely to be colonized with these pathogens at other body sites as well (e.g. nose, rectum, intestinal tract), and should therefore be handled with contact precautions and housed in isolation.

Specific data are given in the SOPs of FVM clinics.

5. FEEDING OF RAW MEAT

It is small animal clinic policy not to feed raw meat to hospitalized animals.

6. ADMISSION OF ANIMALS FROM SHELTERS

Humane societies, animal shelters and similar facilities typically contain transient, stressed populations of animals, large numbers of young animals, sick animals and animals with unknown health and vaccination status. As such, they should be considered high risk from an infectious disease standpoint. Animals admitted from these facilities should be subjected to a high degree of scrutiny. Recommended practices include:

• All animals from such facilities should be examined immediately upon arrival. They should not be allowed to come in contact with other animals in the waiting/reception area.

• If there is an ongoing outbreak of an infectious disease at an animal shelter, admission of animals from the facility for elective procedures should be restricted (i.e. admission for emergencies only). Otherwise, all animals from the facility should be admitted directly to isolation.

• Animals from these facilities should be housed separately from other patients, if possible. Use of a

separate ward, separate area of a ward or leaving empty cages between those animals and other patients can be used, depending on the degree of separation required for the diseases of primary concern.

For elective procedures (e.g. spay, neuter):
- All dogs, cats and ferrets must have been vaccinated against rabies at least 2 weeks prior to presentation if they are more than 14 weeks old.
- All dogs and cats must have received other routine vaccinations (as needed according to geographic region) at least twice if they are more than 14 weeks old, with the most recent vaccine administered at least 2 weeks prior to presentation.
- All animals must have been dewormed with a broad spectrum anthelmintic at least 7-10 days prior to admission.
- Animals with abnormalities including, but not limited to, fever, oculo-nasal discharge, coughing/sneezing, diarrhoea and potentially infectious skin conditions should not be admitted for elective procedures.
- Depending on the geographic region and time of year, flea treatment prior to admission may also be required.

Specific data are given in the SOPs of FVM clinics

4.3.2 Safety of veterinary clinic personnel and students

4.3.2.1 Bites and scratches

Bites and scratches are an inherent risk in veterinary medicine and a common cause of occupational injury and illness. In a survey of veterinarians from the USA, approximately two-thirds had sustained a major animal-related injury at one time. Bites and scratches accounted for just over one-third of these injuries. Up to 60% of dog bites and 80% of cat bites require medical attention. Approximately 3% to 18% of dog bites and 20% to 50% of cat bites become infected. Most dog and cat bite wound infections are caused by a mixture of aerobic and anaerobic bacteria. In general, veterinary personnel should be able to recognize behaviour in animals and situations that are associated with an increased tendency for an animal to bite. Professional judgment must be exercised to guide bite prevention practices. Personnel should take all necessary precautions to prevent animal-related injuries in the clinic. These may include physical restraint or chemical restraint (sedation or anesthesia) of an animal. Appropriate equipment (e.g. different sizes of muzzles, bite-resistant gloves, catch pole, cat bags) should be readily available. Such equipment should also be as easy to clean as possible. Experienced veterinary personnel rather than owners should restrain animals for procedures whenever possible. Personnel must always be aware of changes in their patients' behaviour which may precede attempts to bite. Veterinary personnel should not let client perceptions or attitudes prevent them from using appropriate bite-prevention measures (e.g. muzzling). If anyone is bitten or scratched by an animal:

- Immediately wash the wound thoroughly with plenty of soap and water.
- Report the incident to the local public health unit.
  - If a bite occurred, the rabies vaccination status of the animal must be noted
- Seek medical attention as soon as possible for any bite that:
  - is on a hand or is over a joint
  - is over a prosthetic device or an implant
  - is in the genital area
  - is over a tendon sheath, such as bite on the wrist or the ankle
  - causes a large amount of tissue damage (e.g. a deep tear or tissue "flap")

Medical attention should also be sought for any bite (particularly from a cat) sustained by a person with any of the following conditions:

- Compromised immune system (e.g. HIV/AIDS, transplant or chemotherapy patients)
- Chronic swelling (edema) in the area that was bitten
- If the person has had his or her spleen removed
- Liver disease, diabetes, lupus or other chronic systemic disease

If the bitten area becomes increasingly painful or swollen, if the wound develops a discharge, or if the person develops a fever or swollen lymph nodes, consult a physician as soon as possible.

