School of Veterinary Science
The University of Queensland

Biosecurity, Hygiene and Infection Control Manual
Standard Operating Procedures for Clinical Veterinary Services
2010

Radiation Safety Protection Plan
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1. INTRODUCTION

Biosecurity and infection control are increasingly important in veterinary practice. All professionals involved in veterinary practice have a responsibility to ensure the safety and welfare of people and animals involved in veterinary care. Infection prevention and control strategies are designed to protect patients, owners, veterinary personnel, students and the community. A significant percentage of hospital-associated infections in veterinary clinics can likely be prevented with proper compliance to basic, practical infection control practices. A systematic approach to infection prevention and control requires all personnel to play an active role in protecting every person and animal associated with the veterinary clinic, patients or veterinary personnel. Veterinary personnel need to follow infection prevention and control protocols at all times and apply critical thinking and problem solving in managing clinical situations.

This short, practical biosecurity and infection control guideline is intended to ensure that all staff, students and clients who interface with the clinical veterinary services of the School of Veterinary Science, University of Queensland are aware of the minimum standards expected, and that procedures and principles are similar in every location. This guideline is not intended to be a comprehensive document covering all aspects of biosecurity and infection control.

Understanding and application of excellent infection control principles are important requirements for accrediting bodies for veterinary schools. Biosecurity and infection control procedures are evaluated during accreditation visits. In Queensland, veterinary surgeries, hospitals and clinics are required to comply with Occupational Health and Safety requirements relating to infection control as well as other areas. State government inspections of veterinary premises will commence in 2010, thus it is extremely important that staff and students review their knowledge and skills in this area.

Overall, the aims of this document are to:

1. Protect staff, students and clients from exposure to zoonotic disease agents
2. Minimise the risk of nosocomial (hospital-acquired) infection to patients
3. Ensure students learn and apply best-practice in biosecurity and infection control in the clinical setting
4. Educate, by example, clients and members of the public in biosecurity and infection control
5. Provide a clean, safe and attractive working environment for everyone concerned
6. Protect operational capabilities of the clinics

To follow, we have included excerpts from two key reference documents used during the development of this Biosecurity, Hygiene and Infection Control Manual

(1) An excerpt from the ‘Australian Veterinary Association Policy for Infection Control’ and ‘Code of Practice for Management of Hygiene and Infection Control’
AVA policy 3.3 - Code for Infection Control

The Australian Veterinary Association (AVA) supports practices that:

- ensure the safety and welfare of all animals under veterinary care
- provide a safe and healthy working environment for owners, veterinarians and staff

Animal hospitals and veterinary practitioners have a duty of care and must take reasonable action to safeguard animals, staff and the public from infection. Employers must establish procedures and provide information, training and supervision, especially for infection control.

Veterinarians must be conscious of both the potential for zoonoses to present as unapparent infections in animals, and of their responsibilities regarding cross infection amongst animal patients. They must recognise the potential for pathogens to be introduced through inadequate infection control during administration of medication.

The following recommendations are compiled from the ‘AVA Code of Practice for Management of Hygiene and Infection Control for Veterinarians’:

1. Workplace based infection control plan
   Each workplace, including ambulatory services, attended by the veterinarian will be assessed for the risk of infection to all workers, clients and animals. The risk assessment will include development and audit of standard operational procedures to minimise the risk of adverse consequences from a foreseeable event at that workplace. The risk assessment will be documented and reviewed at least annually against published material for the control of infection in veterinary workplaces. A senior professional staff member should have responsibility for currency of the plan and inclusion of all staff in the development and application of the procedures to manage risks.

2. Standard Infection Control Procedures
   All staff involved in the handling of animals, animal waste or material that may be contaminated with animal fluids or veterinary therapeutic agents will be regularly instructed in the correct use of standard infection control barriers and monitored for correct application of these practices.

3. High Risk Procedures
   Veterinarians who are undertaking high risk procedures, where the risk of adverse consequences would be very likely or very severe due to the nature of the procedure or infectious agent need to ensure additional precautions are observed for themselves and any at risk human or animals. High risk procedures would include procedures where aerosol dispersion or gross contamination by body fluids could occur while undertaking the veterinary procedure. Additional protection levels including exclusion of nonessential persons or animals and the use of specialised protective equipment are required.

4. Demonstrated commitment to infection control practices
   Veterinarians must demonstrate a commitment for continual application of the principles of protection of themselves, and all other human and animals under their control. Verbal instruction and educational material is vital for all staff at
their work place. Written material must also be available for clients of high risk animals. Staff are required to actively participate in developing standard procedures for management of risks as well as reporting new risks and incident reporting.

5. Monitoring of infection control programs

The monitoring and documentation of participation by staff and clients in management and minimisation of risk of infection within the workplace must be encouraged through formal audit procedures. Demonstrated continued professional education programs as well as informal discussions with staff and clients should be documented as evidence of application of the infection control plan and a commitment to minimisation of the risks to all persons and animals.

The following summary for infection prevention and control best practices or small animal veterinary clinics is written by the Canadian Committee on Antibiotic Resistance (2008):

1. Infection prevention and control strategies are designed to protect patients, owners, veterinary personnel and the community. All veterinary personnel should play an active role in protecting every person and animal associated with the veterinary clinic.

2. Every veterinary clinic, regardless of type or size, should have a formal infection control program, a written infection control manual, and an infection control practitioner (ICP) to coordinate the program.

3. Some form of surveillance (either passive or active) should be practiced by all veterinary facilities. The keys to passive surveillance are to centralize the available data, and to have a designated ICP who compiles and evaluates the data on a regular basis.

4. Routine Practices that are critical to infectious disease prevention and control:

a. Hand hygiene, including hand washing and the use of alcohol-based hand sanitizers

b. Risk reduction strategies, particularly those related to: the use of personal protective equipment (PPE), cleaning and disinfection, laundry and waste management

c. Risk assessment of animals and personnel with regard to: disease transmission and disease susceptibility.

d. Education of veterinary personnel, students, animal owners and the public

5. All surgical procedures cause breaks in the normal defensive barriers of the skin or mucous membranes, and therefore carry an inherent risk of surgical site infection (SSI). Good general infection control practices (e.g. hand hygiene, cleaning and disinfection) are important for prevention of SSIs, but there are also specific infection control measures pertaining to surgery that should be considered.

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

7. Proper wound care is critical to preventing transmission of bacteria, particularly multidrug-resistant pathogens, between animals, personnel and the environment.
8. Animals from shelters and similar facilities should be considered high risk from an infectious disease standpoint and managed appropriately to prevent transmission of disease.

9. Safety of personnel and animal owners should always be a priority. Personnel should take all necessary precautions to prevent animal-related injuries (e.g. bites, scratches), and all bite wounds should be taken seriously. Proper sharps handling practices should be emphasized to reduce the risk of needle-stick injuries.

10. Education of personnel and clients about zoonotic and infectious disease risks and prevention is crucial.

**RATIONALE FOR ROUTINE PRACTICES – THE CHAIN OF TRANSMISSION**

Modified from information compiled by the Public Health Agency of Canada, 1999 and Canadian Committee on Antibiotic Resistance (2008)

Transmission of infection during the provision of health care requires three elements:

(1) **A source of infectious microorganisms** – includes animals, people (clothing, hands etc), food, water, medical equip, drugs, bedding, waste material etc. Microorganisms to consider include bacteria, viruses, fungi and parasites. In some cases, vectors such as lice, mosquitoes, flies, ticks, fleas, rodents and other vermin can transmit pathogens.

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

(3) **A means of transmission for the microorganism.** Prevention of infection in animal health care settings should be directed at interrupting the transmission of microorganisms from source to host, because agent and host factors are typically more difficult to control.

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

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

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

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

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

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

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

**THE INFECTION CONTROL PROGRAM**

Every veterinary clinic, regardless of type or size, should have a formal infection control
program that is coordinated by one specific person. This infection control practitioner
(ICP) should develop protocols, ensure that protocols are being followed, act as a resource
for infection control questions, ensure proper training of new staff, direct and interpret
surveillance and communicate with staff regarding infection control issues.

The day-to-day responsibilities are typically minimal. It is also a not a position that needs
to be filled by an expert in infection control or someone with specific training, although
that would certainly be desirable. In human hospitals, ICPs are typically nurses with
specialized infection control training, who perform the day-to-day infection control duties
and work under an infection control head, who is typically a physician with training in one
or more of infection control, infectious diseases, microbiology and/or public health. These individuals are rarely available in veterinary medicine, but that does not mean that an effective program cannot be established. Either veterinary technicians or veterinarians would be appropriate in veterinary clinics. Formal training would be ideal but is not readily available, and the key requirement for the position is an interest in infection control. Ideally, over time, the ICP will advance his or her skills through formal and informal continuing education.

In veterinary clinics, the ICP should be the central infection control resource. Among other duties, he or she should:

- Help facilitate development of a written infection control manual
- Direct and document training of new staff (particularly lay staff)
- Perform formal or informal quality control evaluation of infection control practice compliance (e.g. observing cleaning and disinfection practices, hand hygiene)
- Perform ongoing surveillance and be the person designated to receive information about and record incidents of suspected hospital-associated infections.

A written infection control manual is a critical part of the infection control program. Written documentation can clearly explain infection control practices, ensure that new staff members are properly informed and raise awareness about infection control. Furthermore, written documentation may be important legally in the event of hospital-associated, or more concerning, zoonotic infections. A written manual demonstrates a level of awareness and effort towards infection control and could be a critical measure to reduce liability risks by demonstrating use of some degree of due diligence.

Support of hospital administration is also crucial to an effective infection control program. If practice owners and managers are unwilling to provide the ICP with adequate time, resources and support, the infection control program will fail. Hospital administration needs to ensure that all veterinary personnel understand and accept the importance of an infection control program, and intervene when required if issues (e.g. poor compliance) arise.
2. SURVEILLANCE

Surveillance is a key component of any infection control program. Effective infection control is impossible without surveillance and should be performed by the ICP. It involves analysis of data that are already available (e.g. bacterial culture and susceptibility results, results of other kinds of infectious disease testing) to determine elements such as endemic disease rates, antimicrobial susceptibility patterns and trends, and changes in disease patterns. An example of passive surveillance would be monitoring the surgical site infection (SSI) rate following all surgical procedures and specific surgical procedures (e.g. spays, neuters). Monitoring of bacterial culture and susceptibility testing can provide information regarding possible outbreaks of hospital associated infections (HAIs), as well as information to guide empirical antimicrobial therapy. Routine recording of animals with specific syndromes such as vomiting, diarrhea, coughing or sneezing is another simple means of providing information that can help in the prevention and early detection of outbreaks, and can help to identify index cases should a hospital outbreak occur.

Post-discharge surveillance is more problematic, but is very important for conditions such as SSIs, as many such infections do not develop until after the animal is discharged from the hospital. Post-discharge surveillance can consist of direct examination of the patient during a recheck appointment, evaluation of readmission data or simple telephone or mail contact with owners.

The keys to passive surveillance are to centralize the available data, and to have a designated infection control practitioner (ICP) who is responsible for compiling and evaluating this data on a regular basis. Simply collecting the data or even entering it in a spreadsheet is of no value unless someone looks at it. This is particularly important in large clinics or hospitals where multiple veterinarians may have patients with similar infections but do not communicate this to others, and therefore the start of an outbreak can be missed. If an outbreak is identified, then a plan can be formulated and implemented in order to stop the spread of disease. This plan may or may not include additional active surveillance to identify additional cases.

Current infection surveillance activities at the Veterinary Medical Centre, Gatton are coordinated by Dr Justine Gibson (gibson.j@uq.edu.au) or Dr Rowland Cobbold (r.cobbold@uq.edu.au) and include the following:

**Passive Surveillance**
Passive surveillance will be performed routinely via monitoring clinical samples sent from the Veterinary Teaching Hospital to the diagnostic laboratory, and providing monthly reports of zoonotic and antimicrobial resistant organisms. Clinical data associated with the cases are available for epidemiological analysis if necessary.

**Active Surveillance**
The presence of MDR E.coli, Salmonella, and MRSA in dogs and horses on admission to hospital will be determined by taking rectal and nasal samples when the animal is presented to the clinic. This will also ascertain how pathogens are introduced into the hospital. Initially, 200 animals will be sampled, which will enable detection of prevalence of 2%, 2-5% and 3-15%, respectively of these organisms. The sampling regime will be adjusted as required after baseline data is obtained. All swabs will be taken from dogs and horses with the owner’s consent and providing the procedure does not compromise the health of the animal or hospital personnel.
• Obtain informed written consent from owner;
• Obtain rectal and nasal swab from the animal (labeled date, species, animal ID, source);
• Send samples to diagnostic laboratory with appropriate request slip.

**Environmental surveillance: longitudinal surveillance**
Environmental surveillance will initially occur over a 12-month period, commencing prior to the opening of the veterinary clinic to provide baseline data.

Baseline data: Environmental samples (n=400) have been taken from high risk areas such as drains, cages, floors and contact surfaces (doors, phones, shovels, railings, tables) or where it is important that the environment is free of pathogens e.g. surgeries and intensive care units.

• For the first 3 months after opening: 10-15 samples are to be taken weekly;
• For 3 – 6 months after opening: 10-15 samples to be taken fortnightly;
• After 6 months: 10-15 samples to be taken monthly.

This protocol will be modified depending on the actual prevalence of organisms. Environmental samples will be collected by swabs or electrostatic wipes. These samples will then be placed in a pre-enrichment broth. Total bacterial counts will determine the environmental load and *Salmonella*, MRSA and MDR *E.coli* will be identified and reported to Veterinary Teaching Hospital management and other stakeholders.

**Evaluation of infection control strategies**
Clinical staff will answer a questionnaire, to assess compliance and barriers to infection control, after 6 months, which will be followed by focus group interviews (chief nurse, interns, students). This information combined with the results of incidence of infections at admission, clinical infections, and environmental surveillance will evaluate biosecurity and infection control protocols.

**Re-assessment and modification of infection control practices**
If breakdowns in infection control are noted, further protocols for surveillance or infection control may need to be implemented. will be formally evaluated after the first 6 months of opening the Veterinary Teaching Hospital. This is to mitigate the risk of infection and to maximise compliance with infection control procedures. Need for intervention or procedure modification can then be evaluated. If no interventions are necessary the objective will be to establish longer term surveillance and biosecurity protocols.

*Similar strategies are currently being developed for the remainder of the veterinary clinical services provided by the School of Veterinary Science.*
3. ROUTINE PRACTICES

Routine Practices are a way of thinking and of acting that forms the foundation for limiting the transmission of microorganisms in all health care settings.

Routine practices include:

- Hand hygiene

- Risk reduction strategies through use of personal protective equipment (PPE), cleaning and disinfection of the environment and equipment, laundry management, waste management, safe sharps handling, patient placement, and healthy workplace practices

- Risk assessment related to animal clinical signs, including screening for syndromes that might indicate the presence of infectious disease (e.g. fever, coughing/sneezing, diarrhea, abnormal excretions/secretions), and use of risk assessment to guide control practices

- Education of veterinary personnel and owners

HAND HYGIENE

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

Hand hygiene is the single most important way to prevent infections in the healthcare setting.

(a) HAND WASHING

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

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

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

Antibacterial soaps should be used throughout the hospital, particularly in high risk areas such as ICU. There are multiple hand washing stations situated throughout the Veterinary Medical Centre. These stations contain Microshield 4 (Chlorhexidine Gluconate 4%) in
disposable pump dispensers. There are also alcoholic hand sanitiser bottles positioned around the clinic for all personnel to use intermittently throughout the day. Bar soaps are not acceptable in veterinary practice settings because of the potential for transmission of pathogens from one person to another.

Wash hands before and after every patient and after contact with any body fluids, potentially infectious or contaminated material; before and after contact with items in the patient’s environment; before performing invasive procedures; before eating food and after personal body functions, such as using the toilet or blowing one’s nose.

**Recommended Technique for Hand Washing**

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

**NOTE:** If air hand dryers are used, hands-free taps are necessary, as turning taps off without using paper towel as described will result in recontamination of hands after washing.

It is recommended that jewellery not be worn on the hands during clinical work as it is difficult to wash hands adequately; rings can be kept on a neck chain in these circumstances; short-sleeved clothing or sleeves to the elbow at maximum is recommended to facilitate adequate handwashing.

**(B) USE OF ALCOHOL-BASED HAND SANITIZERS**

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

Alcohol-based hand sanitizers should contain 70-90% alcohol. Use of products containing emollients helps to reduce skin damage which can otherwise occur with frequent use of hand sanitizers. Products containing alcohol and chlorhexidine are also available. Chlorhexidine provides some residual antimicrobial action on the hands after use, but it is unclear whether or not these combinations provide any true benefit in clinical settings. They may be more useful as alternatives to traditional surgical scrubbing techniques (see Surgery section on page 40).
Alcohol-based hand sanitizers are not effective against certain pathogens, including bacterial spores (e.g. clostridial spores) and Cryptosporidium spp. Nonetheless, alcohol-based hand sanitizers may be useful even if alcohol-resistant pathogens like Clostridium difficile are present. The improved hand hygiene compliance seen with alcohol-based hand sanitizers and their efficacy against other pathogens are important aspects of infection control. Routine use of these products has not resulted in detectable increases in C. difficile infection rates in human hospitals. However, if hands are potentially contaminated by one of these organisms, hand washing with soap and running water should be performed if possible. Although even antimicrobial soaps are similarly ineffective against these pathogens directly, the physical process and mechanical action of hand washing can decrease the number of these organisms on the hands. Alcohol is also not as effective against non-enveloped viruses (e.g. canine parvovirus, feline panleukopenia virus) as it is against most other microbes. As for clostridial pathogens, hand washing with soap and running water is likely more effective, and should be used whenever possible when these pathogens are involved.

**Recommended Technique for Alcohol Based Sanitizers**

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

**FACTORS THAT INFLUENCE THE EFFECTIVENESS OF HAND HYGIENE**

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

**SKIN CARE**

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

Intact skin is the first line of defense against bacteria.
**4. PERSONAL PROTECTIVE EQUIPMENT (PPE)**

Personal protective equipment (PPE) is an important routine infection control tool. PPE use is designed to reduce the risk of contamination of personal clothing, reduce exposure of skin and mucous membranes of veterinary personnel to pathogens, and reduce transmission of pathogens between patients by veterinary personnel. Some form of PPE must be worn in all clinical situations, including any contact with animals and their environment. These recommendations must always be tempered by professional judgment, while still bearing in mind the basic principles of infectious disease control, as every situation is unique in terms of the specific clinic, animal, personnel, procedures and suspected infectious disease.

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).

Here are some of the basic personal practices to be considered by clinic personnel and students. Long hair should be tied back. Closed-toe shoes which are easily cleaned should be worn. Fingernails should be short to make washing and scrubbing effective. Special care should be taken in the case of personal risk factors such as possible immunosuppression in persons with conditions which may affect the immune system, or taking immunosuppressive drugs (cortisone, cyclosporine etc); wounds, cuts & scratches; chronic or acute intercurrent medical conditions (eg colds and influenza, asthma, eczema, respiratory disease, diabetes etc), pregnancy. Avoid touching the face with hands to minimise likelihood of germ transfer. Protective clothing such as scrubs tops, scrubs, gowns, overalls or lab coats should be worn. Protective clothing must be changed if grossly contaminated or if an animal with a known infectious disease is contacted. Fresh protective clothing must be worn every day. Used protective clothing should be put in a suitable bag separate from clean items until it is laundered. Students to provide their own protective clothing which should be kept separately from other clothing and equipment after wearing (eg in a garbage bag) and laundered in hot water after each use.

Gloves and masks should be worn if in warranted in the judgment of the student or staff member, eg if there is likely to be contact with body fluids or transmission of a zoonotic disease by aerosol (eg Bordetella). Protective eye wear should be born if there is a possibility of contamination of the eyes with organic material or a pathogen (eg during orthopaedic or dental procedures). Gloves do not preclude the necessity of regular handwashing between each animal. Special protective equipment should be used if there is a higher risk, eg heavy gloves for handling bats (Lyssa Virus, Hendra Virus), other wildlife or fractious cats (cat scratch).

No human food is to be kept in the clinical areas except for designated kitchen or dining areas. No eating or drinking in clinic areas except for designated areas.

**LAB COATS/ CONSULTING JACKETS**

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

**SCRUBS**

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

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

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

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

**NON-STERILE GOWNS**

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

Personnel should learn to remove gowns properly, in such a way as to avoid contaminating themselves and the environment. All gowns should be used only once, then discarded or laundered.

**GLOVES**

Gloves reduce the risk of pathogen transmission by providing barrier protection. They should be worn when contact with blood, body fluids, secretions, excretions and mucous membranes is possible. Gloves should also be worn when cleaning cages and environmental surfaces, as well as when doing laundry if gross contamination of items is present.
Gloves should be removed promptly after use, avoiding contact between skin and the outer glove surface. Gloved hands should not be used to touch surfaces that will be touched by people with non-gloved hands. Care should be taken to avoid contamination of personal item such as telephones, pens and pagers. Hands should be washed or an alcohol-based hand sanitizer should be used immediately after glove removal. It is a common misconception that using disposable gloves negates the need for hand hygiene. Gloves do not provide complete protection against hand contamination, therefore hand hygiene immediately after removing gloves is essential. Disposable gloves should not be washed and reused. Gloves are NOT a substitute for proper hand hygiene.

Change gloves and perform hand hygiene when:

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

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

**FACE PROTECTION**

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

**RESPIRATORY PROTECTION**

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

**FOOTWEAR**

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

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

Cleaning and disinfection are two separate tasks. Cleaning involves the removal of visible organic matter with soap or detergent, whereas disinfection involves the application of a chemical or other procedure in order to kill the remaining microbes that cannot be adequately removed by cleaning. Cleaning is essential because the survival time of many infectious agents outside the host is prolonged by the presence of organic matter, and organic matter also decreases the effectiveness of disinfectants. Depending on the level of disinfection used, disinfection kills or prevents the growth of many or most pathogens.

Equipment should be cleaned and disinfected according to its intended use, the manufacturer's recommendations, and practice policy. Equipment must be cleaned before sterilization or disinfection. Surfaces where animals are housed, examined, or treated should be made of non-porous, sealed, easy-to-clean materials to facilitate cleaning and disinfection and minimize infection transmission.

Personnel whose duties include cleaning and disinfection of equipment and different hospital areas should be trained regarding how to safely handle and use the products available in the clinic. In Australia, Material Safety Data Sheets (MSDS) must be readily accessible for all the applicable chemical products.

CLEANING

Cleaning entails the removal of all forms of organic matter (e.g. feces, urine, blood, food, dirt etc.) from a surface. Ensure all areas are well ventilated during cleaning. Cleaning must always be done before a disinfectant is used. After cleaning, allow all surfaces to dry completely.

Avoid generating airborne dust that may contain pathogens by:

- using a vacuum cleaner equipped with a HEPA filter. The filter helps to prevent aerosolization of pathogens such as ringworm. For this reason, vacuums without HEPA filters should not be used for cleaning in patient-contact areas.
- lightly spraying surfaces with water prior to mopping or sweeping using an electrostatic wipe (e.g. SwifferTM cloth) using a wet mop

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

**DISINFECTION**
Disinfection is more effective if preceded by thorough mechanical cleaning. Ensure the area is well ventilated before using disinfectants. Gloves should be worn when handling disinfectants, but latex gloves will decompose and lose their integrity when exposed to many chemicals. For small jobs, disposable nitrile gloves should be used instead. For large jobs, heavier rubber gloves (e.g. common dishwashing gloves) can be used, but reusable gloves of this type must also be disinfected at the end of each task.

Always refer to the product label with respect to dilution rates and required contact time. For general cleaning purposes, UQ Veterinary Medical Centre utilizes Value Plus Stable and Kennel Disinfectant (10mls:500mls water). This solution is used only a general cleaner, and should not be used as a high grade disinfectant. For infectious diseases (e.g. Canine Cough, Cat Flu) UQ SAC & Teaching Hospital uses Virkon S* (Broad Spectrum virucidal/bactericidal/fungicidal disinfectant)

*Refer to SOP on Disinfectants

**Reception areas**
Reception areas are the public face of the clinic and create the all-important first impression for clients. Reception areas should be noticeably clean and fresh.

Specifically:

All surfaces damp-dusted daily using an appropriate disinfectant. Surfaces which are touched by people (e.g door handles and door plates, front and top of reception counter) should be regularly cleaned with alcohol spray and dried.

Floors should be vacuumed at least daily and more often if any noticeable amount of hair accumulates during the day. Hair should be vacuumed from the floor using a vacuum cleaner equipped with a hepa-filter to minimize spread of potential pathogens such as ringworm spores into the environment. Vacuuming should be performed before floor washing.

Floors must be washed daily with a suitable detergent (to remove grease and oils) and a germicidal disinfectant (one which kills parvovirus). During the day, any organic matter on the floor (urine, saliva, faeces, vomitus) or any liquid (e.g solution spills) must be cleaned promptly. Clean-up areas should be either dried immediately with paper or cloth towel, or any slip hazard identified and taped off and marked as a hazard until the floor is dry.

Any display shelving must be damp dusted using a suitable disinfectant at least weekly and preferable more often. Shelf contents must be similarly kept clean.

Toys should be of a material which can be disinfected. Soft toys are unsuitable for reception areas where they may be handled by many children or their carers. Toys should be disinfected as least weekly, eg by immersion in a bleach solution and natural drying, more often if indicated. Toy boxes should be cleaned with bleach or alcohol at least weekly.

A designated waiting area should be available for any animal which might have an infectious disease. This area should be away from other patients, preferably in another room or outside. For example, animals with acute cough (Bordetella), diarrhea (Canine
parvovirus), or skin lesions (ringworm) should be segregated from other patients while waiting.

**Consulting rooms**

Consulting rooms are the public face of clinical practice in the hospital. The environment in the consulting room is keenly observed by clients and procedures must not only minimize the risk of spread of infection but be seen to do so. Infection control is as for reception areas and additionally:

Examination table surfaces must be sprayed with alcohol and dried with paper towel after every animal.

Any area which becomes contaminated during a consultation (e.g., sink bench after minor procedures such as ear cleaning, corneal staining, venepuncture) must be sprayed with alcohol and wiped between every animal examined and treated.

Sinks and benches in consulting rooms must be cleaned thoroughly with a standard cleaner which will lift grease, oil, and water-soluble contaminants (for example Jif or Ajax), finished with alcohol spray and wiped dry at least daily.

All surfaces in consulting rooms including table legs, shelves, equipment trolleys etc must be cleaned at least weekly, including cleaning with alcohol spray or other suitable disinfectant. Everything on shelves and trolleys must be moved for effective cleaning. Equipment, models, books, leaflets, etc should be cleaned or damp-wiped as appropriate.

Floors must be vacuumed and washed daily and spills and contamination removed promptly as for floor care in the reception areas. It is useful to have easy access to a small vacuum cleaner in the consulting room.

Disinfectant including alcohol sprays should be kept in the consulting room. Paper towels rather than cloth towels should be used and appropriate yellow biohazard bags for disposal of organic waste located in the consulting room. If cloth towels are used they should be used only once and disposed of immediately after use into an appropriate laundry container.

**Hospital, preparation and theatre areas**

All persons entering the hospital area, including visiting clients, should wash hands on entry and exit. Hands must be washed after any animal, its bedding or equipment is touched. Cages must be changed regularly at least daily, and soiled bedding or equipment changed promptly. As for consulting rooms, all sharps to be disposed of immediately in sharps containers, soiled dressings or organic material to be disposed of in yellow biohazard bags. Regular cleaning of all surfaces, shelves, trolleys, etc as for consulting rooms.

**Isolation wards**

Scrupulous cleaning and hygiene as for other areas plus:

Change of shoes OR footbath and paper booties on entry; change of shoes OR remove booties and footbath on exit;

Wash hands on entry and exit;
Fresh gown on entry, to be removed on exit. (If consideration is given to leaving the same gown ‘hung up’ in the isolation ward, extreme care should be taken not to contaminate clothing with the outside of the gown).

Gloves should be worn if touching an animal or its bedding or equipment.

Consideration given to masks (P2 if necessary) and protective eyewear.

Isolation wards to have their own equipment – thermometers, stethoscopes etc, must be disinfected after each use and if brought outside isolation ward.
6. SINGLE-USE VS REUSABLE EQUIPMENT

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

Multi-use equipment must be properly cleaned and disinfected between each patient.

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

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

COLD STERILIZATION

“Cold sterilization” is used to sterilize items through immersion in a sterilizing solution. Because of the toxicity of some cold sterile solutions, the time required to achieve sterilization using these chemicals, and the availability of autoclaves for sterilization, there is minimal indication for the use of cold sterilization. Its main indication is for sterilization of items that cannot tolerate steam sterilization, such as endoscopes.

Although cold sterilization can be an effective means of sterilizing instruments, misuse can result in ineffective sterilization. Potential problems include the use of inappropriate solutions, improper preparation of solutions (i.e. inadequate concentration), inadequate contact time, inadequate replacement/refreshment of solution, or inadequate removal of organic debris from equipment prior to immersion in solution. Commonly used
disinfectants such as alcohol, iodophors, phenolics and most quaternary ammonium compounds are not effective sterilants and therefore are not acceptable for use on items intended to be used in surgical or other invasive procedures. Of the chemical sterilants, only glutaraldehyde and stabilized hydrogen peroxide-based compounds are effective at sterilizing instruments, and then only if the solutions are prepared and maintained properly, and allowed adequate contact time.

