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GUIDELINES FOR VETERINARY PERSONAL BIOSECURITY

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Preface

Hendra virus and Australian bat lyssavirus have caused tragic deaths of people in Australia in recent years. Veterinary personnel are at risk of infection from a variety of infectious diseases, especially those caused by zoonotic pathogens. Recent cases of Q fever infections in small animal practice employees and research revealing a high incidence of MRSA infection in Australian veterinarians (Jordan et al. 2011) underline the need for high standards of infection control to lower the risk of zoonotic diseases for veterinary workers.

These guidelines are designed specifically to help veterinary personnel reduce their risks of acquiring a zoonotic disease from an animal. Following the guidelines recommendations will also ensure that infection is not spread between animals through a human intermediary. This is not designed to be a comprehensive manual for all aspects of infection control, though the need for an infection control plan for every veterinary practice is highlighted. There is also a model infection control plan in Appendix 1.

Two primary sources have been drawn upon:

- Canadian Committee on Antibiotic Resistance, 2008, *Infection Prevention and Control Best Practices for Small Animal Veterinary Clinics*.
- NASPHV Veterinary Infection Control Committee, 2010, 'Compendium of veterinary standard precautions for zoonotic disease prevention in veterinary personnel', *JAVMA*, vol. 237, pp. 1403-1422.

Other selected references have been used to provide insight into specialised procedures, or to give background for approaches to zoonotic disease prevention.

This third edition of the guidelines has reviewed and updated the second edition.

The second edition was produced by a working group in consultation with a broader review panel. New additions included more detailed information on Q fever and MRSA infection in veterinary settings. The working group also made amendments to increase ease of reading and accessibility for all practice staff, such as adding a summary of the key guidelines messages in the Executive Summary and Resources 1a and 1b. Content was edited and streamlined to improve communication of the main issues and still directing readers to sources of additional detailed information in appendices.

The AVA would also like to acknowledge and thank Dr Matt Playford, Dawbuts Pty Ltd, for his invaluable contribution to the development of the first edition of these guidelines.

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DISCLAIMER:

These guidelines aim to combine a review of the available evidence with current clinical practice. They are designed to provide information based on the evidence available at the time of publication to assist in preparation of personal biosecurity plans and decision-making. The Australian Veterinary Association gives no warranty that the information contained in this document and any online updates available on the AVA website is correct or complete.

Infection prevention and control guidelines are necessarily general and are not intended to be a substitute for a veterinarian's professional judgment in each case. The Australian Veterinary Association shall not be liable for any loss whatsoever whether due to negligence or otherwise arising from the use of or reliance on this document.

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1. Executive summary

These guidelines provide a practical manual for veterinarians and animal handlers on how to reduce their risk of contracting an animal disease (zoonotic disease) as a result of working with animals.

They also provide valuable guidance on infection control procedures for veterinary practices of all types, and offer a simple approach to developing an infection control plan appropriate to each practice's circumstances. They are inclusive of the clinic environment as well as when veterinarians undertake farm visits and house calls.

The *Guidelines for Veterinary Personal Biosecurity* complement other more detailed guidelines, such as the *Guidelines for veterinarians handling potential Hendra virus infection in horses* published by Biosecurity Queensland and the Hendra virus infection resource kit published by the Queensland Government's Hendra Virus Interagency Technical Working Group.

The first sections provide essential background information about zoonoses and how they are transmitted in the Australian context.

Sections 3 and 4 explain infection control and the basic processes relevant to veterinary practice such as personal protective actions and equipment, protection strategies during specific veterinary procedures such as dentistry and obstetrics, and environmental infection control through strategies such as isolation and disinfection.

High risk veterinary procedures are given a separate section. The process of risk management is explained, and the sequence of events set out for attendance at a high risk site visit.

The section on employee health explains record keeping, immunisations, training and issues relating to immunocompromised and pregnant personnel.

The final section explains that every veterinary practice needs its own infection control plan. A model infection control plan for adaptation and implementation by individual practices is included in Appendix 1.

Other appendices contain important background or detailed information about zoonotic and other diseases relevant to the Australian veterinary profession and their modes of transmission. Appendix 3 sets out the current state of knowledge on particular emerging or reemerging zoonotic disease risks for veterinary personnel such as Q fever and MRSA. Appendix 7 lists a selection of additional sources of information about the topics covered in these guidelines. There is detailed information about disinfectant selection in Appendix 4 and Appendix 5, while Appendix 6 contains information about the types of respirators available in Australia and how to fit them.

A set of seven practical resources is included with these guidelines. They contain information from the guidelines summarised as wall posters or checklists for quick and frequent reference by veterinary personnel.

Figure 1 summarises the main key points of these guidelines, and Resource 1 is a version suitable for display in veterinary practices. There is a version for mixed veterinary practices (Resource 1a) and one for small animal practices (Resource 1b).

How to protect yourself from animal diseases

- // All veterinary practices should have a written infection control plan
- // Hand hygiene is not an optional extra (Resource 2)
 - Wash and dry or use hand rub
 - Before and after significant patient contact or contamination
 - Gloves are not a substitute for hand hygiene (Resource 4)
- // Protective outerwear should be worn at all times in the clinic
- // Dirty overalls should not be worn inside the practice
- // Practice vehicles should carry water, sharps container and hand rub (Resource 5)
- // Special protective equipment is required for dental and obstetric procedures (Resource 7)
- // Never resuscitate an animal by direct contact
- // Remember to advise owners how to protect themselves from any risks

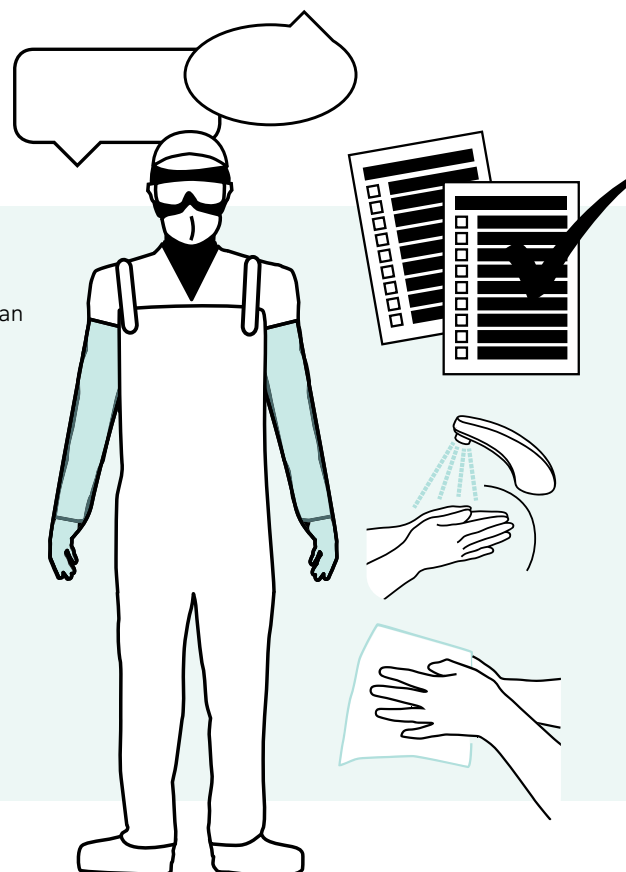


Figure 1: How to protect yourself from animal diseases



2. Introduction

2.1 Background and objectives

People and animals live together in close proximity and are mutually dependent across the globe.

However a wide variety of agents can be transferred from animals to humans, and interactions between animals and humans may occasionally result in infection. It is estimated that of the 1,415 agents causing disease in humans, 868 (61%) are zoonotic (capable of transferring between humans and animals). Moreover, of the 175 pathogens defined as emerging infections, 75% are zoonotic (Taylor et al. 2001; Jones et al. 2008).

Veterinarians, their staff and clients are at greater risk of acquiring or transmitting zoonotic disease due to their extended contact with animals.

Recent cases of sickness and deaths among veterinarians and animal handlers have highlighted the grave danger of emerging and established zoonoses for those who treat and investigate animal diseases.

In particular, the death of four people between 1994 and 2016, including two veterinarians, from the previously unknown Hendra virus infection in Queensland is a solemn reminder of this risk (Biosecurity Queensland 2010; Hanna et al. 2006).

These guidelines provide a practical understanding of zoonotic diseases, and empower veterinarians to significantly reduce the risk of zoonotic infection to themselves, their staff or clients.

It is not practical or possible to eliminate all risks associated with zoonotic infections. However, reasonable measures can be taken to minimise risks of exposure to known pathogens (Lipton et al. 2008).

These guidelines should be adapted to individual practice and workplace settings, and should be considered alongside state and federal legislation relating to workplace health and safety. The approach should incorporate hand hygiene, personal

protective equipment, procedures to avoid contamination of premises and equipment, safe systems of work to protect against infection risks and protocols for preventing exposure to pathogens. These should be backed up by appropriate education, administrative procedures, staff vaccination and environmental control measures (NASPHV Veterinary Infection Control Committee 2008).

Employers have an ethical and legal duty of care to ensure health and safety for all in the workplace. There is also a high cost to veterinary businesses of sickness and injury from exposure to zoonotic and other pathogens, along with associated animal welfare issues and losses due to damage to reputation and litigation. Workplace health and safety practices should be combined with client education to emphasise the importance of routine measures such as vaccination, preventive worming, and hygiene in minimising disease risk to veterinarians, handlers and owners.

These guidelines focus primarily on preventing zoonotic disease in humans involved in the veterinary care and investigation of animals.

By following the recommendations in these guidelines, the risk of infection between animals through the actions of a human intermediary will also be reduced.

These guidelines do not address the whole spectrum of infection control in veterinary settings, particularly preventing infection through direct contact between animals.

However, all veterinary practices should have a written infection control plan that addresses these additional risks. There is a model infection control plan included in Appendix 1 of these guidelines.



See Appendix 1 for a model infection control plan for veterinary practices





3. Zoonotic disease transmission

This section is adapted from the Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel (NASPHV Veterinary Infection Control Committee 2010).

 See Appendix 2 for details of zoonotic diseases of importance to Australian veterinarians.

Transmission of infections requires three elements: a source of pathogens, a susceptible host, and a means of transmission for the microorganism (Garner 1996).

3.1 Source

Sources of zoonotic diseases include animals or environments contaminated by animals. Pathogens may be transmitted to humans directly from the animal via blood or other body substances or indirectly from the animal's environment.

3.2 Host susceptibility

Animals may be clinically ill, asymptomatic carriers of an infectious agent, harbour endogenous flora that are pathogenic to humans, or in the incubation period of an infectious disease. Pathogens may also be transmitted indirectly from fomites in the environment including walls, floors, counters, equipment, supplies, animal feed, and water.

Host resistance to pathogenic microorganisms varies greatly. Some people may be immune to infection or may be able to resist colonisation by an infectious agent. Others exposed to the same agent may become asymptomatic carriers while still others may develop clinical disease. Host factors such as age, underlying diseases, immunosuppression, pregnancy, and breaks in the body's first-line of defence mechanisms (intact skin, cough reflex, low stomach pH) may render a host more susceptible to infection or to more serious illness if infected. Conversely, vaccination or prior exposure may reduce susceptibility to infection.

3.3 Routes of transmission

Transmission occurs through four main mechanisms; contact, droplet, airborne and vector-borne. The same agent may be transmitted by more than one route. Transmission is largely influenced by the stability of the pathogen, its virulence, and the routes by which it leaves the infected host. Different agents vary in their degree of infectivity through the various routes.

Contact transmission

This can occur when pathogens from animals or their environments enter the human host through ingestion, mucous membranes, or cutaneous/percutaneous exposure. Direct contact transmission may occur during activities such as examining, medicating, bathing, and handling animals. Indirect contact transmission involves contact with a contaminated intermediate object (fomite), such as occurs during cleaning cages and equipment and handling soiled laundry. Injuries from contaminated sharps, such as scalpel blades, needles, and necropsy knives, may result in exposure to live vaccines

and pathogens. In addition, injury from sharps increases risk of exposure to other pathogens through direct and indirect contact (Garner 1996).

Droplet transmission

Droplet transmission results from contamination of mucous membranes by splashes, spray and spatter. Transmission over short distances occurs when droplets created by coughing, sneezing, vocalising, or procedures such as suctioning and bronchoscopy, are propelled through the air and deposited on the host's conjunctivae, nasal or oral mucosa.

Risk controls includes personal protective equipment (PPE) to protect mucous membranes such as face shields, surgical masks and safety eyewear.

Airborne transmission

Airborne transmission occurs when pathogens from animals or their environments travel via the air and enter the human host through inhalation. The infectious agents can be contained in contaminated dusts and fine aerosols. Risk controls include ventilation controls and respiratory protection.

Certain pathogens may remain infective over longer distances (Garner 1996; Lenhart et al. 2004). However, defining the infective distance is difficult because it depends on particle size, the nature of the pathogen, and environmental factors (Lenhart et al. 2004). Although data are not available to define specific infection risk from airborne transmission for most pathogens, some pathogens known to be transmitted by airborne transmission over longer distances include *Coxiella burnetii* (Q Fever) (Acha and Szyfres 2003; Marrie 1998; McQuiston & Childs 2002) and *Mycobacterium bovis* (bovine tuberculosis - not present in Australia since 1997) (Nation et al. 1999).

Vector-borne transmission

Vectors such as mosquitoes, fleas, ticks, rats, and other animals may transmit microorganisms. Animals may bring fleas and ticks into contact with veterinary personnel. Veterinary personnel working in outdoor settings may be at risk for diseases carried by arthropods and other biological vectors.

3.4 Emerging zoonotic diseases

In the last 25 years, a number of previously unknown zoonotic diseases have been identified in animals in Australia, including Hendra virus (1994), Australian bat lyssavirus (1996) and Menangle virus (1997).



In addition, enzootic infections with zoonotic potential, such as babesiosis and leishmaniosis (2003), have recently been reported for the first time in animals or humans in Australia.

Practitioners should be aware of the possibility of seeing a previously unknown disease in an animal, or a known disease in a new animal species, and take appropriate precautions to prevent transmission to veterinary practice staff. Hypothetical examples might be a clinical Hendra case in a dog, or *Mycobacterium ulcerans* infection in a ferret.


In the event of such an occurrence, veterinarians should contact the Emergency Animal Disease hotline on 1800-675-888 or the equivalent state telephone service for advice. All practice staff, including those not at work at the time of the incident, should be advised of the incident and the differential diagnosis. This can then be communicated to the treating doctor if any staff member falls ill.

 See Appendix 3 for further details of specific emerging zoonotic disease risks to Australian veterinarians.

4. Hierarchy of infection control measures

This section is adapted from *Infection prevention and control best practices for small animal veterinary clinics* (Canadian Committee on Antibiotic Resistance 2008).

 National infection control recommendations for health care professionals are found in *Australian guidelines for the prevention and control of infection in healthcare 2010* at www.nhmrc.gov.au/node/30290.

 National guidelines for control of emergency animal diseases are found in the Australian Veterinary Emergency Plan (AUSVETPLAN) at www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/.

Australian workplace health and safety legislation sets out a hierarchy of six levels of control to manage risks in the workplace - elimination, substitution, isolation, engineering controls, administrative controls and the use of personal protective equipment (PPE).

4.1 Elimination

This highest level of controls completely eliminates the risk. In relation to zoonotic diseases, this means removing all risk of infection. An example in veterinary practice would be to eliminate risks from Australian bat lyssavirus by immediately referring an injured flying fox to a wildlife specialist for treatment.

4.2 Substitution

The next level of risk controls involves substituting a safer alternative to reduce the risk - for example, removing scalpel blades with an automated scalpel blade removal device rather than with forceps.

4.3 Isolation

This involves limiting contact with hazards. Some examples from veterinary practice include isolating animals with contagious zoonoses and disposing of sharps in an appropriate sharps container.

4.4 Engineering controls

These are built into the design of a facility (e.g. room design, sink placement, and air quality and air handling systems). Infection prevention and control professionals can assist in the design and planning of new facilities or upgrading 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.

4.5 Administrative controls

These measures include staff vaccination programs, protocols for infection control such as hand hygiene or reprocessing equipment, and providing staff with information, instruction, training and supervision to ensure health and safety. Measures also include appropriate communication with state authorities when a notifiable disease is suspected (Evers 2008) or a work-related injury or illness has taken place.

4.6 Personal protective equipment

Although very important, personal protective equipment (PPE) is really an adjunct to other means 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 practice 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. PPE should be considered an essential line of defence for hazards that cannot be overcome with other preventative measures.

PPE may include outerwear (such as lab coats, surgical gowns, overalls, boots and hats), examination or surgical gloves, surgical masks, respirators, protective eyewear and face shields.



5. Veterinary standard and transmission-based precautions

Veterinary standard precautions should be 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.

5.1 Standard precautions

Hand hygiene

 Resource 2 is a wall poster of hand hygiene basics

- // Hand hygiene is the most important way to prevent the spread of infection.
- // Gloves are not a substitute for hand hygiene.
- // Hand hygiene should be performed before and after each patient, after activities likely to cause contamination, before eating, drinking or smoking, after leaving clinical areas and after removing gloves.
- // A mild liquid handwash (with no added substances that may cause irritation or dryness) should be used for routine handwashing, especially when hands are visibly dirty or contaminated.
- // Skin disinfectants formulated for use without water (e.g. alcohol-based hand rub) may be used when hands appear clean.