A physician will decide (in some cases in consultation with public health personnel) if antimicrobial therapy, tetanus vaccination, rabies vaccination, or any additional treatment (e.g. lavage, debridement, sutures) are necessary. Most bite wounds are not sutured in order to promote drainage and reduce the risk of infection.
Emergency contact information (i.e. physician, public health department) should be clearly posted in the clinic.
All bites or scratches should be reported to the clinic infection control practitioner (ICP) and the injury documented.
Bites and scratches should not be considered "part of the job" and summarily dismissed. Even seemingly small, innocuous injuries can develop severe complications. Regular review of injuries is useful to identify trends in behaviour that may be associated with injuries and to develop protocols to reduce the risk of injuries. Documentation is also important for employees in the event that serious health problems subsequently develop.
Specific data are given in the SOPs of FVM clinics

4.3.2.2 Sharps

Injuries from needles and other sharp implements are common in veterinary medicine but are largely preventable. Although there is not the level of risk of bloodborne pathogen exposure in veterinary practice as there is in human medicine, serious outcomes can result following needlestick or other sharps injuries, including significant trauma, secondary infection and drug reaction (i.e. toxic, allergic, idiosyncratic).
Proper sharps handling practices are a practical yet effective way of reducing workplace injuries in veterinary clinics. Use appropriate barriers (e.g. closed toed shoes) and safe work practices when using sharp instruments and devices (e.g. needles, scalpels, etc.), after procedures and when cleaning used instruments.

- Never remove needle caps by mouth.
- Do not bend or manipulate needles in any way.
- Do not pass uncapped needles to another person.
- Ensure proper animal restraint to reduce inadvertent needlestick injuries from animal movement.
- Do not recap needles by hand. If recapping is required, use the "one-handed scoop" technique (see below), forceps or a needle cap holder.
- Ensure that approved point-of-use sharps disposal containers are located everywhere needles are handled. These containers are puncture-resistant, leakproof, and prevent removal (both accidental and intentional) of discarded sharps.
- Always dispose of sharps immediately in an approved sharps disposal container.
- Never dispose of needles or other sharps into anything other than an approved sharps container, even if they are capped or otherwise contained. This reduces the risk of accidental injury to veterinary personnel, patients, clients and non-veterinary personnel (e.g. waste disposal personnel).

The most important precaution for preventing needle-stick injuries is to avoid recapping needles. Recapping needles cause more injuries than it prevents. When it is absolutely necessary to recap needles as part of a medical procedure or protocol:
- Use a mechanical device such as forceps or hemostats to replace the cap on the needle.
- Alternatively, the needle can be recapped using the "one-handed scoop" technique:

    - Place the cap on a flat horizontal surface.
    - Holding the syringe with the attached needle, or the needle hub alone (when unattached), scoop up the cap with the needle by sliding the needle tip inside, without touching the cap with one's other hand.
    - Once the point of the needle is covered, tighten the cap by pushing it against an object, or by pulling the base of the needle cap onto the hub of the needle with the same hand holding the syringe.

Recapping needles causes more injuries than it prevents.

After injecting live vaccines or aspirating body fluids or tissue, the used syringe should be placed in a sharps container with the needle attached. Following most other veterinary procedures, the needle and syringe may be separated for disposal of the needle in the sharps container. This is most safely accomplished by using the needle removal device on an approved sharps container, which allows the needle to drop directly into the container without being handled or touched.

When injecting live vaccines or aspirating body substances or tissue, the used syringe with the needle attached should be placed in a sharps container. Following most other veterinary procedures, the needle and syringe may be separated for the disposal of the needle in the sharps container. This can be most safely accomplished by using the needle removal device on the sharps container, which allows the needle to drop directly into the container. Needles should never be removed from the syringe by hand, if possible. In addition, needle caps should not be removed by mouth.