Prolonged contact time (e.g. 10 hours) is required for sterilization using these solutions. Therefore, cold sterilization is not a means for rapid sterilization of surgical instruments that have been inadvertently contaminated during surgery or for surgical instruments that will be used frequently on different patients throughout the day. In some veterinary clinics, disinfectant solutions of other kinds in which a set of instruments is routinely kept are frequently referred to as “cold sterile.” Such misuse of this term should be avoided, as instruments kept in disinfectant solutions other than glutaraldehyde or high-level sterilants should not be used for surgical or other invasive procedures.

Instruments must be cleaned to remove all visible organic debris (including blood) before placing them in a clean, fresh cold sterilant solution in order for the procedure to be effective. Most chemical sterilants come in solutions consisting of two parts that, when combined, form what is referred to as an "activated" solution. Refer to the product’s label for the shelf life of the activated solution. Cold sterilant must be rinsed off all instruments using sterile saline or water before they are used, as some of these compounds (particularly glutaraldehyde) can be irritating to tissues. As with all other chemicals used in a veterinary clinic, Material Safety Data Sheets (MSDS) for these products must be readily available to all personnel who work with them and around them.

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

- Endoscopes must be meticulously cleaned immediately after every use. Endoscopes typically have several moving or detachable parts and small channels in which moisture, debris and discharge can become trapped. Cleaning must be performed as soon as possible in order to prevent debris from drying onto surfaces, as this can make the debris considerably harder to remove. Prior cleaning is crucial to effective disinfection.

- All instrument and suction channels must be thoroughly cleaned after each use, even if the channels were not used during the procedure. Failure to clean these channels is a common error which can result in accumulation of debris, bacteria and biofilms within
the instrument. Not only does this pose risk of disease transmission to subsequent patients, but it can also confound sample collection and culture.

- Rinsing and drying of the endoscope are also critical to proper maintenance. Failure to rinse off detergents or disinfectants can lead to significant irritation of the tissues of the next patient.

- Chemical sterilants (e.g. glutaraldehyde) are typically used for high-level disinfection or sterilization of endoscopes, as most cannot be steam-sterilized (autoclaved). Consult the manufacturer’s instructions regarding what methods can be safely used for any particular endoscope. If a chemical sterilant is used, a timer should be used to measure the exact contact time – too short a time may result in an inadequate microbial killing, while too long a time may result in damage to the instrument.

**MAINTENANCE OF CLIPPERS**

Use of good-quality clippers and maintenance of clipper blades are of great importance. Improper clipper use or maintenance can result in skin trauma, with subsequent risk for infection, or transmission of opportunistic pathogens between patients.

Following routine use of clippers on areas of unbroken skin and non-infectious animals, basic cleaning with a stiff brush to remove visible dirt and hair from the blade is likely adequate. More thorough cleaning and disinfection of the blade, as described below, should be done periodically as well, depending on how often the clippers are used.

Clippers should be thoroughly cleaned and disinfected after every use on an animal with a potentially transmissible infection (e.g. an animal with diarrhea), on any area where the skin or hair is significantly contaminated with feces, urine, blood or other body fluids, and before and after use on an area where the skin is broken (especially if there is evidence of skin infection). First, a stiff brush should be used to remove visible dirt and hair from the blade, and a soapy, wet cloth used to remove any visible debris from the body of the clippers. The clipper blades can then be sterilized using a chemical sterilant (e.g. glutaraldehyde) or by autoclaving. The body of the clippers can be sterilized using hydrogen peroxide vapour or ethylene oxide (if available). Otherwise, after removing all visible debris, thorough manual wiping with a cloth wetted with a standard disinfectant solution should be performed, paying particular attention to the small crevices of the device and allowing for adequate contact time with the disinfectant. Refer to the clipper’s instruction manual to determine what degree of contact with liquid the clippers can safely withstand.

**LAUNDRY**

Although soiled linens are a potential source of microorganisms, with appropriate hygienic handling, storage and processing of clean and soiled linens, the risk of disease transmission from these items can be reduced to an almost negligible level.

Linens and special clothing used in veterinary clinics (e.g. cage blankets, towels, surgical drapes, surgical gowns, scrubs, lab coats) can be an important means of transporting pathogens from one area to another within the clinic, and to areas outside the clinic. As a result, clinic clothing (e.g. scrubs, lab coats) should always be washed on-site or sent to a commercial laundry facility that is equipped to handle laundry from medical/veterinary facilities. This helps to prevent transmission of pathogens to family members, family pets and the general population. Personnel should change into clinic clothes at the beginning of their shift and back into street clothes at the end of their shift. Clinics should have
appropriate laundry facilities or laundry services to accommodate the need to change clothing daily, or more frequently if required.

Microbial numbers on soiled linens (e.g. towels, blankets) and clothing are significantly reduced by dilution and during the mechanical action of washing and rinsing. Linens used in veterinary clinics should be laundered together using detergent, and dried in a hot air dryer to promote killing of microorganisms.

COLLECTION AND HANDLING
Except for linens potentially contaminated with infectious agents (see below), all used linens can be handled in the same way. Heavily soiled linens should be rolled or folded to contain the heaviest contamination in the centre of the bundle, without contaminating personal clothing or the environment. Large amounts of solid debris, feces or blood clots should be removed from linen with a gloved hand and disposable tissue or paper towel, which are then immediately placed in the garbage. Excrement should not be removed by spraying with water or shaking as this may result in contamination of the surrounding area and personal clothing.

BAGGING AND CONTAINMENT
- Linens should be handled with a minimum of agitation and shaking.
- Always place soiled linens directly in a hamper or bag designated for dirty laundry.
- Never place soiled linens on the floor.
- Laundry bags should be tied securely and not over-filled.
- Carts and hampers should be cleaned after each use.
- Laundry bags should be washed after each use. They can be washed in the same cycle as the linens they contain.

TRANSPORT
Linen transported by cart should be moved in such a way that the risk of cross-contamination is minimized (e.g. avoid moving the cart from potentially contaminated areas (runs/kennel area) to cleaner areas (prep room, surgery).

Clean linen should be transported and stored in a manner that prevents contamination. If laundry carts are used, separate carts should be used for clean and dirty linens.

Linen contaminated with gross organic material must be pre-cleaned by hand to remove such material prior to laundering. It is not possible to adequately clean laundry by machine when gross organic material is present, and laundering such items can lead to contamination of other laundered items.

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

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

**LAUNDRY FROM INFECTIOUS CASES**

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

**PROTECTION OF PERSONNEL**

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

Laundry should not be considered clean until it has also been dried.

**WASTE MANAGEMENT**

Veterinary biomedical waste is a potential source of both zoonotic and non-zoonotic infectious pathogens. Therefore, it is important to handle all such waste appropriately. Biomedical waste typically includes sharps, tissues (anatomic waste), highly contaminated (e.g. blood-soaked) materials, and dead animals.

Used sharps are considered biomedical waste and should be disposed of in approved, puncture-resistant sharps disposal containers to remove, store and dispose of used sharps such as needles, blades, razors and other items capable of causing punctures. Non-anatomical waste saturated or dripping with blood (e.g. blood-soaked lap sponges and gauze) are also best disposed of as biomedical waste. If there is likely to be splashes or sprays during this disposal process, appropriate personal protective equipment should be worn.

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

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

Precautions should be taken to minimize contamination of the clinic environment and the risks to people and animals from potentially infectious waste.

**Companion animal infectious diseases of concern**

Bordetella spp infection
Canine parainfluenza virus
Canine influenza
Canine infectious hepatitis
Feline calicivirus
Feline herpesvirus
Feline panleukopaenia virus
Canine leptospirosis
Campylobacter spp infection
Salmonella spp infection
Cryptosporidium and Giardia
Psittacosis (Chlamydia psittici (avian))
Feline Leukaemia
Feline Immunodeficiency Virus
Cat scratch disease (Bartonella henselae & other bacteria)
Methicillin Resistant Staphlococcus Aureus infection
Australian Bat Lyssavirus (not reported clinically in dogs & cats but develop antibodies after experimental exposure)
Canine distemper
Toxoplasma gondii
Giardia spp
Roundworms - Toxocara canis & Toxascaris spp
Hookworms – esp Ancyclostoma caninum
External parasites (fleas, ticks & mites)
Canine parvovirus

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1 This list not exhaustive – please add to it and annotate if needed!
7. SURGERY

All surgical procedures cause breaks in the normal defensive barriers of the skin or mucous membranes. These breaks are therefore accompanied by an inherent risk of surgical site infection (SSI). Surgical site infections can occur sporadically or as part of an outbreak, and can have devastating outcomes in some situations. Good general infection control practices (e.g. hand hygiene, cleaning and disinfection) are important for prevention of SSIs. Specific measures pertaining to surgery include maintenance of the surgical environment, use of appropriate personal protective equipment and hand hygiene, disinfection and sterilization of anesthetic equipment and surgical instruments, appropriate use if peri-operative antimicrobials, and surgical site care before, during and after the procedure.

SURGICAL ENVIRONMENT

Having a well designed and maintained surgical area or suite is very important. In order to keep the surgical environment as clean as possible, this area should be separated from personnel and animal traffic, and be easy to thoroughly clean and disinfect. A surgical area should only be used for surgical procedures, and should not be used for non-surgical procedures between surgeries. Entrance to the area should be restricted at all times to minimize traffic in the room. The number of people in the surgical area has been identified as a risk factor for SSI in small animals, so only essential personnel should be allowed in the area during any surgical procedure. All personnel participating in the procedure, including those performing surgical nursing duties, must be trained in operating room procedures.

PERSONNEL CONSIDERATIONS

PERSONAL PROTECTIVE EQUIPMENT

All personnel in the surgical area should wear designated surgical scrubs, a surgery cap or hair bonnet, and a nose- and-mouth mask when surgery is underway, regardless of whether or not they are directly involved in the procedure itself. Scrubs worn in surgery should not be worn when handling or treating other patients, and at a minimum should be covered with a lab coat when outside the surgery area (see Personal Protective Equipment under Routine Procedures). Personnel directly involved in the procedure should also wear a sterile gown and sterile gloves.

HAND HYGIENE AND SURGICAL SCRUB

A surgical hand scrub should be performed before putting on a sterile gown and sterile gloves. Various surgical scrub techniques have been described. Most commonly, a structured five-minute surgical scrub with antibacterial soap is used:

- Remove all hand and arm jewelry
- A pick or file should be used to clean all dirt out from underneath the fingernails.
- If hands or arms are visibly dirty, they should initially be washed with soap and water as per standard hand hygiene protocols.
- Hands and forearms are then lathered with antibacterial soap. Scrubbing with a bristled sponge proceeds proximally from the fingertips to the forearms, just below the elbow.
- A sterile towel must be used to dry the hands before donning a gown and gloves.
A surgical area should only be used for surgical procedures.

**EQUIPMENT CONSIDERATIONS**

**STERILIZATION OF INSTRUMENTS**

Complete sterilization of surgical instruments and any items that might come in contact with the surgical field is a crucial procedure. Poor sterilization or inappropriate handling of instruments after sterilization can result in contamination of sterile tissues during surgery. Steam sterilization (i.e. autoclaving) is most commonly used in veterinary clinics. Quality control testing of autoclaves should be performed regularly and documented:

- Sterility indicator strips should be placed in every surgical pack. External autoclave indicator tape is not a reliable indicator of the sterility of a pack’s internal contents.

- Biological sterility indicators should be used periodically. These indicators contain bacterial spores, which are the most resistant form of bacteria. After being autoclaved, the indicator is submitted for testing to ensure that all of the spores have been killed by the sterilization process. In human healthcare facilities it is recommended that these indicators are used daily, or at least weekly. Weekly or bi-weekly use is likely adequate in most veterinary clinics, depending on how heavily the autoclave is used. A biological sterility indicator should also be used in the next cycle anytime the autoclave has been moved, repaired, or if there has been any other indication of sterilization failure.

Flash sterilization should not be used unless absolutely necessary for emergencies only. Flash sterilization should never be used for surgical implants. Countertop “cold sterile” disinfectant solutions should not be used for any surgical instruments or implants, as these solutions typically do not achieve true sterilization of the instruments they contain.

**DISINFECTION OF ANESTHETIC EQUIPMENT**

Endotracheal tubes: In human medicine, endotracheal (ET) tubes are typically considered single-use devices, but reuse of ET tubes has become more common with the rising costs of healthcare. These tubes can be effectively re- sterilized between patients using glutaraldehyde or ethylene oxide gas, although the physical integrity of the cuffs in particular can be compromised by repeated sterilization with these methods. These tubes are considered semi-critical equipment, and as such should be subjected to high-level disinfection or sterilization. In veterinary medicine, it is impractical to discard ET tubes after a single use, but glutaraldehyde or ethylene oxide gas sterilization may not be readily available. Evidence-based guidelines for reuse of ET tubes in veterinary medicine are not available. Nonetheless, at an absolute minimum, ET tubes must be thoroughly cleaned (inside and outside) with hot water and detergent immediately after use to prevent any discharge or debris from drying and forming a biofilm on the device. Tubes should then be soaked in a solution of a quaternary ammonium compound (QAC), rinsed thoroughly and dried prior to being reused. It is important to test the integrity of the cuff before every use to ensure the device has not been compromised by repeated exposure to the disinfectant.

Anesthetic gas tubing and rebreathing bags: Although the tubing connecting the anesthetic machine to the patient’s endotracheal tube should not come in direct contact with the patient, moisture and condensation often accumulate in the tubes and may contain microorganisms from the animal’s airway. In human medicine, this equipment is also typically single-use. As for ET tubes, evidence-based guidelines for reuse of this equipment in veterinary medicine are not available. At a minimum, gas tubing should routinely be washed thoroughly with hot water and detergent and hung to dry at the end.
of the day’s procedures, or more often if they are heavily used. If there is visible discharge in the tubing, or if the animal has a known or suspected respiratory tract infection, the tubing should be washed with hot water and detergent, soaked in a solution of a QAC, rinsed with water and dried prior to being reused. Rebreathing bags should be cleaned/disinfected as for the associated gas tubing, as they also come in contact with the expired air from the patient.

If an animal has a known or suspected transmissible respiratory tract infection, filters are available which can be placed between the ET tube and the rest of the anesthetic circuit in order to help protect the equipment from contamination.

Quality control testing of autoclaves should be performed regularly.

**PERI-OPERATIVE ANTIMICROBIALS**

Administration of peri-operative (i.e. before, during and after surgery) antimicrobials is an important and complex issue. The goal of peri-operative antimicrobial therapy is to reduce the risk of post-operative infection, while minimizing the negative impact on the patient’s natural microflora and the risk of antimicrobial-associated complications such as diarrhea.

There is currently very little objective information about the need for antimicrobials for specific veterinary procedures, as well as the optimal choice of drug(s), timing and dosages. Antimicrobials are indicated in clean-contaminated, contaminated and dirty procedures. The need for antimicrobial prophylaxis in clean procedures is unclear. In human medicine, antimicrobials are not typically recommended for clean procedures such as arthroscopy, however there are conflicting opinions. Regardless, it is unclear whether recommendations from human medicine should be directly extrapolated to veterinary procedures, because there are obvious differences in post-operative incision care and patient environment for animals, which may increase the risk of infection. The need for peri-operative antimicrobial therapy for different procedures, particularly clean procedures, requires further research. Concerns with this practice that currently exist include inappropriate timing of administration (i.e. too far in advance of surgery or starting after surgery), excessive duration of therapy, inadequate dosing and inappropriate drug choice.

If peri-operative antimicrobials are used, they should be administered so that therapeutic levels are present at the surgical site at the time of first incision. This typically requires parenteral (i.e. not oral) administration of an antimicrobial approximately one hour before surgery. If the surgical time is longer than two half-lives of the drug(s), then an additional dose should be given during the surgery. In human medicine, it has been shown that starting antimicrobial therapy after surgery is no more effective than not using antimicrobials at all. Typically, antimicrobials are not needed after surgery since the highest-risk time for contamination of the surgical site (i.e. during the surgery itself) is already passed.

Starting antimicrobial therapy after surgery is no more effective than not using antimicrobials at all.

**SURGICAL SITE MANAGEMENT**

**PRE-OPERATIVE CARE**

Pre-operative management of the surgical site may be very important, but there has been very little research in this area in veterinary medicine. The goal of pre-operative surgical
site management is to eliminate potential pathogens without creating a physical environment that may increase bacterial colonization or infection post-operatively.

If the patient’s hair coat is visibly dirty, bathing the animal before surgery is reasonable if there is adequate time for the hair coat to dry before the procedure. In humans, it has been suggested that any method of hair removal can be associated with higher SSI rates, but obviously this cannot be avoided for the vast majority of procedures in veterinary medicine. Shaving the surgical site the night before has been associated with higher SSI rates in humans, therefore clipping (not shaving) of the surgical site should only be performed right before surgery. Care must be taken to avoid damaging the skin during this procedure, as abrasions provide sites for invasion and proliferation of opportunistic bacteria. Use of good quality, well-maintained clippers and blades helps to reduce the risk of skin abrasions.

If skin lesions around the surgical site are noted before or after surgery, the finding should be recorded and investigated, to determine whether equipment maintenance and/or personnel training need to be improved. Animals should not be clipped in the surgery area/suite itself. A “prep” area outside of surgery area should ideally be used for this and any other pre-operative procedures.

Skin preparation after clipping is also important. Typical practices include thoroughly cleaning and scrubbing the site with antibacterial soap, followed by application of alcohol, and finally application of a chlorhexidine or iodine solution. Potential problems that need to be avoided include:

- Failure to prepare a large enough area of skin
- Inadequate initial cleaning with soap and water
- Contamination of preparation solutions
- Inadequate contact time with the antiseptic
- Contamination of the area during or after preparation due to improper technique

If skin preparation solutions (e.g. antibacterial soap and water, alcohol, chlorhexidine, iodine) are kept in refillable containers, these containers must be disinfected when empty before being refilled. Contamination of these solutions with bacteria that are resistant to their respective antimicrobial actions can occur. Refilling the containers without disinfecting them can allow these resistant contaminants to accumulate. An outbreak of catheter site infections was reported in a small animal clinic that was associated with contaminated skin preparation solutions.

**POST-OPERATIVE CARE**

Post-operatively, a surgical incision site is highly susceptible to opportunistic infection from the bacteria of the patient’s own microflora, from the environment or from hospital personnel. Contact with the surgical incision, particularly with bare hands, should be avoided. Covering or bandaging incisions for a minimum of 24 to 48 hours after surgery has been recommended in humans; this is also a reasonable recommendation in small animals in most situations. Bandage changes should be performed using aseptic technique. Pet owners and handlers should be instructed on how to manage an animal with an incision, and the signs for which to look that may indicate the development of a SSI. There is no objective information about the need to cover surgical incisions for more than 48 hours in veterinary or human medicine, but arguments can be made for both
sides. Preventing the animal from licking, scratching or otherwise traumatizing the surgical site is critical. Damaging to the healing incision or the skin around it can result in the deposition of opportunistic pathogens, and make it easier for bacteria to grow in the area.

Clipping (not shaving) of the surgical site should be performed right before surgery.
8. PATIENT CARE AND HANDLING

ISOLATION FACILITIES
The isolation area is dedicated to caring for and housing animals with potentially contagious infectious diseases. An isolation area should allow for complete physical separation of potentially infectious cases, and have areas for performing routine procedures such as bandage changes, thereby reducing the risk of direct or indirect infection of other hospitalized animals or clinic personnel. Ideally, isolation facilities should be in a low traffic location within the clinic.

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

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

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

When the isolation room is in use by an animal with a potentially contagious infectious disease, prominent signage should indicate that the animal may be infectious and should outline any additional precautions that need to be taken in addition to routine isolation protocols. Access to the isolation room should be limited to the minimum number of essential personnel necessary to provide appropriate patient care.

PERSONAL PROTECTIVE EQUIPMENT AND WASTE IN ISOLATION
All personnel entering an isolation area housing a potentially infectious animal, regardless of whether they plan on having direct contact with the animal, must wear appropriate personal protective clothing. At a minimum, this consists of a clean lab coat or similar item of outerwear that is only worn in the isolation area and disposable examination gloves. Depending on the diagnosis and the mode of transmission of the disease, shoe covers, masks and eye protection may be required when handling an animal in isolation.

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

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

Contaminated items and waste alike should be bagged prior to being removed from the isolation area. Articles should then immediately be either discarded or taken to the appropriate area for additional cleaning and disinfection. Waste from an isolation room should be treated as potentially infectious.

**PATIENTS IN ISOLATION**

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

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

• Appropriate personal protective equipment should be worn by all personnel involved with the procedure. • Other animals should be kept out of the procedure area. • The procedure area should be thoroughly cleaned and disinfected as soon as the procedure is completed.

**FOOTBATHS AND FOOTMATS**

Footbaths or footmats are used to decrease (but do not eliminate) microbiological contamination of footwear. Footbaths are shallow containers containing a disinfectant solution. Footmats are spongy commercial mats covered with a durable, easy-to-clean material that can be saturated with disinfectant. Footmats can increase compliance because they are easier to use, but they are more expensive and more difficult to maintain than footbaths.

Data regarding the need for and efficacy of footbaths and footmats are very limited, and there is essentially no information relating to small animal clinics specifically. It has been shown that footbaths can reduce bacterial contamination of footwear in large animal clinic settings. Although other sources of contamination have been shown to be more
significant in infection transmission, footwear and floor surfaces cannot be overlooked in an infection control program in a small animal clinic, because patients so often have extensive direct contact with the floor. Possible problems with footbath or footmat use must also be considered. Footbath or footmat use is almost invariably accompanied by spillage of disinfectant solution; this can create a slipping hazard on smooth floor surfaces, which are typically present in small animal clinics. Certain disinfectants can also damage floor surfaces with prolonged contact.

Footbaths or footmats should be considered when personnel will be walking on a surface that could potentially be more contaminated than the general floor environment, and where spread of this contamination might pose a risk to patients or personnel. The most likely area where footbaths or footmats could be useful would be at the exit of an animal housing area (e.g. dog run) that contains a potentially infectious case, and where clinic personnel will be walking in and out of the potentially contaminated area. The need for routine use of footbaths or footmats in isolation areas where animals are confined in cages is questionable. If footbaths or footmats are used, selection of an appropriate disinfectant is important. The disinfectant should be effective against the specific pathogen(s) of concern, stable in solution, and effective with a relatively short contact time (see Tables 5 and 6). Oxidizing agents such as accelerated/stabilized hydrogen peroxide and peroxygen disinfectants are ideal. The solution should be changed daily, or sooner if gross contamination of the bath/mat occurs.

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

**Isolation Procedures at the UQ Veterinary Medical Centre**

All personnel entering the isolation area must wear the appropriate PPE (ie. Disposable gowns, disposable shoe covers, disposable gloves) regardless of whether they intend to have direct contact with an infectious patient.

Upon exiting the isolation area, all disposable items worn should be discarded in the clinical waste bin provided. Reusable gowns or coats used in isolation must be washed after each use.

Animals who are housed in isolation are not to be walked, or be allowed to urinate or defecate in areas used by other animals.

If an infectious patient requires procedures within the clinic (e.g. x-rays), the patient must be transported on a trolley to avoid contamination of the clinic floor. These procedures should also be performed at a time where there is the least amount of patient and personnel traffic within the clinic (ie. Last procedure of the day). Appropriate PPE must be worn by staff transporting the animal, and the procedure area must be cleaned and disinfected thoroughly after use.

**Indicators for isolation**

The Isolation Ward is used to isolate dogs and cats with infectious diseases that could potentially infect other patients.

These diseases include (but are not limited to):

- Canine Parvovirus
- Feline Herpesvirus and/or Feline Calcivirus (Cat Flu)
- Canine Infectious Tracheobronchitis (Kennel Cough)
- Feline Leukaemia Virus
- Psittacine Beak and Feather Disease
- Psittacosis (Chlamydiosis)

**Admission protocols**

The receptionist or nurse making an appointment for a coughing dog, a dog with bloody diarrhoea, a sneezing cat, a parrot with feather loss, a parrot with sore eyes and/or sneezing, etc should request the client to leave the animal in the car on arrival (if safe to do so eg temperature dependent).

Explain to the client that their pet may be infectious to other pets and that, for the safety of these other pets, we may need to isolate their pet.

The diagnosis of infectious diseases is made after veterinary examination but if this cannot be made immediately – and where the index of suspicion is high – patients can be admitted to the Isolation Ward prior to a final diagnosis.

Once the decision is made to admit an animal into isolation, the animal must be transported on a stainless steel trolley and not permitted to walk on (or come into contact with) the floor. Any surfaces touched by the animal or coming into contact with body fluids or discharge must be cleaned and disinfected immediately. Staff transporting the animal must be fully gowned and gloved with disposable PPE. The most direct route of entrance should be followed.

**Patient contact and movement**

Once an animal is placed into the Isolation Ward, the animal must be housed there for the duration of their stay.

Animals in the Isolation Ward must not be walked outside the Ward.

Animals who need further work up within the VMC (e.g. radiology, ultrasound) can be brought into the VMC only if the following conditions are met:

Wherever possible, procedures within the VMC involving these animals should be the last procedure of the day.

Personnel handling the animal must be fully gowned and gloved with disposable PPE.

The animal must be transported on a stainless steel trolley and not allowed to walk on (or come into contact with) the floor.

Any surfaces touched by the animal or coming into contact with body fluids or discharge must be cleaned and disinfected immediately.

Patients been discharged from the Isolation Ward must not enter the VMC – they are to be taken directly to the client’s car on a leash or in a carrier provided by the client.

**Cleaning, disinfection and waste disposal**

Separate cleaning equipment including spray bottles, mops, buckets etc. must be kept for this area with the anteroom.

All surfaces including bench tops, inside cages, cage doors and food bowls must be sprayed with an appropriate disinfectant. Please refer to the Disinfectant Protocol on the
use and handling of disinfectants. Virkon, the required disinfectant must be freshly prepared every 7 days.

Floors must be mopped daily with a disinfectant as appropriate. All organic matter should be removed before disinfectant is used.

Yellow clinical waste bags must be kept in the room for disposal of bedding and rubbish. Disposable boot covers, gowns and gloves that have been worn while in the presence of an infectious patient must be disposed of in a yellow clinical waste bin upon exit.

Patient Bedding – Soiled bedding of infectious patients must be placed in a clinical waste bag for laundry. Gloves must be worn by kennel staff when placing into laundry to be washed.

**Personnel movement and barrier precautions**

No unnecessary personnel are to enter the ward; no more than 4 people are to be in the ward at any one time

Disposable boot covers, gowns and gloves are to be worn at all times in the isolation ward when a confirmed or suspected infectious patient is present. These items are not for multiple use, and must be disposed of in a yellow clinical waste bin upon exiting the ante room

Clients may enter the Isolation Ward, but only:

By appointment

Under supervision

They must follow the same precautions as detailed above. It is the responsibility of the senior person present to ensure biosecurity is not breached by a client

**Supply stocking**

The nurse rostered for duty in the Isolation Ward is responsible for stocking supplies in the ward.

Supplies include, but are not limited to, the following:

- Food
- Tinned food
- Hills AD diet
- Liquid food
- can opener
- Consumables
- Syringes and needles
- Thermometer covers
- Fluid bags, administration sets, extension sets, IV catheters
- Bandaging material
- PPE
- Gloves
- Disposable overalls
- Foot covers
Medications are to be brought into the ward when required, and are not to be left in the room.

Stocking levels are to be checked in the morning and then restocking is to occur in the afternoon, unless the need is urgent.

**WOUNDS AND BANDAGES**

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

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

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

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

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

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

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

**FEEDING OF RAW MEAT**

Raw meat-based diets for cats and dogs often contain a variety of enteropathogens, including Salmonella spp, Campylobacter spp, Clostridium difficile, Clostridium perfringens, extended spectrum beta-lactamase (ESBL) Enterobacteriacea, and enterohemorrhagic strains of Escherichia coli such as O157:H7. It has also been shown that animals fed raw meat diets may shed higher levels of Salmonella and ESBL Enterobacteriacea in their feces. Raw meat diets and feces from animals fed these diets may pose a risk to hospitalized animals and clinic personnel, and may contaminate the hospital environment. Therefore, a policy against the feeding of raw meat to hospitalized...
Animals should be in place. Clients who do not wish to have their animal fed a commercial kibble diet could consider cooking the pet's normal diet for the duration of the hospitalization period. However, if it is the opinion of the attending veterinarian that changing an animal's diet from a raw meat diet would adversely affect the animal's health, then the following guidelines should be followed:

- Animals regularly fed raw meat should be housed in isolation and considered infectious. All protocols for handling isolated animals should apply.
- Raw meat should be kept frozen until the day before feeding. It should be thawed in the refrigerator on the bottom shelf in a sealed container.
- Any uneaten meat should be promptly discarded in such a way that it will not attract nor be accessible to insects, vermin or other animals. Significant bacterial growth can occur in any meat that is left out at room temperature, even for a short period of time.
- Any items that come in contact with raw meat (e.g. bowls, storage containers) should be cleaned and disinfected immediately after use.
- Hand hygiene should be strongly emphasized after handling raw meat or any items that have been in contact with raw meat.

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

- All animals from such facilities should be examined immediately upon arrival. They should not be allowed to come in contact with other animals in the waiting/reception area.
- If there is an ongoing outbreak of an infectious disease at an animal shelter, admission of animals from the facility for elective procedures should be restricted (i.e. admission for emergencies only). Otherwise, all animals from the facility should be admitted directly to isolation.
- Animals from these facilities should be housed separately from other patients, if possible. Use of a separate ward, separate area of a ward or leaving empty cages between those animals and other patients can be used, depending on the degree of separation required for the diseases of primary concern.