Intact skin is a natural defence
against infection

Hand hygiene is generally considered to be the most important measure in preventing the spread of infection in health care establishments (Larson 1996). Veterinary clinic staff should perform hand hygiene before and after significant contact with any patient and after activities likely to cause contamination. Significant patient contact may include:

- // contact with, or physical examination of, an animal
- // cleaning cages, equipment or bedding
- // undertaking venepuncture or giving an injection.

Activities that can cause contamination include:

- // handling equipment or instruments soiled with blood or other body substances
- // handling laundry, equipment and waste
- // contact with blood, body substances and contaminated fomites.

All veterinary personnel should perform hand hygiene between examinations of individual animals or animal groups, such as litters of puppies or herds of cattle. Every exam room should have a sink with running water, a liquid soap dispenser, and paper towels. Alcohol-based hand rubs should also be provided for use in conjunction with handwashing.

Refillable containers are a potential source of contamination as bacteria can multiply within many products. Liquid handwash dispensers with disposable cartridges, including a disposable dispensing nozzle or sensors for movement activated delivery, are recommended. Special attention should be taken to clean pump mechanisms before refilling as these have been implicated as sources of infection (Barry et al. 1984; Archibald et al. 1997; Sartor et al. 2000). Scrub brushes should not be used: they can cause abrasion of the skin, and may be a source of infection (Kikuchi-Numagami et al. 1999).

- // Bar soaps are not acceptable in veterinary practice
- // Liquid or foam soap should be dispensed in a disposable pump or sensor-delivered dispenser
- // Soap containers should not be refilled without being cleaned, since there is a risk of contamination
- // Antibacterial soaps should be used in critical areas such as ICU, and in other areas where invasive procedures are performed
- // Dry hands with a disposable towel after washing



Table 1 summarises handwashing techniques for routine, aseptic (nonsurgical) and surgical procedures and includes examples for each level of handwashing.

Table 1: Handwashing techniques

Level	Washing technique	Duration	Drying	When needed
Routine handwash	<p>Remove jewellery</p> <p>Wet hands thoroughly and lather vigorously using neutral pH liquid handwash</p> <p>Rinse under running water</p> <p>Do not touch taps with clean hands - if elbow or foot controls are not available, use paper towel to turn taps off</p>	At least 15 seconds	Pat dry using paper towel, clean cloth towel, or a fresh portion of a roller towel	<p>Before eating and/or smoking</p> <p>After going to the toilet</p> <p>After contact with animals</p> <p>Before significant contact with patients (eg physical examination, emptying a drainage reservoir such as a catheter bag)</p> <p>Before injection or venepuncture</p> <p>Before and after routine use of gloves</p> <p>After handling any instruments or equipment soiled with blood or body substances</p>
Aseptic procedures	<p>Remove jewellery</p> <p>Wash hands thoroughly using an antimicrobial skin cleaner</p> <p>Rinse carefully</p> <p>Do not touch taps with clean hands - if elbow or foot controls are not available, use paper towel to turn taps off</p>	1 minute	Pat dry using paper towel	Before any procedures that require aseptic technique (such as inserting intravenous catheters)
Surgical wash	<p>Remove jewellery</p> <p>Wash hands, nails and forearms thoroughly and apply an antimicrobial skin cleaner (containing 4% w/v chlorhexidine) or detergent based povidone-iodine containing 0.75% available iodine or an aqueous povidone-iodine solution containing 1% available iodine</p> <p>Rinse carefully, keeping hands above the elbows</p> <p>No-touch techniques apply</p>	First wash for the day 5 minutes; subsequent washes 3 minutes	Dry with sterile towels	Before any invasive surgical procedure

Table 1 is from *Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting*, used with permission from the Australian Government.



Alcohol-based hand rub can be used when the hands are clean and there is no obvious contamination from body substances. It is also useful in emergency situations where there may be insufficient time or where handwashing facilities are inadequate.

Visible soil should be removed by some means (e.g. rinsing, mechanical rubbing or wipes) before use of alcohol-based hand rubs. Veterinary personnel should wash their hands as soon as appropriate facilities become available. Veterinary vehicles should be equipped with alcohol-based hand rub, soap, water and hand towels for drying.

Hand care is important because intact skin (with no cuts or abrasions) is a natural defence against infection. Any breaks or lesions of the skin are possible sources of entry for pathogens (Larson 1996). Rings should not be worn, nails should be short and clean, and artificial nails should not be worn, as they contribute to increased bacterial counts (Larson 1996). Chipped nail polish can also contribute to microbial growth. Rings or artificial nails should not be worn when performing invasive procedures (i.e. where gloved hands are placed inside body cavities).


Repeated handwashing and wearing of gloves can cause irritation or sensitivity, leading to irritant or allergic contact dermatitis. This can be minimised by early intervention, including assessment of handwashing technique, the use of suitable individual-use hand creams and appropriate selection of gloves (eg. low protein, powder-free latex gloves).

To minimise chapping of hands, use warm water and pat hands dry rather than rubbing 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 or weeping dermatitis should seek medical advice and should be removed from direct patient care until the condition resolves.

Hand care products marketed in Australia that claim a therapeutic use are generally either listed (AUST L) or registered (AUST R) on the Australian Register of Therapeutic Goods and must display the AUST L or AUST R number, respectively, on the label. Registered products are assessed for safety, quality and efficacy. Listed products are reviewed for safety and quality. Labelling is part of this regulatory system, and should be checked to determine the product's suitability, as some hand creams are not compatible with the use of chlorhexidine.

Aqueous-based hand creams should be used before wearing gloves. Oil-based preparations should be avoided, as these may cause latex gloves to deteriorate.

 Refer to Appendix 5 for appropriate skin disinfectants

 Information is also available on the Hand Hygiene Australia website at www.hha.org.au. It includes useful resources for staff in hand hygiene, especially a simple and quick online training resource

Aseptic non-touch technique

Aseptic non-touch technique is designed to ensure that hands, even if washed, do not contaminate sterile equipment or patients. This can be achieved by the use of sterile gloves or forceps. The technique complements other procedures like the wearing of gowns and its use in any situation should be based on a risk assessment of that situation and the options available.

Further information is available in the *Australian guidelines for the prevention and control of infection in healthcare* (NHMRC 2010).

Sharps safety

The basic principles of sharps safety are:

- // The person who generates the sharp is responsible for its safe disposal
- // Don't pass sharps by hand between people
- // Replace sharps containers when $\frac{3}{4}$ full
- // Keep sharps containers out of the reach of children
- // Avoid recapping needles unless absolutely necessary.

All veterinary vehicles
should have a secure and conveniently
located sharps container for disposal
of needles, scalpels and other
sharp objects immediately after use

Needlestick injury prevention

Needlestick injuries are among the most prevalent accidents in the veterinary workplace (Poole et al. 1998, 1999). The most common needlestick injury is inadvertent injection of a vaccine (Langley et al. 1995; Hafer et al. 1996; Wilkins & Bowman 1997). In a 1995 survey of 701 North Carolina veterinarians, 27% of respondents had accidentally self-inoculated rabies vaccine and 7% (23% of large animal veterinarians) live *Brucella* vaccine (Langley et al. 1995). Needle punctures sustained during procedures such as fine-needle aspiration are potential sources of zoonotic pathogens (Ramsey 1994). Similar risks are presented by ovine John's disease and anthrax vaccines in Australia.

The most important precaution is to avoid recapping needles. Recapping causes more injuries than it prevents (US Department of Labor Occupational Safety and Health Administration 2006). When it is absolutely necessary to recap needles as part of a medical procedure or protocol, a mechanical device such as forceps can be used to replace the cap on the needle or the one-handed "scoop" technique may be employed (Cornell Center for Animal Resources and Education 2006). This technique involves holding the syringe with the attached needle or the needle hub alone (when unattached) and scooping or sliding the cap, which is lying on a horizontal surface, onto the needle's sharp end. Once the point of the needle is covered, the cap is tightened 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.

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 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. 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 (Brody 1993; Grizzle & Fredenburgh 2001; Seibert 1994). Sharps should not be transferred from one container to another. Devices that cut needles prior to disposal should not be used because they increase the potential for aerosolisation of the contents (Seibert 1994).

Barrier protection

Gloves should be worn during venipuncture on animals suspected of having an infectious disease and when performing soft tissue aspirations. Currently, there is no data indicating that venipuncture on healthy animals carries a significant risk of infection, but as a standard practice, gloves should be worn if there is a chance of contact with blood.

Other safety engineered medical devices that may be utilised include scalpel blade removal devices, retractable needles, needle-free IV access systems, safety intravenous cannula and safety blood collection sets.

Personal protective equipment

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 transmission of pathogens between patients by 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.

This should occur as a routine practice, rather than based on professional judgement.

Table 2 (page 19) lists risk and protection levels with recommended PPE and decontamination procedures. Appendix 2 (page 31) lists zoonotic disease of importance in Australia and means of transmission. Appendix 5 (page 44) provides guidelines for respiratory protection.

Staff should be trained in the correct use of PPE, the correct sequence for putting on and removing each piece of equipment and associated hand hygiene. Figure 2 (pages 10-11) describes correct usage.

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.

Lab coats and overalls

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

Lab coats and overalls 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 blood or body substances is anticipated. These garments should be changed promptly whenever they become visibly soiled or contaminated with body substances, and at the end of each day. Overalls should be changed between properties when visiting farms.

Protective outerwear, including scrubs, should not be worn outside the clinic. Overalls worn in the field should not be worn inside the clinic or home

Lab coats worn in the clinic should not be worn outside of the work environment, while overalls used on farms should not be worn inside. Lab coats and overalls worn when handling patients with potentially infectious diseases should be laundered after each use, because it is almost impossible to remove, store and reuse a contaminated garment without contaminating hands, clothing or the environment.

Scrubs

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. Staff should be aware that taking scrubs home for washing could potentially transfer pathogens from clinic to home. If scrubs are brought home, they should be kept in a plastic bag until being placed in the washing machine, and washed separately from other laundry. Scrubs should be washed on-site in hot water and detergent, with other clinic laundry. Larger clinics should consider supplying separate washing machines for animal laundry (blankets etc.) and scrubs. Scrubs should be washed at the end of each day and whenever they become visibly soiled.

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.

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 substances are present or anticipated e.g. for obstetrical procedures, especially in large animals.

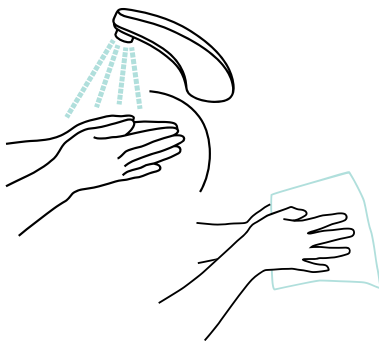
Disposable gowns should not be reused, and reusable fabric gowns should be laundered after each use, because storing and reusing contaminated gowns inevitably leads to contamination of hands, clothing or the environment. Gloves should be worn whenever gowns are worn. Gowns (and gloves) should be removed and placed in the garbage or laundry bin before leaving the animal's environment, and hands should be washed immediately afterwards.

Personnel should be taught to remove gowns properly, in such a way as to avoid contaminating themselves and the environment (Figure 2). 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 substances soaked through the gown, promptly remove the contaminated underlying clothing and wash the skin.

Figure 2: Sequence for putting on and removing PPE

Sequence for putting on PPE



1. HAND HYGIENE

- // Perform hand hygiene



2. GOWN

- // Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
- // Fasten at the back of neck and waist



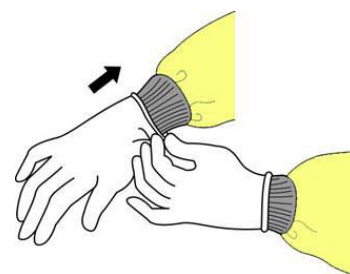
3. MASK

- // Secure ties or elastic bands at middle of head and neck



4. PROTECTIVE EYEWEAR OR FACE SHIELD

- // Place over face and eyes and adjust to fit



5. GLOVES

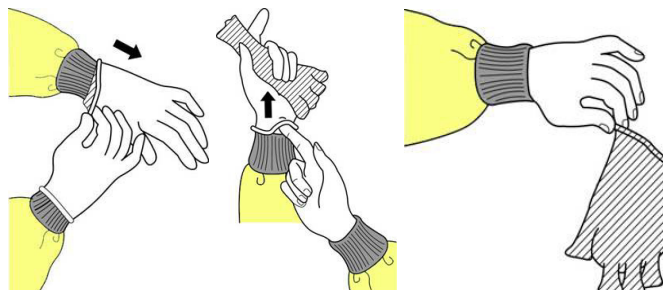
- // Extend to cover wrist of isolation gown



Sequence for removing PPE

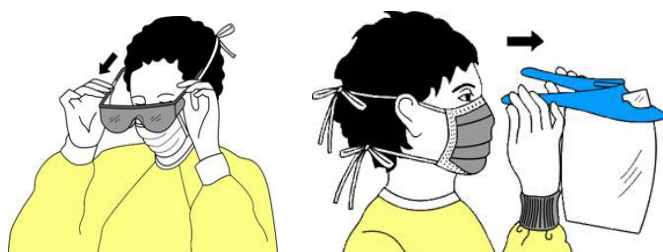
1. GLOVES

- // Outside of glove is contaminated!
- // Grasp outside of glove with opposite gloved hand; peel off
- // Hold removed glove in gloved hand
- // Slide fingers of ungloved hand under remaining glove at wrist
- // Peel glove off over first glove
- // Discard gloves in waste container
- // **Perform hand hygiene**



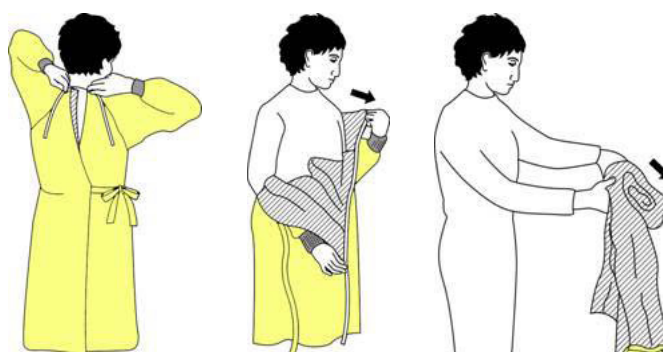
2. PROTECTIVE EYEWEAR OR FACE SHIELD

- // Outside of eye protection or face shield is contaminated!
- // To remove, handle by head band or ear pieces
- // Place in designated receptacle for reprocessing or in waste container



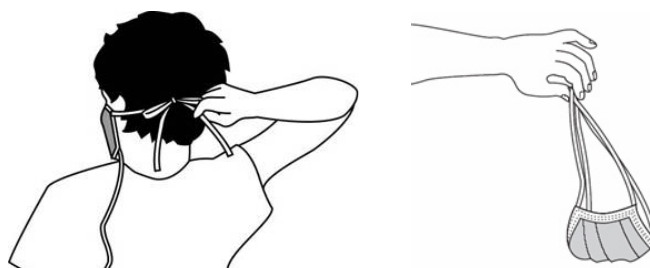
3. GOWN

- // Gown front and sleeves are contaminated!
- // Unfasten ties
- // Pull away from neck and shoulders, touching inside of gown only
- // Turn gown inside out
- // Fold or roll into a bundle and discard



4. MASK

- // Front of mask is contaminated - DO NOT TOUCH!
- // Grasp bottom, then top ties or elastics and remove
- // Discard in waste container



Note that for surgical procedures and dentistry, the sequence for putting on PPE differs. In these situations, masks and protective eyewear are applied first prior to hand preparation. Gown and gloves are then put on.

Figure 1: is from *Australian guidelines for the prevention and control of infection in healthcare*, adapted from www.cdc.gov/hicpac/2007ip/2007isolationprecautions.html, and used with permission.



Gloves

 Resource 4 is a wall poster of the basics of glove use

Gloves are NOT a substitute for proper hand hygiene

Gloves reduce the risk of pathogen transmission by providing barrier protection. They should be worn for contact with an animal's blood, body substances, mucous membranes or non-intact skin. Gloves should also be worn when handling used instruments and equipment, handling clinical waste, cleaning cages and environmental surfaces, as well as when doing laundry.

- // 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 sanitiser 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 washing immediately after removing gloves is essential.
- // Disposable gloves should not be washed and re-used.

Change gloves and perform hand hygiene:

- // when moving from dirty to clean areas on the same animal
- // when moving from dirty to clean procedures on the same animal
- // after contact with blood or body substances between individual animals
- // before touching equipment such as computer keyboards during patient care
- // if gloves become torn or damaged.

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. Low protein powder-free latex gloves will reduce the risk of latex allergy and ensure that the clinic is latex safe if a staff member is known to have a latex allergy.

Latex gloves will decompose and lose their integrity when exposed to many chemicals. If exposure to chemicals such as disinfectants is expected, such as when cleaning and disinfecting cages, disposable nitrile gloves or heavier, reusable rubber gloves like common dishwashing gloves can be used. Reusable gloves should also be cleaned at the end of each task.

Disposable or washable plastic sleeves can be used as an additional measure to prevent contamination of clothes and skin when performing some procedures such as pregnancy testing and obstetrics in large animals.

Other types of gloves used in veterinary practice include bite-resistant gloves and cut-resistant gloves for necropsies. "Double

gloving" or the use of cut resistant glove liners are appropriate where there's a risk of damage to gloves or an increased risk of infection.

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, nebulisation, and wound lavage.

Goggles provide a higher level of protection from splashes than safety glasses. Those who wear prescription glasses should choose a style of safety eyewear that fits comfortably over glasses or consider getting safety glasses or goggles with prescription lenses. Personal glasses and contact lenses do not provide adequate eye protection.