Sharps containers are safe and economical, and should be located in every area where animal care occurs. 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 risk of aerosolisation of the contents.

4.3.2.3 Diagnostic specimen handling

Urine from animals with suspected urinary tract disease, and all faeces, aspirates, and swabs should be treated as potentially infectious material. Protective outerwear (e.g. lab coat) and disposable gloves should be worn when handling these specimens. Gloves should be discarded and hands washed immediately after handling these items. Care should be taken to avoiding touching clean items (e.g., microscopes, telephones, food) while handling specimens or before glove removal. A separate refrigerator should be used for diagnostic specimens, which should be cleaned on a regular basis.

A designated area of the clinic should be used for specimen processing. This should be separate from treatment and surgery areas so as to decrease the risk of contamination of these areas. After processing a specimen, materials should be disposed of or stored properly and promptly.

- Specimen processing areas should be cleaned and disinfected immediately after use.
- Samples from animals with suspected or known infectious diseases should be disposed of as infectious waste.
- Leak-proof plastic containers should be used for specimen storage in a designated refrigerator which does not contain food, vaccines or medications of any kind.

- Contamination of the outside of sample containers should be avoided. If the outside of a container becomes contaminated, it should be cleaned and disinfected prior to storage.

• Sharps such as microscope slides and glass pipettes should be disposed of in approved sharps containers.
Specific data are given in the SOPs of FVM clinics.

4.3.2.4 Dental procedures

Dental procedures often entail a significant risk of splash exposure involving saliva, blood, and bacteria-laden debris. Procedures such as ultrasonic scaling can result in aerosolization of large numbers of bacteria. There is also potential for personnel to sustain cuts and abrasions from dental equipment or teeth during dental procedures. To reduce the risk of transmission of harmful bacteria from the animal's mouth to veterinary personnel, the person performing the procedure and anyone in the immediate vicinity should wear:

• Protective outerwear (e.g. designated lab coat, designated scrubs)
• Disposable gloves
• Surgical (i.e. nose and mouth) mask
• Protective eye glasses/goggles, or a full face shield

Dental procedures should be performed in a contained area away from other patients, personnel and high traffic areas. Procedure such as bandage changes, wound care or placement of invasive devices (e.g. intravenous catheters, urinary catheters) should never be performed in close proximity to a dental procedure due to the risk of contamination by aerosolized bacteria.
Specific data are given in the SOPs of FVM clinics.

4.3.2.5 Necropsies

Necropsies are high risk procedures because of potential contact with infectious body fluids, aerosols, and contaminated sharps. Non-essential persons should not be present during necropsy procedures in order to minimize exposure of personnel to these hazards. Personnel involved in or present at necropsies should wear:

• Protective outerwear (e.g. designated lab coat, designated scrubs)
• Disposable gloves
• Protective eye glasses/goggles, or a full-face shield

In addition, when opening the body cavities of larger animals or for any other heavy cutting, cut-proof gloves which can be washed in the laundry should be used to prevent accidental injury from necropsy blades. Additional precautions for respiratory protection (including environmental controls and face masks) should be employed if power equipment is used, since these instruments increase the amount of potentially infected material that becomes aerosolized.
It is recommended that in-clinic necropsies not be conducted on any animal suspected of being infected with a pathogen requiring biosafety precautions above level 2 (e.g. *Chlamydia psittaci*, *Coxiella burnetti*, *Francisella tularensis*). Instead the entire body should be submitted to an approved diagnostic laboratory. Ensure that all requirements for shipment of biological samples are met (these can usually be provided by the laboratory in question), including providing notification of any suspected infectious disease in order to protect laboratory personnel.

4.3.2.6 Vaccination of personnel

Vaccination should be considered a final line of protection but is important for certain diseases. Decisions regarding vaccination policies should consider the risk of exposure, the severity of disease, whether the disease is treatable, the transmissibility of disease, as well as the quality and safety of the vaccine.