For elective procedures (e.g. spay, neuter):

- All dogs and cats must have received other routine vaccinations (as needed according to geographic region)
  - at least twice if they are more than 14 weeks old, with the most recent vaccine administered at least 2 weeks prior to presentation. • All animals must have been dewormed with a broad spectrum anthelmintic at least
• 7-10 days prior to admission. • Animals with abnormalities including, but not limited to, fever, ocular/nasal discharge,
coughing/sneezing, diarrhea and potentially infectious skin conditions should not be admitted for elective procedures. • Depending on the geographic region and time of year, flea treatment prior to admission.
9. SAFETY OF CLINIC PERSONNEL

BITES AND SCRATCHES

Bites and scratches are an inherent risk in veterinary medicine and a common cause of occupational injury and illness. In general, veterinary personnel should be able to recognize behaviour in animals and situations that are associated with an increased tendency for an animal to bite. Professional judgment must be exercised to guide bite prevention practices. Personnel should take all necessary precautions to prevent animal-related injuries in the clinic. These may include physical restraint or chemical restraint (sedation or anesthesia) of an animal. Appropriate equipment (e.g. different sizes of muzzles, bite-resistant gloves, catch pole, cat bags) should be readily available. Such equipment should also be as easy to clean as possible. Experienced veterinary personnel rather than owners should restrain animals for procedures whenever possible. Personnel must always be aware of changes in their patients’ behaviour which may precede attempts to bite. Veterinary personnel should not let client perceptions or attitudes prevent them from using appropriate bite-prevention measures (e.g. muzzling).

If anyone is bitten or scratched by an animal:

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

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

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

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

A physician will decide (in some cases in consultation with public health personnel) if antimicrobial therapy, tetanus vaccination, rabies vaccination, or any additional treatment (e.g. lavage, debridement, sutures) are necessary. Most bite wounds are not sutured in order to promote drainage and reduce the risk of infection.

Emergency contact information (i.e. physician, public health department) should be clearly posted in the clinic.

All bites or scratches should be reported to the clinic infection control practitioner (ICP) and the injury documented. Bites and scratches should not be considered “part of the job”
and summarily dismissed. Even seemingly small, innocuous injuries can develop severe complications. Regular review of injuries is useful to identify trends in behaviour that may be associated with injuries and to develop protocols to reduce the risk of injuries. Documentation is also important for employees in the event that serious health problems subsequently develop.

**SHARPS**
Injuries from needles and other sharp implements are common in veterinary medicine but are largely preventable. Although there is not the level of risk of bloodborne pathogen exposure in veterinary practice as there is in human medicine, serious outcomes can result following needlestick or other sharps injuries, including significant trauma, secondary infection and drug reaction (i.e. toxic, allergic, idiosyncratic).

Proper sharps handling practices are a practical yet effective way of reducing workplace injuries in veterinary clinics. Use appropriate barriers (e.g. closed toed shoes) and safe work practices when using sharp instruments and devices (e.g. needles, scalpels, etc.), after procedures and when cleaning used instruments.

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

The most important precaution for preventing needle-stick injuries is to avoid recapping needles. Recapping needles causes more injuries than it prevents. When it is absolutely necessary to recap needles as part of a medical procedure or protocol use a mechanical device such as forceps or hemostats to replace the cap on the needle. Alternatively, the needle can be recapped using the “one-handed scoop” technique. Place the cap on a flat horizontal surface. Holding the syringe with the attached needle, or the needle hub alone (when unattached), scoop up the cap with the needle by sliding the needle tip inside, without touching the cap with one’s other hand. Once the point of the needle is covered, tighten the cap by pushing it against an object, or by pulling the base of the needle cap onto the hub of the needle with the same hand holding the syringe.

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

**SHARPS SAFETY FOR CLIENTS**

Periodically, owners may be required to treat their animals at home with injectable medications (i.e. insulin, subcutaneous fluids). In these situations, it is the responsibility of the attending veterinarian to:

- Provide (and document) training on how to handle sharps, including injection and disposal practices.
- Provide an approved sharps container or give clients clear instructions regarding how to obtain one.
- Ensure that the client is able to safely handle and dispose of sharps.
- Advise clients that the sharps container should be returned to the clinic for disposal when 3/4 full, and exchanged for a new container (if necessary).

Used sharps are considered biomedical waste in veterinary practices. Dispose of used sharps containers in accordance with regulations.

**DIAGNOSTIC SPECIMEN HANDLING**

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

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

- Specimen processing areas should be cleaned and disinfected immediately after use.
- Samples from animals with suspected or known infectious diseases should be disposed of as infectious waste.
- Leak-proof plastic containers should be used for specimen storage in a designated refrigerator which does not contain food, vaccines or medications of any kind.
- Contamination of the outside of sample containers should be avoided. If the outside of a container becomes contaminated, it should be cleaned and disinfected prior to storage.
- Sharps such as microscope slides and glass pipettes should be disposed of in approved sharps containers.
**DENTAL PROCEDURES**

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

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

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

**NECROPSIES**

Necropsies are high risk procedures because of potential contact with infectious body fluids, aerosols, and contaminated sharps. Non-essential persons should not be present during necropsy procedures in order to minimize exposure of personnel to these hazards. Personnel involved in or present at necropsies should wear: Protective outerwear (e.g. designated lab coat, designated scrubs) Disposable gloves Protective eye glasses/goggles, or a full face shield

In addition, when opening the body cavities of larger animals or for any other heavy cutting, cut-proof gloves which can be washed in the laundry should be used to prevent accidental injury from necropsy blades. Additional precautions for respiratory protection (including environmental controls and face masks) should be employed if power equipment is used, since these instruments increase the amount of potentially infected material that becomes aerosolized.

**VACCINATION OF PERSONNEL**

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

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

Q Fever: Veterinary students are expected to be immunologically protected against Q Fever. For further information see: [http://www.uq.edu.au/vetschool/requirements](http://www.uq.edu.au/vetschool/requirements).

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

**TRAINING AND EDUCATION OF PERSONNEL**

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

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

**CLIENT EDUCATION**

Client education is the responsibility of the entire practice team. By helping clients understand infectious and zoonotic disease risks and the basic steps they can take to protect themselves and their animals, they can live happier and healthier lives with their pets.

Discussion of zoonotic disease risks should be a routine part of new pet examinations and new client visits. Client education must also occur when the veterinarian has a reasonable suspicion of a potentially infectious disease, and particularly if the disease is zoonotic. Notification of the owner to this effect must be documented in the patient’s medical record. This documentation may also be very important legally, should an animal’s infection result in human illness.

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

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

**CLIENT VISITATION**

Given the strong bond between owners and their pets, it is understandable when clients wish to visit their hospitalized pets. However, animals carrying transmissible infectious
pathogens pose a potential risk to other animals at the clinic and at the owner’s home, as well as to the clinic employees, the owner and other household members. As a policy, clients should not be allowed to visit animals that are considered potentially infectious. Under extenuating circumstances, such as an animal whose condition is imminently life-threatening, owners may be allowed to visit their animal, but the use of proper personal protective equipment should be demonstrated to the clients and all infection control procedures should be followed, as for clinic personnel involved in the animal’s care.

Client education is the responsibility of the entire practice team.

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

**CLINIC PETS**

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

While suboptimal from an infection control standpoint, if a clinic has a clinic pet, the following recommendations should be considered. The clinic pet should not have access to any patient treatment areas, patient housing areas, examination rooms, isolation, surgery or the patient waiting area. It should not be allowed to wander freely through the kennel/ward areas where it could cross-contaminate kennels. The animal should have a dedicated food and water bowl, litter box, toys, etc. The pet must also receive regular health checks and have an appropriate vaccination, deworming and external parasite control program. Clinic pets, particularly cats, should not be allowed to have unsupervised outdoor access because of the higher risk of exposure to (and subsequent shedding of) pathogens such as Salmonella and Toxoplasma from hunting birds and rodents.

**VECTOR CONTROL**

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

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

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

From an infection control standpoint, veterinary clinics should never have a resident “clinic pet.”

**CLINIC DESIGN**

Clinic design is critical to effectively implementing infection control measures. Unfortunately, infection control has not always been considered when designing clinics. Commonly encountered problems include:

- High animal and personnel movement in areas where procedures are performed
- Use of flooring and kennel surfaces that are difficult or impossible to disinfect
- Inadequate (or absent) isolation facilities
- Lack of a separate area to examine or treat animals with potentially infectious diseases
- Lack of sinks in all examination rooms and treatment areas
- Lack of a separate area for diagnostic specimen processing
- Lack of a separate area for staff to store personal items and eat

In established clinics, correcting these deficiencies can be difficult or impossible, and often expensive. However, practical and cost-effective measures can often be undertaken to improve infection control within an existing facility. For example:

- Place alcohol-based hand sanitizers in patient contact areas wherever sink access is inadequate.
- Provide separate refrigerators for diagnostic specimens, vaccines and medications, and food for human consumption.
- Alter personnel and animal movement patterns to reduce direct and indirect contact of relatively healthy patients with sick patients.

Infection control issues should be considered when designing new clinics or when undertaking renovation or expansion of existing clinics. An architect with experience designing veterinary clinics should be used, and infection control considerations should be emphasized. Consultation or review of preliminary plans by a veterinary infection control expert is also useful. However, critical assessment of plans with an infection control mindset can readily be performed by any veterinarian. Special emphasis should be given to issues such as:

- Number and placement of sinks – a sink should be present in every examination and procedure room.
- Overall clinic flow from “clean to dirty”, with isolation areas well removed from other animal housing or procedure areas.
- Use of sealed flooring materials that are amenable to frequent cleaning and disinfection.
- Separation of animal procedure areas from areas
where specimens (i.e. stool) are processed. • Provision of a dedicated “personnel-only” space for breaks, food storage and consumption, and storage of personal items.

**REPORTABLE DISEASES**

Certain diseases are immediately reportable to regulatory bodies, often at the time the disease is suspected but still not diagnosed. These diseases vary between countries and tend to focus on exotic pathogens and those of significant zoonotic concern (e.g. rabies). Every veterinary clinic should have a list of reportable diseases prominently displayed in an area easily accessible to clinic personnel. The clinic’s Infection Control Manual should clearly state the required reporting procedures, including contact numbers for the appropriate animal health and/or public health authorities.
10. EQUINE CLINICS: GATTON, DAYBORO, GOONDIWINDI

The University of Queensland, School of Veterinary Science

Biosecurity and Infection Control Procedures:

Equine Hospital (Gatton)

This document outlines the protocols and standard operating procedures (SOPs) for biosecurity at the Equine Hospital at the Gatton Campus.

All staff or students entering the Equine Hospital must have read these biosecurity guidelines.

All staff must have undergone a staff hospital induction, including basic biosecurity training.

Students must have undergone an induction and orientation session (unless under constant supervision by a member of hospital staff).
Equine Hospital Biosecurity: Minimum hygiene standards

These measures are to be implemented at all times, for all patients, as the minimum standard

**Basic clothing, personal hygiene and entry/exit procedures**

- All staff and students having contact with horses are to wear appropriate clothing within the hospital, either:
  - Overalls (not to be worn outside the hospital)
  - Scrubs (not to be worn outside the hospital)

Appropriate footwear (covered shoes, preferably boots) to be worn at all times within the hospital

- Shoes must be clean (no mud, no manure) prior to entry to the hospital
- All persons entering and exiting the hospital to wash hands and arms to the elbow at the basin provided at the hospital entry. Paper towels to be used.
- Jewellery should not be worn on hands or arms. If a watch is worn, it must be capable of thorough disinfection (ie suitable for immersion in disinfectant)
- Any equipment that is carried in and out of the hospital (e.g. stethoscope) must be disinfected with alcohol-based disinfectant gel (Microshield Angel antimicrobial hand rub cleanser – provided on the door of every stable and throughout the hospital)
- Long hair should be tied back.
- All horse owners and visitors must be accompanied by a member of staff who is to ensure compliance with biosecurity protocols.
- Laundered overalls and scrubs are available daily to staff. Students to provide their own cloth overalls; these should be kept separately from other clothing and equipment after wearing (e.g. in a garbage bag) and laundered in hot water after each use.

**Patient handling (minimum standards for all patients regardless of disease status)**

- **Gloves** (latex or nitrile) to be worn at all times when examining new patients or handling hospitalised patients. Gloves are provided on all stable doors and throughout the hospital.
- **Disinfect hands** with alcohol-based disinfectant gel (Microshield Angel antimicrobial hand rub cleanser – provided on the door of every stable and throughout the hospital) before and after handling every patient
- Wash hands thoroughly with Microshield chlorhexidine soap (provided over sinks) under running water if hands come in contact with any faeces or body fluids
- All patients must be triaged on/prior to arrival and assigned a biosecurity classification as described below.
- **Procedure-based requirements for PPE for normal horses are outlined in Table 1**
Disposal of waste

- Soiled dressings and infected or contaminated material to be removed from work areas and placed in biohazard bins (yellow liner) for appropriate disposal (incineration)
- Appropriate bins are provided and changed once to twice daily or more if required; wear gloves while changing and disinfecting bins
- All work areas are to be cleaned and disinfected immediately after procedure is completed
- Soiled bedding to be disposed of away from the hospital in accordance with local council regulations
- Sharps to be disposed of immediately after use in designated sharps container.

Cleaning and disinfection of equipment between patients

- This includes husbandry equipment (such as halters, twitches) and medical equipment (such as endoscopes, mouth gags, stethoscopes, nasogastric tubes etc) – must be cleaned and disinfected promptly after use
- Contaminated or dirty clothing should be changed prior to examination of the next patient

Hospital room and stable cleaning protocols

- Wherever possible, contamination of the hospital environment should be minimised:
  - All horses should have feet picked out prior to removal from their stable (hoof pick provided on all stable doors)
  - Faeces, urine and other body fluids should be cleaned as soon as possible from the work area or from corridors
- Hospital floors to be cleaned daily; all impervious surfaces (floors, bench tops, cupboards etc) to be cleaned and wiped over with disinfectant/alcohol daily;
- Porous surfaces (walls, ceilings) to be cleaned regularly to prevent build-up of dust and cobwebs.
- All stables will be cleaned and disinfected between patients using standard protocols: See “Stable cleaning and disinfection protocols” below
**Stable cleaning and disinfection protocols**

After a horse leaves the stable and prior to a new horse entering:

1. **Remove all bedding and manure.**
   - The activity of disinfectants is decreased in the presence of organic debris so in order to maximize the effectiveness of disinfection it is important to include a detergent cleaning step in addition to physical removal of bedding and manure.

2. **Clean all surfaces with an anionic detergent** (follow recommended dilution on pack)
   - Detergent solution can be delivered using a Hydrofoamer (set to appropriate dilution).
   - For some contaminated areas or equipment it may be necessary to use a hand-sized brush and be sure to “disrupt” all surfaces that animals or faecal material may have contacted.

3. **Rinse with clean water.**

4. **Apply a dilute solution (2-4%) of bleach and allow at least 10 minutes contact time.**
   - For small areas or equipment, bleach can be applied with a mop or brush.
   - More efficient application of bleach with better coverage and longer contact time can be obtained by using a Hydrofoamer filled with 3 parts bleach to 1 part anionic detergent.

5. **Rinse thoroughly with clean water and allow the treated area to dry as much as possible.**

6. **Spray walls and floor with a peroxoxygen disinfectant: 2% Virkon®-S**
   - delivered using a back-pack pump sprayer, gas-powered sprayer or similar
   - When spraying Virkon®-S or similar agents a mask (fit-tested type such as P-2) and gloves must be worn.
   - Allow 10-20 minutes contact time for Virkon®-S.

7. The area may be rinsed with clean water but as the oxidizing activity of Virkon®-S dissipates over a relatively short period of time this is not essential.

8. **Drying is important to achieving maximum effect so allow the area to dry as much as possible before re-bedding or reintroducing animals.**
When using any cleaning and disinfecting agents it is essential that the Material Safety Data Sheet (MSDS) for each product be consulted and the guidelines for proper mixing, use, disposal and any specific precautions be carefully followed. In particular, the recommendations for appropriate Personal Protective Equipment e.g., gloves, eye protection etc. must be strictly adhered to.

Other considerations for stall cleaning:

- Remember, “dirt” cannot be disinfected. Removal of gross organic debris prior to cleaning and disinfection of solid, non-porous surfaces is critical.

- All stall equipment such as buckets and feed tubs, should also be thoroughly cleaned; scrub with a brush using an anionic detergent, rinse, and then apply a bleach solution (2-4%). Spraying with 2% Virkon®-S should be used as a final step with high risk or known positive animals. Equipment that is used for feed and water should be allowed to dry and then be rinsed thoroughly with clean water before reusing.

- Stall cleaning equipment; brooms, shovels, pitchforks etc., should also be cleaned using a detergent and a brush to remove gross debris followed by immersion of the equipment’s head in 2% bleach solution and wiping down of the handles. Such equipment can also be soaked in tubs of disinfectant (e.g., Nolvasan® [chlorhexidine], 2 oz per gallon). Drying in the sun is helpful.

- For equipment such as muzzles, brushes, lead shanks, twitches, halters, etc., some disinfectants will cause certain materials such as rubber to deteriorate: be sure to read the label to check that a disinfectant is safe to use with a given material. In general, clean off gross debris with anionic detergent using a sponge or brush, then soak for approximately 1 hour in drums or buckets containing an appropriately diluted chorhexidine solution.

- Be aware that it is unlikely that everything in the animal housing/handling environment is completely cleanable. Porous surfaces with intact finishes such as painted or varnished wood can be cleaned but items with surface damage or those that are made up entirely or in part of porous materials are much more difficult to clean and may be impossible to disinfect completely. For example, nylon ropes can be immersed in disinfectant for several hours and then allowed to dry, but a fully porous material such as a cotton lead rope cannot be properly disinfected.
Equine patient biosecurity triage and classification at admission

- In terms of hospital biosecurity, the most important infectious organisms carried by horses are:
  - *Salmonella* spp (z)
  - *Clostridium difficile* (z)
  - *Cryptosporidium* spp (z)
  - *Streptococcus equi equi* (Strangles)
  - Methicillin Resistant *Staphylococcus aureus* (MRSA) (z)
  - Equine herpes virus 1 (neurologic-abortion form)
  - Hendra virus (z)

(z) Signifies zoonotic potential

- The identification of horses that are suspected of/confirmed to be carrying these organisms is imperative, as prevention of transmission will require biosecurity precautions in addition to the minimum standards described above.

Cases can be divided into the following 3 categories based on clinician assessment and history:
1) **Low Risk**
   - No signs or history of systemic illness (no fever, no diarrhoea)
   - Includes most cases presented for elective/routine procedures and for musculoskeletal injury

2) **Medium Risk**
   - Horse has non-specific clinical signs of systemic disease, including any of the following:
     - Pyrexia
     - Colic
     - Neurological dysfunction
     - Acute respiratory signs (dyspnoea, nasal discharge etc.)
     - History of recent abortion (last 7 days)

3) **High Risk**
   - Horses with clinical signs that are highly suggestive of active disease caused by the organisms mentioned above. This includes:
     - Horses with diarrhoea (at admission)
     - Horses that have a combination of acute neurological disease and pyrexia
     - Horses with acute disease coming from a property where there has been recent, undiagnosed acute death in other “in-contact” horses
     - Horses where one of the organisms mentioned above has been confirmed by laboratory testing
   - Any other horse where there is significant concern of communicable, exotic or zoonotic disease, at the discretion of the admitting clinician
10.8

Protocols for admission, handling and treatment based on biosecurity

1) Low Risk
   - Housing and handling according to minimum standards described above
   - **Procedure-based PPE only** (as described in Table 1)

2) Medium Risk
   - Housing and handling according to minimum standards,
   - **Procedure-based PPE only** (slightly higher level, as described in Table 1)
   - These horses should be tested for Hendra Virus as soon as possible
     - Nasal swabs and EDTA blood submitted for PCR analysis
     - If the Hendra virus PCR is negative, and depending on clinical signs, the horse may be downgraded to the Low Risk category at the discretion of the clinician responsible for the case

3) High Risk
   - These horses should only be **admitted to the isolation facility**, and should be housed in isolation stalls
   - **Standard isolation protocols (including PPE)** to be followed for all procedures (see below)
   - These horses must be tested for Hendra Virus as soon as possible (prior to admission if clinical signs are highly suggestive)
     - Nasal swabs and EDTA blood submitted for PCR analysis
     - If the Hendra virus PCR is negative, and depending on clinical signs, the horse may be downgraded to the Low Risk category at the discretion of the clinician responsible for the case
   - Horses should undergo laboratory testing for other specific organisms mentioned above, as deemed appropriate by the clinician responsible for the case
   - Horses with clinical signs that are highly suggestive of Hendra virus or EHV1 (abortion/neurological form) should not be admitted to the hospital (until appropriate tests have shown the horse to be free of these diseases).
Obtaining and submitting samples for Hendra virus testing

- Contact the Laboratory Liaison Officer before sending any samples
  - Call (07) 3276 6062 (business hours) or email bslclo@deedi.qld.gov.au
- Samples should only be obtained by staff wearing appropriate PPE (see Table 1)
- A range of samples can be taken from live horses – generally a nasal swab and EDTA blood will be sufficient
- Sample dispatch:
  - Samples must be packaged appropriately – training will be provided to staff
  - Samples must be dispatched to a government veterinary laboratory in the shortest time possible.
  - Notify the laboratory that HeV samples are coming by telephoning the Laboratory Liaison Officer on (07) 3276 6062.
  - Fill out a specimen advice sheet (SAS) with all details, including a thorough history. Place the SAS outside the sample package so it can be read before the package is opened.
  - Clearly write HENDRA VIRUS EXCLUSION – URGENT PRIORITY on the SAS.
  - Samples should be kept refrigerated, NOT frozen.
Table 1: Procedure-based personal protective equipment (PPE) protocols for UQ Equine Hospital

Theses protocols are aimed at minimising the zoonotic risk of diseases including Hendra virus, as well as the spread of infectious disease to other horses.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Procedures involving no/minimal contact with body fluid</th>
<th>Procedures that involve non-aerosolised body fluid contact</th>
<th>Procedures that involve contact with aerosolised body fluid and potential inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General handling</td>
<td>- General handling</td>
<td>- Rectal examination</td>
<td>- Dentistry</td>
</tr>
<tr>
<td>Lameness examination</td>
<td>- Lameness examination</td>
<td>- General surgery</td>
<td>- URT endoscopy</td>
</tr>
<tr>
<td>Auscultation</td>
<td>- Auscultation</td>
<td>- All injections</td>
<td>- Nasogastric intubation</td>
</tr>
<tr>
<td>Radiology, ultrasound</td>
<td>- Radiology, ultrasound</td>
<td>- Venipuncture</td>
<td>- Nasal swab</td>
</tr>
<tr>
<td><strong>Case Classification</strong></td>
<td><strong>1. Minimum hygiene standards</strong></td>
<td><strong>1. Minimum hygiene standards</strong></td>
<td><strong>1. Minimum hygiene standards</strong></td>
</tr>
<tr>
<td><strong>Low Risk</strong></td>
<td>- No systemic illness</td>
<td>- Rectal examination</td>
<td>- Dentistry</td>
</tr>
<tr>
<td>- Lameness cases, elective surgery</td>
<td>- General surgery</td>
<td>- URT endoscopy</td>
<td>- URT endoscopy</td>
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<td></td>
<td>- All injections</td>
<td>- Nasogastric intubation</td>
<td>- Nasogastric intubation</td>
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<td>- Venipuncture</td>
<td>- Nasal swab</td>
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<td></td>
<td>- Collection of fluid from cavities (eg thoracocentesis)</td>
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<tr>
<td><strong>Medium Risk</strong></td>
<td><strong>1. Minimum hygiene standards</strong></td>
<td><strong>1. Minimum hygiene standards</strong></td>
<td><strong>1. Minimum hygiene standards</strong></td>
</tr>
<tr>
<td>- Systemically ill horses, with e.g. fever, colic, respiratory disease (prior to definitive diagnosis)</td>
<td>- Rectal examination</td>
<td>- Dentistry</td>
<td>- Dentistry</td>
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<tr>
<td></td>
<td>- General surgery</td>
<td>- URT endoscopy</td>
<td>- URT endoscopy</td>
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</tr>
<tr>
<td>- Horses with diarrhoea upon admission</td>
<td>- Rectal examination</td>
<td>- Dentistry</td>
<td>- Dentistry</td>
</tr>
<tr>
<td>- In cases where there is a high suspicion of Hendra virus (based on history and/or clinical signs)</td>
<td>- General surgery</td>
<td>- URT endoscopy</td>
<td>- URT endoscopy</td>
</tr>
<tr>
<td>- Confirmed or highly suspicious Strangles cases</td>
<td>- All injections</td>
<td>- Nasogastric intubation</td>
<td>- Nasogastric intubation</td>
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<td></td>
<td>- Venipuncture</td>
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<td></td>
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</tr>
</tbody>
</table>

Horses to be moved to isolation facility. Observe isolation protocols and PPE

- Impervious disposable overalls
- Impervious boots
- Nitrile gloves
- Goggles and P2 mask (if HeV suspect)
Equine Isolation Procedures

Admission to isolation
- Horses to be admitted to isolation stalls only if authorised by clinician responsible for the case
- Horses considered “high risk” based on history should be admitted to isolation upon arrival at the hospital (eg. cases with diarrhoea)
- Based upon information provided over the phone, cases with clinical signs or history that is highly suspicious of Hendra virus or EHV1 (neurological-abortion form) will not be permitted to come to the hospital. Instead, the caller will be advised by the clinician on duty to alert Biosecurity Queensland, and to pursue appropriate procedures/testing.

Staff and student entry/exit procedure and PPE requirements for isolation cases
- Human entry should be kept to the minimum necessary. Where possible, treatment times should be synchronised to minimise unnecessary entry
- In general, entry by staff/students to isolation stalls should be left to last if a batch of procedures is being performed across the hospital (e.g. stable cleaning, morning or afternoon treatments)

Entry procedure for isolation stalls:
- Don latex gloves and impervious boot covers at the entry to the isolation area (kept at perimeter gate)
- Enter isolation stall ante room
- Don nitrile gloves (over latex), rubber over-boots and impervious disposable overalls
- Don safety goggles and P2 mask (if HeV suspect only)
- Walk through Virkon-S foot bath
- Enter patient stall via internal stall door

Exit procedure for isolation stalls:
- Exit stall via internal stall door into ante room
- Remove outer pair of gloves and dispose in provided bin
- Remove impervious disposable overalls and dispose in infectious waste bin
- Wash hands (still inside latex gloves) with chorhexidine soap and water
- Remove mask and goggles (if applicable)
- Walk into Virkon-S foot bath and scrub boots (soles and walls) using brush provided, taking care to remove any gross contamination and to cover the entire surface with Virkon-S
- Remove boots on other side of foot bath and place back on rack.
- Exit stall
- Walk to isolation area perimeter gate and remove impervious boot covers and latex gloves, disposing in provided bin
- Walk across Virkon-S mat
- Disinfect hands with alcohol-based disinfectant gel (Microshield Angel antimicrobial hand rub cleanser)
- Exit isolation area
Isolation equipment and cleaning protocol

- Isolated patients must have their own equipment including thermometers, stethoscopes, halters, lead ropes, buckets, NG tubes, funnels, stall cleaning equipment;
- Disinfectant foot baths/mats must be cleaned and re-stocked daily (or more often if contaminated with organic material)
- Isolation stalls must be cleaned last or preferably by different personnel than those cleaning non-isolation stalls.
- Drugs, feed, bedding and other consumables that enter the isolation area must not leave the isolation area (except as waste)
- All waste from the isolation area must be disposed of in the provided infectious waste bins
- Equipment that must enter/leave isolation temporarily (e.g. x-ray equipment) must be cleaned and disinfected after use and before leaving the isolation area (use appropriate disinfectant according to specific equipment materials)
- Stall and equipment cleaning between cases should be performed using the multiple step protocol described in “Stable cleaning and disinfection protocols” below, and must include all stable-cleaning equipment to be re-used in the stall.
- Isolation stalls that have housed diarrhoea cases or cases that have had positive faecal Salmonella cultures must have 2 consecutive negative environmental cultures before the next horse can be accepted

Barrier precautions and isolation procedures for horses that develop clinical signs of infectious disease whilst in hospital

- Horses that develop clinical signs of potentially infectious disease (eg diarrhoea) should be confined to their stall, with barrier precautions applied to entry/exit, until further testing
  - A small area around the entry to the stall is isolated with tape
  - A stall-side foot bath of Virkon-S is provided
  - Appropriate PPE is provided for donning/doffing within the taped area, including impervious boot covers, impervious gowns (or overalls), nitrile gloves, and goggles/masks (if applicable)
  - All waste (including bedding) is treated as infectious waste and disposed of in appropriate bins placed within taped area
  - Horse movement is minimised
  - Equipment must not be shared with other horses, and must be cleaned and disinfected if removed from the stall area
  - A flow chart specifically for diarrhoea, fever and leucopoenia (suspect Salmonella spp.) is shown in Figure 1. below
  - Removal of barrier precautions, or (alternatively) movement of the horse to an isolation is based on:
    ▪ Results of testing
    ▪ Progression or resolution of clinical signs
    ▪ Discretion of the clinician responsible for the case

Hospitalised horses that develop highly suspicious clinical signs, or that return a positive test for Hendra virus, must be placed immediately in isolation (by staff wearing appropriate PPE) and Biosecurity Queensland must be immediately notified.
Figure 1. Barrier precautions and isolation of cases with diarrhea, leucopaenia and/or pyrexia.