Footwear

In clinic

Enclosed footwear should be worn at all times to reduce the risk of injury from dropped equipment like scalpels and needles, scratches from being stepped on by animals, and to protect the feet from contact with potentially infectious substances (e.g. faeces, discharges and other body substances).

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.

Designated footwear or disposable shoe covers may be required for staff when patients with infectious diseases are kept on the floor (e.g. in a large dog run) or may contaminate the floor around their kennel (such as an animal with severe diarrhoea). Designated footwear should also be used around stables for horses or other animals known to carry infectious diseases such as salmonellosis.

This footwear should 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.

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 transmission of zoonotic diseases to humans.

Washable rubber boots are recommended when conducting field visits. All visible soil should be removed by scrubbing brush and water when leaving each property (NASPHV Veterinary Infection Control Committee 2008). If leather boots are worn on farm they should be cleaned of all visible contaminating material (faeces, dirt, blood, 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 should be worn and cleaned with water and scrubbing brush, then disinfected with a suitable disinfectant solution.



See section 6.1 on risk assessment for the principles of decision-making about appropriate protection for site visits when an infectious disease is suspected.

Water should be carried in the practitioner's vehicle for washing hands and boots and other equipment in case fresh water is not available on farm

Head covers and ear plugs

Disposable head covers provide a barrier when gross contamination of the hair and scalp is expected, and protect the head from blood and other body substances. Disposable head covers should be treated as veterinary waste after use and not be reused.

A washable cotton hat is a suitable head cover when conducting farm visits in low-risk situations. Hats should be washed regularly, or immediately after any contamination with body substances.

Disposable ear plugs should be discarded after use or as soon as there is any sign of contamination with blood or body substances.

Prevention of bites and other animal-related injuries

During their careers, the majority (61%–68%) of veterinarians suffer an animal-related injury resulting in hospitalisation and/or significant lost work time (Langley et al. 1995; Landercasper et al. 1988). These are mainly dog and cat bites, kicks, cat scratches and crush injuries (Lucas et al. 2009).

In a recent study seeking to identify factors associated with increased risk of being bitten by a dog or cat in a veterinary teaching hospital, pets identified with a warning sign or considered more difficult to handle were four to five times more likely than other animals to have bitten a staff member while hospitalised. Yet only 47% of dogs and cats considered likely to bite were muzzled (compared to 12% to 14% of animals considered unlikely to bite) (Drobatz and Smith 2003). Veterinary personnel reliably interpret the behaviours associated with an animal's propensity to bite; their professional judgment should be relied upon to guide bite prevention practices.

Approximately 3% to 18% of dog bites and 28% to 80% of cat bites become infected (Talan et al. 1999). Most clinically infected dog and cat bite wounds are mixed infections of aerobic and anaerobic bacteria. The most commonly isolated aerobes are *Pasteurella multocida* (cats), *Pasteurella canis* (dogs), streptococci, staphylococci, *Moraxella*, and *Neisseria weaverii*. The most commonly isolated anaerobes include *Fusobacterium*, *Bacteroides*, *Porphyromonas*, and *Prevotella*. In addition, rare but serious systemic infections with invasive pathogens including *Capnocytophaga canimorsus*, *Bergeyella zoohelicum*, *Bartonella henselae*, and CDC nonoxidizer 1 group may occur following bites or scratches (Abrahamian & Goldstein 2011; Hara et al. 2002; Kaiser et al. 2002; Le Moal et al. 2003; Shukla et al. 2004; Talan et al. 1999).

Veterinary personnel should take all necessary precautions to prevent animal-related injuries in the clinic and in the field. These may include physical restraints, bite-resistant gloves, muzzles,

sedation, or anaesthesia, and relying on experienced veterinary personnel rather than owners to restrain animals. Practitioners should remain alert for changes in their patients' behaviour.

Veterinary personnel attending large animals should have an escape route in mind at all times (Langley et al. 1995; Neinhaus et al. 2005).



For details of recommended vaccinations, consult the Australian Immunisation Handbook available at www.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook-home

Emergency contact information should be posted in the clinic

Cleaning and disinfection of equipment and environmental surfaces

Proper cleaning of environmental surfaces, including work areas and equipment, prevents transmission of zoonotic pathogens. Environmental surfaces and equipment should be cleaned between uses or whenever visibly soiled (Patterson et al. 2005).

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 (Dwyer 2004). 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 items such 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 sterilisation or chemical or thermal disinfection. Exposure to droplets generated by brushes during cleaning can be minimised 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 hospitalised patients with infectious diseases (Garner 1996), although disposable dishes might be considered for animals hospitalised 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 contact 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.



Disinfectants and sterilants

Sterilants are chemical agents that may be used to sterilise instruments or devices for use in critical sites (entry or penetration into a sterile tissue cavity or the bloodstream).

Instrument-grade disinfectants are further classified as high, low or intermediate level, where the level of activity is defined by the risk associated with specific in-use situations.

High-level instrument-grade disinfectants provide the minimum level of processing for instruments used in semicritical sites (contact with nonsterile mucosa or nonintact skin).

The performance of chemical disinfectants and sterilants is affected by temperature, contact time, concentration, pH, presence of organic and inorganic material, and numbers and resistance of microorganisms present.

Surface disinfectants and sterilants are regulated by the Therapeutic Goods Administration (TGA) under Therapeutic Goods Order No 54 (TGO 54) as sterilants, instrument-grade disinfectants, hospital-grade disinfectants or household/commercial-grade disinfectants.

Chemical disinfectants and sterilants should always be used with care according to the manufacturer's instructions and safety data sheets. Some chemical disinfectants and sterilants are hazardous chemicals and OHS requirements exist for their safe use. For further information contact the relevant OHS authority.

 See Appendix 4 for details of appropriate disinfectant selection

Handling of laundry

Although soiled laundry may be contaminated with pathogenic microorganisms, the risk of disease transmission is negligible if handled correctly (Nordstrom et al 2012; Aureden et al 2010). There have been cases of Q fever being contracted by laundry workers in contact with contaminated clothing. Gloves should always be worn when handling soiled laundry.

Bedding and other laundry should be machine-washed with standard laundry detergent and hot water, and machine dried or hung out to dry in sunlight. To prevent cross-contamination, separate storage and transport bins should be used for clean and dirty laundry. Hand hygiene should be performed after handling used linen.

Decontamination and spill response

Spills and splashes of blood or other body substances should be immediately contained by dropping absorbent material such as paper towels, sawdust or cat litter on them. A staff member should put on gloves and protective clothing (including washable rubber boots or shoe covers if the spill is on the floor and may be stepped in) before beginning the clean-up. A surgical mask with protective eyewear or face shield should be worn if there's a risk of splashes to the face.

The spilled material should be picked up and sealed in leak-proof plastic bags. After the spilled material is removed, the area should be cleaned, and disinfected according to the manufacturer's instructions. Perform hand hygiene after cleaning up the spill. Clients, patients, and employees not involved in the clean-up should be kept away from the area until disinfection is completed (Centers for Disease Control and Prevention 2003).

Clinical waste management

The principles of safe clinical waste management are (NHMRC 2010):

- // segregate clinical waste at point of generation
- // use appropriate receptacle identified by colour and label
- // wear PPE when handling waste
- // perform hand hygiene after handling waste
- // store waste away from public access and protect from vermin.

Veterinary waste is a potential source of zoonotic pathogens if not handled appropriately (Brody 1989, 1993). Clinical waste is defined and regulated at the state level by multiple agencies, but may include sharps, tissues, contaminated materials, and dead animals. It is beyond the scope of these guidelines to describe veterinary medical waste management in detail. Consult with state health departments and municipal governments for guidance. Several private companies provide veterinary waste collection and disposal services (SITA, 2010).

Disposal of bodies should follow guidelines set out in AUSVETPLAN (Animal Health Australia 2015).

Rodent and vector control

Many important zoonotic pathogens are transmitted by rodents or insect vectors. The principles of integrated pest management are central to effective prevention and control (Kogan 1998; Peter et al. 2005). Practices include:

- // Sealing entry and exit points into buildings. Common methods include the use of caulk, steel wool, or lath metal under doors and around pipes.
- // Storing food and garbage in metal or thick plastic containers with tight lids.
- // Disposing of food waste promptly.
- // Eliminating potential rodent nesting sites (such as clutter or hay storage).
- // Maintaining snap traps throughout the practice to trap rodents. These should be checked daily.
- // Removing sources of standing water (empty cans, tyres) from around the building to prevent breeding of mosquitoes.
- // Installing and maintaining window screens to prevent entry of insects into buildings.

Additional measures may be warranted for control of specific pests. Veterinary practices may wish to contact a pest control company for additional guidance.

Other environmental controls

Designated staff areas should be set aside for eating, drinking and smoking. These activities should never occur in patient care or instrument processing areas. Separate refrigerators should be used for human food, animal food, and biologics. Dishes for human use should be cleaned and stored away from animal care areas.



5.2 Transmission-based precautions

Transmission-based precautions are infection control practices that are applied in addition to standard precautions for patients known or suspected to be colonised with infectious agents that require additional control measures to prevent disease transmission. This includes highly transmissible pathogens (e.g. salmonellosis), epidemiologically important pathogens (e.g. Hendra virus) and disease spread by droplet and airborne transmission (e.g. psittacosis).

Transmission-based precautions target the route of transmission of the infectious agent.

Contact precautions include:

- // Animal isolation or quarantine
- // Patient dedicated equipment
- // Enhanced cleaning and disinfection of the animal care environment
- // Restricted transfer of animals within and between facilities
- // Setting up entry and exit decontamination sites
- // Use of insecticides and pest control
- // Additional PPE to prevent contamination of skin, clothing and mucous membranes.

Droplet precautions are:

- // As for contact precautions plus additional PPE to prevent droplets being deposited on mucous membranes (safety eyewear, surgical masks or face shields)

Airborne precautions are:

- // As for contact precautions plus additional PPE to prevent inhalation of contaminated dusts and aerosols (respiratory protection), work practices to minimise aerosols and dusts (e.g. avoid high pressure hose, use damp dusting instead of sweeping, install ventilation controls (e.g. dilution ventilation, local exhaust ventilation, negative pressure air flow).

Droplet precautions

Protection is required against droplet transmission of infectious diseases. Transmission requires close contact because droplets do not remain suspended in the air and generally travel short distances (usually 1 metre or less). Special air handling and ventilation are not required to prevent droplet transmission because droplets do not remain suspended in the air. In addition to standard precautions, use of safety eyewear, surgical masks and face shields will provide a barrier between droplets and mucous membranes.

Airborne precautions

Protection is also required against airborne transmission from droplet nuclei or dust that remain suspended for long periods. This requires personal respiratory protection and special ventilation and air handling.

Respiratory protection is designed to protect the respiratory tract from zoonotic infectious diseases spread by airborne transmission. The P2 rated disposable particulate respirator (also referred to as N95 in the US) is inexpensive, readily available, easy to use and provides adequate respiratory protection against airborne infectious agents in most situations. However, people need to ensure proper placement and be fit-tested to ensure

they are provided with a brand and size of respirator that is most suited to their facial characteristics. Special respirators are required for people with facial hair that could interfere with the respirator seal, including beards. Employers should ensure that all staff should have the medical ability to wear a respirator, in accordance with the current Australian infection control guidelines (NHMRC 2010).

Surgical masks do not provide respiratory protection and are not a replacement for respirators. It is important to perform a fit check every time a respirator is worn.

 Specifications and fitting instructions for Australian respirators can be seen in Appendix 5

Contact precautions

Isolation of animals

Waiting rooms should be a safe environment for clients, animals and employees.

Potentially infectious animals should be placed directly into an exam room or stable. Potentially infectious animals should be examined in this dedicated area and should remain there until initial diagnostic procedures and treatments have been performed. For example, animals with respiratory or gastrointestinal signs, or a history of exposure to a known infectious disease should be asked to enter through an alternative entrance to avoid traversing the reception area (Centers for Disease Control 2003). If they come through the reception area, they should be taken directly into a dedicated area to avoid unnecessary contact with other animals or people.

Patients with a contagious or zoonotic disease should be clearly identified so their infection status is obvious to everyone, including visitors allowed access to clinical areas. Prominent signage should indicate that the animal may be infectious and should outline any additional precautions that should be taken (American Animal Hospital Association 2005; Weese 2002).

Ideally, veterinary practices should have a single-purpose isolation room or stable for caring for and housing contagious patients (American Animal Hospital Association 2005).

Alternatively, a dedicated exam room or stable that can be easily emptied of non-essential equipment, cleaned and disinfected can be transformed into an isolation facility. A mobile cage unit may be brought in for exclusive use by the infectious animal. If an isolation room has negative pressure air handling, air pressures should be monitored daily while in use and the air should be exhausted outside of the building, away from animal and public access areas, employee break areas, and air intake vents (American Animal Hospital Association 2005; Centers for Disease Control 2003; Garner 1996). Ventilation systems must be maintained regularly, and accurate maintenance records kept.

Only the equipment and materials needed for the care and treatment of the patient (including lead ropes and halters) should be kept in the isolation facility. Items intended for use in the isolation facility should remain in this area and duplicate new items purchased for use elsewhere in the hospital. When necessary, items removed from the isolation area should be taken apart, cleaned, and disinfected prior to removal. Use of disposable articles can minimise the need to bring soiled items out of the isolation room. Access to the isolation facility should



be limited and a sign-in sheet should be kept of all people having contact with a patient in isolation (American Animal Hospital Association 2005).

Limited data are available on the efficacy of footbaths. When used, a disinfectant footbath should be placed just inside the door of the isolation area and used before departing the room (American Animal Hospital Association 2005; Morley et al 2005). Footbath disinfectant should be changed daily or when visibly dirty. If shoe or boot coverings are used, personnel should be trained to use, remove, and dispose of them properly.

Depending on the diagnosis and the mode of transmission of the disease, clean (non-sterile) gowns, overalls, shoe covers, gloves, masks and eye protection should be worn when handling an animal with a zoonotic disease. Gloves, masks and respirators should be discarded, but typically the rest of the personal protective equipment (e.g. gown) may be re-used and should remain in the isolation room with the patient. However, if the gown or other protective equipment is contaminated with body substances, it should be replaced.

Protective equipment should be cleaned and disinfected between patients. Potentially contaminated materials should be bagged before transport within the practice and disinfected or disposed of appropriately according to their level of hazard. In many cases, all the materials used in the isolation room would be treated as clinical waste (American Animal Hospital Association 2005; Brody 1993; Weese 2004).

Essential personnel only

Only people who need to be directly involved should remain in the vicinity of a potentially infectious animal or when higher risk procedures such as dentistry or obstetrics are being performed. Appropriate PPE must be worn by all people present including animal owners and handlers.

5.3 Protective actions during veterinary procedures

Veterinary personnel should conduct a risk assessment to determine appropriate precautions for each individual case. Factors that must be taken into consideration include the level of risk of an infectious disease, its characteristics, the vaccination status of people present, and the likelihood and seriousness of possible exposure.

However, standard precautions should be taken as a routine work practice independent of the perceived risk (see section 5.1).

Dental procedures

Dental procedures create infectious aerosols and there is risk of exposure to splashes or sprays of saliva, blood, and infectious particles. There is also the potential for cuts and abrasions from dental equipment or teeth (Holstrom et al. 2005). The veterinary staff performing the dental procedure and anyone in the immediate vicinity (e.g. the veterinary anaesthesiologist) should wear protective outerwear, gloves, mask, and a face shield or goggles. In one study, irrigating the oral cavity with a 0.12% chlorohexidine solution significantly decreased bacterial aerosolisation (Logothetis and Martinez-Welles 1995). A surgical mask will not protect against inhalation of enamel particles.

For equine dentistry, additional precautions include the use of a P2 respirator and cut resistant gloves. This is because of the potential for Hendra virus infected horses to shed the virus in nasopharyngeal secretions during the late incubation period when still asymptomatic. These precautions should be extended to any person in the immediate vicinity such as the horse handler. Dental equipment should be cleaned and sterilised or thoroughly disinfected between every patient.



Resource 7 is a checklist of PPE standards for dental and obstetric procedures

Resuscitations

Resuscitations are particularly hazardous because they may occur without warning and unrecognised or undiagnosed zoonotic infectious agents may be involved.

Barrier precautions such as gloves, mask, and face shield or goggles should be worn at all times.

Never blow into the nose or mouth of an animal or into an endotracheal tube to resuscitate an animal. Instead, intubate the animal and use an ambubag, anaesthetic machine or mechanical respirator.

Obstetrics

Common zoonotic agents, including *Brucella*, *Coxiella burnetii*, *Leptospira* and *Listeria monocytogenes*, may be found in high concentrations in the birthing fluids of aborting or parturient animals, stillborn fetuses, and neonates (Heymann 2008). Note that in Australia the only zoonotic *Brucella* species present is *B. suis* in pigs (Animal Health Australia 2010).

Gloves, sleeves, mask or respirator, face shield or goggles, and impermeable protective outerwear should be used as needed to prevent exposures to potentially infectious materials. During resuscitation, do not blow into the nose or mouth of a neonate.



Resource 7 is a checklist of PPE standards for dental and obstetric procedures

Post mortem investigations

Necropsy is a high-risk procedure due to high potential for contact with infectious body substances, aerosols, and contaminated sharps. Non-essential people should not be present. Everyone present at necropsies should wear gloves, masks, face shields or goggles and impermeable protective outerwear as needed. In addition, veterinarians should use cut-proof gloves to prevent sharps injuries. Respiratory protection (including environmental controls and respirators) should be employed when band saws or other power equipment are used and where airborne infection risks exist e.g. psittacosis, Hendra virus.