Rabies: Rabies vaccination is indicated for anyone who has a greater than average risk of exposure to the virus. All veterinary personnel that might have contact with animals should therefore be vaccinated against rabies, the Czech Republic have been formally declared rabies-free. Rabies vaccines for humans are generally considered safe and highly effective. In countries where rabies is endemic, rabies titres should be checked every 1-2 years to ensure that protective immunity is maintained, with re-vaccination provided as required.

Tetanus: Although bites and scratches are very low risk for tetanus infection, cuts and scratches from other objects or soil contamination of puncture wounds are still a risk. Therefore, tetanus vaccination is indicated in veterinary personnel. Boosters are generally administered every 10 years.

Influenza: Human influenza is a common and highly transmissible disease, even though it is not transmissible to companion animals. Infected veterinary personnel can rapidly infect their colleagues and veterinary clinics could act as sources of community infection if infected employees are present. It is reasonable for veterinary clinics to recommend annual influenza vaccination of all personnel, and to ensure that personnel have time to visit their physician or a vaccination clinic for this purpose. Employees should also be encouraged to stay home if they are ill.

4.4 TRAINING AND EDUCATION OF PERSONNEL

Personnel training and education are essential components of an effective infection control program. All personnel, including temporary lay personnel, kennel staff, students and volunteers, should receive education and training about injury prevention and infection control during their initial orientation and periodically thereafter. Additional training should be provided as recommendations change or if problems with infection control practices are identified. Training should emphasize awareness of the hazards associated with individual work duties, and prevention of zoonotic disease exposure. Staff participation in training should be documented by the authorized person. A list of additional electronic and print resources that may be useful for training purposes can be found in partial SOP.

All personnel should receive education and training about injury prevention and infection control.

4.4.1 Client education

Client education is the responsibility of the entire practice team. By helping clients understand infectious and zoonotic disease risks and the basic steps they can take to protect themselves and their animals, they can live happier and healthier lives with their pets.
Discussion of zoonotic disease risks should be a routine part of new pet examinations and new client visits. Client education must also occur when the veterinarian has a reasonable suspicion of a potentially infectious disease, and particularly if the disease is zoonotic. Notification of the owner to this effect must be documented in the patient's medical record. This documentation may also be very important legally, should an animal's infection result in human illness.

Client education is the responsibility of the entire practice team.

Items to discuss, information to provide to the client in print form, and/or information to document in the medical record may include:

- What disease is suspected or has been diagnosed
- How the disease is confirmed, if necessary
- How the disease is transmitted
- Risks to members of the household
- Risks to other in-contact individuals (e.g. elderly grandparents who live elsewhere)
- Risks to in-contact pets
- Symptoms in humans
- Clinical signs in animals
- How to prevent disease transmission from the pet to people and to other pets
- How the disease is treated in animals
- Public health enforcement issues such as quarantine, submission of tissues to labs, etc.
- Circumstances under which the client should seek medical attention, if applicable

4.4.1.1 Client visitation

Given the strong bond between owners and their pets, it is understandable when clients wish to visit their hospitalized pets. However, animals carrying transmissible infectious pathogens pose a potential risk to other animals at the clinic and at the owner's home, as well as to the clinic employees, the owner and other household members. As a policy, clients should not be allowed to visit animals that are considered potentially infectious.

Under extenuating circumstances, such as an animal whose condition is imminently life-threatening, owners may be allowed to visit their animal, but the use of proper personal protective equipment should be demonstrated to the clients and all infection control procedures should be followed, as for clinic personnel involved in the animal's care.

As a policy, clients should not be allowed to visit hospitalized animals carrying any suspected infectious disease.

4.4.1.2 Clinic pets

It is currently common for university clinics and institutes to have resident animals. From an infection control perspective, these animals pose a potential risk for disease transmission, and from the health perspective of the clinic pet itself. Clinic animals that have free access within the clinic could be sources of pathogen transmission. Uncontrolled access to waiting room areas could result in a large number of contacts, with the corresponding potential for pathogen transmission. Although there are no objective data quantifying the risks to patients, people or clinic animals themselves, the theoretical risks and lack of a real need for clinic pets indicates a need for consideration of the costbenefit of keeping clinic pets. Based on the potential risks, it is recommended that veterinary clinics do not keep such animals, and every attempt should be made to adopt out any existing pets.