- **Diarrhea**
  - Check temperature
  - Check WBC
  - Start culture series

  **Normal**
  - Send to Isolation
  - Barrier
  - Wait 24 hours

  **Fever**
  - Check WBC
  - Leukopenic
  - Normal
  - Repeat WBC in 24 hours
  - No action required

  **Leukopenia**
  - Start culture series
  - Barrier
  - Repeat WBC in 24 hours
  - Normal
  - Complete series of 3 cultures
  - Remove barrier after 1 negative culture

  **Severe leucopenia**
  - Continue with barrier until all 3 cultures negative

* A second episode of diarrhea during hospitalization requires placement of barriers until 3 negative cultures have been obtained.
Definitions

- Leucopenia: WCC less than \(4 \times 10^9\)/L
- Fever: multiple instances of rectal temperature increase to greater than 38.5°C in a 24 hour period
- Diarrhoea: soft/liquid manure retaining no shape in the bedding passed more than twice in a 12 hour period
- Barrier precautions: stop movement of patient and confine to stall, warning tape around patient stall, disposable boots, gowns/overalls, nitrile gloves, and 2% Virkon foot bath provided stall-side
- Culture Series: Series of three faecal *Salmonella* cultures (reflux can be used in absence of faeces) submitted on consecutive days.

A positive *Salmonella* culture in the presence of clinical signs mandates moving to isolation facility

Human exposure to Hendra virus and other zoonoses

- Any staff or students that have been exposed to biological materials from a suspected or confirmed infectious zoonotic case should report to the clinician in charge of the case, and should immediately be referred to the Gatton campus medical staff.
- In the event of a Hendra virus positive case, Biosecurity Queensland will contact Queensland Health as per an agreed notification protocol. Queensland Health will decide whether any people require monitoring and/or medical assistance.
- If any person is concerned about their health, they should report their concerns to the senior clinicians immediately, and they should then be referred to the Gatton campus medical staff.

Exotic/emergency animal diseases affecting equines

- African horse sickness
- Anthrax
- Australian lyssaviruses (including bat lyssavirus)
- Brucellosis
- Contagious Equine Metritis
- Dourine
- Equine babesiosis (piroplasmosis)
- Equine encephalomyelitis (Western Eastern & Venezuelan)
- Equine encephalosis
- Equine influenza
- Glanders
- Hendra Virus
- Japanese Encephalitis
- Potomac fever
- Rabies
- Screw Worm fly
- Surra
- Vesicular stomatitis

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2 See Ausvetplan

SVS Biosecurity, Hygiene & Inf Control Manual & SOPs V9  Dated 23rd September 2010  Print date 23/09/2010
Notification procedure:

Notification of exotic/notifiable diseases can be made by contacting one of the following:

- Biosecurity Queensland on 13 25 23 (business hours)
- Emergency Animal Disease Watch Hotline on 1800 675 888 (24 hours).

**EQUINE: REFERENCES & RESOURCES**

Biosecurity QLD Guidelines:


Ausvetplan:


AAEP guidelines [www.aaep.org](http://www.aaep.org)


STANDARD OPERATING PROCEDURE – EQUINE ANAESTHESIA INDUCTION

1. The patient should be appropriately fasted (from 6 am the morning of surgery unless a laparascopic case). Water should not be with held. Permission must be granted by the owner and a consent form for anaesthesia signed or phone consent verified by at least two people have occurred before proceeding with any anaesthesia.

2. The horse should be physically examined, have appropriate blood work [CBC and biochemistry for a standard, healthy case (ASA 1 or 2) +/- venous or arterial blood gas for complex cases (ASA 3, 4 or 5 or 1E, 2E, 3E, 4E or 5E) at a minimum]. The anaesthetist should have a good knowledge of the history of the case and have discussed the case with the surgeon or clinician regarding any concerns. A TPR must occur in the 12 hours prior to the anaesthetic induction unless the animal is too difficult to take its rectal temperature. The horse must have an accurate body weight recorded.

3. An anaesthesia request should be submitted for the procedure by 4 pm the previous day in the case of an elective procedure. In an emergency, the clinician should discuss the case with the anaesthetist on duty before submitting the anaesthesia request to ensure staff are adequately prepared for the case.

4. The horse should be transferred from the stable area in a calm state by an experienced handler. This may require appropriate pre-medication which will be determined by the anaesthetist on duty or another experienced equine veterinarian.

5. The horse’s mouth should be lavaged to remove any debris that has accumulated in the oral cavity. If the horse resists excessively, more physical restraint (skin twitch, nose twitch) or drug restraint should be applied as determined by the anaesthetist or other experienced equine veterinarian involved in the case.

6. An intravenous catheter must be placed for any horse undergoing general anaesthesia. The site (preferably the up side jugular vein but must be clear of the surgical site, particularly with airway surgery) must be clipped and surgically prepared with chlorhexidine scrub and alcohol before placing the catheter. The catheter placement should be performed or supervised by an experienced veterinarian or experienced veterinary nurse using published techniques (over the needle, Seldinger, etc.). If the catheter is already in place or after it has been placed, it should have a 75 cm extension set placed if not already present, and taped through the mane. It should be checked for patency by drawing back with a 20 ml syringe half filled with 0.9% saline +/- heparin 1U/ml to check there is presence of venous blood in the extension set with no pulsatile activity that may indicate arterial placement and then flushed through to prevent coagulation.

7. The horse may need some surgical preparation prior to induction but after catheter placement and oral lavage.
8. Once the horse is ready to be induced, it must be adequately sedated to ensure the safety of handlers around it. This will be performed by an experienced equine anaesthetist. There should be a minimum of three experienced handlers involved in any anaesthetic induction.

9. The horse may be induced using the swing gate with one person holding the head, the anaesthetist injecting drugs and operating the swing gate and the other person retrieving items as requested. The horse may be induced against a wall with one person holding the head rope (fed through a ring on the wall adjacent to the head with a single loop in the rope) with the anaesthetist injecting drugs and pushing on the shoulder and any spare people pushing on the hip and body of the horse and then retrieving items once the horse is unconscious. An alternative to people pushing against the rump of the horse is to place a tail rope and have this looped through a ring at the rear of the horse with two loops in the rope. The horse may be induced in a sling, in which case the sling is placed on the standing horse and then attached to the hoist in the ceiling. The anaesthetist injects induction drugs and then tells the hoist operator to lift the hoist once the horse is about to fall. In all situations, no handler should get beneath the horse at any time or put themselves in a dangerous position, such as between the horse and the wall. Instructions should be delivered by the anaesthetist and should be obeyed unless another experienced and qualified person sees a contraindication to this. Any bystanders need to keep noise to a minimum so instructions can be clearly heard. The anaesthetist should comment loudly when the induction drugs have been administered so everyone is aware the horse will be imminently recumbent.

10. Once the horse is recumbent, the anaesthetist should feel for a pulse on the horse and determine whether the depth is sufficient for placement of hobbles. This should be loudly qualified. An assistant should hand the anaesthetist the lubricated endotracheal tube and bite block (if required for orotracheal intubation). The anaesthetist intubates the horse and then loudly confirms when the hoist is ready to be raised or a procedure is ready to be performed. Items such as a demand valve and emergency drugs (including additional induction drug) should be available should any unpredicted events occur.
STANDARD OPERATING PROCEDURE – EQUINE RECOVERY FROM ANAESTHESIA

1. Once the procedure is complete, the horse will be placed in the recovery stall in the same recovery as it was last on the procedure table. If it was in dorsal recumbency, it will be placed in the recumbency so that its intravenous catheter is upmost. In some situations (neurological cases or orthopaedic cases), the patient may be recovered in a sling or on a recovery mat to reduced the likelihood of self trauma on recovery. If sling recovered, the horse will be elevated once light to reduce the length of ventilator impairment of the sling and an Anderson sling will preferentially be used.

2. Intermittent positive pressure ventilation will be applied with a demand valve until such time as the horse is spontaneously ventilating, at which time, an orotracheal tube will be exchanged for a nasotracheal tube, if not already in place. The nasotracheal tube will be tied to the head to hold it in place until standing. Oxygen may be delivered through this tube if the anaesthetist chooses. Alternatively, the orotracheal tube may be left in for recovery in which case it must be firmly tied to the area between the incisors and molars to prevent chewing through the tube and inhaling the unfixed portion. If the cuff is left inflated for recovery to prevent aspiration of blood or gastric secretions, it must be deflated at continued sternal recovery or immediately on standing to prevent the more limited airway provided by a smaller airway, particularly if a cuffed nasotracheal tube has been utilised.

3. The horse may have an unassisted recovery determined by the anaesthetist. Such recoveries may be preferable for poorly handled, larger animals. In this case, the doors are closed on the horse once the anaesthetist is satisfied of continued spontaneous ventilation and sufficient lightness of anaesthesia and the doors are bolted. The anaesthetist views the recovery from the walkway or windows to ensure that the patient does not become cast or have other complications (catheter detachment, fracture, etc.) to allow prompt attention should intervention be necessary. Warming devices may be applied as indicated (forced air warmer, passive recovery methods such as blankets, warmed IV fluids, etc.)

4. If an assisted recovery is chosen, a rope from the halter to the hallway door window is placed and held such that the horse cannot become tangled if it changes position. This is supervised or performed by an experienced and qualified person. A rope is tied to the tail and fed through the rope ferrule in the surgery door and held such that the horse cannot become tangled in it. The horse may be lying perpendicular to the doors on a mat with its back against the wall or parallel to the doors with its back to the door of the surgery if a mat is not being used.

5. The horse’s pulse is checked for rate, rhythm, tone and amplitude. Hobbles are removed once the horse is placed and small movements can
be made by pulling on limbs or the tail if needed. The lower forelimb should be pulled cranially to prevent radial neuropathy. The jugular catheter should be checked for patency and flushed and sedation may be given once the horse is spontaneously ventilating or before if indicated.

6. Someone may sit on the horse’s neck to prevent premature attempts at rising by pulling the head towards their chest and thus setting the horse off balance. Once it is decided to let the horse rise, the head and tail ropes are held taught and pressure is applied to help to lift the horse and get its footing when it attempts to stand. One rear door may remain open during this process or both doors may be closed depending on the anaesthetist. As above, the anaesthetist should be vigilant for any potential required intervention. At least 4 people need to be available for any recovery in case the horse becomes cast and requires repositioning or placement in a Davis sling.

7. Once the horse is safely standing, the recovery mat can be lifted out of the way if used and potentially removed from the room altogether. The tail rope can be removed once the horse is able to keep its hindlimb balance without support from the rope. The clinician on the case can decide when the horse is able to be returned to the stable and should be carefully moved, preferably with tail support if it will tolerate this. The horse should be monitored carefully until it has resumed its normal behaviour. Directions after returning to stall will be at the discretion of the clinician in charge of the case.
11. LARGE ANIMAL AMBULATORY PRACTICES:
GATTON, DAYBORO, GOONDIWINDI

ROUTINE PRACTICES
Routine Practices are a way of thinking and of acting that forms the foundation for limiting the transmission of microorganisms in all health care settings. It is the standard of care for all patients/clients/residents. – Rick Wray, Hospital for Sick Children, Toronto, Canada

Routine practices include:

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

Personal procedures
- Use disposable boots at each farm (or use rubber boots & disinfect with Virkon or equivalent)
- Change to clean coveralls at each farm
- Wear glove on non palpating hand
- Long hair should be tied back
- No or very limited jewellery
- Equipment
- Surgery packs used once then cleaned / packed / autoclaved
- Thermometer - alcohol wiped between uses
- Teat knives - sterilized & individual packs
- Instruments (oral speculums, hoof knives, etc) rinsed & washed with chlorhexidine (or equivalent) after use

Vehicles
- Cleaned weekly
- If taken into a field or pen are washed at a carwash (or equivalent) afterwards
- Sharps containers to be kept in vehicles
- Garbage bags to be kept in vehicles and used to contain contaminated material

Standard Operating Procedures (SOPs) for Working with Horses (Post-Mortem Room).

Process or job description:

Small numbers of horses are submitted for post-mortem examinations, conducted with groups of 5th year veterinary students and postgraduate pathology interns. While most would be expected to be free of Hendra Virus, there is a small risk of exposure to the virus where horses have inadequate history e.g. sudden deaths. There is also concern regarding non-symptomatic horses that may be carrying the virus. The post-mortem facilities at the St. Lucia site are not of PC2 standard.

**Current controls:**
Currently if horses have a history of respiratory disease suggestive of Hendra virus infection, the case is not accepted for submission and is referred to the DPI. However, horses in the current Hendra virus outbreak in Queensland (July-August 2008) have shown neurological signs, which is a new clinical presentation.

The current PPE applied are plastic aprons, overalls (not comprised of waterproof material), latex or rubber gloves and rubber boots. However overalls are easily soaked through with blood and fluids during the procedure, blood can splash on wrists, and face masks and protective goggles are not worn. A significant amount of exposure to blood occurs during cutting up of the carcass to put into bins for disposal. Currently the whole body cannot be picked up by the disposal truck.

**Plan:**
Typically staff are contacted by telephone regarding potential post-mortem examinations. No horse will be accepted if not referred by a veterinary surgeon who has examined the animal in the last 24-28 hours. No horse with clinical signs consistent with (but not necessarily specific for) Hendra virus infection will be accepted. These clinical signs include: acute onset of illness with fever (over 40°C) and rapid deterioration; respiratory signs including pulmonary oedema, respiratory distress, nasal discharge and pulmonary congestion; neurological signs including depression, ataxia, difficulty in rising, loss of vision in one or both eyes, head tilt, circling, and muscle twitching; facial oedema; colic (some judgement will need to be used in the latter cases). For such cases, an owner calling will be told to contact their veterinary surgeon, and veterinary surgeons will be asked to contact DPI&F Business Information Centre during business hours on 13 25 23 or the Emergency Animal Disease Watch Hotline on 1800 675 888 (after hours/ at any time).

However it is the asymptomatic, carrier horses which are of our biggest concerns considering the current inadequate facilities here at St Lucia. PCR testing for viraemia is stated to have a 24 hour turnaround time, and serological testing (for past exposure) 3-5 days.

In cases where the history is acute i.e. there has not been an opportunity to obtain blood samples for PCR and serological testing prior to submission (or results from them), and the horse is being referred by a veterinary surgeon who has not observed any neurological or respiratory signs (including nasal discharge), a post-mortem examination will be conducted by pathologists and interns. This would include for example, deaths occurring on the racetrack, or a horse with severe colic that requires or has required immediate
euthanasia. If the horse is to be euthanased or has died off-site, the referring veterinarian will be advised to bag and tape the head prior to submission. For this situation there will be an update of our current PPE. No undergraduate students will be present. Persons performing these examinations will wear hooded impervious overalls with long sleeves (to prevent contamination of skin where there may be cuts and abrasions) which can easily be disinfected and machine washed and left within the post-mortem room, and impervious rubber boots. There will be triple gloving, with latex gloves over rectal gloves over cotton/latex gloves (for puncture and abrasion resistance; washable). Each pathologist/intern will wear a full-face respirator with a P2 filter. Currently we remove the brain from the cranial cavity using an axe; this practice will be discontinued for horses. The brain will be removed by placing the head in a vice, and removing the skull cap with a hand-saw. At least 3 people will be required to conduct the examination for safe cutting up and disposal of the carcass. The carcass parts will be double-bagged and tied within the plastic bins, and the outside of the bins washed and disinfected.

For other horses where we have an adequate history that does not suggest Hendra virus infection, and there is time to obtain PCR and serological testing for Hendra virus prior to the examination, the post-mortem examinations will be performed with veterinary students present. This will typically be the case with horses with chronic conditions that are donated, or horses brought in for research projects that are also used for the post-mortem classes. Such cases constitute most of our equine post-mortem submissions. The examination will be performed if the testing is negative i.e. we have ruled out viraemia and past exposure (but not necessarily carrier animals). We will alter our PPE such that all students and pathologists working on the horse are clothed in impervious overalls and boots, triple gloved, and wearing anti-splash safety goggles and P2 respirator valved disposable face masks. Other students will conduct their post-mortem examinations in the adjoining room, or will also be required to wear protective clothing of the above level. As above, the brain will be removed using a hand-saw and body parts will be bagged within bins.

Standard Operating Procedures (SOPs) will be made available to all staff concerned.
13. Standard Operating Procedures (SOPs) for teaching activities involving horses.

The following protocols commenced on September 14, 2009, and apply to all practical classes involving veterinary students conducted within the School of Veterinary Science and associated clinics. They are intended to minimize the risk of transmission of Hendra Virus but general principles apply to other infectious diseases.

**Practical classes that utilise horse tissues from abattoirs:**

PPE including overalls, boots, face masks (P2 masks preferable, surgical masks acceptable), eye protection (safety glasses) and gloves (latex or nitrile) will be worn throughout the class.

**Post mortem practical classes using externally acquired horses:**

All horses to be used must be first tested (whole blood PCR, submitted to the Queensland DPI laboratory (ARI Yeerongpilly) for Hendra virus within the 3 days preceding the practical class; only horses with negative results will be used.

Horse temperature and general clinical appearance will be monitored immediately prior to the practical class (only horses with normal rectal temperature and no signs of acute disease consistent with Hendra virus will be used).

PPE including impervious (Tyvek disposable or similar) overalls, boots, P2 face masks, eye protection and gloves will be worn throughout the class.

**Teaching using live horses from the Gatton teaching herd:**

Horses will be housed in the paddock and not left in the yards overnight.

Horses will have rectal temperature taken and clinical appearance assessed on the morning of all practical classes (only horses with normal rectal temperature (<=38.5° C) and no signs of acute disease will be used).

Recommendations as published by Equine Veterinarians Australia will be followed (see attached document).

**Students on rotations conducted at the UQ Dayboro and Goondiwindi clinics:**

When attending clinical cases, recommendations as published by Equine Veterinarians Australia will be followed (see attached document).

Students may not participate in post mortem examinations performed on site (outside the UQ SVS St Lucia pathology facility) unless a definitive diagnosis has been made ante mortem and there is no suspicion of Hendra virus. If students are involved in post mortem examination of any equine case, PPE including overalls, boots, P2 face masks, eye protection and gloves will be worn.

Students and staff should ensure that used or contaminated overalls should be stored separately (eg garbage bag) and washed in hot water and detergent after each use.
14. UQ Veterinary teaching hospital and small animal clinic: Kennel Cough and infectious diseases.

Canine Cough and Infectious Diseases

**Purpose**
To inform all staff including Nursing, Reception and Veterinary Staff of precautionary and reactive steps to be taken when Canine Cough or any other infectious disease is confirmed or suspected.

Kennel Cough = Canine Cough = highly Infectious upper respiratory tract infection

Disinfection = Process in which most or nearly all microorganisms (whether or not pathogenic) on clothing, hard surfaces, and/or wounds are killed through the use of chemicals, heat, or ultraviolet rays.

**Procedure**

**Reception / WAEC nurses**

The receptionist or nurse making an appointment for a coughing dog, a dog with bloody diarrhoea, a sneezing cat, a parrot with feather loss, a parrot with sore eyes and/or sneezing, etc should ask the client to leave the animal in the car on arrival (if safe to do so).

Explain to the client that their pet may be infectious to other pets and that, for the safety of these other pets, we may need to isolate them.

It should be explained to the Client that the signs the animal is displaying could possibly be an infectious disease and the Clinic has a duty of care to other patients visiting the hospital to prevent possible exposure to the disease. Therefore the animal may need to be placed in isolation.

Reception staff to notify consulting Vet of potential risk associated with the case and what steps the client has been requested to take upon arrival.

If a vet is unavailable, the receptionist is notify the nursing staff of the animal arrival, so that a nurse is able to identify the infectious risk of the animal.

Reception staff to notify Hospital Nursing staff of need to ensure appropriate disinfectant is available for consultation room 4.

**Veterinarians**

As the risk of infection may not be known the animal should ideally be carried or driven as close as possible to the Ante room door, not by reception.

All possible infectious animals are to be examined in the isolation room and if unavailable consulting room 4. Access to room 4 can be via the side door near the head anaesthetists office.

When entering the Ante room, all protective clothing (gowns, booties, gloves) should be put on before entering isolation.
If isolation is unavailable due to a hospitalised infectious patient, room 4 must be used. Again all protective clothing must be put on before entering the room.

Upon completion of examination all protective clothing etc should be placed in a Clinical waste bag, sealed and disposed of in the ante room before entering the outside environment. The clinical waster bags are to be disposed of into the clinical waste wheelie bins in the cold room. All infectious clinical waste bags are to be carried to cold room via the outside of the clinical not through the clinic.

If the decision is made to admit an animal into isolation, the animal must be transported on a stainless steel trolley and not allowed to walk on (or come into contact with) the floor. Any surfaces touched by the animal or coming into contact with body fluids or discharge must be cleaned and disinfected immediately. Staff transporting the animal must be clothed with disposable gowns, gloves and booties.

Attending Veterinary staff are to ensure that Virkon is the isolation & ante rooms, plus all the consult rooms.

Attending staff upon completion should wash hands thoroughly and spray shoe base with Virkon before leaving the ante room or room 4.

Veterinarians attending to high risk patients e.g. ICU should not examine such animals. If necessary the attending Vet should wear full protective clothing and dispose as above.

The animal should remain confined within the designated room and upon completion of examination exit via the ante/side door, and client to settle account.

Attending Vet staff are to notify Nursing staff as soon as room vacated.

**Nursing staff / Kennel attendants**

After animal / client has vacated the building a note stating ‘DO NOT ENTER – CLEANING IN PROGRESS’ is to be placed on all access doors to the consultation/ante room.

After animal / client has vacated the building all contact areas are to be disinfected thoroughly with Virkon.

Any areas of biological matter to be wiped up with paper towels in the first place and sealed in a Clinical waste bag.

With aerosol diseases such as kennel cough a 360 degree spread of 1.4 meters is expected—accordingly all walls, floors and other surfaces should be disinfected appropriately.

**Other Infectious Diseases**

**Purpose**

To inform all staff including Nursing, Reception and Veterinary Staff of precautionary and reactive steps to be taken when kennel Cough or any other infectious disease is confirmed or suspected.

Kennel Cough = Canine Cough = highly Infectious upper respiratory tract infection
**Procedure**

**Reception / WAEC nurses**
If a Client contacts the UQ SAC requesting a consultation for a coughing dog, a dog suspected of Parvo or a dog with bloody diarrhoea etc the client should be requested to leave their animal in their car (weather dependent), proceed to reception and inform staff of their arrival.

It should be explained to the Client that the signs the animal is displaying could possibly be an infectious disease and the Clinic has a duty of care to other patients visiting the hospital to prevent possible exposure to the disease.

Reception staff to notify consulting Vet of potential risk associated with the case and what steps the client has been requested to take upon arrival.

Reception staff to notify hospital Nursing staff of need to ensure appropriate disinfectant is available for consultation room.

**Veterinarians**
Veterinarians and any accompanying staff / students should enter the animal through the rear door and examine the animal in Consultation room 4.

As the risk of infection may not be known the animal should ideally be carried or driven to the rear door of the clinic.

Attending staff should cover clothes with a disposable gown (available from Isolation Ward) and upon completion of examination all exterior coats etc should be placed in a Clinical waste bag, sealed and disposed of.

Attending Veterinary staff are to ensure an appropriate disinfectant is available prior to examining animal.

Attending staff upon completion should wash hands thoroughly and spray shoe base before leaving the room.

Veterinarians attending to high risk patients e.g. ICU should not examine such animals. If necessary e.g. WAEC shifts the attending Vet should wear full protective clothing and dispose as above.

The animal should remain confined within the consult room and upon completion of examination exit via the rear door, and client to settle account.

Attending Vet staff are to notify Nursing staff as soon as room vacated.

**Nursing staff / Kennel attendants**

After animal / client has vacated the building a note stating ‘DO NOT ENTER – CLEANING IN PROGRESS’ is to be placed on all access doors to the consultation room.

After animal / client has vacated the building all contact areas are to be disinfected thoroughly.

Any areas of biological matter to be wiped up with paper towels in the first place and sealed in a Clinical waste bag.
With aerosol diseases such as kennel cough a 360 degree spread of 1.4 meters is expected – accordingly all walls, floors and other surfaces should be disinfected appropriately.
15. Disinfectants – Virkon S

**Purpose**
To inform all UQ VTH staff of appropriate use and handling of Virkon S

**Procedure**
Virkon S completely deactivates Parvovirus, Cat Flu, Ringworm spores and hyphae and Canine Cough in one minute at dilution 1:50.

Virkon is a highly water soluble pink powder with a built in pink colour potency indicator whereby solution changes colour from pink to clear as loses potency. Once prepared Virkon is 100% stable for approximately 7 days.

Virkon S consists mainly of inorganic salts which decompose to harmless by-products – thus is considered environmentally friendly.

Virkon S has a high safety profile towards users / animals and has no significant toxicity implications. Note if a small amount of spray should land on an animal, this will be perfectly safe - avoid eyes.

**WHEN TO USE:-**
After any infectious/ potentially infectious animals has been in the UQ SAC&VTH. Pre-cleaning by removing any organic material is required. Please ensure any organic material bagged, sealed and disposed of.

**HOW TO PREPARE:-**
High Risk situations use dilution 1:50

To prepare a 1% Virkon solution ie 1:100 add 10 gm (one scoopful) per litre of water. Adding Virkon to water not water to Virkon.

To prepare a 2% Virkon solution ie 1:50 add 20 gm (two scoopful) per litre.

**HOW TO USE:-**
Virkon should be sprayed on a semi-dry, pre-cleaned surface.

It is not necessary to wash Virkon off surfaces following application. It is preferred that the solution is allowed to dry before reusing surface. Some residue may persist but this can be removed later with fresh water.

**WHS ISSUES:-**
Virkon is classified as non-irritant to eyes and skin at 1% in-use dilution. There are no occupational exposure limits. The solution is non irritant to skin and eyes and does not have a harmful vapour phase.
General Rules in the use and handling of disinfectants

Remove solid waste prior to disinfecting

Clean walls to a height of 1.5 metres

Metal surfaces should be wiped dry after 15 minutes

Always wear gloves and other PPE as described in the MSDS when handling disinfectant concentrate.

Replace lids after use

Disinfectants should be added to water - not water to disinfectant

UQ Veterinary Teaching Hospital & Small Animal Clinic – Administrative Procedures: Kennel Cough and Infectious Diseases

UQ Veterinary Teaching Hospital & Small Animal Clinic – Administrative Procedures: Disinfectants – Virkon S.


17. CLEANING & DISINFECTION POSTER

CLEANING & DISINFECTION ARE AN IMPORTANT PROCESS IN BIOSECURITY & INFECTION

Cleaning and Disinfection Principles

Cleaning involves the removal of visible debris from surfaces with soap or detergent

Disinfection involves the application of a chemical in order to kill microbes that cannot be removed by cleaning

DISPOSABLE GLOVES SHOULD BE WORN WHEN CLEANING AND DISINFECTING AND PROPER HAND HYGIENE SHOULD BE CARRIED OUT AFTER ANY CLEANING ACTIVITY

Cleaning and Disinfection Procedures

Ensure all areas are well ventilated during cleaning & disinfecting and disposable gloves are worn

First clean the surface by removing dried-on or sticky debris from surfaces using a cloth/paper towel and a kennel disinfectant (use correct dilution rates).

Follow cleaning using a higher grade disinfectant (Virkon S*).

Floor surfaces should be mopped using either a stable/kennel disinfectant or a higher grade disinfectant (Virkon S*). Replace mop heads regularly.

Always apply cleaners and disinfectants according to the product label, paying particular attention to dilution rates and required contact time

*Refer to SOP on Disinfecting
18. HAND HYGIENE POSTER

**HAND HYGIENE IS THE MOST IMPORTANT WAY OF PREVENTING INFECTIONS IN THE CLINICAL SETTING**

Hand Hygiene Principles

Effective hand hygiene removes microorganisms on the skin while maintaining hand health.

Antibacterial soaps should be used throughout the hospital, particularly in high risk areas such as the ICU.

There are multiple hand washing stations situated throughout the University SAC & Teaching hospital. These stations use Microshield 4 (Chlorhexidine Gluconate 4%) in disposable pump dispensers.

Bar soaps are not acceptable in veterinary practice settings because of the potential for transmission of pathogens from one person to another.

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**When Hand Hygiene Should Be Performed**

- Before and after patient contact or contact with items in the patient’s environment
- Before performing invasive procedures
- Before eating food
- After personal body functions, such as using the toilet or blowing one’s nose

Recommended Technique:

Remove all hand and arm jewellery and wet hands with warm water.

Apply 1–2 pumps of liquid soap and work into a lather for a minimum of 15 seconds, paying particular attention to finger tips, between fingers and back of hands. 15 seconds is the minimum amount of time required for mechanical removal of transient bacteria.

Thoroughly rinse soap under warm running water and dry hands with disposable paper towel.
19. ISOLATION POSTER

**ISOLATION ROOMS ARE USED TO HOUSE PATIENTS WITH POTENTIALLY CONTAGIOUS CONDITIONS**

**Isolation Principles**
The isolation room is a designated area to care for and house patients with potentially infectious conditions such as Canine Cough, Parvo or Cat Flu

The isolation area must be in a low traffic area

Equipment and materials within the isolation area must be designated for isolation use only, and should not be removed from isolation without being disposed of or disinfected

**ACCESS TO ISOLATION SHOULD BE LIMITED TO THE MINIMUM NUMBER OF ESSENTIAL PERSONNEL NECESSARY TO PROVIDE THE APPROPRIATE CARE**

**Isolation Procedures**
All personnel entering the isolation area must wear the appropriate PPE (ie. Disposable gowns, disposable shoe covers, disposable gloves)

Upon exiting the isolation area, all disposable items worn should be discarded in the clinical waste bin which can be found by the exit door. Reusable gowns or coats used in isolation must be washed after each use.

Disposable shoe covers must be worn and removed upon exiting isolation and a foot bath containing a high grade disinfectant (Virkon S*) should be available upon exiting isolation to minimize contamination of footwear

Animals that are housed in isolation are not to be walked, or be allowed to urinate or defecate in areas used by other animals

If an infectious patient requires procedures within the clinic, it must be transported on a trolley to avoid contamination of the clinic floor. These procedures should also be performed at a time where there is the least amount of patient and personnel traffic within the clinic (ie. Last procedure of the day) and these areas must be disinfected according to disinfecting protocols following the procedure/s.