Decisions regarding whether to perform necropsy on animals suspected of having a notifiable infectious disease or foreign animal disease should be made in consultation with a government veterinary officer. Diseases of special concern include anthrax, Hendra virus infections, Q fever, pneumonic plague, Rift Valley Fever, rabies, Australian bat lyssavirus, Murray Valley encephalitis, kunjin virus, Japanese encephalitis virus, highly-pathogenic avian influenza and West Nile virus.



Diagnostic specimen handling

Faeces, urine, aspirates, and swabs should be presumed to be infectious. Protective outerwear and disposable gloves should be worn when handling these specimens. Discard gloves and perform hand hygiene before touching clean items (eg. microscopes, telephones, food).

Care should be taken to ensure that specimens for laboratory submission are hygienically and securely sealed so that laboratory, postal or courier personnel are not exposed to potentially infectious agents. Packaging must comply with Australia Post regulations for infectious substances. Specimens carried by road or air may need to comply with the recommendations of the National Pathology Accreditation

Advisory Council (NPAAC) - see www.health.gov.au/npaac and the regulations of bodies such as the International Air Transport Association (IATA) - www.iata.org/Pages/default.aspx

Where veterinary practices have in-house laboratories Australian Standards such as AS/NZS 2243.3:2010 *Safety in Laboratory Standards Part 3 Microbiological aspects and containment facilities* may be applicable.

Although in veterinary practices animal blood specimens have not been a significant source of occupational infection, percutaneous and mucosal exposure to blood and blood products should be avoided.

Eating and drinking should not be allowed in the laboratory.





6. Disease investigation and property biosecurity

Some activities of veterinarians and their staff pose a high risk to their health. This is due to the fact that some zoonotic diseases can transfer from animals to humans under conditions considered to be 'normal'. The consequences may be severe, in that death, serious illness, time off work and long-term disability may result from zoonotic infections.

Veterinarians should be able to identify risk factors, and use extra caution in dealing with 'high risk' activities. See section 5.3 for details of protective measures for high risk veterinary procedures such as dentistry, obstetrics and post mortem investigations. This chapter explains the process of assessing risks for site visits, and provides advice for managing high risks during veterinary visits to properties.

Resource 5 contains a checklist of biosecurity supplies for veterinary vehicles used for site visits

Biosecurity procedures for high risk or very high risk site visits are summarised in Resource 6 for easy reference on-site

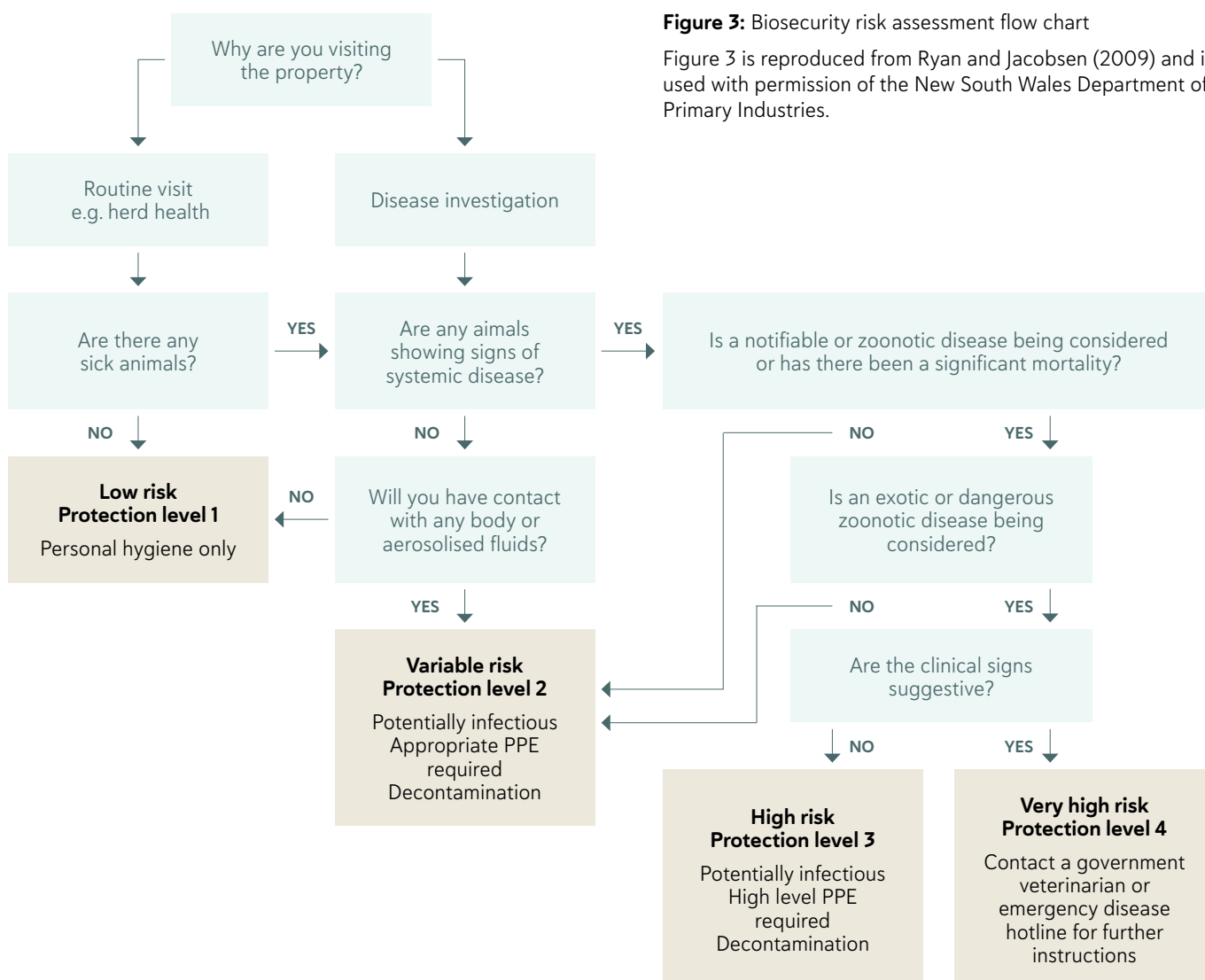
6.1 Risk assessment

Often done as an informal and routine part of veterinary practice, a properly conducted risk assessment is invaluable for identifying and dealing with potential zoonotic infections. This helps determine the PPE and decontamination procedures that should be employed (Ryan & Jacobsen 2009).

When dealing with animal disease at properties there are two main areas of risk:

1. Risk of humans contracting the disease (zoonoses).
2. Risk of the disease spreading from the affected property.

Figure 3 contains a flow chart that guides you through a general risk assessment process that can be used in assessing the risk during a property site visit.





Once the level of risk has been determined, Table 2 can be used as a guide to the appropriate PPE and decontamination procedures. It should be remembered that every situation is different and sound judgement, based on knowledge of the basic principles of infectious disease, should be used.

Table 2: Risk and protection levels relevant to Australian veterinary practice

Risk and protection level	Description	Recommended PPE and decontamination procedure
Low risk Protection level 1	Minimal exposure to infectious material	Personal hygiene measures such as hand washing after contact with each animal or wearing gloves, remove overalls at end of property visit, wash hands, face and boots on exit.
Variable risk Protection level 2	Potential exposure to infectious material	Appropriate PPE and decontamination. This will vary depending on the situation but may include the use of overalls, boots and gloves. Decontamination should involve removal of gross contamination from boots and overalls and hand washing after contact with each animal.
High risk Protection level 3	Potential exposure to infectious material of an exotic or dangerous zoonotic disease	High level PPE and decontamination should be employed. Equipment and procedures as stipulated in notes. Notification to relevant authorities.
Very high risk Protection level 4	Likely exposure to infectious material of an exotic or dangerous zoonotic disease	Contact a government veterinarian for advice on how to proceed. National Emergency Animal Disease Hotline is 1800 675 888.

6.2 Biosecurity sequence of events for property visits at high risk

This section is adapted from Ryan and Jacobsen (2009) and is used with the permission of the New South Wales Department of Primary Industries.

Before going to the property

Ensure you have all the required PPE, sampling and decontamination equipment. Make sure you know what samples are required and are familiar with the case definition for the suspected disease. This information is available from your state government primary industries department.

At the property

When you arrive, park your vehicle outside the property, or outside the 'dirty' area if it is not the property boundary.

1. Identify the 'dirty' area (where the suspected case is located) and the 'clean' area outside this. Select an entry/ exit point between the 'clean' and 'dirty' areas. Designate a small transition area at the entry/exit point where actions will be taken to move back and forth between the 'clean' and 'dirty' areas (see Figure 4).
2. In the 'clean' area lay out all PPE and equipment to be taken with you into the 'dirty' zone. Ensure you have everything you need including overalls, boots, eye protection, mask or respirator, two pairs of gloves, sampling equipment, two plastic bags for samples, disinfectant wipe, stethoscope, thermometer, bucket, soap or detergent and scrubbing brush for gross decontamination. If no water is available in the dirty area you will need to fill the bucket with water now.
3. Set up the transition zone ready for decontamination when you move from the 'dirty' zone back into the 'clean' zone:
 - // Lay out a ground sheet if you have one.
 - // On the 'dirty side', place a footbath full of disinfectant, a bucket and/or spray bottle full of disinfectant, a scrubbing brush and 2 x large plastic bags with ties for waste.
 - // On the 'clean' side place a bucket and/or spray bottle full of disinfectant and 2 x large plastic bags with ties for contaminated PPE.
4. Put on PPE in the following sequence
 - // Wash hands with soap or detergent and water and dry.
 - // Put on overalls.
 - // Put on boots (overall legs go outside boots).
 - // Put on mask or respirator. Check it fits correctly.
 - // Put on eye protection.
 - // Put on cap or hood of overalls if there is one.
 - // Put on two pairs of gloves. Ensure the outer gloves fit snugly over the sleeves of your overalls. If required you can tape the outer gloves to the overall sleeves with duct tape.
5. Pick up sampling equipment, stethoscope, thermometer, bucket, soap or detergent and scrubbing brush and enter the dirty area. Anyone assisting you will require the same PPE.



Figure 4: Diagram of suitable entry and exit decontamination site

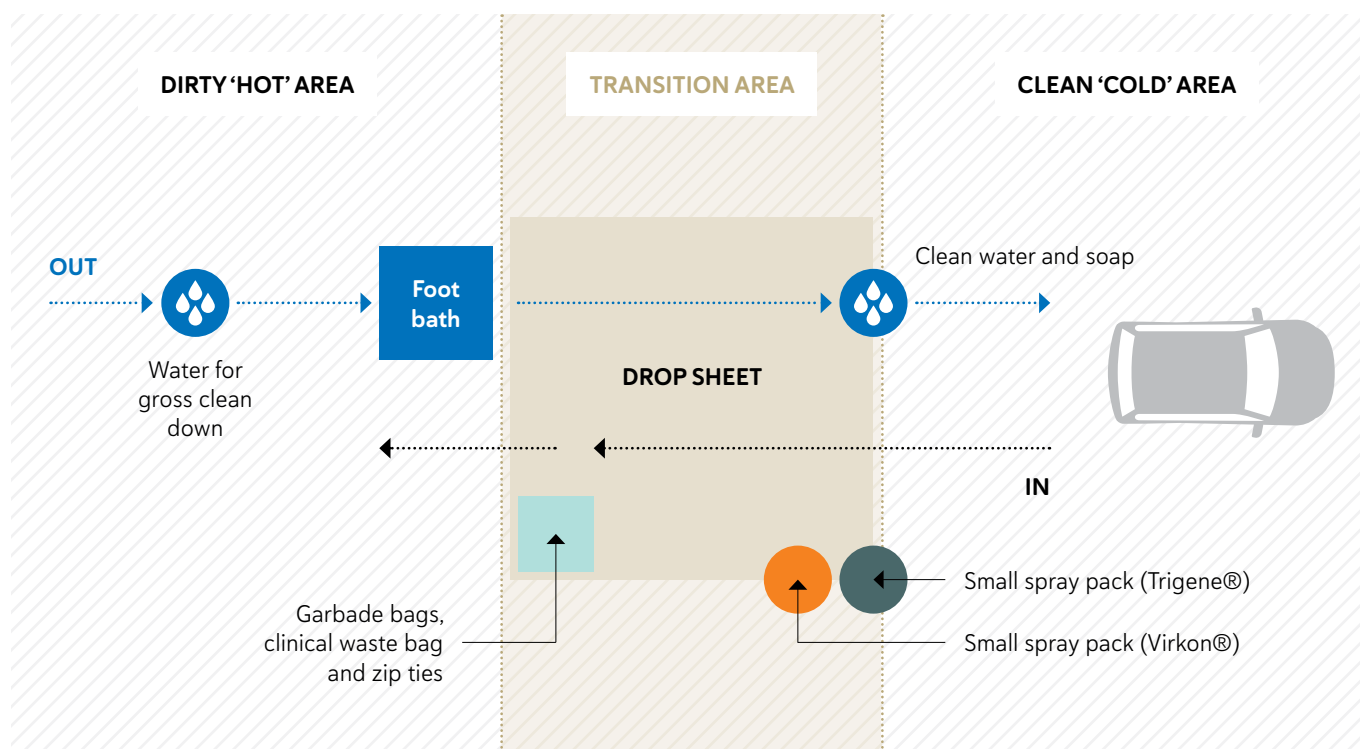


Figure 1 is reproduced with permission from Guidelines for veterinarians handling potential Hendra virus infection in horses Version 4 (2010) published by Biosecurity Queensland www.dpi.qld.gov.au/4790_2900.htm.

6. Undertake examination, live animal sampling or post-mortem sampling as required.
7. Decontaminate the primary sample containers by wiping with disinfectant after collection and place in a plastic bag and seal. Repeat this step so that the sample is double bagged. This is important to protect the sample during decontamination into the clean area as disinfectants may leach into the sample and destroy it.
8. Remove any gross contamination from you and your equipment while in the 'dirty' area using the brush, soap or detergent and water you have brought with you. Clean the treads on your boots.
9. Leave the bucket, soap or detergent and scrubbing brush in the 'dirty' area if they will be needed again, or otherwise take them with you and return to the 'dirty' side of the transition area.
10. Place waste in a plastic bag and seal. Decontaminate the outside by dipping in or spraying with disinfectant. Place it in a second plastic bag, seal and decontaminate the outside. Place the double-bagged waste in the 'clean' area.
11. Decontaminate yourself and your equipment:
 - // Decontaminate boots by scrubbing in a footbath of disinfectant.
 - // Spray disinfectant on outer gloves or dip into bucket of disinfectant.
 - // Decontaminate sample containers and other equipment to the 'clean' side by dipping them in or spraying with disinfectant.
12. Move to the 'clean' side of the transition area and remove PPE in the following sequence:
 - // Remove the outer pair of gloves and wash hands (still encased in the inner pair of gloves) in disinfectant.
 - // Remove overalls and boots.
 - // Remove cap and eye protection.
 - // Wait for dust to settle before removing respirator.
 - // Put removed PPE in contaminated waste bag.
 - // Remove inner pair of gloves and put in contaminated waste bag. Tie off bag.
 - // Disinfect bag by spraying or dipping in disinfectant then put in a second bag and repeat disinfection. Place in clean area for disposal.
 - // Wash hands and dry.

Before leaving the property advise the owner or manager on biosecurity procedures for use on the property to contain the disease, as well as any measures needed to protect people against infection. Ensure they know what PPE they will require for handling affected animals and where to get this PPE from.

Notify the relevant authorities and dispatch the samples.

If accidental exposure to blood or body fluid or sharps injury occurs, wash the affected area of skin thoroughly with soap and water and/or irrigate mucous membranes with water or saline. If the suspected disease is zoonotic

(e.g. Hendra virus), seek prompt medical advice.



Biosecurity advice for owners and managers

Advice may include the following:

- // Isolate sick or dead animals from other animals and people.
- // Isolate any other sick animal that has been associated with the sick or dead animals.
- // The correct use of PPE for people who have to have contact with affected animals, and keep this contact to a minimum.
- // Maintain a high standard of personal hygiene including frequent washing of hands and exposed surfaces with soap and water.
- // Stop or limit movement of animals and animal products on and off the property.
- // Stop or minimise visitors to the property.
- // If the animal is dead and there is a zoonotic disease risk, inform the animal disposal contractor of the risk.
- // Where to find information about the specific disease suspected.

Double bagged items can remain double bagged until results are known. If positive, relevant state authorities will assist with disposal. If negative, dispose of as normal.

Before you have contact with other animals, people or properties:

- // Wash exposed areas of skin thoroughly with soap and water.
- // Remove and wash dirty clothes in a separate hot wash cycle with detergent.
- // Take a hot shower with soap and shampoo.
- // Dress in clean clothes and put on clean footwear.

What to do if you have unplanned contact with a suspect animal

- // Minimise exposure. Withdraw to a safe area and instruct any other people present to do the same.
- // Remove contamination with soap and water. Shower if necessary and available.
- // Proceed with examining, taking samples and treating the animal if it is safe to do so and the required PPE and decontamination equipment is available. Follow the protocol outlined above.





7. Employee health

Adapted from *Infection Prevention and Control Best Practices for Small Animal Veterinary Practices* (Canadian Committee on Antibiotic Resistance 2008).

Veterinary personnel should notify medical practitioners of their occupation during all consultations to ensure that zoonotic disease risks can be considered.