From an infection control standpoint, university clinics should never have a resident "clinic pet."

Pets are not allowed in the offices or classrooms unless they are used for teaching purposes. At other times these pets should be held in a separate room at the clinic with no sick animals present.

4.4.2 Vector control

Some important pathogens can be transmitted by wild rodents (e.g. mice, rats) or insect vectors (e.g. fleas, ticks, mosquitoes, houseflies). A few of these pests can be true carriers of certain diseases, meaning they can be infected by or incubate particular pathogens, but many of them can also be non-specific mechanical vectors that simply move microbes from one area or surface to another. Pest management is an important aspect of effective prevention and control of infectious disease transmission. Pest management practices include:

- Examination of animals upon arrival for ectoparasites such as fleas, and treatment with an adulticidal antiparasitic medication prior to admission if ectoparasites are detected.
- Storing food and garbage in metal or thick plastic containers with tight-fitting lids.
- Prompt disposal of food waste and other material (e.g. feces) that may attract rodents or insects.
- Sealing potential pest points-of-entry into buildings. Common methods include the use of caulk, steel wool or mesh wire under doors and around pipes.
- Installation and maintenance of window screens to prevent entry of insects into buildings.
- Elimination of potential rodent nesting sites (e.g. clutter).
- Removal of standing water (e.g. empty cans, clogged gutters) outside buildings that can otherwise serve as breeding grounds for mosquitoes.

Additional measures may be warranted for the control of specific pests. Consultation with a pest control expert is recommended if a particular infestation is present, or for additional guidance and information.

Appendix 01 Přehled dezinfekčních látek a detergentů, jejich účinnost a ředění/Overview of disinfectants and detergents, their effectiveness and dilution

Antimikrobiální spektrum dezinfekčních prostředků (převzato z: Linton et al., 1987)

	Chemické dezinfekční prostředky									
	Poznámka: Odstranění organického materiálu musí vždy předcházet použití jakéhokoli dezifekčního prostředku									
	Kyseliny (kyselina chlorovodíková, octová, citronová)	**Alkoholy** (ethylalkohol, isopropylalkohol)	**Aldehydy** (formaldehyd, paraformaldehyd, glutaraldehyd)	**Alkálie** (hydroxid sodný nebo amonný, uhličitan sodný)	**Biguanidy** (chlorhexidin)	**Halogeny**		**Oxidační činidla** (hydrogen peroxid, kyselina peroctová)	**Fenolické sloučeniny**	**Kvartérní amoniové sloučeniny**
						chlornan	jód			
Nejnáchylnější										
Mykoplazmata	+	++	++	++	++	++	++	++	++	+
Grampozitivní bakterie	+	++	++	+	++	+	+	+	++	++
Gramnegativní bakterie	+	++	++	+	++	+	+	+	++	+
Pseudomonas	+	++	++	+	±	+	+	+	++	-
Rickettsie	±	+	+	+	±	+	+	+	+	±
Obalené viry	+	+	++	+	±	+	+	+	±[a]	±
Chlamydiaceae	±	±	+	+	±	+	+	+	±	-
Neobalené viry	-	-	+	±	-	+	±	±	-	-
Plísňové spory	±	±	+	+	±	+	+	±	+	±
Picornaviry (FMD)	+	N	+	+	N	N	N	+	N	N
Parvoviry	N	N	+	N	N	+	N	N	N	-
Acidorezistentní bakterie	-	+	+	+	-	+	+	±	±	-
Bakteriální spory	±	-	+	±	-	+	+	x[b]	-	-
Kokcidie	-	-	-	+[c]	-	-	-	-	+[d]	-
Priony	-	-	-	-	-	-	-	-	-	-

Legenda: ++ vysoce účinné, + účinné, ± omezená aktivita, - žádná aktivita, N = informace není k dispozici, [a]liší se ve složení, [b]kyselina paraoctová je sporicidní, [c]hydroxid amonný, [d]některé mají aktivitu proti kokcidiím