*Refer to SOP on Disinfectants*
20. PERSONAL PROTECTIVE EQUIPMENT (PPE) POSTER

PERSONAL PROTECTIVE EQUIPMENT IS AN IMPORTANT ROUTINE INFECTION CONTROL TOOL

Personal Protective Equipment Principles

PPE use reduces the risk of contamination of personal clothing and reduce transmission of pathogens between patients by veterinary personnel

Protective outerwear such as lab coat or scrubs must always be worn whenever personnel are working in the clinical environment

PPE USE REDUCES THE RISK OF CONTAMINATION AND TRANSMISSION OF PATHOGENS BETWEEN PATIENTS, STUDENTS AND VETERINARY PERSONEL

Personal Protective Equipment Procedures

The following PPE must be utilised when appropriate within the clinic:

Protective Outerwear (scrubs/coats)

Protective Footwear

Disposable Gloves

Non-sterile Gowns

Face Protection (mask/goggles)

Street Clothes should always be covered by protective outerwear such as a lab coat or scrubs

All gowns should be used only once, then disposed of or washed

Garments such as lab coats and scrubs should be changed promptly whenever they become soiled or contaminated, and at the end of each day

Reusable non-sterile gowns must not be hung up after use. Hanging and reusing contaminated gowns leads to contamination of hands, clothing and the environment

Gloves should be worn when in contact with blood, body fluids, secretions or excretions, and also when cleaning contaminated areas
21. Surgical Scrub Poster
THE SURGICAL SCRUB

*Total scrub time*
- 5-7 minutes

*Procedure*
- Open brush, wet hands and arms, dispense scrub and lather hands and arms
- Clean under nails with nail pick, rinse periodically under running water
- Rinse hands and arms
- Scrub dorsal surface of all fingernails with nylon bristles (approx 20-30 strokes)
- Scrub approx 20-30 strokes to under under nails and finger tips

*FROM THIS POINT FORWARD, USE ONLY THE SPONGE SIDE OF THE BRUSH*
- Divide fingers into 4 planes and scrub each sequentially (15 strokes per plane)
- Scrub between fingers (webbing) (15 strokes per plane)
- Divide hand into 4-6 planes (to ensure complete coverage) and scrub sequentially (15 strokes per plane)
- Scrub proximal (towards elbow) and distal (towards the hand) planes of both forearms
- Rinse off from fingers to elbows
- Collect more scrub from dispenser and lather hands only
- Rinse

*NOTE…*
- Hands should always be held above elbows
- Don’t contaminate yourself by touching tap, dispensers etc
- It is acceptable to scrub both hands before scrubbing forearms
22. Fire and emergency evacuation procedures

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Fire & Emergency Evacuation Procedures
For UQ Veterinary Hospital Gatton

If you discover a fire or emergency:

- Call extension 53333 and advise:
- Details of location, type and scale of the fire or emergency, and
- The name and location of the caller.
- Alert other people in the vicinity and notify the Floor Warden.

For Undergraduate Teaching: At the commencement of semester lecturers and tutors should ensure that the students are advised how to recognise the different alarms, which exits to use and the assembly point.

For all others:

In the event of an emergency, including a fire alarm, any person in charge of a seminar or other meeting, shall instruct other staff and visitors to respond to the appropriate emergency signals.

- On hearing the ALERT TONE, all occupants are to remain at their current location and wait for further instructions from the Floor Warden.
- When and if the EVACUATION TONE sounds, all building occupants shall leave the building via the nearest marked fire exit and proceed to the assembly area.
- No one is to re-enter the building until the All Clear has been given by the Building Warden or Security.
- Emergency Procedure coloured cards should be in all labs and offices. These cards contain a section on emergency evacuation.
- University Fire Safety Officers: Neil Finlayson ext. 52329 and Steve McCann ext 69723

For more information, please go to www.uq.edu.au/ohs (Policies, Procedures and Guidelines) under “f” for Fire and Emergency Evacuation procedures.
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<th>Position</th>
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<td>Chief Building Warden</td>
<td>Grant Frazer</td>
<td>50787</td>
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<td>Deputy Building Warden</td>
<td>Anne Covill</td>
<td>50977</td>
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<td>Reception and consult rooms</td>
<td>Judith Jefferys</td>
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<td>Francis Purnell-Webb</td>
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<td>Emma Bennett</td>
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<td>Hospital wards / laundry / store</td>
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<td>Tutorial rooms / lunch rooms etc</td>
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<tr>
<td>Treadmill. Txment ultrasound and standing surgery LA</td>
<td>Chris Gray</td>
<td></td>
</tr>
<tr>
<td>Scintigraphy outside</td>
<td>Kate Hertrick</td>
<td></td>
</tr>
<tr>
<td>Stables</td>
<td>Susan Keane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rebecca Johnson</td>
<td></td>
</tr>
<tr>
<td>Isolation equine</td>
<td>David Manchon</td>
<td></td>
</tr>
<tr>
<td>UQ Fire Safety Officers</td>
<td>Neil Finlayson</td>
<td>52329</td>
</tr>
<tr>
<td></td>
<td>Melissa Jones</td>
<td>69723</td>
</tr>
</tbody>
</table>

Point of Meeting Place: Outside of the main entrance, to the parkland on the opposite side of road, on Main Drive and Outer Ring Road.
During fire drill: Please advise clients that it is only the fire drill and there is no need to evacuate.

For surgery/radiology and other treatment area: as above.

Fire and Emergency Evacuation: Please follow the guideline above (Fire and Emergency Evacuation Procedures), and vacate the premises (staff/ students and clients) at the second evacuation tone and advise the clients of the meeting place.

For surgery/radiology and other procedures: If there is no fire/smoke or gas leak near-by, please continue with your activities. However the wardens must advise UQ Fire safety Officer attending the scene that the procedures are taking place (detailed location and the number of staff involved). He will then keep a close eye on the area, and evacuate when it is absolutely necessary.

Animals (dogs) that can be walked out on the leads will be evacuated to the point of meeting place. Other animals (cats, birds etc) will be put in cages and carried out.

Horses to be initially evacuated to the outer car park at the Equine end of the building and if necessary, to adjoining paddocks, where they will remain secure.

Animals who are receiving treatment at the time of the evacuation will be wheeled/carried out where possible.
23. Procedure for handling of oxygen cylinders

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Protocol for Handling of Oxygen Cylinders

GENERAL INFORMATION:
Cylinders contain pressurized substances which pose the risk of releasing their contents with considerable force. The sudden release or escape of the contents can make the cylinders potentially powerful projectiles, therefore having the potential to cause considerable personal injury and physical property damage. Risks include explosion, burns, and physical injuries from manual handling of cylinders.

POLICY:
- Ensure staff receives instruction on appropriate cylinder use and handling.
- Ensure cylinder contents are clearly identified. Unidentified cylinders should be kept aside and returned to the supplier.
- Store and use cylinders only in an upright position. Cylinders should be chained against a solid wall or kept in a designated, signposted storage locker.
- Do not roll cylinders on the ground as it risks damaging or opening the valve.
- The hand trolley must be used to move the large cylinders. Ensure they are firmly secured during transport.
- Transported cylinders must be well secured to avoid hitting one another, whether in a vehicle or trolley.
- When securing cylinders during storage, transport or use, do not secure using the valve or regulator. Secure to the body of the cylinder.
- Do not allow cylinders to strike each other or hit hard surfaces violently.
- Cylinders should be stored away from heat or ignition sources.
- Always turn cylinders off at the valve when not in use.
- Cylinder valves should be turned on gradually.
- Point the valve opening away from yourself or other people.
- Check cylinder and attachments for leaks regularly.
- Have cylinders and attachments serviced yearly.
- Prior to attachment, ensure that the threads on the cylinder and the connection match.
- Check for leaks once connected and pressurized.
- Ensure the valve is shut and pressure is released before disconnection.
- Ensure regulators are used and fitted to all cylinders.
- Store cylinders in cool, dry, well ventilated areas.
- Avoid storage of cylinders in thoroughfare. Return to storage room when not in use.
- Keep full and empty cylinders separate.
- Keep oil and grease away from cylinders.
- Never use force when opening or closing the valve.
24. Protocol for animal handling procedures/restraint

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UQ Equine Hospital Standard Operating Procedures

PROTOCOL FOR ANIMAL HANDLING / RESTRAINT

- Ensure all staff / students are appropriately trained in animal restraint / handling and are given clear, precise instructions when holding fractious animals.
- When students are handling horses, there is to be a minimum of two people present.
- Aggressive / dangerous behaviour should be kept on record for future reference. Stalls housing an aggressive horse should be appropriately labelled with warnings.
- Have suitable restraint available e.g: twitches, rearing bits etc. Use the stocks/crush where necessary.
- Use chemical restraint wherever necessary to minimize injury to holders and reduce trauma / injury to animals.
- All members of staff have the right to refuse to attend to an animal on the grounds of their personal safety.
- Always stabilize footing before attempting any procedure.
- Children should not be present. Parents must move them to a safe area, away from the animal.
- Before entering a yard / stable to catch an animal ensure the following:
  - You have read any warnings posted about the animal
  - You have on appropriate footwear.
  - The head collar and lead are in good condition and the correct size (fit appropriately).
- Once in a yard / stable with the animal, ensure you have an escape route.
- If it is necessary to move around the rear of a horse do so in the following manner:
  - Far enough away to avoid the potential of contact with an extended leg during a kick
  - Immediately along the horse’s body

PROTOCOL FOR CATCHING A FOAL WITH THE MARE

- Two people to attend to stall if possible. A halter must be put on the mare when attending the foal. The foal must be restrained by the front end first.

PROTOCOL FOR LIFTING AND TURNING A FOAL

- Revise the manual handling protocols as described elsewhere.
- Always lift and turn foals with 2 people.

PROTOCOL FOR LOADING / UNLOADING HORSES

- Ensure drivers to contact a member of staff before loading / unloading.
- A member of staff will load / unload each horse.
- If necessary, contact a veterinarian to administer sedation to difficult horses, especially when human safety is at risk.
- Be aware of horses that may be ataxic or colicking.
- All stallions / colts are to have a rearing bit placed before being unloaded.
- Ensure loading ramp gate is closed once horses are loaded and the truck has departed.
25. Standard operating procedures for equine facilities for undergraduates, visitors and staff

This page is intentionally blank.
In Case of Emergency, call 53333

- All visitors must be signed in at the reception upon arrival
- Be aware of emergency evacuation procedures including nearest First-Aid officers
- Closed-in, sturdy shoes must be worn at all times. Depending on the nature of the activities, additional personal protective clothing such as over-alls and rubber boots must be worn.
- All undergraduates and visitors must be supervised or accompanied by staff member at all times
- No smoking, drinking, eating permitted
- In case of injuries, accidents or illness, please report to reception.
26. Protocol for handling and disposal of medical waste and sharps

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Protocol for Handling & Disposal of Medical Waste & Sharps

Medical waste is defined as (but not confined to) waste consisting of a body part or a specimen or culture discarded in the course of a veterinary procedure that possesses a significant risk to the health of a person who comes into contact with it.

Sharps are defined as any object that is capable of penetrating the skin such as needles and blades. These items are a physical hazard themselves however they are also likely to have been in direct contact with body fluids, blood, microbiological materials or toxic chemicals.

ENVIRONMENT PROTECTION LEGISLATION:
Medical waste is a listed waste under Schedule 1, Part B of the Environment Protection Act 1993. Any person who carries on an activity in which anything listed in Part B of the schedule is produced as or becomes waste must be licensed.

REQUIREMENTS FOR STORAGE OF MEDICAL WASTE:
- Treat any waste mixed with medical waste, as medical waste.
- The disposal of sharps should not incorporate cutting, bending or any other manipulation that could generate aerosols or splatter of contaminated fluids.
- Place sharps into a suitable container that:
  - Is puncture-resistant, leak-proof, shatter proof and able to withstand heavy handling.
  - Displays the universal biohazard label
  - Has an opening which is accessible, safe to use, and designed so that it is obvious when the container is full.
  - Is sealable when full or ready for disposal.
  - Can be handled without danger of the contents spilling or falling out.
  - All needle stick injuries must be recorded.

Place all medical waste other than sharps in clearly labelled heavy duty plastic bags. Bags intended for domestic use are unsuitable for this waste.
Tie the bags so as to prevent leakage or expulsion of solid or liquid wastes during storage, handling or transport and ensure they will not be subject to compaction by any compacting device.

27. UNIVERSITY OF QUEENSLAND RISK ASSESSMENTS
Risk Assessment: Radiographs of anaesthetized dogs.

Task/Process ID: 2360
Name: VETS 5006 Advanced radiographic techniques for veterinary students
Author: annabelle margaret galloway
Last updated by annabelle margaret galloway on 6/5/2010 9:35:58 AM
Audited by

Effective Risk Level: Low (Risk/Hazard)

Location of Workplace Associated with the Task or Process...
Campus: St Lucia
Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
School/Centre: Farms and Vet Clinics
Workplace: Seddon building

Supervisor: Helen keala
Approval Status: Not Approved

Risk Analysis

Consequence: Minor
Details: Exposure to radiation has stochastic and non-stochastic effects. The non-stochastic effect have a threshold of radiation needed to initiate the effect. This would not be induced by accidental exposure of the level used in this tutorial. Stochastic effects are more relevant and do not have a threshold of exposure levels. The effects include induction of neoplasias, mutations etc. A certain amount of radiation is allowable under radiation monitoring systems and the ALARA principles are followed. As low as reasonably acceptable.

24/08/2010
<table>
<thead>
<tr>
<th>Exposure:</th>
<th>Probability:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very rare</td>
<td>This would only occur if there was a breakdown in radiation protection principles.</td>
</tr>
<tr>
<td>Remotely possible</td>
<td>This would occur if the student accidentally entered the room during exposure. Students work in groups and do not re-enter the room until the student taking the exposure opens the door. The tutor is also in attendance.</td>
</tr>
</tbody>
</table>

**Risk Level:** Low  
**Suggested Action:** Risk is normally acceptable  
**Assessment Date:** 8/4/2006

24/08/2010
Risk assessment: Performing diagnostic ultrasound on client owned dogs and cats.

Task/Process ID: 4269
Name: Performing Diagnostic Ultrasound on client owned dogs and cats
Author: Annie Rose
Last updated by Annie Rose on 1/3/2005 4:23:27 PM
Audited by

Effective Risk Level:
Very High (Risk Hazard)

Location of Workplace Associated with the Task or Process...
Campus: St Lucia
Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
School/Centre: Veterinary Sciences
Workplace: Not Assigned
Supervisor:
Approval Status: Not Approved
Supervisor Notes:

SOP:

Risks Associated with this Task, Process or Situation

Risk Situation: Musculoskeletal Injury
Persons at Risk: 3

Notes: Performing abdominal and cardiac ultrasound using current table - well documented within the industry that sonographers experience musculoskeletal injury. The use of a specially designed table to position the dog/cat will limit musculoskeletal injury.

Pregnancy Risk: None
Energy Source: Muscular (strain)
Current Controls: Height adjustable table and chair which is greater than 10 years old. Inadequate facilities to perform cardiac ultrasound which requires ultrasound probe to be positioned from underneath the laterally recumbent patient.
Hazard Event: Loss of work time and require rehab due to musculoskeletal injury
Incident Category: Repetitive movement with low muscular loading

<table>
<thead>
<tr>
<th>Risk</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequence:</td>
<td>Well documented that workers performing diagnostic ultrasound have musculoskeletal problems - under current work environment.</td>
</tr>
<tr>
<td>Exposure:</td>
<td>Exposure occurs many times daily. Each ultrasound examination takes 60 minutes to perform and may be repeated 3-4 times daily.</td>
</tr>
<tr>
<td>Probability:</td>
<td>Almost certain</td>
</tr>
<tr>
<td>Risk Level:</td>
<td>Very High</td>
</tr>
<tr>
<td>Suggested Action:</td>
<td>Immediate correction required</td>
</tr>
<tr>
<td>Assessment Date:</td>
<td>8/2/2005</td>
</tr>
</tbody>
</table>

Risk assessment: Performing diagnostic ultrasound on dogs and cats.

Risk Treatment or Control

Task/Process ID: 4269  
Name: Performing Diagnostic Ultrasound on client owned dogs and cats

Location of Workplace Associated with the Task or Process...

Campus: St Lucia

Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences

School/Centre: Veterinary Sciences

Workplace: Not Assigned

Supervisor:  
Approval Status: Not Approved

Risk Treatment or Control

Original Risk Situation: Musculoskeletal Injury  
Original Risk Level: Very High

Treatment/Control Description: New Control

Control Class Action: Design

Cost: 453.00

Cost Frequency: Once Only

Notes: An specifically designed ultrasound table has been purchased. This design is used by experienced veterinarians performing cardiac ultrasound in both USA and Australia. The table is designed to allow the veterinarian performing the cardiac ultrasound to position the probe underneath the patient with minimal strain/comfort. This is a once off cost of $453 to upgrade the current inadequate table which is over 10 years old. Experienced veterinarians using this table design report a decrease in musculoskeletal problems.

Term: Long term

Status: Pending

Risk Analysis

<table>
<thead>
<tr>
<th>Details</th>
<th>Consequence</th>
<th>Catastrophe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>Exposure: Continuous</td>
<td></td>
</tr>
<tr>
<td>Probability</td>
<td>Almost certain</td>
<td></td>
</tr>
</tbody>
</table>

Risk Level: Very High

Suggested Action: Immediate correction required

Person Responsible:

Date of Sign Off: 24/08/2010

Risk assessment: UQ Equine hospital after hours procedure.

<table>
<thead>
<tr>
<th>Task/Process ID:</th>
<th>25232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>UQ Equine Hospital Afterhours Protocol</td>
</tr>
<tr>
<td>Author:</td>
<td>Susan Keane</td>
</tr>
<tr>
<td>Last updated by:</td>
<td>Andrew van Eps on 23/09/2010 11:00:29 AM</td>
</tr>
<tr>
<td>Effective Risk Level:</td>
<td>Low (Risk/ Hazard)</td>
</tr>
<tr>
<td>Location of Workplace Associated with the Task or Process:</td>
<td></td>
</tr>
<tr>
<td>Campus:</td>
<td>Gatton</td>
</tr>
<tr>
<td>Faculty/Division:</td>
<td>Natural Resources, Agriculture and Veterinary Sciences</td>
</tr>
<tr>
<td>School/Centre:</td>
<td>Veterinary Sciences</td>
</tr>
<tr>
<td>Workplace:</td>
<td>UQ Equine Hospital</td>
</tr>
<tr>
<td>Supervisor:</td>
<td>Andrew van Eps</td>
</tr>
<tr>
<td>Approval Status:</td>
<td>Approved</td>
</tr>
<tr>
<td>Approval Date:</td>
<td>20/06/2010</td>
</tr>
</tbody>
</table>

SOP: 501 - Afterhours Standard Operating Procedure

<table>
<thead>
<tr>
<th>Risks Associated with this Task, Process or Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Situation:</td>
</tr>
<tr>
<td>Persons at Risk:</td>
</tr>
<tr>
<td>Notes:</td>
</tr>
<tr>
<td>Pregnancy Risk:</td>
</tr>
<tr>
<td>Energy Source:</td>
</tr>
<tr>
<td>Current Controls:</td>
</tr>
<tr>
<td>Hazard Event:</td>
</tr>
</tbody>
</table>

| Incident Category: | Other and multiple incident type |

<table>
<thead>
<tr>
<th>Risk Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details</td>
</tr>
<tr>
<td>Consequence:</td>
</tr>
<tr>
<td>Exposure:</td>
</tr>
<tr>
<td>Probability:</td>
</tr>
</tbody>
</table>

| Risk Level: | Low |
| Suggested Action: | Risk is normally acceptable |

Assessment Date: 17/06/2010
Risk assessment: UQ hoist and slings operating procedure.
Risk assessment: Equine restraint: horse becomes fractious in confined area.

**Task/Process Details Report**

**Risk Assessment**

**Task/Process ID:** 25322  
**Name:** Equine Restraint  
**Author:** Susan Keane  
**Last updated by:** Susan Keane on 20/9/2010 12:02:33 PM  
**Audited by:** 

**Effective Risk Level:** Substantial Risk (Hazard)  
**Location of Workplace Associated with the Task or Process:** 
- **Campus:** Gatton  
- **Faculty/Division:** Natural Resources, Agriculture and Veterinary Sciences  
- **School/Centre:** Veterinary Sciences  
- **Workplace:** UQ Equine Hospital  
**Supervisor:** Andrew van Eps  
**Approval Status:** Not Approved

**SOP:** 506 - Protocol for Horse Handling/Restraint

**Risks Associated with this Task, Process or Situation**

**Risk Situation:** Horse becomes fractious in confined area  
**Person of Risk:** 3  
**Notes:** Horses will be examined in confined areas or in stocks/rush. Some animals may panic in some situations and become dangerous (rearing, striking, lunging forward).

**Pregnancy Risk:** None

**Energy Source:** Body Mass

**Current Controls:** Have suitable restraint available e.g. halter, head collar, stocks, etc. Use the stocks/rush where necessary. Use chemical restraint wherever necessary to minimize injury to handlers and reduce trauma to the animal. Ensure all staff/students are appropriately trained in animal restraint/handling and are given clear, precise instructions when handling fractious animals. Aggressive/dangerous behaviour should be kept on record for future reference. Staffs handling an aggressive horse should be appropriately labelled with warnings. In the case of a horse becoming dangerous, all people (including the horse handler) should move back a safe distance in a quiet manner. The horse should be removed from the crush as soon as possible.

**Hazard Event:** Horse becomes dangerous (rearing, striking, attempting to run) in confined area and has the potential to cause injury to a person in the vicinity.

**Incident Category:** Being hit by moving object

**Risk Analysis**

<table>
<thead>
<tr>
<th>Risk Analysis</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequence:</td>
<td>Serious injury from horse rearing/striking.</td>
</tr>
<tr>
<td>Exposure:</td>
<td>Horses handled multiple times per day.</td>
</tr>
<tr>
<td>Probability:</td>
<td>All horses have the potential to become fractious.</td>
</tr>
</tbody>
</table>

**Risk Level:** Low  
**Suggested Action:** Risk is normally acceptable

**Assessment Date:** 20/9/2010

---

24/08/2010
Risk assessment: Development of malignancy after prolonged radiation exposure.

Risk Assessment

Task/Process ID: 22252
Name: (Copy of) Diagnostic radiography (X-rays) for equine facilities at Gatton
Author: Margaret Day
Last updated by Margaret Day on 12/5/2010 3:43:37 PM
Audited by
Effective Risk Level: High (Risk/Hazard)
Location of Workplace Associated with the Task or Process:
Campus: St Lucia
Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
School/Centre: Veterinary Sciences
Workplace: Not Assigned
Supervisor: Approval Status: Not Approved
Supervisor Notes:

SOP:

Risks Associated with this Task, Process or Situation
Risk Situation: Development of malignancy after prolonged exposure to ionizing radiation
Persons at Risk: 130
Notes: This equipment is required for equine and large animal teaching at the Gatton campus. Current equipment is compliant with government regulations but significant risk always exists when x-ray equipment is used. The University of Queensland Work Place Health and Safety Manual Task Advisory Standard 2000 requires the University to supply staff with equipment that will reduce the possibility of work related injury. Protective lead aprons need to be worn when handling animals during x-ray examinations. Both staff and students will be involved in the x-ray examination of large and small animals during tutorials and there will be several tutors conducting at least 50 tutorials with students attending at least 2 tutorials.

Pregnancy Risk: None
Energy Source: Radiation
Current Controls: Only staff and students that need to be present for the examination will be present and all will be trained in radiation protection and dangers. All others staff will be positioned behind protective shielding. Lead gowns and thyroid shields are worn but those currently supplied are very old and in poor condition and not all provide complete cover.

Incident Category: Exposure to Radiation

<table>
<thead>
<tr>
<th>Risk Analysis</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequence:</td>
<td>Radiation exposure can result in death, infertility and cancer.</td>
</tr>
<tr>
<td>Disaster:</td>
<td>Potentially exposed two to three times/day</td>
</tr>
<tr>
<td>Exposure:</td>
<td>Probability:</td>
</tr>
<tr>
<td>Frequent:</td>
<td>Remotely possible</td>
</tr>
<tr>
<td>Probability:</td>
<td>Has not happened but is well documented</td>
</tr>
</tbody>
</table>

Risk Level: High
Suggested Action: Immediate correction required

Assessment Date: 25/02/2010

## Risk assessment: Diagnostic radiography for equine facilities: malignancy & prolonged exposure.

### Task/Process Details Report

**Risk Treatment or Control**

<table>
<thead>
<tr>
<th>Task/Process ID:</th>
<th>22252</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>(Copy of) Diagnostic radiography (X-rays) for equine facilities at Gatton</td>
</tr>
<tr>
<td>Author:</td>
<td>Margaret Day</td>
</tr>
<tr>
<td>Location of Workplace Associated with the Task or Process...</td>
<td></td>
</tr>
<tr>
<td>Campus:</td>
<td>St Lucia</td>
</tr>
<tr>
<td>Faculty/Division:</td>
<td>Natural Resources, Agriculture and Veterinary Sciences</td>
</tr>
<tr>
<td>School/Centre:</td>
<td>Veterinary Sciences</td>
</tr>
<tr>
<td>Supervisor:</td>
<td>Not Assigned</td>
</tr>
</tbody>
</table>

### Risk Treatment or Control

- **Original Risk Situation:** Development of malignancy after prolonged exposure to ionizing radiation.
- **Treatment/Control Description:** Personal Radiation Protection.
- **Control Class Action:** Personal Protective Equipment.
- **Cost:** 1500.00
- **Cost Frequency:** Once Only
- **Notes:** The University by law (Radiation Safety Act 1999) is required to provided appropriate personal radiation protection to all staff members involved in x-ray examinations. I would like to purchase a range of new gowns to provide this protection.
- **Term:** Long term
- **Status:** Pending

### Risk Analysis

<table>
<thead>
<tr>
<th>Consequence:</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Better protection afforded by new gowns</td>
</tr>
<tr>
<td>Exposure:</td>
<td>Same exposure level as previous</td>
</tr>
<tr>
<td>Frequent</td>
<td>There is always a risk associated with x-ray examinations</td>
</tr>
</tbody>
</table>

### Risk Level: Low

**Suggested Action:** Risk is normally acceptable

**Person Responsible:** Morag Wilton

**Date of Sign Off:** 25/08/2010

### Task/Process Details Report

#### Risk Assessment

**Task/Process ID:** 22252  
**Name:** (Copy of) Diagnostic radiography (X-rays) for equine facilities at Gatton  
**Author:** Margaret Day  
**Last updated by:** Margaret Day on 22/09/2010 3:43:37 PM  
**Audited by:**  

**Effective Risk Level:** High (Risk/Hazard)  
**Location of Workplace Associated with the Task or Process:**  
- **Campus:** St Lucia  
- **Faculty/Division:** Natural Resources, Agriculture and Veterinary Sciences  
- **School/Centre:** Veterinary Sciences  
- **Workplace:** Not Assigned  
- **Supervisor:**  
- **Approval Status:** Not Approved  
**Supervisor Notes:**  
**SOP:**

#### Risks Associated with this Task, Process or Situation

- **Risk Situation:** Development of back pain due to weight of radiation protection aprons  
- **Persons at Risk:** 6  
- **Notes:** One piece aprons of approx 5 kg weight with all weight being carried from the shoulders.  
- **Pregnancy Risk:** None  
- **Energy Source:** Kinetic Energy  
- **Current Controls:** The gowns must be worn for the term of the examination and no other alternatives are available at present.  
- **Hazard Event:** Wearing the style of gowns available for extended periods of time can lead to back and shoulder pain.  
- **Incident Category:** Muscular stress other

<table>
<thead>
<tr>
<th>Risk Analysis</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substantial</td>
<td>Substantial injury requiring physiotherapy treatment; possible severe injury if permanent injury to the back.</td>
</tr>
<tr>
<td>Frequent</td>
<td>Gowns worn as protective devices during X-ray examinations.</td>
</tr>
<tr>
<td>Quite possible</td>
<td>Long standing staff members have all suffered from back and shoulder pain</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Level:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested Action:</td>
<td>Should receive attention as soon as possible</td>
</tr>
</tbody>
</table>

**Assessment Date:** 25/02/2010

---

25/08/2010
Risk assessment: Diagnostic radiography for equine facilities at Gatton: Purchase of lead aprons.

Task/Process Details Report

<table>
<thead>
<tr>
<th>Risk Treatment or Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task/Process ID: 22252</td>
</tr>
<tr>
<td>Name: Diagnostic radiography (X-rays) for equine facilities at Gatton</td>
</tr>
<tr>
<td>Author: Margaret Day</td>
</tr>
<tr>
<td>Location of Workplace Associated with the Task or Process...</td>
</tr>
<tr>
<td>Campus: St Lucia</td>
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<tr>
<td>Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences</td>
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<tr>
<td>School/Centre: Veterinary Sciences</td>
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<tr>
<td>Workplace: Not Assigned</td>
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<td>Supervisor:</td>
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<td>Approval Status: Not Approved</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Treatment or Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Risk Situation: Development of back pain due to weight of radiation protection aprons</td>
</tr>
<tr>
<td>Original Risk Level: Substantial</td>
</tr>
<tr>
<td>Treatment/Control Description: Purchase of 2 piece Lead Aprons for use in x-ray examinations</td>
</tr>
<tr>
<td>Control Class Action: Substitution</td>
</tr>
<tr>
<td>Cost: 3500.00</td>
</tr>
<tr>
<td>Notes: Purchase of two piece lead aprons that provide all round protection and allow for the weight to be carried by both the shoulders and the waist in a 40/60 ratio</td>
</tr>
<tr>
<td>Term: Long term</td>
</tr>
<tr>
<td>Status: Pending</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequence: Minor</td>
</tr>
<tr>
<td>Exposure: Weight is more evenly distributed</td>
</tr>
<tr>
<td>Frequent: Exposure levels remain the same</td>
</tr>
<tr>
<td>Probability: Unusual but possible</td>
</tr>
<tr>
<td>Risk Level: Low</td>
</tr>
<tr>
<td>Suggested Action: Risk is normally acceptable</td>
</tr>
<tr>
<td>Person Responsible: Morag Wilson</td>
</tr>
<tr>
<td>Date of Sign Off: 25/08/2010</td>
</tr>
</tbody>
</table>

Risk assessment: Repro examination of mare: being kicked by horse during procedure.
Risk assessment: Repro examination of mare: Arm could be injured during rectal palpation.