7.1 Bites, scratches and exposure

A recent review of bite wound infections in humans from a range of animals can be found in Abrahamian and Goldstein (2011). Oehler et al (2009) also provides useful information.

In general, veterinarians and animal handlers should be able to recognise behaviour in animals and situations that are associated with an increased tendency for an animal to bite. Professional judgment should be exercised to guide bite prevention practices. Precautions may include physical restraint or chemical restraint (sedation or anaesthesia) of an animal.

Appropriate equipment such as different sizes of muzzles, bite-resistant gloves, halters, rearing bits or a cattle crush 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 should 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 such as muzzling.

If anyone is bitten or scratched by an animal:

- // Immediately wash the wound thoroughly with soap and water and seek medical advice.
- // For a bite or scratch from a flying fox (bat), wash the wound for about 5 minutes and then apply a virucidal antiseptic (e.g. povidone-iodine).
- // Medical attention is particularly important and should be sought 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 such as a deep tear or tissue flap
 - is caused by a flying fox (fruit bat) or microbat
 - is a tetanus-prone wound.

Medical attention is also particularly important and 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 (oedema) 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.

Bites may also need to be reported to local or state public health agencies, especially where a bat or flying fox exposure has occurred so they can test the animal for Australian bat lyssavirus infection.

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 if antimicrobial therapy, tetanus 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 (ie doctor, hospital, ambulance) should be clearly posted in the clinic.

7.2 Employee immunisation policies and record keeping

 For full details of the current recommended vaccinations, consult the Australian Immunisation Handbook available at: www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/handbook10-home

Australian Bat Lyssavirus (ABLV)

Veterinarians and others who have contact with flying foxes (fruit bats) or microbats (bats) should be vaccinated against rabies, and have regular serology and/or booster doses of vaccine in accordance with recommendations of the *Australian Immunisation Handbook* (Department of Health and Ageing 2016).

Pre-exposure rabies vaccination consists of several doses of a licensed human rabies vaccine. Pre-exposure vaccination for rabies does not eliminate the need for appropriate treatment following a known rabies or ABLV exposure or where the flying fox's or microbat's infectious status is unknown, but it does simplify the post-exposure treatment regimen. A person who is potentially exposed to either of these viruses should immediately perform wound care as outlined in Section 7.1. They should also seek medical advice immediately, as booster doses of rabies vaccine are required, even for those who have been previously vaccinated. Pre-exposure vaccination may also protect against unrecognised rabies or ABLV exposures (Centers for Disease Control and Prevention 1999).



Tetanus

All staff should have an initial series of tetanus immunisations, followed by a booster vaccination as recommended by a medical practitioner. In the event of a possible exposure to tetanus, such as a puncture wound, employees should be evaluated by their health care provider; a tetanus booster may be indicated.

Seasonal influenza and other circulating influenza viruses

Veterinary personnel are encouraged to receive the current seasonal influenza vaccine, unless contraindicated, as well as vaccination against other epidemic virus strains. This is intended to minimise the small possibility that dual infection of an individual with human and avian or swine influenza virus could result in a new hybrid strain of the virus.

Q fever

Q fever immunisation is recommended for all veterinarians, veterinary students and veterinary nurses.

A list of Q fever vaccination providers is available at the website of the Q Fever Register www.qfever.org.

7.3 Immunisation and other health records

Veterinary practices should maintain records on immunisations, exposures and emergency contact information for staff. This allows for an efficient response to occupational health incidents, such as Australian Bat lyssavirus exposures, by providing necessary records to healthcare providers. Records should be maintained in a retrievable, secure database. Maintaining these records will facilitate monitoring the work-related health status of employees.

Employers should identify staff immunisation needs, and take all reasonable steps to encourage non-immune staff to be vaccinated. Vaccine refusal should be documented and steps taken to protect the person by other means.

Employee health records should be collected on a voluntary basis, with a clear understanding that confidentiality will be maintained. Other health-related issues that may influence employees' work duties such as immunosuppression should be documented in personnel files. Employees should inform their supervisor of changes in health status that may affect work duties such as pregnancy. All employees should inform their personal physicians that their work duties involve animal contact. Workers should be informed about health conditions that may increase susceptibility to infection and encouraged to report these health conditions so that their individual risk can be managed in the workplace.

7.4 Management and documentation of exposure incidents

All bites or scratches or suspected exposure to a zoonotic disease should be reported to a designated person within the clinic 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.

It is a legal obligation for employers to record and report work-related injuries and illnesses. Work-caused diseases are notifiable to the occupational health and safety regulator.

7.5 Training and education of personnel

Personnel training and education are essential components of an effective infection control program. All personnel, including temporary 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 emphasise awareness of the hazards associated with individual work duties, and prevention of zoonotic disease exposure. Staff participation in training should be documented by the clinic's designated person.

 A list of electronic and print resources for training purposes can be found in Appendix 6

7.6 Immunocompromised personnel

Immune deficiencies may put veterinarians and staff at increased risk for acquiring zoonotic infections (Centers for Disease Control and Prevention 2009). Additionally, immunocompromised personnel are more likely to develop serious complications from infections. Immune deficiencies may result from underlying medical conditions (e.g. HIV/AIDS, diabetes mellitus, asplenia, pregnancy, certain malignancies), therapy for a variety of conditions (e.g. steroids, chemotherapeutic and immunosuppressive agents, radiation) or may be congenital.

Antibiotic-resistant bacteria including Methicillin Resistant *Staph. intermedius* and Multi Drug Resistant *E. coli* have been isolated from both clinically normal and hospitalised dogs (Epstein et al. 2009). The potential for transfer of infection to immunocompromised staff in a veterinary clinic is real and should be addressed (Sidjabat et al. 2006).

Immunocompromised employees and their supervisors should be aware of the following workplace encounters that may result in exposure to zoonotic pathogens:

- // Processing laboratory samples.
- // Direct patient care, especially with the following high risk animals:
 - Young animals (ruminants prior to weaning, dogs and cats less than six months of age)
 - Animals with diarrhoea
 - Parturient animals
 - Stray or feral animals (especially predators of rodents and wildlife)
 - Animals fed raw meat diets
 - Reptiles or exotic, imported species



- Animals housed in crowded conditions (such as shelters)
- Unvaccinated animals or those with untreated internal or external parasites.

Data are limited regarding the risks of zoonotic infection for HIV-infected persons employed in veterinary settings and none exist to justify their exclusion. The risks associated with exposure to zoonotic pathogens in the workplace can be mitigated by appropriate infection control measures (Centre for Food Security and Public Health 2008). Since medical practitioners' knowledge of the risk of zoonotic disease is often limited, veterinarians may be called upon to share information with them to help with diagnosing diseases for themselves and their staff (Grant and Olsen 1999).

7.7 Pregnancy

During pregnancy, women experience physiologic suppression of cell-mediated immunity, increasing their susceptibility to certain infections. These include toxoplasmosis, lymphocytic choriomeningitis virus infection, brucellosis, listeriosis, Q fever, leptospirosis and *Chlamydophila psittaci*. Vertical transmission of certain zoonoses may result in abortion, stillbirth, prematurity or congenital anomalies. Measures to reduce risk from infection with these pathogens will vary depending on individual circumstances, but may include:

- // avoiding jobs such as obstetrics due to the contact with birth fluid
- // Avoiding contact with young cats, cat faeces or raw meat to lessen the chance of contracting *Toxoplasma*.

In Australia pregnant women are not routinely screened to check their antibody titre against *Toxoplasma* due to the complexity of interpreting positive results. Employers should ensure that there are safe systems of work to protect the health and safety of pregnant workers, and provide pregnant workers with information about relevant zoonoses and associated risk controls.

Employees who are pregnant or who have immune dysfunction should discuss their status with the practice manager or owner so the practice can provide appropriate workplace accommodations to protect them. The use of infection control measures and personal protective equipment will reduce the risk of infection. In some cases, it may be advisable to consult the employee's healthcare provider (with the person's consent) or an infection control, public health or occupational health specialist in managing the zoonotic disease risk (Grant and Olsen 1999). Employers must abide by state and federal laws that protect pregnant women and persons with disabilities. The employee should be assured that confidential information will not be disclosed to others.





8. Creating a written infection control plan

All veterinary practices should have a written infection control plan, which should be reviewed and updated at least annually.

 A model plan that can be tailored to individual practices is at Appendix 1. A modifiable electronic version is available on the AVA website www.ava.com.au.

Effective infection control plans should:

- // Be specific to the facility and practice type giving consideration to the species of animals treated by the practice and their associated zoonoses.
- // Be flexible to easily address new issues and incorporate new knowledge.
- // Provide explicit, well organised, understandable guidance.
- // Clearly describe the role of each staff member.
- // Be incorporated into new employee training and regularly reviewed with staff.
- // Include a process for the evaluation of infection control practices.
- // Be kept in work areas for quick reference.
- // Provide contact information, resources, and references (eg. reportable disease list, public health contacts, local environmental health regulations, occupational health and safety requirements, websites of interest, client education materials).

8.1 Communicating and updating the infection control plan

Availability

Keep copies of the infection control plan and resource documents at locations readily accessible to all staff including reception, administrative, animal care, housekeeping and veterinary personnel.

Leadership

Senior and managerial personnel should set the standard for infection control practices, stress its importance to other staff and reference the infection control plan in daily activities.

New staff

New staff should be given a copy of the infection control plan and receive detailed training on the practice's infection control procedures, staff vaccination recommendations, and how to report exposure incidents. Some employers may ask new staff members to sign a form stating they have received and read the plan.

Continuing professional development

Infection control procedures should be reviewed regularly with staff at staff meetings, and veterinary continuing professional development on zoonotic diseases should be encouraged.

Review and revision

A designated staff member should be responsible for regularly reviewing and revising the infection control plan as needed when new information becomes available or when clinical practices change. When revisions are made, they should be shared with all staff members and all copies of the plan updated at the same time.

Assurance

A designated staff member should be responsible for assuring the plan components are being carried out consistently and correctly. This person should also ensure that staff are counselled and corrective measures are instituted when deficiencies in infection control procedures are identified.

Other practical measures to promote infection control could include:

- // incorporating responsibilities for infection control and prevention into position descriptions
- // including infection control in staff performance reviews
- // conducting infection control audits.



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Appendix 1: Model infection control plan for veterinary practices

Adapted from National Association of Public Health Veterinarians (NASPHV) Veterinary Infection Control Committee (VICC) 2010

This plan should be adapted to your practice in keeping with local, state and federal regulations. A modifiable electronic version is available on the website of the Australian Veterinary Association at www.ava.com.au.

Clinic:

Date of plan adoption:

Replaces plan dated:

Date of next review:

Infection Control Officer:

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

Personal protective actions and equipment

Hand hygiene: Wash hands before and after each patient encounter and after contact with faeces, blood, body fluids, secretions, excretions or articles contaminated by these fluids. Wash hands before eating, drinking or smoking; after using the toilet; after cleaning animal cages or animal care areas; and whenever hands are visibly soiled. Wash hands after removing gloves even if not visibly soiled.

Alcohol-based gels may be used if hands are not visibly soiled, but handwashing with soap and running water is preferred. Keep fingernails short. Keep handwashing supplies stocked at all times.

Staff responsible:

Correct handwashing procedure:

- // Wet hands with running water
- // Place soap on palms
- // Rub hands together to make a lather
- // Scrub hands vigorously for 20 seconds
- // Dry hands with a disposable towel
- // Turn off tap using the disposable towel

Correct use of hand rubs:

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

Use of gloves and sleeves: Wear gloves or sleeves when touching faeces, blood, body fluids, secretions, excretions, mucous membranes, and non-intact skin. Wear gloves

for dentistry, resuscitations, necropsies, and obstetrical procedures; when cleaning cages, litter boxes and contaminated environmental surfaces and equipment; when handling dirty laundry; when handling diagnostic specimens (e.g. urine, faeces, aspirates, swabs); and when handling an animal with a suspected infectious disease. Change gloves between examination of individual animals or animal groups (e.g. a litter of puppies) and between dirty and clean procedures on the same patient. Gloves should be removed promptly and disposed of after use. Disposable gloves should not be washed and reused. Hands should be washed immediately after glove removal.

Note: Gloves are not necessary when examining or handling normal, healthy animals.

Facial protection: Wear facial protection whenever splashes or sprays are likely to occur. Use a face shield, or goggles worn with a surgical mask. Wear facial protection for the following procedures: lancing abscesses, flushing wounds, dentistry, resuscitation, nebulisation, suctioning, bronchoscopy, wound irrigation, obstetrical procedures, and necropsies. Use a surgical mask when cleaning with high-pressure sprayers.

Respiratory protection: Wear a disposable P2 respirator or other particulate respirator when investigating abortions in small ruminants or significant poultry mortality, when handling ill psittacine birds, and in any other circumstance where there is concern about aerosol transmission.

Protective outerwear: Wear a protective outer garment such as a lab coat, smock, non-sterile gown, or coveralls when attending animals and when conducting cleaning chores. Outerwear should be changed and laundered daily. These should also be changed whenever soiled, after handling an animal with a known or suspected infectious disease, after working in an isolation room, and after performing a necropsy or other high-risk procedure. Impermeable outerwear should be worn during



obstetric procedures and necropsies and whenever substantial splashes or large quantities of body fluids may be encountered. Shoes or boots should have thick soles and closed toes and be impermeable to water and easily cleaned. Disposable shoe covers should be worn when heavy quantities of infectious materials are present or expected. Promptly remove and dispose of shoe covers and booties when leaving contaminated work areas. Clean shoes or boots between farm visits. Keep clean outer garments available at all times.

Staff responsible:

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

Staff responsible:

Bite and other animal-related injury prevention: Take precautions to prevent bites and other injuries. Identify aggressive animals and alert clinic staff. Use physical restraints, muzzles, bite-resistant gloves, and sedation or anaesthesia in accordance with clinic policy. Plan an escape route when handling large animals.

// Do not rely on owners or untrained staff for animal restraint.

Notify:

if there is concern for personal safety.

// When bites or scratches occur, wash the site with soap and water immediately. Report all bites and other injuries to

Infection control officer:

who will also maintain the incident report log.

// If medical attention is needed contact

Health-care provider:

// As required by law, bite incidents will be reported to

Public health agency:

Telephone number:

uncapped needles. Do not recap needles except in rare instances when required as part of a medical procedure or protocol. Dispose of all sharps in designated puncture-proof sharps containers. Dispose of the used syringe with attached needle in the sharps container when injecting live vaccines or aspirating body fluids. For most other veterinary procedures, use the needle removal device on the sharps container and dispose of the syringe in the regular trash. Do not transfer sharps from one container to another. Replace sharps containers before they are completely full.

Staff responsible:

Dental procedures: Wear protective outerwear, gloves, mask, and facial protection when performing dental procedures or working nearby (such as when monitoring anaesthesia).

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

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

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

Emergency disease hotline:

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

Protective actions during veterinary procedures

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

Examination of animals: Wear appropriate protective outerwear and wash hands before and after examination of individual animals or animal groups (e.g. a litter of puppies). Wear facial protection if a zoonotic respiratory tract infection is suspected. Animals suspected to be infectious will be examined in a dedicated exam room and remain there until diagnostic procedures and treatments have been performed.

Needlestick injury prevention: Do not bend needles, pass an uncapped needle to another person, or walk around with

Environmental infection control

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

Staff responsible:



Cleaning and disinfection of equipment and environmental surfaces:

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

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

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

Veterinary waste: Insert here your local and state regulations regarding disposal of animal waste, pathology waste, animal carcasses, bedding, sharps and biologics.

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

Other environmental controls: There are designated areas for eating, drinking, smoking, applying make-up and similar activities. These activities should never be done in animal care areas or in the laboratory. Do not keep food or drink for human consumption in the same refrigerator as animal food, biologics, or laboratory specimens. Dishes for human use should be cleaned and stored away from animal care and animal food preparation areas.

Employee health

The following personnel are responsible for developing and maintaining the practice's infection control policies, keeping records, and managing workplace exposure and injury incidents.

Staff responsible:

.....

Record keeping: Current emergency contact information will be maintained for each employee. Records will be maintained on immunisations and exposure and injury incidents. Report and record changes in health status (e.g. pregnancy) that may affect work duties.

Australian Bat Lyssavirus pre-exposure vaccination: All staff with bat contact must be vaccinated against rabies, followed by rabies boosters, in accordance with the recommendations of the Australian Immunisation Handbook.

Tetanus vaccination: Tetanus immunisations must be up-to-date. Report and record puncture wounds and other possible exposures to tetanus. Consult a health care provider regarding the need for a tetanus booster.

Q fever vaccination: an accredited medical practitioner needs to be contacted to provide a blood test and vaccination against *Coxiella burnetii*.

Seasonal influenza vaccination: Unless contraindicated, veterinary personnel are encouraged to receive the current seasonal influenza vaccine. Check with the Australian Department of Health and Ageing for current recommendations

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

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

.....

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

Pregnant and immunocompromised personnel: Pregnant and immunocompromised employees are at increased risk from certain zoonotic diseases. Inform

.....

If you are concerned about your work responsibilities, so that accommodations may be made. Consultation between the supervising veterinarian and a health care provider may be needed.

The following information is attached to this infection control plan:

- // List of reportable or notifiable veterinary diseases and where to report.
- // State and local public health contacts for consultation on zoonotic diseases.
- // Public health laboratory services and contact information.
- // Emergency services telephone numbers - fire, police, animal control, poison control, etc.
- // List of APVMA-registered disinfectants.
- // State occupational health and safety regulations.
- // State department of primary industries contact information and regulations.
- // Local animal waste disposal and biohazard regulations.
- // Useful resources.