Hlavní detergenty a dezinfekční prostředky používané ve veterinární medicíně

(Převzato z: Linton et al., 1987)

Dezinfekční prostředky a jejich ředění	Aktivita v organickém materiálu	Spektrum aktivity	Poznámky
Chlorhexidin *0,05%-0,5%* *Používaný pro dezinfekci předmětů v kontaktu s pokožkou nebo se sliznicemi (čenichy, endotracheální intubace, atd.)* *<u>Ředění:</u> 60ml 2% roztoku na 3,785 litru vody= 0,06% roztok* *<u>Impregnované barely:</u> 3,785 litru 2%roztoku na 147,62 l vody = 0,05% roztok (90ml na 3,785 l vody je používaný pro anestezii koní)* *<u>Kontaktní čas</u> : nejméně 15 minut.*	Rychle redukovaný	• Mycoplasma: velmi účinný • Mycobacteria: variabilní • Gram+ bakterie:velmi účinný • Gram- bakterie: velmi účinný • *Pseudomonas* : omezená aktivita • Rickettsie: omezená aktivita • Obalené viry: omezená aktivita • Chlamydiaceae: omezená aktivita • Neobalené viry: žádná aktivita • Spóry plísní: omezená aktivita • Bakteriální spory: žádná aktivita • Kryptosporidie: žádná aktivita • Priony: žádná aktivita	• Široké antibakteriální spektrum, ale omezená účinnost proti virům. • Používaný na dezinfekci materiálů v úzkém kontaktu s pacienty (čenichy, endotracheální intubace, atd.) • Snadno inaktivován mýdly a čistícími prostředky. • Nízký toxický potenciál; obvyklá ředění nejsou dráždivá ani pro sliznice. • Inaktivován aniontovými čistícími prostředky. • Baktericidní aktivita na pokožku je rychlejší než u mnoha dalších sloučenin obsahujících jodofor. • Zbytkový účinek na kůži snižuje opětovný růst. • Funguje pouze při omezeném pH (5-7). • Toxický pro ryby => neměl by být vypouštěný do prostředí
Jodovaný povidon *Používaný na dekontaminaci a desinfekci pokožky (operační příprava).*	Rychle redukovaný	• Mycoplasma: velmi účinný • Mycobacteria: omezená aktivita • Gram+ bakterie: účinný • Gram- bakterie: účinný • *Pseudomonas* : účinný • Rickettsie: účinný • Obalené viry: účinný • Chlamydiaceae: účinný • Neobalené viry: omezená aktivita • Spóry plísní: účinný • Bakteriální spory: účinný • Kryptosporidie: žádná aktivita • Priony: žádná aktivita	• Široké spektrum. • Velmi nízký toxický potenciál => přiměřeně zředěné roztoky jsou vhodné pro použití na tkáně nebo materiály v kontaktu s pokožkou nebo sliznicí. • Lidé mohou pocítit citlivost po kontaktu s kůží. • Roztoky jodoforů zvyšují volnou koncentraci jódu a antimikrobiální aktivitu • Může se objevit rezavění tkanin a plastů. • Stabilní při skladování • Inaktivován organickými zbytky a kvartérními amoniovými sloučeninami. • Vyžaduje častou aplikaci • Korozivní