Risk Assessment

Task/Process ID: 14031
Name: Repro examination of a mare
Author: Lisa Kidd
Last updated by Lisa Kidd on 16/2/2009 3:09:36 PM
Audited by

Effective Risk Level: Low (Risk Hazard)

Location of Workplace Associated with the Task or Process:
- Campus: Gatton
- Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
- School/Centre: Veterinary Sciences
- Workplace: Gatton Equine precinct

Risk Associated with this Task, Process or Situation
- Risk Situation: Injury to arm
- Persons at Risk: 0
- Notes: Arm could be injured if horse moves during rectal palpation
- Pregnancy Risk: None
- Energy Source: Body Mass
- Current Controls: Crush etc
- Hazard Event: Being hit by moving object

Risk Analysis

<table>
<thead>
<tr>
<th>Risk Level: Low</th>
<th>Suggested Action: Risk is normally acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment Date: 16/2/2009</td>
<td></td>
</tr>
</tbody>
</table>

17/08/2010
### Risk Assessment

**Task/Process ID:** 14030  
**Name:** Collection of semen from a stallion in prac  
**Author:** Lisa Kidd  
*Last updated by Lisa Kidd on 16/02/2009 3:04:14 PM*  
*Approved by*

**Effective Risk Level:** Low (Risk Hazard)

**Location of Workplace Associated with the Task or Process:**
- **Campus:** Gatton
- **Faculty/Division:** Natural Resources, Agriculture and Veterinary Sciences
- **School/Centre:** Veterinary Sciences
- **Workplace:** Gatton Equine Unit

**Approval Status:** Not Approved

**SOP:**

### Risks Associated with this Task, Process or Situation

**Risk Situation:** Stallion striking you

**Persons at Risk:** 1

**Notes:** In the process of collection you have to be in close contact with the under carriage of the stallion to collect the semen in an artificial vagina.

**Pregnancy Risk:** None

**Energy Source:** Body Mass

**Current Controls:** Trained personnel to only do the process. Person holding mare and person holding stallion and the person holding AV must wear approved riding helmet.

**Hazard Event:** Person trips or horse behaves uncharacteristically

**Incident Category:** Being hit by moving object

<table>
<thead>
<tr>
<th>Risk Analysis</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consequence:</strong></td>
<td>If the horse did trip that the injury could be substantial</td>
</tr>
<tr>
<td><strong>Exposure:</strong></td>
<td>Procedure only done as demonstration once per week with trained veterinarian in control of the procedure</td>
</tr>
<tr>
<td><strong>Probability:</strong></td>
<td>If person trips than injury could occur</td>
</tr>
<tr>
<td><strong>Risk Level:</strong></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Suggested Action:</strong></td>
<td>Risk is normally acceptable</td>
</tr>
</tbody>
</table>

**Assessment Date:** 29/5/2009

---

**Risk assessment:** Collection of semen from a stallion in prac: Being struck by stallion.
Risk Assessment: Use of high speed treadmill: Horse comes off back of treadmill.
Risk assessment: Horse pracs: VETS1021: Possible exposure to Hendra Virus.

Task/Process Details Report

Risk Assessment

Task/Process ID: 26393  Name: Horse pracs - VETS1021
Author: Myat Kyaw-Taner
Last updated by Myat Kyaw-Taner on 20/9/2010 12:09:40 PM
(This Task/Process has not been audited)

Effective Risk Level: Low (Risk/Hazard)
Location of Workplace Associated with the Task or Process:
Campus: Gatton
Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
School/Centre: Veterinary Sciences
Workplace: Not Assigned
Supervisor: Paul Mills
Approval Status: Not Approved

Risks Associated with this Task, Process or Situation
Risk Situation: possible exposure to Hendra Virus
Persons at Risk: 130
Notes: Horses were PCR tested for Hendra Virus, euthanised at the abortion and brought to School of veterinary Science for practical classes for 14 year undergraduate students. The year is divided into 2 groups - each group spend 12 hours per year
Pregnancy Risk: None
Energy Source: Microbiological
Current Controls: clinically healthy horses were PCR tested for Hendra Virus, PPE trained staff students under supervision at all times
Hazard Event: possible exposure to biological agents
Incident Category: Contact with, or exposure to, biological factors

Risk Analysis

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>serious</td>
</tr>
<tr>
<td>Exposure</td>
<td>this prac is done over a total of 12 hours per half year</td>
</tr>
<tr>
<td>Probability</td>
<td>Practically impossible</td>
</tr>
</tbody>
</table>

Risk Level: Low
Suggested Action: Risk is normally acceptable
Assessment Date: 20/9/2010

Risk assessment: Nuclear scintigraphy room: Person falling into camera pit.
Risk assessment: Nuclear scintigraphy room: Trauma from nuclear scintigraphy hoist/crane.

Risk Assessment

Task/Process ID: 25254
Name: Nuclear Scintigraphy Room

Author: Susan Keane
Last updated by Andrew van Eps on 23/09/2010 11:03:12 AM
Audited by

Effective Risk Level: Substantial (Risk/Hazard)

Location of Workplace Associated with the Task or Process:
Campus: Gatton

Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
School/Centre: Veterinary Sciences
Workplace: UQ Equine Hospital

Supervisor: Andrew van Eps
Approval Status: Approved
Approval Date: 20/09/2010

Supervisor Notes:

SOP:

Risks Associated with this Task, Process or Situation
Risk Situation: Trauma from Nuclear Scintigraphy Hoist/Crane
Persons at Risk: 2
Notes: The hoist/crane is used to move the gamma camera into place during a scan.

Pregnancy Risk: None

Energy Source: Body Mass

Current Controls: Only trained personnel may use the hoist. Staff are to take their time positioning the camera safely. Hosptal undergoing examination are heavily sedated to prevent them moving while the camera is being positioned.

Hazard Event: Person gets hit by moving hoist/camera.

Incident Category: Being hit by moving object.

Risk Analysis

<table>
<thead>
<tr>
<th>Risk Analysis</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequence:</td>
<td>Potentially serious head trauma due to swinging hoist/camera.</td>
</tr>
<tr>
<td>Exposure:</td>
<td>The hoist may be used 2-3 times per week.</td>
</tr>
<tr>
<td>Probability:</td>
<td>Unusual but possible</td>
</tr>
<tr>
<td>Injury is possible if appropriate precautions are not taken.</td>
<td></td>
</tr>
</tbody>
</table>

Risk Level: Substantial

Suggested Action: Should receive attention as soon as possible.

Assessment Date: 18/09/2010

24/08/2010

Risk assessment: VETS4022 Rectal palpation of mares at Gatton: Being kicked during procedure.

Task/Process Details Report

Risk Assessment

Task/Process ID: 22770  Name: VETS4022 Rectal palpation of mares at Gatton
Author: Andrew van Eps
Last updated by rod vernall on 26/09/2010 7:18:05 AM

Effective Risk Level: Low (Risk Hazard)

Location of Workplace Associated with the Task or Process...

Campus: Gatton
Faculty/Division: Natural Resources, Agriculture and Veterinary Sciences
School/Centre: Veterinary Sciences
Workplace: Gatton Equine precinct
Supervisor: rod vernall
Approval Status: Approved
Approval Date: 26/09/2010

Risk Analysis

Risk Situation: Being kicked by a horse during the procedure
Persons at Risk: 1
Notes: The horses have to be caught and lead from the paddock and loaded into the palpation stalls, and then returned to paddock at the end of the procedure
Pregnancy Risk: None
Energy Source: Body Mass
Current Controls: Very well designed stalls will vastly reduce the risk of the hazard. Intervening horses are screened for rectal temperature also selected for temperament
Hazard Event: Horse breaking free of restraint
Incident Category: Being hit by moving object

Consequence: Substantial
Exposure: Occasional
Probability: Remotely possible

Details
If incident did occur it would be substantial
The breakdown of the restraints would be very rare
Conceivable injury would occur if breakdown occurred

Risk Level: Low
Suggested Action: Risk is normally acceptable

Assessment Date: 24/02/2006

Risk assessment: VETS4022 Rectal palpation of mares at Gatton: Injury to arm.

### Risk Assessment

**Task/Process ID:** 22770  
**Name:** VETS4022 Rectal palpation of mares at Gatton  
**Author:** Andrew van Eps  
**Last updated by:** rod verrall on 2/6/2010 7:18:06 AM  
**Effective Risk Level:** Low (Risk/Hazard)  
**Location of Workplace Associated with the Task or Process...**  
**Campus:** Gatton  
**Faculty/Division:** Natural Resources, Agriculture and Veterinary Sciences  
**School/Centre:** Veterinary Sciences  
**Workplace:** Gatton Equine precinct  
**Supervisor:** rod verrall  
**Approval Status:** Approved  
**Approval Date:** 2/6/2010  
**Supervisor Notes:**

**SOP:**

#### Risks Associated with this Task, Process or Situation

**Risk Situation:** Injury to arm  
**Persons at Risk:** 0  
**Notes:** Arm could be injured if horse moves during rectal palpation  
**Pregnancy Risk:** None  
**Energy Source:** Body Mass  
**Current Controls:** Crush etc Supervision  
**Hazard Event:** Being hit by moving object

<table>
<thead>
<tr>
<th>Risk Analysis</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Consequence:** | Very serious  
Arm may be seriously injured by body weight of horse and rigid gate of crush  
Rare  
Exposure: is rare as quiet horses used to this procedure are used. Rectal examination is not painful. Horses rarely try to move within the crush.  
Probability: Conceivable  
This type of injury has been reported but is very rare. rectal examination of mares is very frequently performed safely in practice |

**Risk Level:** Low  
**Suggested Action:** Risk is normally acceptable

**Assessment Date:** 16/2/2009

17/08/2010
28. DRAFT Radiation Safety and Protection Plan for the Veterinary Nuclear Medicine Practice

of

The University of Queensland

School of Veterinary Science
INTRODUCTION

(a) Purpose

The Radiation Safety Act 1999 requires that a radiation safety and protection plan be developed for every radiation practice. This plan has been formulated for the purpose of ensuring that all nuclear medicine practices are conducted as safely as possible and in compliance with the Radiation Safety Act 1999 and the Radiation Safety Regulation 1999.

This plan applies to all of the radioactive substances and premises in the possession of the possession licensee for the practice of veterinary nuclear medicine. For the information of the reader, details of the radioactive substances and premises are listed in Attachment 1. This attachment will be updated by the possession licensee when radioactive substances are acquired, sold, disposed of, or relocated.

Compliance with this radiation safety and protection plan will help ensure that the radiation doses to users, patients and other persons involved in the practice are below the prescribed limits and are as low as reasonably achievable. It will also help to ensure that the number of people exposed to radiation and the likelihood of unexpected exposure to radiation are minimised.

This plan outlines the obligations of the possession licensee and persons who carry out a radiation practice with the possession licensee’s radioactive substances and associated equipment.

(b) Who must read this document

All persons who carry out, or who are involved in carrying out, nuclear medicine at the premises under the control of the possession licensee must be familiar with this plan. All nuclear medicine practices with the possession licensee’s equipment and facilities must be conducted in accordance with this plan.

(c) Definitions
"Activity measuring device" is a device used to measure the activity of a patient's radiopharmaceutical dose. It is commonly referred to in nuclear medicine departments as a "dose calibrator".

"Misadministration" is the incorrect administration of a radiopharmaceutical to a patient.

"Possession licensee" is an individual or corporation who holds a possession licence.

"Use licensee" is an individual who holds a use licence.

(d) **Reference documents**

In addition to the radiation safety and protection plan, the following documents must be complied with:

- *Radiation Safety Act 1999* and *Radiation Safety Regulation 1999*

- Radiation safety standard PR001 *Standard for premises at which radiation sources are used to carry out a radiation practice*

- Radiation safety standard PR002 *Standard for premises at which radiation sources are stored*

- ARPANSA Code of Practice for Radiation Protection in Veterinary Medicine (2009) RPS 17

- ARPANSA *Code of practice for the safe transport of radioactive material (2008 edition)* RPS 2
HAZARD ASSESSMENT

Nuclear medicine is a field of medicine that involves the administration (orally and intravenously) of pharmaceuticals labeled with radionuclides for diagnosis and therapy. The organs and tissues of the body absorb radiation emitted by the radiopharmaceuticals which have been administered to patients. Typically the effective radiation dose to users, other staff, patients and members of the public depend on:

- the type and activity of radiopharmaceuticals being administered;
- the pharmacological and physiological interactions of the radiopharmaceutical;
- the decay scheme of the radionuclide;
- the extent of compliance with approved work practices;
- the extent of compliance the premises with relevant radiation safety standards made under the Radiation Safety Act 1999; and
- the competency of the staff.

The two most common hazards that exist in a nuclear medicine department are incorrect administration of a radiopharmaceutical to a patient or a spill of unsealed radioactive substance. Incorrect administration of a radiopharmaceutical at diagnostic levels results in some radiation damage to the surrounding tissues. In such situations the treating veterinary surgeon must be advised immediately of the situation.

Radiation hazards in preparing radiopharmaceuticals, storing radioactive substances, administering radiopharmaceuticals to patients and handling patients administered with radiopharmaceuticals also exist in nuclear medicine practices. These hazards can be adequately controlled with appropriate staff training, use of personal protective equipment and safety devices and adherence to the safe working procedures in this plan. Failure to successfully implement these aspects of radiation hazard control could lead to excessive radiation dose to staff and patients and the possibility of harmful health effects to those persons excessively exposed.

The Radiation Safety Regulation 1999 prescribes an annual radiation dose limit of 20 mSv for persons involved in carrying out a radiation practice and an annual radiation dose limit of 1 mSv for other staff and members of the public. Also, if a female who is involved in carrying out the radiation practice becomes pregnant, her radiation dose limit is reduced to 1 mSv per annum for the term of the pregnancy.
RESPONSIBILITIES OF POSSESSION LICENSEE

1

The University of Queensland School of Veterinary Science holds a licence to possess radioactive substances. Attachment 2 contains the details of the contact person for the possession licensee. Attachment 2 will be updated if the name or contact details change.

See Attachment 2 for contact details of the possession licensee and other persons relevant to this plan

The possession licensee obtained this licence after demonstrating to the Chief Executive of Queensland Health that all of the radiation safety criteria set by the Radiation Safety Act 1999 have been satisfied.

Nevertheless, there are on-going obligations borne by the possession licensee. The possession licensee must take reasonable steps to ensure any person’s health and safety are not adversely affected by exposure to radiation because of the way a person carries out the practice. To do this, the possession licensee must:

- ensure that the radiation doses arising from the radiation practice are kept below the limits specified in the Radiation Safety Regulation 1999 and as low as reasonably achievable;

- hold a licence, issued under the Radiation Safety Act 1999, with an authority to possess the types of radioactive substances that may be used or stored;

- not employ persons under the age of 16 under conditions where they are directly involved in work with radiation;

- ensure that all users of radioactive substances hold licences, issued under the Radiation Safety Act 1999, allowing them to use such radioactive substances for their required purpose;

- ensure that all users of radioactive substances work at all times within the limitations of their licences;

- ensure compliance with any conditions imposed on the possession licensee by the Chief Executive of Queensland Health and with those stated in the Radiation Safety Act 1999 and the Radiation Safety Regulation 1999;
• ensure that the version of the radiation safety and protection plan being used has been approved by the Chief Executive of Queensland Health;

• appoint a radiation safety officer certified under the *Radiation Safety Act 1999*;

• ensure that the radiation safety officer is carrying out his/her functions properly so that the possession licensee is able to be adequately apprised of the radiation safety status of the practice at all times;

• ensure that adequate resources are provided to implement this radiation safety and protection plan (e.g. provision of appropriate training and adequate numbers of personal protective devices);

• ensure that the records, specified in this radiation safety and protection plan, are kept;

• ensure that the premises where radioactive substances are used or stored continue to comply with radiation safety standards PR001 *Standard for premises at which radiation sources are used to carry out a radiation practice* and PR002 *Standard for premises at which radiation sources are stored*, and obtain certificates of compliance from an appropriately accredited person, before initial use and every five years thereafter;

• ensure that, if there is any proposed change which may affect radiation doses, an appropriately accredited person performs an assessment of the premises for compliance with radiation safety standard PR002 *Standard for premises at which radioactive substances are stored*, before the changes are effected;

• provide personal monitoring devices to persons as required by this radiation safety and protection plan, and ensure that:

  (i) personal monitoring devices are handled properly
  (ii) monitored persons are advised of their personal monitoring assessment results
  (iii) copies of the personal monitoring assessment results are submitted to the Chief Executive of Queensland Health
  (iv) a personal monitoring record for each person monitored is kept;

• ensure that the approval of the Chief Executive of Queensland Health is obtained before acquiring radioactive substances;
• ensure that the approval of the Chief Executive of Queensland Health is obtained before relocating sealed radioactive substances to a place outside of Queensland’s jurisdiction;

• ensure that if a radioactive substance is sold within Queensland, that the person to whom the substance is sold has an approval to acquire the substance;

• ensure that the disposal of sealed and unsealed radioactive substances is in accordance with the Radiation Safety Regulation 1999;

• ensure that the approval of the Chief Executive, Queensland Health is obtained before disposing of radioactive material greater than the amount and concentration prescribed in the Radiation Safety Regulation 1999;

• ensure that the transport of radioactive substances is conducted in accordance with the ARPANSA Code of practice for the safe transport of radioactive material (2008) (Transport Code); and

• ensure that the register of examinations, which includes the following information, is maintained:

  (i) information to adequately identify the animal (e.g. name, breed, gender, registration numbers etc) and its owner
  (ii) date of use of the radioactive substance
  (iii) details of the radiopharmaceuticals used (activity, form etc)
  (iv) details of the procedure performed
  (v) the name of the use licensee administering the radiopharmaceutical
  (vi) date of discharge of the animal

• after an incident not catered for in this plan, immediately notify the Chief Executive of Queensland Health, either orally or in writing. If the notice is given orally, written confirmation must be provided within seven (7) days.
4. DUTIES OF RADIATION SAFETY OFFICER

(a) Functions

The radiation safety officer advises the possession licensee and all persons involved with the radiation practice on radiation safety matters associated with the practice. The name and contact details of the radiation safety officer are detailed in Attachment 2. Attachment 2 will be updated if the name or contact details of the radiation safety officer change.

On-going basis

On an on-going basis, the radiation safety officer must:

- provide, or arrange for the provision of training about radiation hazards, safe working practices and use of techniques to improve image quality, as specified in this radiation safety and protection plan;

- examine personal monitoring results to ensure that radiation doses that a person could receive are within the limits prescribed by the Radiation Safety Regulation 1999, and are as low as reasonably achievable;

- checks that personal monitoring records are updated; and

- check that if a user declares her pregnancy, the possession licensee is advised to ensure, during her pregnancy, her radiation dose is kept as low as reasonably achievable and below the radiation dose limits prescribed by the Radiation Safety Regulation 1999 i.e. 1 mSv per annum. Such a user must not be engaged in procedures which may result in a higher radiation dose.

Biannually

At the commencement of the practice and twice a year thereafter, the radiation safety officer must check, and record, that:

- all users and staff have read, understood, and are complying with this radiation safety and protection plan;
- the details of the radioactive substances and the uses to which they may be put are accurately stated in this radiation safety and protection plan;

- the person in possession of the radioactive substances is appropriately licensed under the Radiation Safety Act 1999;

- all users of the radioactive substances are appropriately licensed under the Radiation Safety Act 1999;

- all maintenance, repair and quality control tests are being conducted;

- radiation contamination surveys of areas where radioactive substances are used or stored or where patients are administered with radioactive substances, are carried out within specified time frames;

- radiation monitoring devices, as required in this radiation safety and protection plan, are available and are in good working order;

- all records required in this radiation safety and protection plan are being kept;

- the calibration of the radiation monitoring device has been checked (This may be done by checking the calibration check report submitted by the service provider); and

- the premises comply with radiation safety standards PR001 Standard for premises at which radiation sources are used to carry out a radiation practice and PR002 Standard for premises at which radiation sources are stored and the compliance certificates for the premises have been obtained within the necessary time frames.

(b) Reporting to the possession licensee

The radiation safety officer must also report the following to the possession licensee:

- any radiation incidents immediately;

- any contravention of this radiation safety and protection plan and/or relevant radiation safety standard;
• any action that needs to be taken to achieve compliance with this radiation safety and protection plan and/or relevant radiation safety standard;

• the effectiveness and extent of compliance with this radiation safety and protection plan annually; and

• annual recommendations about changes to the plan to ensure its continued effectiveness and that the information is correct by reviewing this radiation safety and protection plan.
5. RESPONSIBILITIES OF USERS

All users of radioactive substances are responsible for ensuring that any radiation doses received by persons, other than the patient, as a result of carrying out the practice are below the radiation dose limits prescribed in the Radiation Safety Regulation 1999 and are as low as reasonably achievable.

Users must take reasonable steps to ensure that a person’s health and safety are not adversely affected by exposure to radiation because of the way the user carries out the practice.

Users must:

- hold a licence, issued under the Radiation Safety Act 1999, with an authority to use the radioactive substance for the appropriate radiation practice;

- comply with the conditions of the licence imposed by the Chief Executive of Queensland Health, and with those stated in the Radiation Safety Act 1999 and the Radiation Safety Regulation 1999;

- ensure that they are authorised by the possession licensee to use the radioactive substance;

- comply with this radiation safety and protection plan;

- undertake and satisfactorily complete the training specified in this radiation safety and protection plan;

- wear a personal monitoring device if required by this radiation safety and protection plan;

- wear personal protective equipment and use safety devices as required by this radiation safety and protection plan;

- report any contravention of the radiation safety and protection plan to the radiation safety officer;
• report any incident which may adversely affect the health or safety of any person to the radiation safety officer;

• complete the register (provided by the possession licensee) of examinations performed which includes the following information:

  (i) information to adequately identify the animal (e.g. name, breed, gender, registration numbers etc) and its owner, date of use of the radioactive substance
  (ii) details of the radiopharmaceuticals used (activity, form etc)
  (iii) details of the procedure
  (iv) the name of the use licensee administering the radiopharmaceutical
  (v) date or time of the discharge of the animal

• Mark any images produced with the following information:

  (i) the name, or identifying mark, of the use licensee who administered the radiopharmaceutical
  (ii) the name, or identifying mark, of the possession licensee
  (iii) the address, or identifying mark, of the premises at which the image was produced
  (iv) information to adequately identify the animal
  (v) the date the image is produced
  (vi) details of the radiopharmaceuticals administered to, or injected into, the treated animal for the production of the image
  (vii) adequate information to enable the correct interpretation of the image.

Image marking will be set up in the image acquisition and filing software.
6. ACCESS CONTROL

Only persons permitted by the possession licensee may use radioactive substances.

The names of the persons permitted to use the radioactive substances are listed in Attachment 3. Attachment 3 will be updated from time to time to reflect the current arrangement.
7. TRAINING

The radiation safety officer must provide, or arrange for the provision of, appropriate training to users and other persons in radiation safety matters.

The radiation safety training program must address at least the following:

- radiation hazards in the practice
- safety measures that may be used to minimise or avoid radiation hazards
- minimising radiation dose to those involved in the carrying out of the practice and persons handling animals administered with radiopharmaceuticals (e.g. use of protective devices)
- use of techniques to improve image quality
- details of the radiation safety and protection plan
- disposal of radioactive substances
- incident recording (e.g. incorrect administration)
- estimation of when animals administered with radiopharmaceuticals may be discharged and the instructions they should be given
- scanning for and removal of radioactive substance contamination
- handling of radioactive substances and methods of administration

The following specific procedures will be adopted for training of staff

Staff who may be required to assist in procedures but not actually use radioactive substances will be required to complete the introductory radiation safety training for unsealed source use given by the university Radiation Protection Adviser followed by specific practical training by the practice RSO. This will be given prior to undertaking duties in the nuclear medicine suite.

The RSO may give refresher training sessions annually or otherwise as required.

New staff qualified in Veterinary Science shall also be required to complete the introductory course and will need to be instructed by the RSO on all aspects of veterinary nuclear medicine procedures before being allowed to work under direct supervision as provided for under Part 9, Section 41 of the Regulation. When the RSO is satisfied as to the person’s competency they may issue a letter of recommendation to accompany an application for a use licence.
If it is possible to obtain Queensland Health approved training in nuclear medicine techniques and safety from external training organizations, such training may also be undertaken by staff members qualified in veterinary science who are seeking to obtain use licences.
8. SAFE WORK PRACTICES

The three simple rules to minimise personal radiation doses are:

Time: optimise the use of radioactive substances

Distance: keep as far away as practicable from the radioactive substances

Shielding: use personal protective equipment and safety devices

To ensure radiation doses to all persons are minimised, the following practices must be followed.

(a) General

Justification

- Nuclear medicine procedures must only be performed on the request of a registered veterinary surgeon

Equipment and premises

- Radioactive substances must only be used or stored in premises that are in compliance with the relevant radiation safety standard made under the Radiation Safety Act 1999.

- All doors that constitute part of the radiation shielding must be kept closed.

(b) Hot laboratory procedures

General radiation safety

- The laboratory must be kept clean and tidy at all times.

- Eating, smoking, drinking or applying cosmetics is prohibited in the laboratory.
• All persons using radioactive substances must use appropriate personal protective equipment and safety devices.

• All procedures involving the use of radioactive substances such as reconstitution, elution and similar activities must be carried out on spill trays covered with absorbent material.

• All containers holding radioactive substances must be clearly labeled indicating radionuclide, activity and calibration time and date.

• All unshielded vials of radioactive substances must be handled with appropriate remote handling devices.

• All vials of radioactive substances must remain in appropriate shielded containers except during administration, assay, brief observation or disposal.

(c) Administration of radioactive substances to animals

In general:

(i) Only persons authorised by the possession licensee (see Attachment 3) are allowed to administer radiopharmaceuticals to an animal.

(ii) Administration is to be conducted in the Scintigraphy suite – Room 1037.

(iii) Minimise contact time with animals who have been administered a radiopharmaceutical.

(iv) Record all administrations of radiopharmaceuticals in the register provided for this purpose. Records of administrations include; animal identification, radiopharmaceutical, administration method, date, time, and signature of person who administered the radiopharmaceutical.

(v) Safety shoes/boots, coveralls, protective gloves and personal monitoring devices to be worn by all personnel involved in the procedure.

(vi) Store syringes containing radiopharmaceuticals in a radiation shield.

(vii) Use syringe shields when administering radiopharmaceuticals.
(viii) Carry out administrations over absorbent, disposable material during administration.

(ix) Dispose of used syringe with needle intact in designated radioactive waste sharps bin.

**Animal handling:**

Whenever possible nuclear medicine procedures should be performed after any other required studies (e.g. radiography) to ensure treating staff do not receive any unnecessary radiation exposure.

**For body fluids/biological samples:**

(i) All bodily substances must be considered radioactive following radiopharmaceutical administration until otherwise determined.

(ii) Spillage of bodily substances/biological samples must be considered a radioactive spill and appropriate decontamination procedures must follow.

(iii) Staff handling bodily substances/biological samples must wear disposable gloves at all times while handling samples.

(iv) All bodily substances must be disposed of via a designated drain.

(v) Any biological samples should be labeled to indicate their potential radiological and biological hazard.

**Release of an injected animal**

Following an injection of Tc$^{99m}$ a horse shall be held for sufficient time to ensure that the radiation level at 1 m from the horse does not exceed 25 µSv/h before being returned to the owner. Generally this will be less than 24 hours.

**Sealed radioactive substances used for quality control or marker sources**
Any loss or damage of sealed sources is to be reported immediately to the radiation safety officer for investigation and retrieval.

**Marker sources**

Marker sources are to be stored in appropriately shielded containers and kept in the radiation store when not being used.

[Insert procedures for using and storing the marker sources]

**Sealed radioactive substances for quality control**

Sealed radioactive substances are to be stored in an appropriately shielded container and kept in the Hot Laboratory when not being used.

(f) **Contamination control procedures**

**General**

- If a spill has occurred the radiation safety officer must be advised and decontamination procedures followed, as described in this radiation safety and protection plan.

- A radiation survey must be undertaken following decontamination procedures to ensure the radiation levels are less than those specified in the Radiation Health Series No. 38: Recommended limits on radioactive contamination on surfaces in laboratories (1995).

**Urine contamination of the work place.**

- It is preferable that an animal does not urinate in the scanning area. If at all possible the animal should be returned to holding area.

- If urination in the scanning area is unavoidable, attempt to catch urine in bucket provided, avoiding splatter. Should the floor become contaminated, the scan should be halted and the area washed down thoroughly before resuming the scan. Any urine caught in the bucket is to be disposed of into the drain system of the holding room.
**Contamination of personnel**

- Should personnel become contaminated with technetium directly from the vial or syringe, the radiation safety officer should be called immediately and the horse returned immediately to a box.