Appendix 2: Zoonotic diseases of importance to Australian veterinarians

Disease	Agent	Susceptible animals	Means of transmission to humans	Human fatalities?	Comment
Acarosis (mange)	<i>Sarcoptes scabiei</i> , <i>Notoedres cati</i> , other mites	Dogs, cats, horses, goats, pigs, birds	Contact	No	<i>Sarcoptes</i> and <i>Notoedres</i> are generally considered host specific and zoonotic transmission is ephemeral
Anthrax	<i>Bacillus anthracis</i>	Cattle, sheep, goats, horses, pigs	Contact (main), aerosol (droplets, airborne) (rare), (fomites)	Yes	Rare (<1 human case of cutaneous anthrax per year but potential for many and more severe infections)
Influenza A -	Highly pathogenic avian influenza virus (HPAI - H5, H7 strains) and swine influenza A viruses	Pigs, poultry, water birds	Contact, aerosol (droplet, airborne)	Yes	There have been 7 outbreaks of HPAI in domestic birds in Australia with no transfer of infection to humans, but there are none at present
Babesiosis	<i>Babesia microti</i> , <i>B. bovis</i> , <i>B. divergens</i> , <i>B. duncani</i> , <i>B. venatorum</i>	Rodents, cattle, deer, other mammals	Tick bites, blood contact considered possible	Yes	First case of autochthonous <i>B. microti</i> in Australia reported March 2012, source not identified
Bairnsdale ulcer, Buruli ulcer, Daintree ulcer	<i>Mycobacterium ulcerans</i>	Alpaca, cat, dog, horse, koala, possum, potoroo	Unknown, but mosquitoes, and direct contact with moist environments have been implicated. Contact with lesions of infected animals considered possible.	No	Human fatalities have not been reported in Australia, but consequences of untreated lesions are likely to be severe
Bordetella bronchiseptica infection	<i>Bordetella bronchiseptica</i>	Dogs, pigs, rabbits, guinea pigs	Aerosol	No	There is a small risk of exposure from live attenuated canine vaccine, higher risk from infected animals
Brucellosis	<i>Brucella suis</i>	Feral pigs, pig hunting dogs, pigs	Contact, aerosol, fomites	Yes	2 veterinarians developed Brucellosis in NSW in 2015
Campylobacteriosis	<i>Campylobacter jejuni</i> , <i>C. coli</i> , <i>C. upsaliensis</i> , <i>C. fetus</i> and others	Poultry, cattle, sheep, goats, pigs, cats, dogs	Contact, ingestion (food, water)	Yes	Common food-borne pathogen (<i>C. jejuni</i>). Causes gastroenteritis and less commonly Guillain Barré Syndrome



Disease	Agent	Susceptible animals	Means of transmission to humans	Human fatalities?	Comment
Cat flea typhus	<i>Rickettsia felis</i>	Cats	fleas (Ctenocephalides felis)	Occasional fatalities	5 human cases reported from a single cat in Australia in 2011
Capnocytophaga canimorsus	<i>Capnocytophaga canimorsus</i>	Oral flora of cats, dogs	Cat and dog bites, licks	rare	
Cat scratch disease	<i>Bartonella henselae</i> cause most disease. <i>B. quintana</i> , <i>B. clarridgeiae</i> , <i>B. elizabethae</i> , <i>B. rochalimae</i> and <i>B. trichorum</i> may cause human disease.	Cats, rats	Contact - scratch, bite, lick. Role of cat fleas as vector for human infection is unknown	Rare	
Cryptococcosis	<i>Cryptococcus neoformans</i> var <i>neoformans</i> ; <i>Cryptococcus neoformans</i> var <i>gattii</i>	Pigeons, possibly other birds; koalas, environment	Incompletely understood - aerosol and airborne are likely	Yes	
Cryptosporidiosis	<i>Cryptosporidium parvum</i> , <i>C. hominis</i> , <i>C. bovis</i> , <i>C. canis</i> , <i>C. felis</i> , <i>C. muris</i> , <i>C. meleagridis</i>	Cattle (especially calves) dogs, cats, rodents, birds	Faecal-oral. Ingestion (food, water)	Yes	Many genotypes are host specific. Possibly only <i>C. parvum</i> transmitted from animals to humans
Dermatophilosis	<i>Dermatophilus congolensis</i>	Goats, sheep, cattle, horses, deer	Contact, fomites	No	
Dermatophytosis (ringworm)	<i>Microsporum</i> spp., <i>Trichophyton</i> spp.,	Cats, dogs, cattle, pigs, goats, sheep, horses, lagomorphs, rodents	Contact	No	
<i>Dipylidium</i> infection (tapeworm)	<i>Dipylidium caninum</i>	Dogs, cats	Ingestion of the vector (flea)	No	
Escherichia coli infection	<i>Enterohaemorrhagic E. coli</i> (eg <i>E. coli</i> O157:H7) and many other strains associated with diarrhoea and extra-intestinal infections including some that are resistant to many antimicrobials; ESBL producing strains	Cattle, goats, sheep, deer	Contact, faecal-oral, ingestion in food and water	Yes	



Disease	Agent	Susceptible animals	Means of transmission to humans	Human fatalities?	Comment
Erysipeloid	<i>Erysipelothrix rhusiopathiae</i>	Pigs, poultry, aquatic species	Contact - skin abrasions	Yes	Human infective endocarditis Case Fatality Rate 38% (Mandell)
Giardiasis	<i>Giardia intestinalis</i> (<i>G. lamblia</i>)	Dog, cat etc	Contact, faecal-oral, ingestion in food, water	No	Thought to be highly species-specific and rarely transmitted from animals to humans
Hendra virus (prev Equine morbillivirus)	Genus <i>Henipavirus</i> , Family <i>Paramyxoviridae</i>	Flying foxes. Horses and humans are spillover hosts. Dog is possible spillover host. Ferret and cat have been infected experimentally	Contact, aerosol (droplets, airborne). Respiratory secretions and possibly urine of the horse; placenta and birth fluids, other body fluids of flying foxes (*)	Yes	As at November 2016 there have been 4 human fatalities in Australia after contact with infected horses. Status of the dog as a host species is uncertain - 2 seropositive animal, without signs, has been identified (*) Direct flying fox to human transmission has not been reported, but should be regarded as possible
Hydatids, echinococcosis	<i>Echinococcus granulosus</i>	Definitive hosts: dogs, wild canids, Intermediate hosts: ruminants, wildlife, humans	Contact, faecal oral ingestion	Yes	Human infection only acquired from infected canids and their excrement
Japanese encephalitis	<i>Flavivirus</i>	Pigs, horses, other mammals, birds	Mosquito bite	Yes	There have been 5 recorded human cases acquired in Australia
Larval migrans (hookworm)	<i>Ancylostoma spp.</i>	Dogs, cats	Contact, Penetrating injury	Rare	Regional
Larval migrans: visceral, ocular, neurological (roundworm)	<i>Toxocara canis</i> , <i>Toxocara cati</i>	Dogs, cats	Contact, ingestion	Rare	
Leishmaniosis	<i>Leishmania spp.</i>	Macropods	Biting midges implicated as vectors, but no human cases recorded to date	Yes, but not from this strain	Enzootic in macropods in the Northern Territory. No human cases recorded to date
Leptospirosis	<i>Leptospira spp.</i>	Rodents, pigs, cattle, sheep, goats, horses, dogs, bats	Contact, aerosol, ingestion, food and water	Yes	Av. 140 human cases / year reported between 2002 and 2011



Disease	Agent	Susceptible animals	Means of transmission to humans	Human fatalities?	Comment
Listeriosis	Listeria monocytogenes	Cattle, sheep, goats, pigs, birds, dogs, cats	Contact, ingestion, food and water	Yes	
Lyssavirus encephalitis	Australian bat lyssavirus	Bats	Contact - bite, scratch, parenteral exposure to body fluids	Yes	There have been 3 human fatalities in Australia in 1996, 1998 and 2013
Menangle virus	Pig paramyxovirus	Pigs (fruit bats)	Contact - Incompletely understood, possibly droplet, airborne, faeces, urine	No, but only 2 symptomatic cases reported to March 2012	
Mycobacterial infection (non-tuberculous)	Mycobacterium avium complex, Mycobacterium marinum	Poultry, birds, aquarium fish, reptiles	Aerosol (droplet, airborne), contact	Yes	
Orf	Scabby mouth virus	Sheep, goats	Contact	No	Sheep vaccine virulent - has caused human infection.
Ornithosis	Chlamydophila psittaci	Birds	Contact, aerosol (droplet, airborne), fomites	Yes	Av. 140 human cases/year between 2002 and 2011
Pasteurellosis	Pasteurella multocida, P. canis P aerogenes other species	Dogs, cats, rabbits, rodents, pigs	Contact, bite or scratch wounds	Yes	
Psittacosis	chlamydia psittaci	Birds, horses	Aerosols, handling equine abortions, sick neonate foals	Yes	5 people developed Psittacosis in 2015 after handling infected horses
Q fever	Coxiella burnetii	Goats, sheep, cattle, rodents, lagomorphs, dogs, cats, kangaroos, bandicoots, camelids	Contact, aerosol (droplet, airborne), ingestion, fomites	Yes	Av. 440 human cases/year between 2002 and 2011
Rat bite fever	Streptobacillus monilliformis, Spirillum minus	Rats	Contact, bite, scratch, ingestion, sometimes unknown	Yes	Rare



Disease	Agent	Susceptible animals	Means of transmission to humans	Human fatalities?	Comment
Salmonellosis	Salmonella spp. (non-typhoid), including strains highly resistant to antimicrobials and ESBL producing strains	Reptiles, amphibians, poultry, horses, pigs, cattle, many species of mammals and birds	Contact, ingestion (food, water)	Yes	Common food-borne pathogen causing gastroenteritis. Can cause septicaemia
Staphylococcosis	Staphylococcus aureus. (especially methicillin resistant S aureus), S pseudintermedius	Dogs, cats, horses, pigs, livestock	Contact, droplet, airborne	Yes	MRSA is transferred between humans and various animal species S pseudintermedius infections are rare
Streptococcosis	Streptococcus suis, S. iniae, other spp.	Pigs, fish, some mammals	Contact, aerosol (droplet, airborne)	Yes	S. suis causing toxic shock syndrome and endocarditis has been reported in Australia
Toxoplasmosis	Toxoplasma gondii	Cats mainly, flying foxes, other animals and birds	Contact, ingestion, inhalation (rare), needlestick	Yes	Highest risk factors are handling raw meat or consumption of undercooked meat
Trichurosis	Trichuris suis, T. trichiura, T. vulpis	Pigs, dogs	Contact	Rare	
Tularemia	Francisella tularensis	Lagomorphs and rodents, and a wide range of non-mammalian vertebrates	Fleas, ticks and mosquitoes; aerosols, animal bites, contact with blood and other body fluids of infected animals	Yes	F. tularensis novocida-like subspecies isolated in the NT in 2003 (human case), F. tularensis subsp holarctica identified in Tasmania in 2011 following animal bite
Yersiniosis	Yersinia enterocolitica, Y. pseudotuberculosis	Pigs, many species of mammals, particularly rodents, birds	Contact, faecal-oral, ingestion (food)	Yes, but uncommon	

Note: Several other zoonotic infections have been recorded in Australia occasionally, including:

- // Angiostrongylus
- // Escherichia albertii - gastrointestinal pathogen, but zoonotic status uncertain
- // Fasciolosis
- // Porcine cysticercosis
- // Trichinellosis
- // Trichostrongylosis



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Appendix 3: Emerging zoonotic disease risks to Australian veterinarians

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Over the last 10 years, reports of MRSA in animals have increased substantially. There are essentially three animal-related situations - cats and dogs, horses and large-animal associated MRSA.

MRSA in cats and dogs are almost always human MRSA strains whereas horses are mostly affected by strains belonging to a particular type of MRSA (clonal complex 8) which was originally a human strain but which has become horse adapted. LA-MRSA is to date restricted to a single type of MRSA (ST398) which is clearly an animal adapted strain that originated in pigs and how now spread to a wide range of animals species, mostly in Europe but increasingly in other countries.

MRSA has been confirmed in cats and dogs and horses in Australia but as yet we do not seem to have LA-MRSA. MRSA in animals can cause lesions and wound infections but generally speaking the animals are healthy and simply colonised by the organism. Cat and dog MRSA does not seem to spread readily between animals and duration of colonisation is variable although it seems that some animals may be persistently colonised. A complication with dogs and cats is that methicillin-resistant strains of *Staphylococcus pseudintermedius* (MRSP) are being reported. With horses it seems that MRSA can be transmitted from horse to horse although again the duration of colonisation appears to be variable. LA-MRSA is very readily transmitted between animals.

The problem for veterinarians and their staff is that MRSA colonised and infected animals appear to readily transfer MRSA to humans - and humans can transfer the MRSA back to animals. MRSP can also be transferred to humans. Humans colonised with MRSA are a much higher risk of serious infections if they are hospitalised. A survey of Australian veterinarians has found that small animal practitioners and equine vets have much higher rates of colonisation with MRSA than the general population (Jordan et al. 2011).

Prevention and management of MRSA in veterinary practices requires adoption and strict observance of good infection control practices - hand hygiene, environmental hygiene and personal protective equipment. British Small Animal Veterinary Association guidelines (2011) provide useful advice. Medical advice should be sought on the advisability or otherwise of decolonisation of colonised staff.

Pocket pets

The increasing popularity of 'pocket pets' such as rabbits, rats, mice and guinea pigs increases the possibility of exposure of veterinary clinic staff to previously rare or uncommon zoonotic diseases such as rat bite fever (*Streptobacillus moniliformis*).

Q fever

Q fever is caused by the bacteria *Coxiella burnetii*. It usually presents in people as a flu-like illness but can progress to a

potentially fatal atypical pneumonia, hepatitis and endocarditis. Approximately half of all human infections are asymptomatic.

QVAX vaccine is available and effective and all veterinary personnel should be vaccinated. Potential vaccinees need a blood test to test for *C. burnetii* antibodies, and a skin test.

Any animal can carry Q fever. Wildlife carriers include kangaroos and bandicoots while domestic species are also susceptible - cattle, sheep, goats, dogs, cats, rodents, rabbits and birds. Ticks are temporary hosts that can transfer disease.

Pregnant animals can be a major source of *Coxiella*. *Coxiella* can cause foetal death, which may be the reason for caesarean intervention. Direct contact or aerosol transfer to people has been reported. Urine, birth fluids, placentas, faeces, milk, wool, hides and semen can all carry *Coxiella*.

Coxiella can exist in environment for a long period of time. People can become infected from the environment for some period after the infected animal has moved on.

Cat and dog caesareans have been identified as potentially very dangerous sources of infection for veterinary staff and their clients (Maywood & Boyd 2011). Precautions should include:

- // An immediate ban on mouth to snout resuscitation should be implemented,
- // Q fever serology should be considered in all pets undergoing an elective caesarean and only vaccinated staff should be attending to caesareans.
- // If unvaccinated staff need to be present, they should be wearing a P2 respirator (not a standard surgical mask) as well as eye protection, gloves and a disposable gown.
- // Ensure the air flow in the surgery unit does not flow to client waiting rooms and other areas.
- // Wash hands thoroughly after handling all pregnant patients and before touching another patient, person or common area e.g. opening fridge to get food
- // Collect all birth waste and fluids into biohazard bag.

These precautions are covered in the model infection control plan in Appendix 1.

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Appendix 4: Disinfectants in Australian veterinary practice

Characteristics of selected disinfectants

Source: Canadian Committee on Antibiotic Resistance 2008, *Infection prevention and control best practices for small animal veterinary clinics*, Canadian Committee on Antibiotic Resistance, Guelph, Ontario.

Disinfectant category	Activity in presence of organic matter	Advantages	Disadvantages	Precautions	Comments
Alcohols: Ethyl alcohol Isopropyl alcohol	Rapidly inactivated	Fast-acting No residue Relatively non-toxic	Rapid evaporation	Flammable	Not appropriate for environmental disinfection Primarily used as antiseptics
Aldehydes: Formaldehyde Glutaraldehyde	Good	Broad spectrum Relatively non-corrosive	Highly toxic	Irritant Carcinogenic Requires ventilation	Used as an aqueous solution or as a gas (fumigation)
Alkalis: Ammonia			Unpleasant odour Irritating	Do not mix with bleach	Not recommended for general use
Biguanides: Chlorhexidine	Rapidly inactivated	Non-toxic	Incompatible with anionic detergents		Not appropriate for environmental disinfection Primarily used as antiseptics
Halogens: Hypochlorites (Bleach)	Rapidly inactivated	Broad spectrum, including spores Inexpensive Can be used on food preparation surfaces	Inactivated by cationic soaps/detergents and sunlight Frequent application required	Corrosive Irritant Mixing with other chemicals may produce toxic gas	Used to disinfect clean environmental surfaces Only commonly available sporicidal disinfectant
Oxidizing Agents	Good	Broad spectrum Environmentally friendly	Breakdown with time	Corrosive	Excellent choice for environmental disinfection
Phenols	Good	Broad spectrum Non-corrosive Stable in storage	Toxic to cats Unpleasant odour Incompatible with cationic and nonionic detergents	Irritant	Some residual activity after drying
Quaternary Ammonium Compounds (QACs)	Moderate	Stable in storage Non-irritating to skin Low toxicity Can be used on food preparation surfaces Effective at high temperatures and pH	Incompatible with anionic detergents		Commonly used primary environmental disinfectant Some residual activity after drying

Antimicrobial spectrum of selected disinfectants

Source: Canadian Committee on Antibiotic Resistance 2008, *Infection prevention and control best practices for small animal veterinary clinics*, Canadian Committee on Antibiotic Resistance, Guelph, Ontario.