pokračování

Alkohol *(90% izopropanol nebo 70% denaturovaný alkohol) Používaný na dezinfekci materiálů v blízkém kontaktu s lidmi a pacienty (čenichy, nástroje, roztoky na desinfekci rukou, atd.)*	Redukovaný	• Mycoplasma: velmi účinný • Mycobacteria: účinný • Gram+ bakterie: velmi účinný • Gram- bakterie: velmi účinný • *Pseudomonas* : účinný • Rickettsie: omezená aktivita • Obalené viry: účinný • Chlamydiaceae: omezená aktivita • Neobalené viry: žádná aktivita • Spóry plísní: omezená aktivita • Bakteriální spory: žádná aktivita • Kryptosporidie: žádná aktivita • Priony: žádná aktivita	Široké spektrum. Velmi nízký toxický potenciál => přiměřeně zředěné roztoky jsou vhodné pro použití na tkáně nebo materiály v kontaktu s pokožkou nebo slizničními membránami. Lidé mohou pocítit citlivost po kontaktu s kůží. Žádná zbytková aktivita na povrchy Rychlý výkon Nenechává zbytky. Rychlé vypařování Extrémně hořlavý
Chlornan sodný (bělidlo) *Používaný na dezinfekci čistých povrchů obzvlášť pro zvýšení spektra aktivity desinfekce.* *Ředění:* *1:64 = 60 ml na 3,785 litru vody.Vhodné pro většinu použití v FVM* *1:32 = 125 ml (na 3,785 litruvody)* *1:10 = 375 ml na 3,786 litru vody.Omezená použitelnost-velmi silné*	Rychle redukovaný	• Mycoplasma: velmi účinný • Mycobacteria: účinný • Gram+ bakterie: účinný • Gram- bakterie: účinný • *Pseudomonas* : účinný • Rickettsie: účinný • Obalené viry: účinný • Chlamydiaceae: účinný • Neobalené viry: účinný ve vyšších koncentrcích • Spóry plísní: účinný • Bakteriální spory: účinný • Kryptosporidie: žádná aktivita • Priony: žádná aktivita	• Široké spektrum. • Relativně nízký toxický potenciál standardních ředění; vyšší koncentrace nebo delší doba kontaktu může způsobit podráždění slizničních membrán nebo pokožky. • Může být použit v přítomnosti aniontových čistících prostředků. • Není ovlivněn tvrdostí vody. • Levný • Baktericidní aktivita je snížena s rostoucím pH, nižšími teplotami a v přítomnosti amoniaku a dusíku, což je důležité zvážit při přítomnosti moči. Také je inaktivována kationtovými čistícími prostředky, světlem a některými kovy. • Plynný chlor může vznikat při smíchání s jinými chemikáliemi. Silná oxidační/bělící aktivita, která může zničit látky a má korozivní účinky na kovy jako stříbro a hliník (ne nerozovou ocel). • Omezená stabilita pro pro uskladněné roztoky