- The detailed advice given in Section 18 (Remediation Procedures) should be followed for decontamination.

**Contamination of the scintigraphy room**

- Should technetium be spilled in the scintigraphy room, the spill should be immediately contained with absorbent paper towel or tissue.

- The animal should be removed from the room if it is present.

- Ensure that latex gloves are worn while the spill is being contained.

- Contaminated towel and tissues should be placed in the lead-lined pathology bins.

**Contamination of the patient**

Should an animal become externally contaminated with technetium direct from the vial or syringe it should be returned to its stall and the scanning procedure postponed for a period of two to three days or as advised by the RSO. The area of contaminated skin should be gently washed, trying to minimise the amount of aerosol being formed.
9. RECEIPT AND STORAGE OF RADIOACTIVE SUBSTANCES

The following procedures are to be followed for the receipt and storage of radioactive substances.

(a) Receipt

- Deliveries of packages containing radioactive substances must be taken to the nominated receiving area within the nuclear medicine department. This area is the Hot Lab.
- Packages containing radioactive substances must not be left unattended.
- Only persons permitted to do so by the possession licensee may open packages containing radioactive substances.

The following procedure must be used for opening packages containing radioactive substances.

- Inspect the package for any signs of damage or wetness. If the package is damaged or wet, contact the radiation safety officer and do not open the package.
- Perform a radiation survey of the package prior to opening to ensure the radiation levels are in agreement with the transport index stated on the package. The Transport Index is the maximum radiation level at a distance of 1m from the external surface of the package stated in millirem/hour (1 mrem/h = 10 µSv/h). If radiation levels exceed the stated transport index, contact the radiation safety officer and do not open the package.
- Use disposable gloves when opening the package.
- Check the activity of the radioactive substances against the consignment note.
- Record the receipt of the radioactive substance and store it in its designated storage location (see storage of radioactive substances section below).
- Survey the packing materials for radioactive contamination. If contaminated treat the packing materials as radioactive waste. If not contaminated, dispose of as general waste ensuring that all radioactive labels have been removed or defaced as appropriate.

(b) Storage

- When not in use, radioactive substances must be stored at premises which have been certified as meeting radiation safety standard PR002 Standard for premises at which radiation sources are stored.
- Radioactive substances are to be stored in their nominated storage areas (the Hot Lab) within the certified premises.

- Vials of radioactive substances are to be stored in appropriate shielded areas.

- Storage areas or lockable storage containers must be secured to ensure access is limited to authorised persons.

- Only persons authorised by the possession licensee are to have access to the store.

- The movement of radioactive substances in and out of the radioactive materials store is to be recorded on a log book provided by the possession licensee.
10. RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL

Waste management is the control of radioactive waste starting with the generation of the waste and ending with its ultimate disposal. Waste management operations must minimise radioactive waste generation and ensure the processing and ultimate disposal of the radioactive waste protects persons from associated health risks.

There are three principle methods that may be applied to radioactive waste disposal:

- Concentration and containment
- delay and decay
- dilution and dispersal.

Due to the nature of nuclear medicine departments and the type and quantity of radiopharmaceuticals used the later two principles are often employed.

The following fundamental procedures must be used for radioactive waste management:

- All radioactive waste or suspected radioactive waste material must remain segregated from non-radioactive waste.

- Whenever possible radioactive waste generation must be kept to a minimum.

- Since the half-life of $^{99m}$Tc is short (6 h) the “delay and decay” system of radioactive waste management has been adopted. This means that there will be no release of significant activity to either the sewers or the general environment. All radioactive waste must be retained until the activity concentration is not more than that prescribed under part 4 of the Radiation Safety Regulation 1999. It can then be disposed of as normal clinical waste or as appropriate.
Where it is difficult or impracticable to estimate the exact activity of solid radioactive waste it is recommended that a conservative estimate of the activity be used to determine the activity concentration.

**Concentration limits for $^{99m}$Tc in liquid and solid wastes**

From Part 4 of the Regulation and Schedule 2 of the Regulation:

(a) Liquids disposed to sewer should be diluted to greater than 16 litre of water per MBq of $^{99m}$Tc activity

(b) Solid wastes must be retained until the activity level has fallen below 50 kBq per kg

**Specific waste management procedures and required holding times:**

**Radioactive sharps**

Contaminated syringes, swabs, needles, disposable pipettes etc must be placed in the designated radioactive waste decay sharps bin and retained until the activity concentration is not more than that prescribed under Part 4 of the *Radiation Safety Regulation 1999*. This requirement will be satisfied by holding for a minimum of 3 days. They can then be disposed of as normal clinical waste or as appropriate.

**Stall bedding contaminated with radioactive urine and faeces**

The holding and imaging stalls are to be lined with a suitable absorbent bedding to contain the Tc$^{99m}$ contaminated urine and faeces. This bedding shall be stored in appropriate containers (e.g. lined 200 litre bins) for a minimum of 3 days before disposal. These containers are to be stored within the designated solid waste storage area.

**Unused radiopharmaceuticals**

Unused $^{99m}$Tc must be stored in their shielded containers in the hot lab and retained for a minimum of 3 days to satisfy part 4 of the *Radiation Safety Regulation 1999*. They can then be disposed of as normal clinical waste or as appropriate.

**Other contaminated materials**

Contaminated disposable gloves, absorbent material and protective covers must be packed into plastic bags, labeled with the current date and retained until the activity concentration is not more than that prescribed under Part 4 of the *Radiation Safety Regulation 1999*. They can then be disposed of as normal clinical waste or as appropriate.
Daily procedures for Management of wastes

Twice daily, any solid wastes or urine soaked bedding will be picked up with the shovel provided and put in the waste bin. After the horse is discharged, the stall will be hosed out.

Disposal of sealed radioactive substances

Sealed radioactive substances with a short half lives may be held in a radiation store for a period long enough to reduce their activity concentration to a level that is not more than that prescribed under part 4 of the Radiation Safety Regulation 1999. If the sealed radioactive substance is below the disposal limits in the regulation it can then be disposed of as normal clinical waste or as appropriate.

Sealed radioactive substances not able to be disposed of in the above manner may be sent to the original supplier, radioactive source recycler or an approved storage facility only with the prior approval of the Chief Executive of Queensland Health.
11. PERSONAL RADIATION MONITORING

Personal monitoring devices

Users of radioactive substances and those persons involved in procedures where a radioactive substance is used are to be provided with personal monitoring devices which are capable of measuring the type of radiation emitted (\(\beta\), ( etc), with suitable energy response, from the radioactive substances used.

The following personal monitoring program must be followed:

- personal monitoring devices are to be obtained from, and assessed by ARPANSA who have a personal radiation monitoring service that uses reference sources directly traceable to the Australian National Standards as required by the National Measurement Act 1960;

- the personal monitoring device wearing period is 3 months;

- use licensees must wear a personal monitoring device provided by the possession licensee, in addition to any personal monitoring device they are required to wear as a condition of their licence;

- a personal monitoring device is to be worn on the chest, waist, finger or wrist depending on the type of monitor (eg. finger badge) whenever radioactive substances are used.

- if a protective apron is worn, the personal monitoring device must be worn underneath the apron;

- personal monitoring devices must not be tampered with or misused;

- at the end of each working day the devices must be stored away from ionising radiation sources;

- personal monitoring devices are not to be worn if the monitored person is undergoing a radiographic examination as a patient;
• the control device is to be stored away from radiation sources (under the control of the RSO) with the other monitoring devices while they are not being worn by staff members;

• as soon as practicable after the assessment of the personal monitoring devices, the possession licensee is to:

  (i) arrange for ARPANSA to provide a copy of the results to the Chief Executive of Queensland Health (refer to contact details in Attachment 2)
  (ii) advise the monitored persons of their radiation assessment results.

• the radiation safety officer is to update the personal monitoring record for each monitored person;

• the personal monitoring records are to be kept for the duration of the wearer's working life and for not less than 30 years after the last exposure assessment, and at least until the person has reached the age of 75 years; and

• the personal monitoring records are to be checked by the radiation safety officer to ensure the radiation doses are below the prescribed limits in the *Radiation Safety Regulation 1999* and are as low as reasonably achievable. If any unusual doses are received, including doses in excess of the norm but not necessarily in excess of the prescribed limits, the work practices of the wearer are to be investigated and, if necessary, remedial action taken.
12. SAFETY DEVICES AND PERSONAL PROTECTIVE EQUIPMENT

(a) Safety devices

Attachment 6 is a list of safety devices available for users of radioactive substances and patients to minimise radiation dose.

A list of safety devices provided by the possession licensee are given in Attachment 6

(b) Personal protective equipment

Attachment 6 is a list of personal protective equipment available for users of radioactive substances, carers and patients to minimise their radiation dose.

A list of personal protective equipment provided by the possession licensee are given in Attachment 6
13. RADIATION MONITORING EQUIPMENT

A radiation monitoring device (radiation survey meter) having the following characteristics is provided by the licensee:

- has an appropriate measurement range for the radiations emitted from the radioactive substances;

- has appropriate energy response;

- has a measurement uncertainty not greater than ±25%;

- continues to indicate, either visibly or audibly, when radiation levels exceed the maximum readings in their measurement range.

Details of the radiation survey meter are given in Attachment 5

Radiation monitoring devices must not tampered with or misused.

Prior to use, the radiation survey meter will be subjected to an operational check (eg. battery test, self test) to ensure that it is working as per the manufacturer’s specifications and a test to ensure that it responds to radiation.

A calibration check of the radiation survey meter will be performed once every twelve months and following suspected damage or repair. The survey meter is to be calibrated if the calibration check yields erroneous results.
14. REPAIRS AND MAINTENANCE

The following sections detail the requirements to repair and maintain radiation related equipment in a nuclear medicine practice. Records of all maintenance procedures are to be kept in the equipment log book provided by the possession licensee.

(a) Gamma cameras

All gamma cameras have service and operations manuals provided by the manufacturer. These procedures must be followed for operation and maintenance procedures.

Major repairs and service calls must be handled by a qualified service person. In Med Pty Ltd are the service agents who will perform all service work according to the manufacturer’s schedules.

(b) Radiation monitoring device

A calibration check of the radiation survey meter will be performed once every twelve months and following suspected damage or repair. The survey meter is to be calibrated if the calibration check yields erroneous results.

This check will be performed by Queensland Health Forensic and Scientific Services who has a calibration service that uses reference sources directly traceable to the Australian National Standards as required by the National Measurement Act 1960.

(c) Activity measuring device
Activity measuring devices have service and operations manuals provided by the manufacturer. These procedures must be followed for operation and maintenance procedures.

Major repairs and service calls should be handled by a qualified service person.

(d) Laser printer used to produce diagnostic images

Laser printers have service and operations manuals provided by the manufacturer. These procedures must be followed for all starting up, closing down and maintenance procedures.

Major repairs and service calls should be handled by a qualified service person.
15. QUALITY CONTROL

There is increased awareness of the need to ensure that optimum quality images are produced in nuclear medicine practices. The anticipated benefits of a sound quality assurance program are:

- continued production of images with optimal diagnostic quality
- reduction of radiation dose
- more effective and efficient use of the radiation delivered to the patient
- ability to identify problems before they impact on clinical procedures
- ability to evaluate the performance and extended life of equipment

The following quality control checks will be performed by the persons mentioned in Attachment 4. Attachment 4 will be updated from time to time to reflect the current arrangement. All quality control checks must be recorded in the Maintenance and Quality Control Logbook kept in the veterinary nuclear medicine suite.

The radiation safety officer must be advised of any problems identified by a quality control check.

(a) Quality control of radiopharmaceuticals

Quality control procedures are designed to ensure that patients are administered the correct pharmaceuticals (i.e. activity of the radionuclide and the pharmaceutical are correct to ensure optimal clinical use). The following tests on the radiopharmaceutical are required to ensure this:

- Sterility test (on a random sample of pharmaceuticals)
- Verification of the activity of the radiopharmaceutical: to be as soon as practicable after delivery

(b) Daily checks

The following checks are to be conducted every day:

Gamma camera
• Visual inspection
• Background/Contamination check
• Photopeak check and adjustment
• Uniformity check

Activity measuring device

• Long term drift
• Background and zero adjustment

(c) Weekly checks

The following checks are to be conducted once every week:

Gamma camera

High count flood uniformity check

Premises

• Contamination monitoring of the areas where radioactive substances are used and stored.

• A radiation contamination survey of all areas where radiopharmaceuticals are used and stored.

Use of survey meters

The RSO should scan areas of benches or equipment slowly enough to ensure that small areas of contamination can be detected. For most purposes, the meter serves merely as an indicator of the presence of contamination, although where disposal is an issue, there will be a need to attempt at least an order of magnitude estimate of activity. The RSO should record the results and take any action necessary to control contamination and prevent unnecessary exposure to staff. Since $^{99m}\text{Tc}$ has such a
short half-life, access restriction may be more effective than attempting extensive chemical decontamination.

In view of the short half-life and the standing access restrictions on the nuclear medicine suite, it is not considered appropriate to use the specific levels of surface contamination given in some standards at which remedial action should be implemented. A radiation level significantly greater than background should be the indicator for such action.

(d) **Six monthly checks**

The following checks are to be conducted once every six months or following service or repair:

**Sealed radioactive substances**

- Each sealed radioactive substance will be visually checked for damage

**Gamma camera**

- Spatial resolution
- High count flood uniformity check
- Multiple window spatial resolution
- Whole body resolution

**Activity measuring device (see Attachment 7)**

- Long term drift
- Background and zero adjustment
- Accuracy, linearity, geometry and reproducibility tests

**Radiation monitoring equipment**

- Consistency check
(e) **Annual checks**

The following checks are to be conducted once every year.

*Personal protective equipment*

- Integrity check of personal protective equipment (Note: if the integrity of any item cannot be assured, the item must be replaced)

*Sealed radioactive substance marker or check sources*

- A source leakage test in accordance with Annex A.3 of ISO9978 Radiation protection - Sealed radioactive sources - Leakage test methods on each sealed radioactive substance to confirm that they are not leaking.
16. RECORDS

The following records are to be maintained by the possession licensee. With the exception of the possession licence and the master copy of the Radiation Safety and Protection plan these documents and records are all kept by the practice RSO. The possession licence and the RSPP are kept in the School administrative office.

Possession licence issued under the Radiation Safety Act 1999

The radiation safety and protection plan approved by the Chief Executive of Queensland Health and where copies are kept for staff

Reports by the radiation safety officer

Approvals to acquire the radioactive substances

Approvals to dispose of radioactive substances

Personal monitoring records and explanations of unusual dose readings

Assessment reports of premises

Equipment log books

Results of quality control checks

Register of examinations performed

Inventory and location of radioactive substances

Calibration check certificates for the radiation monitoring devices

Radiation store log (movement of radionuclides to and from the hot laboratory)

Radiation safety audit reports
Incident reports
17. ACQUISITION, SUPPLY, DISPOSAL AND RELOCATION OF RADIOACTIVE SUBSTANCES

This section outlines the legislative requirements associated with the acquisition, supply, disposal and relocation of radioactive substances. Attachment 2 provides the contact details for Radiation Health and the Chief Executive of Queensland Health.

(a) Acquisition

The approval of the Chief Executive of Queensland Health must be sought and obtained prior to acquiring radioactive substances. A continuing approval to acquire is also available for unsealed radioactive substances that are acquired at regular intervals throughout the term of the possession licence. The application must specify the approximate rate (MBq per week) of acquisition for each continuing approval to acquire. Application forms are available from Radiation Health.

Note: The radiation storage facility must be certified to accommodate the type and amount of radioactive substances to be acquired.

(b) Supply

If the radioactive substances are to be sold or given to another person in Queensland’s jurisdiction, the sale must not take place unless the possession licensee has ensured that the proposed new owner has:

- a licence to possess the type of radioactive substances to be purchased; and
- an approval to acquire the radioactive substances.

(c) Disposal

The possession licensee may only dispose of radioactive substances if:

- the concentration or activity of the radionuclide in the substance is not more than the maximum concentration or activity prescribed under the Radiation Safety Regulation 1999; or
• an approval to dispose of the radioactive substance has been obtained from the Chief Executive of Queensland Health. In this case, the Chief Executive must be notified within seven (7) days after the radioactive substance has been disposed of.

(d) Relocation

The approval of the Chief Executive of Queensland Health must be sought and obtained prior to the relocation of radioactive substances to a place outside Queensland. Application forms are available from Radiation Health. The Chief Executive must be notified within seven (7) days after the radioactive substance has been relocated.

18. REMEDIATION PROCEDURES

A radiation incident is an incident adversely affecting, or likely to adversely affect, the health or safety of any person because of the emission of radiation.

The following sections detail the requirements to be followed in the event of radioactive contamination of personnel or equipment, and in the event of a misadministration.

All radioactive spills must be dealt with immediately to avoid spread of contamination and before the radioactivity becomes physically or chemically bound to the medium on which the spill has occurred.

Personal decontamination is to be given priority over decontamination of surfaces and equipment.

Remember to take precautions to ensure the radiation monitoring equipment does not become contaminated (e.g. equipment could be placed in clear plastic bag).

Note: The Chief Executive, Queensland Health, must be immediately notified of any radiation incident that occurs for which there are no predefined remediation procedures.

(a) Misadministration

Misadministration is when there is a technical error or problem with the physical administration of a radiopharmaceutical. The most likely misadministration in veterinary practice would be the total extravasation of a dose, which was intended to be intravenous. Should this occur, the horse is to be taken back to the stalls and the RSO notified as soon as
practicable. Any decision on whether to rescan the horse shall be made by the RSO in consultation with the veterinary surgeon responsible for the horse. The scanning procedure must be postponed for a period of two to three days or as advised by the RSO.

A radiation incident report must be completed by the RSO to determine the cause of the misadministration, the estimated dose delivered, the possibility of harmful effects and the action required to prevent a recurrence.

(b) **Decontamination of personnel**

Methods used for decontamination should not spread the contamination or assist radioactive material in entering the body. If injury has occurred then assistance by a second officer may be required. A person known not to be contaminated should do monitoring of a contaminated person.

The procedure to be followed is:

(i) Move away from the contaminated area without spreading contamination.

(ii) Wear protective clothing as appropriate.

(iii) Conduct a personal contamination survey to determine extent of surface contamination.

(iv) If clothing is contaminated, remove and place in a double bagged container (label as appropriate).

(v) Decontaminate skin by washing and rinsing.

(vi) At the completion of decontamination return personal radiation dosemeters for processing.

**Techniques for personal decontamination**

**Wounds – General advice**

- Seek emergency medical care immediately for severe injuries.

- Minor injuries should be attended to after an initial radiation survey has been completed. Minor injuries may range from minor skin abrasions to deeper wounds and include punctures and lacerations in the skin. Wounds can be
decontaminated in the same manner as would be followed dirt, bacteria, etc. from them.

- Minor skin abrasions and burns present potential for absorption of contamination into the body as the surface may be raw and bleeding. The area is to be washed gently with lukewarm saline solution followed by rinsing and blotting dry. Monitor for radiation and if required, repeat cleaning with a clean wash cloth using saline solution.

**Intact skin**

Decontaminate intact skin by:

- Washing for 2 to 3 minutes with a mild soap in lukewarm water with a good lather, covering the affected area thoroughly. Give special attention to areas between the fingers and around the fingernails. If the water is too hot, it can increase the absorption of contaminants through the skin. Do not use highly alkaline soaps or abrasives.

- Rinse thoroughly and blot dry.

- Monitor the skin for contamination and repeat steps 1 and 2 three or four times if required.

- If the above procedure is not sufficient to remove the contamination, scrub the hands with a soft brush using a heavy lather and lukewarm water. At least three washes, including rinses, should be devoted to scrubbing. Only light pressure should be applied to the brush - not sufficient to bend the bristles out of shape or to scratch or irritate the skin. Rinse thoroughly and monitor.

- If contamination is still present, apply an abrasive cleaner (Sol-Vol titanium dioxide) to hands. Work this over the affected surface and adjacent areas of the skin for at least 2 minutes and follow by thorough washing, with soap, brush and water. Ensure that no paste remains around the nails. Monitor and repeat entire process if necessary.

- If the above procedures do not successfully remove the contamination seek advice from the radiation safety officer.

**Hair**

- Decontamination of hair can be difficult due to its electrostatic charge and oiliness. Hair should be washed with a mild soap several times with the head deflected backwards over the wash basin to prevent water from entering the eyes and ears.

**Mouth**

- In the event of internal contamination of the mouth seek advice from the radiation safety officer.
- Gentle irrigation of the mouth should be started promptly to reduce contamination reaching the stomach. With the mouth turned sideways or down, irrigate the mouth so as to let the irrigation solution run out of the mouth. Brush teeth with toothpaste.

**Nose and ears**

In the event of internal contamination of the nose and ears seek advice from the radiation safety officer.

**Eyes**

Eye washes are available in the first aid kit to rinse the eyes in the event of contamination. Normal cleaning techniques may be used for decontaminating the eyebrows, eyelashes, eyelids or adjacent tissue.

**(c) Decontamination of surfaces and equipment**

As stated in Section 15 (c) above, the rapid decay of $^{99m}$Tc will generally make chemical decontamination a much less preferred method of reducing contamination and only in exceptional circumstances, e.g. where an area or item of equipment needs to be made available rapidly, should decontamination be attempted. In all other cases, access to the contaminated object or area should be restricted for an amount of time necessary to reduce the activity to acceptable levels. In general, 36 hours should be sufficient time.

The RSO is to decide on whether to decontaminate a surface or to control access until decay has reduced the activity to acceptable levels.
19. INCIDENT NOTIFICATION

For incidents dealt with in this plan a written radiation incident report should be completed.

For incidents not dealt with in this plan a written radiation incident report is to be produced by the radiation safety officer and submitted through the possession licensee to the Chief Executive of Queensland Health at the address shown in Attachment 2 within seven (7) days of the occurrence of an incident.

The radiation incident report is to include:

(i) incident description including details of the radioactive substances involved and its location;

(ii) estimates of radiation exposure to individuals (if applicable);

(iii) action taken; and

(iv) proposals to prevent a recurrence.
ATTACHMENT 1: RADIOACTIVE SUBSTANCE DETAILS

[Insert full details of the radioactive substances, including the type of radioactive substances, quantity of radioactive substances and sealed source serial numbers. The premises where they are used/stored and the maximum quantities allowed at each facility should also be specified.]
ATTACHMENT 2: CONTACT DETAILS

Possession Licensee
The University of Queensland School of Veterinary Science

[insert name, contact number, after hours contact number and mobile number]

Contact Person for the Possession Licensee

Radiation Safety Officer

[insert name, contact number, after hours contact number and mobile number]

University Radiation Protection Adviser
Michael Williamson, OHS Unit, Level 6, Building 69
Ph3365 4504
fax: 3365 1577
mobile 0402 043 966
m.williamson@uq.edu.au

The Chief Executive, Queensland Health

c/-Director
Radiation Health Unit
15 Butterfield Street
HERSTON 4006

Telephone: (07) 3328 9987
Facsimile: (07) 3328 9622
Mobile  0413 279 672 (emergencies and out of hours calls)
**ATTACHMENT 3: LIST OF STAFF ALLOWED TO USE RADIOACTIVE SUBSTANCES**

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose of Licence</th>
<th>Types of Radioactive Substances that may be used</th>
<th>Licence No.</th>
<th>Licence Expiry Date</th>
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ATTACHMENT 4: PERSONS PERFORMING MAINTENANCE AND QUALITY CONTROL CHECKS

[This attachment is to include the names of the people, their contact details, and the maintenance and quality control checks they are to perform]
ATTACHMENT 5: DETAILS OF RADIATION MONITORING EQUIPMENT AND PERSONAL ALARM DOSEMETERS

[Insert the make, model and serial numbers of your radiation monitoring devices (radiation survey meter) and personal alarm dosemeters]
ATTACHMENT 6: SAFETY DEVICES AND PERSONAL PROTECTIVE EQUIPMENT

(a) Safety devices

[The following list is provided as an example of safety devices provided and expected to be used by all relevant staff. You should modify this list according to the requirements of your practice. Any additional safety devices that you supply must be included in this section.]

The following safety devices are provided for radiation shielding purposes when radioactive substances are handled:

- Bench shields (lead lined screen with lead glass viewing panel) at radiopharmaceutical storage and reconstitution area in dose preparation area (hot laboratory)

- Lead bricks for localised temporary radiation shielding

- Lead radiation storage shields for vials and loaded syringes

- Fume cabinet for storage and preparation of volatile or gaseous radioactive substances (e.g. I 131)

- Syringe shields (for use during administration of radiopharmaceuticals to patients, and dose drawing)

- Lead lined waste bins for used syringes and vials (designed to fit standard sharp bins)

- Remote handling devices (e.g. tongs, forceps) for handling and manipulation of unshielded vials or syringes

- Aluminum or perspex screens for shielding sources of alpha and beta radiation
• Spill confinement trays and absorbent paper used in dose preparation area to confine potential spills

• Labeled decontamination kit including plastic overshoes and gloves, plastic aprons, paper tissues for absorbing spills, polythene bags, labels (for waste bags) and radiation warning tape, soap, detergent (eg Decon), soft nail brush, barriers or means of demarcating and roping off affected area, remote handling tools, warning notices.

• Movable lead screens for protection of technologists during the imaging of patients.

• Devices to improve image quality (e.g. bladder shields)
(b) **Personal protective equipment**

[Provide details of the personal protective equipment which you provide to prevent or minimise health risks to any person arising from exposure to radiation. You will need to specify:

- \( X \) details of the type of equipment to be supplied
- \( X \) details of who is to wear the equipment
- \( X \) details of how, and when, the equipment is to be worn
- \( X \) details of the intervals at which the equipment is to be checked for wear and tear, and correct operation
- \( X \) details of the person who will check the equipment

If personal protective equipment is not required, you will need to state that no specific personal protective equipment is provided]
ATTACHMENT 7: ACTIVITY MEASURING DEVICE TESTS

The following tests must be performed following adjustment or repair of the activity measuring device:

(a) **Accuracy**

Each activity measuring device must be tested for accuracy upon installation and at least annually thereafter.

(b) **Linearity**

Each activity measuring device must be tested for linearity upon installation and at least quarterly thereafter.

(c) **Reproducibility**

Each activity measuring device must be tested for reproducibility upon installation and at least annually thereafter.

(d) **Geometry**

Geometry dependence of each activity measuring device must be measured upon installation over the range of volumes and volume configurations for which it will be used.

If the geometry or linearity error exceeds 10 percent for dosages greater than 370 kilobecquerels then the dose reading must be corrected for this.
If the accuracy or constancy error exceeds 10 percent the activity measuring device must be repaired or replaced.
### ATTACHMENT 8: REGISTER OF EXAMINATIONS

<table>
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<tr>
<th>Animal identification: breed, name, registration number, etc</th>
<th>Owner’s name</th>
<th>Date of procedure</th>
<th>Type of nuclear medicine procedure</th>
<th>Radiopharmaceutical and administered activity</th>
<th>Administering licensee</th>
<th>Date of discharge</th>
</tr>
</thead>
</table>

Purpose

To provide high quality & timely diagnostic radiographs to Clinicians in a manner that reduces radiation exposure risk to staff and maintains safety of the animal at all times.

Definitions

**Algorithms** - the mathematical equation affecting brightness & contrast, set to a digital radiographic image to improve the image quality for that given anatomical region. Named by projection of anatomy. Eg Thorax VD

**CR** - Computer Radiography. A digital form of x-ray processing involving cassettes that are read and resultant image is digitally stored.

**CLV Number** - Customer Logic Vet Number. The Patient number distributed by the patient information system unique for UQ VMC Gatton.

**Exposure** - the factors selected to indicate the total power and quantity of x-ray photons for the desired projection. Involves kVp, mA and time (secs) selection.

**Exposure Chart** - a chart indicating the best kVp, mA & sec values to be used for a given anatomical region and thickness measured.

**PACS** - Picture Archive Communication System. A computer system that stores all patient’s digital images/examinations. Eg X-ray, CT, US etc

**PPE** - Personal Protective Equipment. For radiation safety this comprises of lead gowns, lead thyroid collars, lead hand gloves or shields and lead curtains or lead shields to shield staff/students from radiation exposure.

**S Number** - the number displayed after processing of the cassette to determine whether the exposure was correct, overexposed or underexposed.

Procedures-

**Radiation Safety:**

1. Before using the equipment in this department you should read the UQ School of Veterinary Science’s Radiation Safety and Protection Plan.
2. Only persons licensed with Radiation Health Queensland are permitted to use this X-ray equipment. Students may use this equipment ONLY under the supervision of staff with a Radiation Use Licence.
3. Non-urgent x-ray examinations should be scheduled between 9am and 5pm Monday to Friday. Urgent x-ray exams after hours may be performed only by those who have had specific training on this equipment, with the Radiographer/Radiologist.
4. Under 18’s and pregnant women are not permitted in the x-ray room during an x-ray exposure.
5. If a need to handle the animal during x-ray exposure is required, full PPE **must** be worn. This includes Lead gown, thyroid collar, lead gloves/hand shields. Staff issued with radiation badges must wear these under their gowns. No part of any operator or assistant should be in the primary beam even if covered by lead protection. ALARA (As Low As Reasonably Achievable) radiation exposure to staff should be a priority.
6. Emergency contact is Meg Day the Radiographer/Radiation Safety Officer for Diagnostic Imaging. Phone 0434 638 624

**Patient Safety:-**

1. Whenever possible, patients for radiographic examinations should be anaesthetised or sedated. This reduces the need for physical restraint during x-ray exposure and reducing occupational radiation dose to staff. This also allows better quality x-ray examinations as the patient can be positioned correctly without movement.