Susceptibility of microorganisms to chemical disinfectants

Agent	Alcohols	Aldehydes	Alkalis: Ammonia	Biguanides: Chlorhexidine	Halogens: Hypochlorite (Bleach)	Oxidizing Agents	Phenols	Quaternary Ammonium Compounds
Most susceptible	Mycoplasmas	++	++	++	++	++	++	+
	Gram-negative bacteria	++	+	++	++	++	++	++
	Gram-negative bacteria	++	+	+	++	++	++	+
	Pseudomonads	++	+	±	++	++	++	±
	Enveloped viruses	+	+	++	++	++	++	+
	Chlamydiae	±	+	±	+	+	±	-
Most resistant	Non-enveloped viruses	-	±	-	++	+	±*	-
	Fungal spores	±	+	±	+	±	+	±
	Acid-fast bacteria	+	+	-	+	±	++	-
	Bacterial spores	-	±	-	++	+	-	-
	Coccidia	-	-	-	-	-	+	-

++ Highly effective; + Effective; ± Limited activity; - No activity

Examples of microorganisms from each category:

Mycoplasmas: *Mycoplasma canis*, *Mycoplasma felis*; **Gram-positive bacteria:** *Streptococcus* spp, *Streptococcus* spp; **Gram-negative bacteria:** *Bordetella bronchiseptica*, *Salmonella* spp;
Pseudomonads: *Pseudomonas aeruginosa*; **Enveloped viruses:** Influenza virus, herpesvirus; **Chlamydiae:** *Chlamydia psittaci*; **Non-enveloped viruses:** feline panleukopenia virus, canine parvovirus; **Fungal spores:** *Blastomyces dermatitidis*, *Sporothrix schenckii*; **Acid-fast bacteria:** *Mycobacterium avium*; **Bacterial spores:** *Clostridium difficile*, *Clostridium perfringens*; **Coccidia:** *Cryptosporidium parvum*, *Isospora* spp, *Toxoplasma gondii*.

*In general, phenols are not effective against non-enveloped viruses, but they have been found to be effective against rotaviruses. They have been recommended for use on horse farms to help control equine rotaviral disease in foals. However, efficacy against small animal parvoviruses has not been demonstrated.



Categories and ranges of activity of the active chemical substances used to formulate disinfectants and antiseptics

Source: from *Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting*, used by permission from the Australian Government.

Activity range	Other properties/comments ^a
Alcohols // Effective: bactericidal Fungicidal mycobactericidal // Variable: virucidal // Poor: not sporicidal // Ineffective: CJD	Ethanol: // 70% w/w ethanol acts rapidly and dries quickly // 90% w/w ethanol is useful as a virucide // 100% ethanol is not an effective disinfectant // Less effective against nonenveloped viruses (eg HAV) than against enveloped viruses (eg HIV) Isopropanol: // Most effective at 60-70% v/v // Variable mycobactericidal activity // Not an effective virucide General properties of alcohols: // Do not penetrate organic matter well, so prior cleaning is required as alcohol acts as fixative // Flammable // May be combined with other bactericidal compounds for skin disinfection May only be used as an instrument-grade disinfectant if labelled accordingly by manufacturer
Aldehydes // Effective: bactericidal fungicidal virucidal sporicidal (slow) // Variable: mycobactericidal // Ineffective: CJD	Highly irritant Act as fixatives: prior cleaning required Penetrate organic material slowly and usually not inactivated by inorganic materials Usually noncorrosive to metals Buffered alkaline solutions must be activated immediately before use and have a limited shelf life Acidic solutions are more stable but are slower acting; glycolated (mildly acidic) solutions have shorter inactivation times Instrument-grade disinfectant when used for a short period (usually <60 minutes) according to label: specific to each formulation Instrument sterilant when used for a prolonged period (usually >5 hours) depending on formulation/labelling Slow acting against atypical mycobacteria
Chlorhexidine and biguanide polymers // Effective: gram-positive organisms less active against gram-negative organisms // Variable: virucidal fungicidal (subject to species variation) // Poor: not mycobactericidal not sporicidal // Ineffective: CJD	Low toxicity and irritancy Inactivated by organic matter, soap and anionic detergents Useful for skin and mucous membrane disinfection but are neurotoxic (must not contact middle ear) and may cause corneal damage Chlorhexidine activity range increased when combined with other agents (e.g. alcohol) Polyhexamethylene biguanide hydrochloride may be combined with quaternary ammonium compounds for increased activity May only be used on instruments if labelled as an instrument-grade disinfectant



Activity range	Other properties/comments ^a
<p>Hypochlorites</p> <p>// Effective: bactericidal fungicidal virucidal</p> <p>// Variable: sporicidal (pH 7.6 buffer) mycobactericidal (5000 ppm available chlorine)</p> <p>May be used at 20,000 ppm available chlorine against CJD if more stringent procedures are not suitable</p>	<p>// Fast acting</p> <p>// Inactivated in presence of organic matter at low concentrations</p> <p>// Incompatible with cationic detergents</p> <p>// High concentrations corrosive to some metals (some compounds may contain corrosion inhibitors)</p> <p>// Diluted form unstable with short shelf life</p> <p>// Decomposed by light, heat, heavy metals</p> <p>// Chlorine gas released when mixed with strong acids</p> <p>// Carcinogenic reaction product when mixed with formaldehyde</p> <p>// Useful in food preparation areas and virology laboratories</p> <p>// Activity may be increased by combining with methanol</p> <p>// May only be used on instruments if labelled as an instrument-grade disinfectant</p> <p>// There are available chlorine requirements for:</p> <ul style="list-style-type: none"> • Blood spills: 10,000 ppm (1%) • Laboratory discard jars: 2500 ppm (0.25%) • Clean environmental disinfection: 1000 ppm (0.1%) (ie environment that has been precleaned of all soil and other organic and inorganic material or has not been exposed to soiling with body fluids) • Disinfection of clean compatible items: 500-1000 ppm (0.05-0.1%) <p>// Higher-risk CJD spills/contamination: 20,000 ppm for 1 hour</p>
<p>Iodine preparations</p> <p>// Effective: bactericidal mycobactericidal fungicidal virucidal</p> <p>// Variable: sporicidal</p> <p>// Variable/partially effective: CJD</p>	<p>// May be inactivated by organic matter</p> <p>// May corrode metals (eg aluminium)</p> <p>// Useful as a skin disinfectant but some preparations may cause skin reactions (povidone-iodine is much less irritant than iodine itself)</p> <p>// Antiseptic-strength iodophores are not usually sporicidal</p> <p>// May be used on instruments only if labelled as an instrument-grade disinfectant</p>
<p>Peracetic acid and other peroxide compounds</p> <p>// Effective: bactericidal fungicidal virucidal sporicidal mycobactericidal</p> <p>// Variable/poor: mycobactericidal (peroxygen compounds)</p> <p>// Ineffective: sporicidal (peroxygen compounds) CJD</p>	<p>// Peracetic acid is highly irritant</p> <p>// Corrosive to some metals/instruments</p> <p>// Reduced activity in presence of organic matter</p> <p>// Usually contain detergent</p> <p>// Useful for small spills</p> <p>// May be used as an instrument-grade disinfectant or sterilant under specified conditions, if compatible</p> <p>// Hydrogen peroxide and potassium monoperoxygen sulfates have low toxicity and irritancy</p>



Activity range	Other properties/comments ^a
Phenolics // Effective: bactericidal mycobactericidal fungicidal // Variable: virucidal // Poor: nonenveloped viruses // Ineffective: CJD	// Avoid contact with skin/mucous membranes // Stable in presence of organic matter // Incompatible with cationic detergents // Not for use on food preparation surfaces/equipment // Detergent usually included // Absorbed by rubber and plastics // Diluted form unstable // Useful for mycobacteria on surfaces
Sodium dichloroisocyanurate (SDIC) granules Similar to hypochlorites // Ineffective: CJD	// Less corrosive than hypochlorite // More resistant to inactivation in presence of organic matter // Stable in dried form; unstable in solution
Acids (formic) and alkalis (sodium hydroxide) // Restricted use for CJD	// Corrosive/caustic // Use only with special care

CJD = Creutzfeldt-Jakob disease; HAV = hepatitis A virus; HIV = human immunodeficiency virus.

^aClassification of a product using any of these active ingredients as household, hospital, instrument or sterilant grade or as an antiseptic depends on the formulation used.

Note: Instruments contaminated with the agent of CJD should either be destroyed or reprocessed according to the guidelines in *Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting*, Commonwealth Department of Health and Ageing 2004.





Disinfectants and sterilants

The information in this section is from *Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting (2001)*, Commonwealth Department of Health and Ageing, Canberra, and is used with permission from the Australian Government.

 The AUSVETPLAN *Operational Procedures Manual - Decontamination* provides information on use of chemicals for emergency animal diseases.

Key points

Surface disinfectants/sterilants

- // Surface disinfectants and sterilants are regulated by the Therapeutic Goods Administration (TGA) under Therapeutic Goods Order No 54 (TGO 54) as sterilants, instrument-grade disinfectants, hospital-grade disinfectants or household/commercial-grade disinfectants
- // Sterilants are chemical agents that may be used to sterilise instruments or devices for use in critical sites (entry or penetration into a sterile tissue cavity or the bloodstream)
- // Instrument-grade disinfectants are further classified as high, low or intermediate level, where the level of activity is defined by the risk associated with specific in-use situations
- // High-level instrument-grade disinfectants provide the minimum level of processing for instruments used in semicritical sites (contact with nonsterile mucosa or nonintact skin)
- // The performance of chemical disinfectants and sterilants is affected by temperature, contact time, concentration, pH, presence of organic and inorganic material, and numbers and resistance of microorganisms present
- // Chemical disinfectants and sterilants should always be used with care according to the manufacturer's instructions and material safety data sheets

Skin disinfectants (antiseptics)

- // Skin disinfectants, or antiseptics, are substances used for dermal or mucous membrane application to kill or prevent the growth of microorganisms. They are regulated by the TGA as either registered medicines (AUST R), or listable medicines or medical devices (AUST L). Label claims must be followed

Chemical disinfectants and sterilants act by damaging the structure or impairing the metabolism of infectious agents. The biocidal (inactivation) structure and the general properties of the group to which it belongs (see Appendix 6). All solutions labelled as disinfectants inactivate a range of vegetative bacteria, such as gram-positive and gram-negative bacteria, but may not inactivate more resistant bacteria, bacterial endospores, viruses or other microorganisms such as fungi (e.g. *Candida* spp) or protozoa (e.g. *Giardia* spp). Contact time specified by the manufacturer should be applied.

Sterilants and higher-level disinfectants also inactivate bacterial endospores, mycobacteria, viruses (both the more sensitive lipid-coated viruses, such as human immunodeficiency virus, and relatively resistant viruses, such as polio virus) and other microorganisms. However, the sporicidal activity during the usual shorter exposure time for high-level disinfection may not be optimal.

Most chemical disinfectants and sterilants are only partially effective against the agents of Creutzfeldt-Jakob disease. For details of inactivation methods for these agents see Appendix 6. Chemical substances may be formulated for use on inanimate surfaces (ie surface disinfectants) or for use on skin (ie skin disinfectants, or antiseptics). Classification of a product using any of these active ingredients as household grade, hospital grade, instrument grade, sterilant or antiseptic depends on the formulation used.

Chemical disinfectants and sterilants

Disinfectants and sterilants intended for use in the health care setting are regulated by the Therapeutic Goods Administration (TGA) under Therapeutic Goods Order No 54 (TGO 54) and are classified in the following broad categories:

- // sterilants
- // instrument-grade disinfectants (three subclasses)
 - low grade
 - intermediate grade
 - high grade
- // hospital-grade disinfectants (two subclasses)
 - dirty conditions
 - clean conditions
- // household/commercial-grade disinfectants.

Critical factors that may affect the performance of disinfectants or sterilants include temperature, contact time, concentration, pH, presence of residual organic and inorganic material, and numbers and resistance of the initial bioburden on a surface.

It is essential that disinfectants and sterilants are always used in accordance with the manufacturer's directions to ensure that the product meets its label claims for efficacy in accordance with the requirements of TGO 54. Disinfectants and sterilants should not harm instruments or equipment and the compatibility of instruments and equipment should be a consideration when choosing products. Products should not be mixed and 'use by' dates should be checked for currency. Products should be used at the recommended strength for soaking or exposure times. The required amount of product should be decanted as required to avoid contamination of the stock solution. Unused product should be discarded after use.



Sterilants and instrument-grade disinfectants

The TGA assesses products as instrument-grade (high, intermediate or low level) disinfectants or sterilants on the basis of stringent conditions outlined in TGO 54. The manufacturer is required to provide data to the TGA that demonstrates in-use efficacy and compatibility with a range of instruments. Those chemical disinfectants intended for use in automated washer-disinfectors should perform effectively as claimed on the label. Any disinfectant or sterilant used to reprocess medical instruments must be registered on the Australian Register of Therapeutic Goods (ARTG).

Sterilants

Sterilants inactivate all microorganisms.

A sterilant is a liquid chemical agent that may be used to sterilise critical medical devices that will not withstand steam sterilisation. Sterilants inactivate all microorganisms, giving a sterility assurance level of less than 10^{-6} , which is the sterility level required for medical equipment that will contact critical body sites.

All chemical sterilants should be used in accordance with the manufacturer's approved label conditions for sterilisation. For products that may be classified as both a sterilant and a high-level disinfectant (multiuse), the sterilisation time is the longer of the two times that appear on the label. Automated chemical processing systems based on peracetic acid or high-concentration hydrogen peroxide (plasma) sterilants achieve sterilisation within 30–80 minutes, depending on the model and the system. There are TGA-approved sterilant products for both manual and automated systems. If users of sterilants and/or high-level disinfectants are unsure of the TGA-approved status of a product, they should ask the manufacturer to supply the product's AUST R code number before they take any further action.

Instrument-grade disinfectants

Instrument-grade disinfectants are classified as high, intermediate or low level. Careful selection of an appropriate level of disinfectant is required to achieve the desired level of disinfection. The definitions given in TGO 54 state that, when used as recommended by the manufacturer:

- // high-level chemical disinfectants inactivate all microbial pathogens, except large numbers of bacterial endospores
- // intermediate-level disinfectants inactivate all microbial pathogens except bacterial endospores; they are bactericidal (including mycobactericidal), fungicidal against asexual spores (but not necessarily dried chlamydospores or sexual spores) and virucidal
- // low-level disinfectants rapidly inactivate most vegetative bacteria as well as medium-sized lipid-containing viruses; they may not be relied upon to destroy, within a practical length of time, bacterial endospores, mycobacteria, fungi or any small nonlipid virus.

The level of activity (high, intermediate or low) is defined by the risk associated with a specific in-use situation. Halogens (such as chlorine and iodine) may perform as high-level disinfectants at high concentrations, but none are currently registered in Australia. Quaternary ammonium compounds usually perform as low-level disinfectants, which are ineffective against many

microorganisms (e.g. bacterial spores, mycobacteria and many viruses). However, when co-formulated with other active chemical substances, the final formulation may deliver the increased activity required of an intermediate or high-level disinfectant. Depending on the formulation, alcohols may be good intermediate-level disinfectants (see Appendix 6).

Hospital-grade disinfectants

Hospital-grade disinfectants are regulated by the TGA. These disinfectants must not be used to disinfect medical instruments. This should be stated on the product label.

The use of hospital-grade disinfectants is not necessary in health care establishments. The recommended procedure is the manual removal of visible soil and dirt, followed by cleaning with water and detergent. However, hospital-grade disinfectants may be used on environmental surfaces such as walls, floors, furniture and equipment that do not come into direct contact with the patient.

The activity of hospital-grade disinfectants is usually restricted to a range of vegetative bacteria of the type usually encountered in a health care setting, unless the TGA approves additional specific label claims, such as tuberculocidal or virucidal activities.

Household/commercial-grade disinfectants

Household/commercial-grade disinfectants are also regulated by the TGA. These disinfectants have limited use, as their efficacy has not been tested under conditions likely to be encountered in health care settings.

Skin disinfectants (antiseptics)

An antiseptic is a substance that is recommended by its manufacturer for application to the skin or mucous membranes of a person or animal to deactivate microorganisms or to prevent the growth of microorganisms to a level that may cause clinical infection. An antiseptic is not represented to be suitable for internal use (TGO 54). Skin disinfectants/antiseptics are regulated by the TGA. Most antiseptic products marketed in Australia are either registered medicines or listable medicines (eg tea tree oil) on the Australian Register of Therapeutic Goods (ARTG) and therefore require an AUST R or AUST L number, respectively, on the label. Other products contained in sachets are currently classified as listable medical devices, for which the display of an AUST L number is optional. The label claims of such products are important and should be followed.

Skin disinfectants/antiseptics should always be used according to the manufacturer's directions, which are designed to ensure that a product, when used as directed, meets its label claims for efficacy in accordance with TGA requirements.

Hygienic handwash/scrub products are formulated to reduce transient bacteria on the hands. Surgical scrubs reduce the level of both transient and resident bacterial flora. Handwashing disinfectants chosen for health care workers (HCWs) should demonstrate residual as well as immediate activity.

HCWs should use skin disinfectants on their hands before participating in any surgical procedures, including cannulation, catheterisation and intubation. Skin disinfection before surgery should reduce the number of resident bacteria and thus the



infectivity of skin or mucosal tissue in the patient and on the hands of the HCW. Each skin disinfectant should be labelled with the date when first opened and discarded after its designated 'use by' date as indicated on the manufacturer's label.