pokračování

Kvartérní amoniové sloučeniny (KAS) *Primární dezinfekce povrchů používaná ve FVM (bodová dezinfekce ale i celková dezinfekce prostředí)* *Ředění:10 gramů na litr vody je 1% roztok* *Rozprašovač: 5 ml prášku (5 gramů) přidaných do 500 ml vody (1% roztok)* *Kontaktní čas: nejméně 15 minut*	Střední	• Mycoplasma: účinný • Mycobacteria: variabilní • Gram+ bakterie: velmi účinný • Gram- bakterie: účinný • *Pseudomonas* : žádná aktivita • Rickettsie: omezená aktivita • Obalené viry: omezená aktivita • Chlamydiaceae: žádná aktivita • Neobalené viry: omezená aktivita • Spóry plísní: omezená aktivita • Bakteriální spory: žádná aktivita • Kryptosporidie: žádná aktivita • Priony: žádná aktivita	• Široké spektrum. • Podráždění a toxicita jsou mezi produkty variabilní , obecně jsou ale tyto sloučeniny v typických ředěních nedráždivé a mají nízkou toxicitu. • Inaktivované aniontovými čistícími prostředky • Zbytková aktivita po vysušení • Více účinné v zásaditém pH • Méně účinné v nízkých teplotách • Stabilní při skladování • Inaktivované tvrdou vodou • Inaktivované mýdly/čistícími prostředky
Oxidační činidla: Hydrogen peroxid *Používaný pro dezinfekční mlžení a dezinfekční koupel nohou na klinice velkých zvířat* *Ředění: 10 gramů na litrvody je 1% roztok* *Rozprašovač: 5 ml prášku (5 gramů) přidaných do 500 ml vody (1% roztok)* *kontaktní čas: nejméně 15 minut*	Variabilní ve třídě; velmi dobrá pro peroxymonosulfát a urychlený hydrogen peroxid	• Mycoplasma: velmi účinný • Mycobacteria: účinný • Gram+ bakterie: velmi účinný • Gram- bakterie: účinný • *Pseudomonas* : účinný • Rickettsie: účinný • Obalené viry: účinný • Chlamydiaceae: účinný • Neobalené viry: omezená aktivita • Spóry plísní: omezená aktivita • Bakteriální spory: účinný • Kryptosporidie: omezená aktivita • Priony: žádná aktivita	• Široké spektrum • Produkty mají velmi nízký toxický potenciál, mohou ale způsobit podráždění kůže skrze sušení obzvlášť jako prášek nebo v koncentrovaných roztocích • Ostatní složky, které nejsou používané v FVM mohou být velmi toxické (např. oxid chloričitý) • Žádný škodlivý rozklad produktů • Zbytková aktivita na povrchy • Slabá rozpustnost lipidů • Méně aktivní při nízkých teplotách • Korozivní na ocel, železo, měď, mosaz, bronz, vinyl • Přidání prášku do vody pomáhá při míchání. • Při přípravě roztoku mějte nasazenou masku a gumové rukavice, abyste se vyhnuli podráždění.
Fenoly *Používané pouze pro dezinfekci nástrojů a pitevní oblasti, které mohou být kontaminované priony (např. bovinní spongiformní encefalopatie, chronické chřadnutí a klusavka).*	Velmi dobrá	• Mycoplasma: velmi účinný • Mycobacteria: variabilní • Gram+ bakterie: velmi účinný • Gram- bakterie: velmi účinný • *Pseudomonas* : velmi účinný • Rickettsie: účinný • Obalené viry: účinný • Chlamydiaceae: omezená aktivita • Neobalené viry: omezená aktivita • Spóry plísní: účinný • Bakteriální spory: žádná aktivita • Kryptosporidie: žádná aktivita • Priony: omezená aktivita, variabilní mezi sloučeninami	• Široké spektrum • Dráždivý potenciál je mezi sloučeninami v této třídě variabilní, ale fenolické dezinfekční produkty jsou obecně považovány za vysoce dráždivé a neměly by být používány na povrchy v kontaktu s pokožkou nebo sliznicí. • Koncentrace přes 2% jsou pro zvířata vysoce toxické obzvlášť pro kočky. • Aktivita není ovlivněna tvrdostí vody • Zbytková aktivita po sušení • Účinné v širokém rozsahu pH • Nekorozivní • Stabilní při skladování

Appendix 02 Dilution of disinfectants

Ředění dezinfekčních prostředků

Dávkovací tabulka

Množství pracovního roztoku	Koncentrace									
	0,25%	0,50%	0,80%	1%	1,50%	2%	3%	4%	5%	10%
1 l	2,5	5	8	10	15	20	30	40	50	100
2 l	5	10	16	20	30	40	60	80	100	200
3 l	7,5	15	24	30	45	60	90	120	150	300
4 l	10	20	32	40	60	80	120	160	200	400
5 l	12,5	25	40	50	75	100	150	200	250	500
6 l	15	30	48	60	90	120	180	240	300	600
7 l	17,5	35	56	70	105	140	210	280	350	700
8 l	20	40	64	80	120	160	240	320	400	800
9 l	22,5	45	72	90	135	180	270	360	450	900
10 l	25	50	80	100	150	200	300	400	500	1000
Množství dezinfekčního přípravku v ml (koncentrát) nebo g (prášek)										

ŘEDĚNÍ DEZINFEKČNÍCH PROSTŘEDKŮ

- Výpočet pomocí vzorce:

$$X = \frac{\textbf{Požadované množství x požadovaná koncentrace}}{\textbf{Výchozí koncentrace dezinfekčního prostředku}}$$

- Příklad: příprava 1 litru 0,5% Persterilu z 10%

$$\frac{1000\text{ml} \times 0{,}5}{10} = 50\text{ml}$$

- 50 ml 10% Persterilu + 950 ml vody = 1l 0,5% roztoku Persterilu