Before use, sufficient skin disinfectant for an individual patient's use should be decanted into a sterile container. Any fluid remaining in this container should be discarded at the end of each procedure. HCWs should check the label for the specific contact time of each antiseptic used and should use the antiseptic strictly in accordance with the manufacturer's instructions. There is a wide range of antiseptics available. The formulations and concentrations chosen should be appropriate to the tissues to which the antiseptic is applied. Particular note should be taken of the flammability of the product in relation to the setting in which it is to be used.

The following preparations may be used, but the choice should be appropriate for the nature and site of the procedure:

- // 70-80% w/w ethanol
- // 60-70% v/v isopropanol
- // chlorhexidine in aqueous formulations (0.5-4% w/v) or in alcoholic formulations with chlorhexidine (0.5-1% w/v) in 60-70% isopropanol or ethanol

- // 10% w/v aqueous or alcoholic povidone-iodine (1% w/v available iodine)

- // solutions containing 1% w/v diphenyl ether (triclosan) (Gardner and Peel 1998).

Note that particular preparations are contraindicated for use at particular sites. For example, 4% w/v chlorhexidine is widely used as a bacterial skin cleaner for hygienic and surgical handwashing. An aqueous solution of 0.5% w/v chlorhexidine is recommended for use on facial skin. Weaker solutions (0.02- 0.05% w/v) may be used for application to mucous membranes - for example during bladder irrigation. Where disinfectant is used during dental procedures, oral membranes should be dried/isolated to prevent dilution of the disinfectant with saliva.

Studies have indicated that 2% aqueous chlorhexidine is more effective than 10% povidone-iodine or 70% alcohol for cutaneous disinfection before insertion of an intravascular device and for post-insertion care, and may substantially reduce the incidence of device-related transmission of infection. However, 2% aqueous chlorhexidine is not currently marketed in Australia.





Appendix 5: Specifications and fitting instructions for respirators for Australian veterinarians

This information is adapted from Ryan and Jacobsen (2009), and is reproduced with permission of the New South Wales Department of Primary Industries.

 The National Health and Medical Research Council guidelines for the use of P2 respirators are available at www.nhmrc.gov.au/b2.4.3-how-should-airborne-precautions-be-applied

Required respirator features for use in animal disease investigations

- // A P2 respirator is the standard for use in animal disease investigations.
- // These respirators are for single use only.
- // Users need to be fit-tested and trained how to perform a fit check.
- // Respirators need to have adjustable straps so they can be tightened to fit.
- // It's important that a respirator is the right size for each user. A large respirator can't be tightened properly to fit a small face.
- // A relief valve can be useful, especially if the respirator will be worn for long periods of time.
- // Well-made respirators made with good quality materials are recommended.

Respirator fit

The respirator must fit snugly over the nose with no gaps on either side. This is important to ensure no particles can get in and so that glasses and goggles fit correctly over the top.



Correct fit

No gaps



Incorrect fit

Gap between skin and respirator

Features of P2 respirators available in Australia



Example 1:

These respirators have a sturdy dome shape. The straps are not adjustable. The two on the left have relief valves, while the one on the right does not.



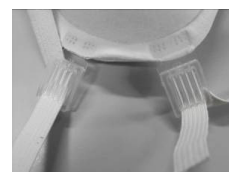
Example 2:

This respirator has a sturdy dome shape, relief valve and adjustable straps.



Example 3:

This respirator does not have adjustable straps or a relief valve. The material is thinner than other respirators. It tends to fit well with a good facial seal, and is better suited for indoor than outdoor use.



Example 4:

This respirator has adjustable straps and a relief valve. Material is thinner than other respirators. The picture on the right shows the inside of the respirator with padding over the nose to improve comfort and to improve facial seal.



Example 5:

This respirator has a well moulded nose bridge, adjustable straps, relief valve and sturdy dome shape.



Appendix 6: Sources of information for prevention of zoonotic diseases for Australian veterinarians

Source	Publisher (year)	Comments
Suit up! Personal protective equipment for veterinarians	Australian Veterinary Association (2011)	Instructional film on how to correctly put on and take off full PPE for high risk site visits. Available at www.ava.com.au/suit-up
FECVA Key Recommendations for Hygiene and Infection Control in Veterinary Practice	Federation of Veterinarians of Europe (2010)	A wall poster with comprehensive hygiene measures to control infections in veterinary settings. Available at www.fve.org/news/publications/pdf/fecava_hygiene%20poster_2011.pdf
Hand Hygiene Australia	Hand Hygiene Australia	Information and online training course suitable for all veterinary practice staff. Available at www.hha.org.au
How to fit and remove a P2 respirator	Australian Department of Health and Ageing	Simple diagrams suitable for wall display. Available at www.health.gov.au/internet/main/publishing.nsf/Content/DA1F578F885B4872CA257E35007F6924/\$File/p2_mask.pdf
Infection prevention and control best practices for small animal veterinary clinics	Canadian Committee on Antibiotic Resistance (2008)	Highly detailed guide to preventing surgical infection, transfer of infection between patients as well as zoonotic disease. Relevant to small animal clinics.
Compendium of veterinary standard precautions: zoonotic disease prevention in veterinary personnel	National Association of State Public Health Veterinarians Veterinary Infection Control Committee 2010, JAVMA vol. 237, pp. 1402-1422	Comprehensive literature review. Balanced approach to preventing infection in staff, based on understanding of disease, facility design, hygienic practices and equipment. Practice-specific guidelines outlined as 'Model Infection Control Plan'.
Guidelines for veterinarians handling potential Hendra virus infection in horses	Department of Employment, Economic Development and Innovation, Queensland (2011)	Comprehensive instructions for veterinary practitioners for a) preparation to avert risk b) zoonosis prevention and c) regulatory requirements in relation to Hendra virus. Available at www.daf.qld.gov.au/animal-industries/animal-health-and-diseases/a-z-list/hendra-virus
Australian guidelines for the prevention and control of infection in health care	National Health and Medical Research Council (2010)	Best practice recommendations for infection control in medical settings, based on scientific, legal and medical evidence-based sources. Comprehensive and practical approach, covers important matters in great detail, well set out, backed by references. Training resources available at www.nhmrc.gov.au/node/30290
Rabies and other lyssaviruses (including Australian bat lyssavirus)	Australian Department of Health	General information on rabies and other lyssaviruses. Available at www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home~handbook10part4~handbook10-4-16#4-16-3



Source	Publisher (year)	Comments
Animal Disease Surveillance and Monitoring- Chapter 4 in 'Animal Health in Australia'	Animal Health Australia (2009)	Reports on animal disease for trading partners. Provides tables showing the incidence of zoonotic diseases reported in Australia 2004-2008. Figures for notifiable diseases are updated quarterly at www.animalhealthaustralia.com.au/our-publications/animal-health-surveillance-quarterly/
Biosecurity of veterinary practices	Paul S Morley - Vet Clin Food An 18: 133-155 (2002)	Main focus on infectious disease control to protect patients. Outlines principles behind infection control programs.
Biosecurity in practice: Protecting you and your clients. A practical workshop for veterinarians and their staff	Industry & Investment NSW (2009)	Practical and targeted advice. Focus on large animal practitioners. Clear photos included on how to put on and take off PPE, as well as approximate cost and source of PPE.
Zoonoses - animal diseases that may also affect humans (AG1032)	Department of Primary Industries, State of Victoria	Simple overview of common conditions associated with pets, wildlife and farm animals
Australia's notifiable diseases status, 2009: Annual report of the National Notifiable Diseases Surveillance System - Zoonoses	Commonwealth Department of Health and Ageing (2011) <i>Communicable Diseases Intelligence</i> Volume 35, Number 2 - June 2011	Provides details of incidence of human cases of notifiable zoonotic diseases, along with geographical distribution, case definition, diagnostic requirements and trends at www.health.gov.au/internet/main/publishing.nsf/Content/cda-cdi3502atoc.htm
Zoonotic infections in Europe in 2007: A summary of the EFSA-ECDC annual report	European Food Safety Authority and European Centre for Disease Prevention and Control Eurosurveillance14,3 (2009)	Reports on trends in food safety and zoonotic disease. Figures collated from all EU member states. Focus on food-borne pathogens.
Queensland pandemic influenza preparedness and response guide for businesses	Queensland Government (2009)	Detailed protocols to advise businesses on approaches to minimise risk of infection with influenza virus. Incorporates regulatory, legal and medical recommendations. Available at www.health.qld.gov.au/flu/business/pandemic-flu.asp
Annual report on zoonoses in Denmark 2005	Ministry of Family and Consumer Affairs, Copenhagen, Denmark (2005)	Focus on food-borne pathogens. Detailed information on abattoir surveillance, little detail on prevention of infection for veterinarians and staff.
BSAVA practice guidelines - reducing the risk from MRSA and MRSP	British Small Animal Veterinary Association (2011)	Practice guidelines to minimise transmission of MRSA and MRSP highlighting scrupulous hand hygiene, a clean environment, prudent antibiotic use and compliance. Available at www.bsava.com/Resources/Veterinary-resources/Scientific-information/MRSA



Appendix 7: Glossary of terms

Administration Procedure by which a vaccine or treatment is introduced into the animal, such as by injection, oral drenching or pouron.

Airborne transmission Transmission by inhalation of infectious agents from respiratory secretions.

Antibiotic Chemical substance used to treat bacterial infections.

Antibody (immunoglobulin) Specialised protein produced in response to an antigen (acquired naturally by infection or administered as a vaccine), which is a component of the immune response against a specific infection or disease.

Antigen Substance which the body recognises as foreign- binds to the corresponding antibody in the body.

Antiseptic Chemical disinfectant for use on skin or mucous membranes.

Arthropod Animal of the phylum Arthropoda, and with segmented body and jointed legs (includes insects, mites and ticks).

Arthropod vector An arthropod capable of transmitting micro-organisms between animals (hosts).

Aseptic A technique that allows no contamination with infectious agents such as bacteria or viruses.

Attenuated Reduced in virulence, often used to describe vaccines.

Booster Second, or subsequent, dose of vaccine given to enhance the immune response.

Carrier A person or animal which harbours an agent and served as a potential source of infection yet may show no clinical disease. "Incubatory carrier" is the designation given to persons or animals during the incubation period of a disease, while "convalescent carrier" implies infection persisting during the recovery period.

Cell-mediated immunity Immunity effected predominantly by cells (T-lymphocytes and accessory cells) rather than by antibody.

Diluent A liquid used to rehydrate a desiccated (usually lyophilised) product or a liquid used to dilute another substance.

Disinfectant Substance used to kill or prevent the growth of pathogenic microorganisms.

Droplet transmission Transmission by contact of infectious agents in droplets from respiratory secretions.

Efficacy Specific ability or capacity of a product to effect the result for which it is offered when used under the conditions recommended by the manufacturer. For a drench, it is often defined as the percentage of parasites killed by the product.

Emergency Animal Disease (EAD) A disease not normally occurring in a place that requires emergency responses to prevent animal and human illness and economic loss.

Endemic, enzootic (disease) Disease that is continuously present in a particular population ; sometimes the word "endemic" is used for human populations and "enzootic" for populations of other animals.

Epidemic, epizootic (disease) Disease occurring in an unusually high number of humans or animals in a population in a specified time interval.

Fomites Inanimate objects that may be contaminated with viruses and other infectious agents and transmit infection to a new host

Hazard In risk assessment the entity or factor that can cause injury, damage or disease.

Healthy Apparently normal in all vital functions and free of signs of disease.

Helminth parasites Worms that cause internal infections, often but not always in the intestinal tract.. There are three types of helminths - "cestodes" (tapeworms), "nematodes" (roundworms) and "trematodes" (flukes).

Herd Any group of animals, including birds, fish and reptiles, maintained at a common location (e.g. lot, farm or ranch) for any purpose.

High-level disinfectant A disinfectant that kills most microbial pathogens (except bacterial endospores), when used as recommended by its manufacturer. High-level disinfectants used in Australia must comply with Therapeutic Goods Order 54 – Standard for composition, packaging, labelling and performance of disinfectants and sterilants.

High-level disinfection Minimum treatment recommended for reprocessing instruments and devices that cannot be sterilised for use in semi-critical sites

Host A person, animal, fish, bird or arthropod, which is, or can, become infected with, and give sustenance to, a disease causing organism.

Humoral immunity Immunity effected by antibodies rather than cells (cf cell-mediated immunity)

Hypersensitivity Also called an "allergic reaction". A reaction of the previously immunised body in which tissue damage results from the additional immune response to a further dose of antigen. Can also result from natural exposure to antigen e.g. repeated bee stings.

Immune system The collection of organs, cells and molecules that together provide the animal with defence against invading organisms

Immunity Non-susceptibility to the invasive or pathogenic effects of foreign organisms or to the toxic effects of antigenic substances.

Immunisation (1) Administration of antigen in order to produce an immune response to that antigen; or (2) In clinical contexts, the term is used more specifically to mean administration of either antigen, to produce active immunity, or antibody, to produce passive immunity, in order to confer protection against harmful effects of antigenic substances or organisms.

Incidence (of disease) Proportion of a population contracting that disease during a specified period.

Incubation period Interval between the time of infection and the onset of clinical signs or symptoms.



Infection Penetration and multiplication of a pathogen in a susceptible host.

Integrated Pest Management (IPM) Using various different strategies to combat a pest such as insects or internal parasites. The aim is to decrease chemical usage and therefore decrease the chance of chemical resistance occurring.

Label All written, graphic or printed matter. (1) Upon or attached to a final container of a biological product; (2) appearing upon any immediate carton or box used to package such a final container; (3) appearing on any accompanying enclosures (leaflets, inserts or circulars) on which required information or directions as to the use of the biological product shall be found.

Live vaccine A vaccine containing live viruses or bacteria, often attenuated.

Lymphocyte A type of leukocyte found in lymphatic tissue in the blood, lymph nodes and organs. Lymphocytes are continuously made in the bone marrow and mature into antibody-forming cells or T-cells. See also B-lymphocytes; T-lymphocytes.

Microorganism Any organism (usually bacteria or viruses) that cannot be seen with the naked eye; also called microbe.

Mucosa The lining of body tracts such the respiratory, gastrointestinal tract and the reproductive tract.

Neonate Newborn.

Organism Any biological entity with the capacity for replication and response to evolutionary forces; includes plants, animals, fungi, protozoa, metazoa, viruses and bacteria.

Outbreak (of a disease) Epidemiological unit of clinically expressed or silent pathological cases which occur in the same location during a limited period of time.

Pandemic (panzootic) An epidemic that is geographically widespread, occurring throughout a region or even throughout the world in a specified time period.

Parasite An organism that, for all or some part of its life, lives in or on a living organism of another species (the host).

Pathogenic Capable of causing disease.

Pathogen Disease-causing organism

Personal protective equipment (PPE) Barrier protection worn to reduce the risk of infection; includes protective outerwear, surgical gloves, surgical masks, respirators and face shields.

Prevalence (of disease) Proportion of a population infected or sick at a specified point in time.

Protocol A document which states the rationale and objectives of the trial with the conditions under which it is to be performed and managed.

Protozoa Single celled organisms. Some of these are parasitic and cause disease in animals e.g. toxoplasmosis. Some protozoa live harmlessly in the environment, or help animals e.g. rumen flora.

Quarantine The process of separating goods, animals or people, usually by confining them to a defined area, while checks are carried out to ensure they pose no biosecurity threat.

Recipient (animal) Animal receiving a transfusion or vaccine, or in embryo transfer, the animal receiving the embryo.

Reservoir An animal that carries a potentially infective organisms and is a potential source of infection for other animals or people.

Rickettsia A type of bacteria responsible for diseases such as Q fever.

Risk In risk assessment, the likelihood that something will cause injury, combined with the potential severity or consequence of that injury.

Risk assessment A process in which the hazard is identified, exposure is assessed, the risk associated with that hazard is evaluated and appropriate ways of eliminating or controlling the hazard (risk management) are determined.

Standard operating procedures (SOPs) Detailed written instructions describing the practical procedures, test methods and management operations to be performed or followed, precautions to be taken and measures to apply.

Sterilant Chemical agent that kills or inactivates all microorganisms (including bacterial endospores) used to sterilise instruments or devices for use in critical sites (entry or penetration into a sterile tissue cavity or the bloodstream).

Sterility Freedom from all viable contaminating microorganisms, as demonstrated by procedures prescribed.

Sterilisation A process which kills or removes all microorganisms present on a surface or contained in a fluid or medication. Sterilisation methods include heat, chemicals, irradiation and filtration.

Vaccinate As a verb, used to mean “to inoculate” or administer a vaccine.

Vaccination Production of active immunity (protective immunity) in man or animal by administration of vaccines.

Vaccine A suspension of attenuated or killed microorganisms administered to animals usually for the prevention or amelioration of infectious diseases.

Vehicle A carrier, composed of one or more inert substances or the diluent for the active ingredient(s) in a liquid preparation. The vehicle may have an action itself, or influence the action of the preparation and the release of the active ingredient(s).

Vector 1. Intermediate host (e.g. arthropod) that transmits the causative agent of disease from infected to noninfected hosts

Vertical transmission Transmission of pathogenic agents from parent to progeny through the genome, sperm or ovum, or extracellularly (e.g. through milk or across the placenta).

Zoonosis Those diseases and infections (the agent of) which are naturally transmitted between (other) vertebrate animals and man. An example is lyssavirus, which can be spread to humans through contact with bats.

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