2. Patients **MUST** always be supervised during x-ray examination from start to finish to reduce the risk of injury to patient &/or staff.

**Turning Machines On-**

The red /yellow switch on the far wall of the x-ray room should always be switched ON.

There are 5 screens in the x-ray console room. They are labelled and appear from Left to Right. CR Reader, X-ray console, Fluoro, Fluoro Post Process, PACS.

Check that the CR reader is on by moving the mouse. If nothing appears on the screen, you must turn on the hard drive computer (black box on the floor labelled DELL). The on button is black, about the size of 5c piece and located on the front just above the DELL symbol. The green/grey FCR Capsula unit must also be turned on. Button is on top right hand side near little screen. When ready, the screen will say Image Reading + Online.

To turn the x-ray machine on you must;

1. Turn silver key on wall above the CR Reader to ON
2. Press the circle button on the Left hand side of the X-ray Console so that it appears yellow

The fluoro and fluoro post processing computers will switch on, they are supposed to. Don’t touch them unless you need to Shutdown.

**To X-ray-**

- Make sure X-ray console is selected to machine #2 (ie GENE or Tech) buttons on bottom left of touch screen. (Top left hand on touch screen should display a figure with number 2 in it).
- Perform WARM UP (this must be performed every time machine is switched on)
  - Select GENE button
  - Select EXTREMITIES
  - Touch box with kVp value, use Right hand dial to 70kVp
  - Touch box with mAs value, use Right hand dial to 320mA
  - Touch box with time value, use Right hand dial to 0.500secs
  - THE mAs BOX SHOULD SAY 160.0 mAs
  - Make sure main x-ray door is closed & locked, and console door is closed
  - Make sure no person is in the room
Fluoroscopy -
- May only be performed by the Radiographer or Radiologist
- Cases MUST be discussed with the Radiologist prior to examination
- Machine #1 is required for all fluoroscopy examinations. Select the appropriate protocol from the DR menu. Eg Myelo, IVP etc
- It is desirable that all animals for these examinations are anaesthetised
- Only staff essential for the examination are permitted in the x-ray room during exposure, and must exercise proper use of PPE and distance from the fluoroscopy machine
- Images obtained using fluoroscopy will be saved to PACS for reporting and future reference

Fuji CR -

Introduction
- Fuji is a Computer Radiography system which obtains images by digital means. The cassette is exposed and then read by the CR reader which displays the resultant image on the computer screen.

Cassettes
- There are 3 sizes of cassettes for use – 18x24cm, 24x30cm, 35x43cm
- Two different types of cassettes are used in this department. Detail cassettes (pink label near the barcode on the back of the cassette) are used for extremity & skull x-rays, regular cassettes (green label on the back) are used for Bucky work and thickness of anatomy greater than 10cm. They are stored in two different boxes and labelled appropriately
- The green side of the cassette must face the x-ray tube during exposure
- Cassettes MUST be primary erased prior to exposure to ensure no artefact marks are visible on the plate prior/during exposure
- To perform primary erasure, look at little screen on the FCR Capsula machine, and press Change Mode. Use the arrow keys to select Primary Erasure and select ok. Place the cassette with the barcode side facing away from you and slot into the machine opening with the barcode end first. The machine will alarm if not placed correctly. Simply remove and try again (ensure correct cassette position).
- MAKE SURE no tape or Side markers are still attached to the cassette. These will cause great damage to the CR plate reader if left attached.
- Scatter radiation affects CR plates more that film/screen systems. Please be diligent when collimating the region of interest. This is particularly relevant for larger patients.
- Process the films immediately. The image is stored in the best distribution on the cassette plate for a limited time.

Registering Patients
- Patients MUST be registered correctly to store images correctly on PACS
- Click on the Register tab (top left corner)
• **Patient number (CLV number) MUST be entered to start the examination. You must include CLV in this field. Ie patient number 13, write CLV13 in the Patient ID box**

• Client’s surname is written first in capital letters, and then patient (animal's) name is written second in lower case. Eg SMITH Fido

• Date of Birth must be written in the following form Eg 20.06.2008

• Select Male/Female and your name under technician (if you are not listed in the drop menu, see Meg)

• **Click REGISTER/START STUDY**

• A list of animal regions will be listed. Select the one most appropriate for your examination. You can change these later if you make a mistake. Eg if you are performing Canine Thorax and Shoulder X-rays you would select Canine Body from the upper menu and then select Thorax VD & Thorax Lat from the bottom menu. For the Shoulder select Canine Limbs from the top menu and then select Shoulder CC and Shoulder Lat from the bottom menu.

• **Click START STUDY**

• To read a cassette, click on the menu (algorithm) you would like use for this particular exposure and place the cassette into the reader as described in Cassette section. (Barcode away from you and barcode side first into machine)

• Images can be manipulated after processing. You can zoom, change the contrast or brightness and annotate if required. A help booklet is found on the CR reader.

• When examination is finished, click on the arrow out the door button (bottom right of screen) and click Exposure/QA Complete. This will send the pictures to PACS.

• If you require a CD to be burned for your study, consult the Radiographer with the patient’s name, DOB and when the study was performed.

**Exposures**

• An exposure chart has been made up corresponding to your position.

• Clinicians/nurses will use a different chart to the Radiographer.

• Measure the thickness of the patient with the callipers provided and assess the chart for the appropriate kVp, mA and time values.

• Ensure machine #2 is selected.

• For extremities/skull press GENE button.

• For Bucky work (Thorax/Abdomen/Spine/Pelvis) press Tech button and ENSURE the submenu button is selected to Manual. (ie press Tech, middle of screen select Thorax Manual)

• To change values, press the touch screen box and use right hand dial to increase/decrease value.

• Ensure all doors to the room are closed

• Exposure is performed by “prepping the machine” Half push of exposure button, wait 3 seconds then fully push button down to expose.

• **REMEMBER: IT IS THE USER’S RESPONSIBILITY TO ENSURE ALL PERSONNEL WITHOUT PPE HAVE DEPARTED FROM THE ROOM PRIOR TO EXPOSURE.**

• Once the image has been processed take note of the **S Number**. This value is the only way to determine if the exposure is under or overexposed. Consult with the table listing the appropriate S numbers for given anatomy.

• Numbers **smaller** than the listed S numbers are OVEREXPOSED eg 4

• Numbers **larger** than the listed S numbers are UNDEREXPOSED eg 865
• **Consistently checking S Numbers is very important to ensure the correct exposures are being used and any handler dose (if any) is reduced!**

**To use CR**

• On the keyboard there is a booklet to help you if you select the wrong algorithm, window the image too much etc.
• If you wish to discard an image (ie not send to PACS) there is a cross button on the right hand side menu. Click the image you no longer wish to use and then select the cross button. A cross should appear next to your image.
• Any S values that indicate great UNDEREXPOSURE should be repeated.
• Try and always centre anatomy to the middle of the film to achieve true S Number values. At least one third of the cassette should be exposed for true S Number also.
• If you accidently complete the exam on the CR reader before finishing, select the Delivered tab (middle button at top of screen) find your patient, hit the SHIFT key and press return at the same time. The patient menu should return as before.
• A Log book is supplied to record all examinations in the room. It is found near the X-ray console. Please fill out all details so we can ensure all examinations are completed and reported.
• To access examinations for review, find the PACS computer and view the images there.

**PACS (Synapse)**

• Is a computer system used to store patient’s images.
• X-ray, Ultrasound, CT, Nuclear Medicine, II images can be found on the PACS (named Synapse) system. It DOES NOT store any information about the patient or client.
• If patient details are incorrect on Synapse it is very difficult to search for patients and also to correct the mistakes. Please ensure patient number is correct and name is spelt correctly when performing examinations on Fuji CR.
• You will need to supply Meg with your UQ Login username to gain access to Synapse. To access Synapse simply log on (with UQ username) to the PACS computer (last one in Small Animal control room), any computer in the radiology tutorial room or large screen in Radiologist's room. Synapse is found on the desk top. Double click it to open.
• A number of folders should appear. All patients, all recent studies etc. There should be a folder with your name as well.

**To search for patient’s images**

- Click open the ALL RECENT STUDIES folder.
- Search for the patient’s name by entering it in the box underneath Patient name and hit enter.
o If you can’t find your patient either search in ALL PATIENTS or use PATIENT ID to find.

o If you can’t find your patient’s images check to see that you have sent your images from the Fuji CR to PACS (have you pressed the arrow out the door button & selected Exposure/QA Complete?)

o All other problems with PACS should be directed to Meg the Radiographer or Amanda Russell (ITS) BEFORE contacting Fuji. This applies during business hours and After Hours.

o To exit Synapse, simply close the window. You MUST log off after using Synapse so other users cannot change your settings.

**X-ray machine shutdown:-**

- If the fluoroscopy hasn’t been used today click urgent patient on the Fluoro Post Process screen. Click OK to confirm patient registration.
- On top Left hand corner of desktop click file then scroll down to LOGOFF & click
- Wait until computer displays; **ok to turn computer off**
- On X-ray console touch screen, touch the button with the two circles and arrow between them (middle right of the touch screen)
- Then hit SHUTDOWN
- It will take a few minutes to shut the machine down
- Once shutdown, turn the silver key on the wall to off

**Equipment:-**

**X-ray Equipment**

A list of x-ray apparatus may be found in Attachment 1 of the Radiation Safety and Protection Plan (RSPP). Servicing and Compliance testing of this equipment must be completed as per the RSPP. The next due dates for such testing can be found in Attachment 1 of the RSPP and is covered in more detail in X-ray Apparatus Compliance and Service Standard Operating Procedure.

If you suspect any x-ray equipment to be faulty, you must:-

1. Switch equipment off with console switch
2. If possible switch off at mains power switch on wall
3. **Notify the Radiation Safety Officer (Meg Day 0434 638 624) IMMEDIATELY**

**PPE Equipment**
Gowns must be stored hanging in a position at all times. Thyroid collars and lead shields must be stored lying flat. All PPE equipment is to be checked thoroughly for damage annually during the Radiation Safety Audit.

If you suspect any PPE equipment to be faulty, remove it from the PPE storage area. Place it in LYING FLAT (not folded or dumped) on the radiographer’s desk with a quick note saying where you suspect the damage is and when this occurred. The radiographer will assess if it needs repair or is to be replaced.

**Related Documents:**

- Radiation Safety and Protection Plan (RSPP) for the UQ School of Veterinary Science
- X-ray Apparatus Compliance and Service Standard Operating Procedure
- UQ Veterinary Teaching Hospital & Small Animal Clinic, St Lucia, Small Animal Radiography Standard Operating Procedures
30. UQ Veterinary Medical Centre, Gatton. Large Animal Radiography Standard Operating Procedures

**Purpose**

To provide high quality & timely diagnostic radiographs to Equine Clinicians in a manner that reduces radiation exposure risk to staff and maintains safety of the animal at all times.

**Definitions**

*Algorithms:* the mathematical equation affecting brightness & contrast, set to a digital radiographic image to improve the image quality for that given anatomical region. Named by projection of anatomy. Eg Thorax VD

*Bucky:* moving grid component of the x-ray machine. It is found suspended from the ceiling as a green box.

*CR:* Computer Radiography. A digital form of x-ray processing involving cassettes that are read and resultant image is digitally stored.

*CLV Number:* Customer Logic Vet Number. The Patient number distributed by the patient information system unique for UQ VMC Gatton.

*Exposure:* the factors selected to indicate the total power and quantity of x-ray photons for the desired projection. Involves kVp, mA and time (secs) selection.

*Exposure Chart:* a chart indicating the best kVp, mA & sec values to be used for a given anatomical region and thickness measured.

*PACS:* Picture Archive Communication System. A computer system that stores all patient’s digital images/examinations. Eg X-ray, CT, US etc

*PPE:* Personal Protective Equipment. For radiation safety this comprises of lead gowns, lead thyroid collars, lead hand gloves or shields and lead curtains or lead shields to shield staff/students from radiation exposure.

*S Number:* the number displayed after processing of the cassette to determine whether the exposure was correct, overexposed or

**Procedures**

**Radiation Safety:**-
7. Before using any equipment in this department you should read the UQ School of Veterinary Science’s Radiation Safety and Protection Plan.

8. Only persons licensed with Radiation Health Queensland are permitted to use this X-ray equipment. Students may use this equipment ONLY under the supervision of staff with a Radiation Use Licence.

9. Non-urgent x-ray examinations should be scheduled between 9am and 5pm Monday to Friday. Urgent x-ray exams after hours may be performed only by those who have a licence and had specific training on this equipment x-ray machine, with the Radiographer/Radiologist.

10. Under 18’s and pregnant women are not permitted in the x-ray room during an x-ray exposure.

11. If a need to handle the animal during x-ray exposure is required, full PPE must be worn. This includes Lead gown, thyroid collar, lead gloves/hand shields. Staff issued with radiation badges must wear these under their gowns. No part of any operator or assistant should be in the primary beam even if covered by lead protection. ALARA (As Low As Reasonably Achievable) radiation exposure to staff should be a priority.

12. Emergency contact is Meg Day the Radiographer/Radiation Safety Officer for Diagnostic Imaging. Phone 0434 638 624

13. Radiography of Equine patients and other large animals presents challenges to staff and students in regard to radiation and personal safety. Care should be taken to ensure MINIMUM radiation dose to staff is received during x-ray examinations.

14. Staff/students required to supervise the horse MUST wear PPE (lead gowns/thyroid collar etc) and rotate often during long x-ray examinations to reduce radiation exposure.

15. Staff should NEVER stand in front of the primary beam and should aim to increase the distance from the primary x-ray beam wherever possible. This particular applies to using the exposure button attached to the x-ray tube.

**Staff/Patient Safety:-**

16. Patients should be sedated to reduce the risk of injury to themselves and staff/student members supervising them.

17. Care should be taken so patients do not shy, kick or cause any other damage to the x-ray equipment.

**Turning Machines On**

- The Shimadzu X-ray machine has a separate ON/OFF button on the left hand side of the console. Press the on button to activate the machine.
• Check that all 3 doors (1 near stable area, 1 to the breezeway and 1 to CT) are all closed and locked.
• The X-ray tube on this machine MUST be warmed up prior to use. Firstly in the morning and also if been left idle for more than 2 hours.
• To warm up, select the CHEST menu (top of touch screen). Sub section should show WARMUP exposures. Select this menu. Ensure no person is in the room. Once selected, expose all 3 exposures one at a time with a 30 second break in between.
• You are ready to commence x-ray examination.

To X-ray -
The X-ray tube must be locked into certain positions for effective lower limb or Bucky work. Here are the instructions to place the tube according to the anatomy to be imaged; NB The machine is labelled with the various measurements.

FETLOCK/LOWER LIMB X-RAYS
• Turn locks off (button)
• Rotate the tube console (green handles) so the light box faces the ground (screen says 0 degrees)
• Rotate the tube head so red arrow points to 90 degrees (use black top locking screw)
• Rotate the entire column so arrow points to 90 degrees on the purple counter (top)
• You can now use any rotation angle around 360 degrees
• Double click rotation and all move buttons to stop machine from locking when positioning for lower limb work

BUCKY WORK
NB the Bucky (Green Square) must be locked into position before setting up the x-ray tube. Bucky lock button must be switched on. The Bucky must be locked towards the centre of the room so that the ceiling attachment is level around the second metal bar (counting from the CT door). This allows proper Focal Film Distance (SID on machine) to be calculated. SID should = 150cm for all Bucky work.

X-ray Tube
• Lift the machine up (easier to work with)
• Enable locks (button highlighted)
• Rotate the entire column so arrow points to 0 degrees on the purple counter (top)
• Rotate the tube head using the black top locking screw to the position where the red arrow points to 0 degrees
• Rotate the tube console (green handles) towards the Bucky so screen says + 90 degrees
• Move the tube sideways so that the laser light lines up with the black line in the yellow area (top of Bucky
• On both the Bucky and the X-ray tube is the automatic all up/down button. It will light up green when switched on at the Bucky. If selected properly on both parts of the machine the tube automatically moves to the Bucky’s height when re positioned.
• Ensure prior to exposure the Bucky exposure button is selected
To Expose-

- Exposures for most anatomical regions have been pre programmed into the Shimadzu unit. To select, simply touch screen the anatomy of interest ie Fore Limb, Hind Limb, Thorax, Abdomen, Spine etc and select the sub section (ie DP Fetlock)
- Make sure the patient & all personnel in the room are positioned correctly prior to exposure. Communication is a must.
- To expose, half push the exposure button for 3 seconds (green border will flash when ready) then full push to expose. Machine will sound.
- REMEMBER: IT IS THE USER’S RESPONSIBILITY TO ENSURE ALL PERSONNEL WITHOUT PPE HAVE DEPARTED FROM THE ROOM PRIOR TO EXPOSURE.
- The exposure button attached to the x-ray tube MUST ONLY BE USED during lower limb work or when the animal does not tolerate the exam and multiple re-take x-rays have been taken. If exposing with this button, YOU MUST ensure a minimum distance of 3m away from the tube in the direction AWAY from the primary beam.
- The machine will keep a record of the previous exposure and automatically select the next anatomical exposure sub section. Please ensure you check your exposure values prior to exposing in case the wrong value has been selected.
- The Fuji CR system is found in the Small Animal X-ray Control area. Please take exposed films directly for processing as the image is stored in the best distribution on the cassette plate for only a limited time.
- Return cassettes back to the Equine X-ray room if required.

Fuji CR-

Introduction

- Fuji is a Computer Radiography system which obtains images by digital means. The cassette is exposed and then read by the CR reader which displays the resultant image on the computer screen.

Switching Fuji CR on-

Check that the CR reader is on by moving the mouse. If nothing appears on the screen, you must turn on the hard drive computer (black box on the floor labelled DELL). The on button is black, about the size of 5c piece and located on the front just above the DELL symbol. The green/grey FCR Capsula unit must also be turned on. Button is on top right hand side near little screen. When ready, the screen will say Image Reading + Online.

Cassettes

- There are 3 sizes of cassettes for use – 18x24cm, 24x30cm, 35x43cm
- Two different types of cassettes are used in this department. Detail cassettes (pink label near the barcode on the back of the cassette) are used for extremity & skull x-rays, regular cassettes (green label on the back) are used for Bucky work and
thickness of anatomy greater than 10cm. They are stored in two different boxes and labelled appropriately

- The green side of the cassette must face the x-ray tube during exposure
- **Cassettes MUST be primary erased prior to exposure** to ensure no artefact marks are visible on the plate prior/during exposure
- To perform primary erasure, look at little screen on the FCR Capsula machine, and press Change Mode. Use the arrow keys to select Primary Erasure and select ok. Place the cassette with the barcode side facing away from you and slot into the machine opening with the barcode end first. The machine will alarm if not placed correctly. Simply remove and try again (ensure correct cassette position). MAKE SURE no tape or Side markers are still attached to the cassette. These will cause great damage to the CR plate reader if left attached.
- Scatter radiation affects CR plates more that film/screen systems. Please be diligent when collimating the region of interest. This is particularly relevant for larger patients.
- Process the films immediately. The image is stored in the best distribution on the cassette plate for a limited time.

**Registering Patients**

- Patients MUST be registered correctly to store images correctly on PACS
- Click on the Register tab (top left corner)
- **Patient number (CLV number) MUST be entered to start the examination. You must include CLV in this field. Le patient number 13, write CLV13 in the Patient ID box**
  - Client’s surname is written first in capital letters, and then patient (animal’s) name is written second in lower case. Eg SMITH Fido
  - Date of Birth must be written in the following form Eg 20.06.2008
  - Select Male/Female and your name under technician (if you are not listed in the drop menu, see Meg)
- Click REGISTER/START STUDY
- A list of animal regions will be listed. Select the one most appropriate for your examination. You can change these later if you make a mistake. Eg if you are performing Canine Thorax and Shoulder X-rays you would select Canine Body from the upper menu and then select Thorax VD & Thorax Lat from the bottom menu. For the Shoulder select Canine Limbs from the top menu and then select Shoulder CC and Shoulder Lat from the bottom menu.
- Click START STUDY

- To read a cassette, click on the menu (algorithm) you would like use for this particular exposure and place the cassette into the reader as described in Cassette section. (Barcode away from you and barcode side first into machine)
- Images can be manipulated after processing. You can zoom, change the contrast or brightness and annotate if required. A help booklet is found on the CR reader.
- Once the image has been processed take note of the **S Number**. This value is the only way to determine if the exposure is under or overexposed. Consult with the table listing the appropriate S numbers for given anatomy.
- Numbers smaller than the listed S numbers are **OVEREXPOSED** eg 4
- Numbers larger than the listed S numbers are UNDEREXPOSED, eg 865.
- Consistently checking S Numbers is very important to ensure the correct exposures are being used and any handler dose (if any) is reduced!
- When examination is finished, click on the arrow out the door button (bottom right of screen) and click Exposure/QA Complete. This will send the pictures to PACS.
- If you require a CD to be burned for your study, consult the Radiographer with the patient’s name, DOB and when the study was performed.

To use CR

- On the keyboard there is a booklet to help you if you select the wrong algorithm, window the image too much etc.
- If you wish to discard an image (ie not send to PACS) there is a cross button on the right hand side menu. Click the image you no longer wish to use and then select the cross button. A cross should appear next to your image.
- Any S values that indicate great UNDEREXPOSURE should be repeated.
- Try and always centre anatomy to the middle of the film to achieve true S Number values. At least one third of the cassette should be exposed for true S Number also.
- If you accidently complete the exam on the CR reader before finishing, select the Delivered tab (middle button at top of screen) find your patient, hit the SHIFT key and press return at the same time. The patient menu should return as before.
- A Log book is supplied to record all examinations in the room. It is found near the X-ray console. Please fill out all details so we can ensure all examinations are completed and reported.
- To access examinations for review, find the PACS computer and view the images there.

PACS (Synapse)

- Is a computer system used to store patient’s images.
- X-ray, Ultrasound, CT, Nuclear Medicine, II images can be found on the PACS (named Synapse) system. It DOES NOT store any information about the patient or client.
- If patient details are incorrect on Synapse it is very difficult to search for patients and also to correct the mistakes. Please ensure patient number is correct and name is spelt correctly when performing examinations on Fuji CR.
You will need to supply Meg with your UQ Login username to gain access to Synapse. To access Synapse simply log on (with UQ username) to the PACS computer (last one in Small Animal control room), any computer in the radiology tutorial room or large screen in Radiologist’s room. Synapse is found on the desk top. Double click it to open.

A number of folders should appear. All patients, all recent studies etc. There should be a folder with your name as well.

**To search for patient's images**

- Click open the ALL RECENT STUDIES folder.
- Search for the patient’s name by entering it in the box underneath Patient name and hit enter.
- If you can’t find your patient either search in ALL PATIENTS or use PATIENT ID to find.
- If you can’t find your patient’s images check to see that you have sent your images from the Fuji CR to PACS (have you pressed the arrow out the door button & selected Exposure/QA Complete?)
- **All other problems with PACS should be directed to Meg the Radiographer or Amanda Russell (ITS) BEFORE contacting Fuji. This applies during business hours and After Hours.**
- To exit Synapse, simply close the window. You MUST log off after using Synapse so other users cannot change your settings.

**X-ray machine shutdown:**

- Ensure the X-ray tube and Bucky are parked close to the far wall (near generator box on Southern side of room) to avoid possible damage when switched off.
- Press the OFF button on the tube console.
- Make sure all doors to the X-ray room and console room are locked at the end of the day.

**Equipment:**
X-ray Equipment

A list of x-ray apparatus may be found in Attachment 1 of the Radiation Safety and Protection Plan (RSPP). Servicing and Compliance testing of this equipment must be completed as per the RSPP. The next due dates for such testing can be found in Attachment 1 of the RSPP and is covered in more detail in X-ray Apparatus Compliance and Service Standard Operating Procedure.

If you suspect any x-ray equipment to be faulty, you must:

4. Switch equipment off with console switch
5. If possible, switch off at mains power switch on wall
6. Notify the Radiation Safety Officer (Meg Day 0434 638 624) IMMEDIATELY

PPE Equipment

Gowns must be stored hanging in a position at all times. Thyroid collars and lead shields must be stored lying flat. All PPE equipment is to be checked thoroughly for damage annually during the Radiation Safety Audit.

If you suspect any PPE equipment to be faulty, remove it from the PPE storage area. Place it in LYING FLAT (not folded or dumped) on the radiographer’s desk with a quick note saying where you suspect the damage is and when this occurred. The radiographer will assess if it needs repair or is to be replaced.

Related Documents:

- Radiation Safety and Protection Plan (RSPP) for the UQ School of Veterinary Science
- X-ray Apparatus Compliance and Service Standard Operating Procedure
- UQ Veterinary Medical Centre Gatton, Small Animal Radiography Standard Operating Procedures
31. UQ Veterinary Teaching Hospital & Small Animal Clinic, St Lucia.
Small Animal Radiography Standard Operating Procedures

**Purpose**

To provide high quality & timely diagnostic radiographs to Clinicians in a manner that reduces radiation exposure risk to staff and maintains safety of the animal at all times.

**Definitions**

*Bucky*- moving grid component of the x-ray machine. It is found under the x-ray table with a pull out tray.

*Exposure*- the factors selected to indicate the total power and quantity of x-ray photons for the desired projection. Involves kVp, mA and time (secs) selection.

*Exposure Chart*- a chart indicating the best kVp, mA & sec values to be used for a given anatomical region and thickness measured.

*Film ID labeller*- a device which is used to permanently imprint the name, DOB, species, date and clinic details on to the film.

*Hopper*- a large light proof box used for storing unexposed X-ray film. Found in the darkroom.

*LBD*- Light Beam Diaphragm. Is the box emitting an area of light, attached to the X-ray tube responsible for showing the intended primary x-ray beam coverage during an x-ray exposure. May be adjusted using lead collimators.

*PPE*- Personal Protective Equipment. For radiation safety this comprises of lead gowns, lead thyroid collars, lead hand gloves or shields and lead curtains or lead shields to shield staff/students from radiation exposure.

*Processor*- An automatic machine which uses developer and fixer chemicals to process the exposed film into visible images on the film.

*RSO*- Radiation Safety Officer. Person appointed and certified by governing bodies to give guidance and report issues relating to radiation use, training, compliance and maintenance within the School or workplace department.

*Tube side*- side of any x-ray equipment that must face the x-ray tube to function properly. Particularly relevant with grids.

*X-ray tube*- component of the x-ray machine responsible for the formation of x-ray photons.
**Procedures**

**Radiation Safety:**

1. Before using any equipment in this department you should read the UQ School of Veterinary Science's Radiation Safety and Protection Plan.
2. Only persons licensed with Radiation Health Queensland are permitted to use this X-ray equipment. Students may use this equipment ONLY under the supervision of staff with a Radiation Use Licence.
3. Non-urgent x-ray examinations should be scheduled between 9am and 5pm Monday to Friday. Urgent x-ray exams after hours may be performed only by those who have a licence and had specific training on this equipment or WAEC x-ray machine, with the Radiographer/Radiologist.
4. Under 18’s and pregnant women are not permitted in the x-ray room during an x-ray exposure.
5. If a need to handle the animal during x-ray exposure is required, full PPE must be worn. This includes Lead gown, thyroid collar, lead gloves/hand shields. Staff issued with radiation badges must wear these under their gowns. No part of any operator or assistant should be in the primary beam even if covered by lead protection. ALARA (As Low As Reasonably Achievable) radiation exposure to staff should be a priority.
6. **Emergency contact is Meg Day the Radiographer/Radiation Safety Officer for Diagnostic Imaging. Phone 0434 638 624**

**Patient Safety:**

1. Whenever possible, patients for radiographic examinations should be anaesthetised or sedated. This reduces the need for physical restraint during x-ray exposure and reducing occupational radiation dose to staff. This also allows better quality x-ray examinations as the patient can be positioned correctly without movement.
2. Patients MUST always be supervised during x-ray examination from start to finish to reduce the risk of injury to patient &/or staff.

**X-ray Machine Operations:**

**Turning the Machines on.**

1. In the control room (this is where the x-ray machine control panel and the processor are found) there is a chart on the wall explaining this procedure. Most of the time you will not need to worry about Step 2 when turning on the processor or Step 1 when turning on the X-ray machine.

**The Processor.**

1. Turn on the processor by the on/off switch on the front of the processor. It may take 5-10 minutes to warm up and reach the required temperature of 35.5 degrees.
2. Check the water tap in the darkroom (it is under the feed tray) is closed (Tap should be parallel with the wall the processor is mounted in). If this is not closed
the wash tank will be empty and your films will come out smelling acidic and feeling slightly gritty.
3. The processor automatically replenishes developer and fixer chemicals and the radiographer will keep the tanks filled.
4. When the processor is at 35.5 degrees, place 2 clearing films (one after the other) through the processor. Check there are no marks on these films from the rollers etc once they have been processed.

The X-ray Machine.
1. Turn on at the on/off buttons in the top left hand corner of the control panel.
2. If the machine has been off for some time do warm up by pressing warm up exposure setting (middle button on bottom row) and expose twice 15 seconds apart.
3. To set exposures select the area you are radiographing (eg Chest), then the view (eg Lat) and all settings required for an average exposure will automatically come up. The exposure charts are on the wall above the control panel. When using general or chest film you will only need to adjust only the kVp require according to the size of the dog. For extremity exposure using the Single Screen cassettes and mammo film use the chart with the red border and only the time needs to be adjusted with the thickness of the area being examined.
4. The exposure charts are very accurate so please make use of them for best results. The calipers are on the window sill in the x-ray room – please return them to this position after use. Record your exposures in the scrapbook on top of the processor in case you need to repeat the x-ray.

The Main X-ray Room.
1. The movement locks on the tube head are colour coded with the arrows on the gantry above. The grey button allows you to move the tube in all three directions at once. The pink button allows the tube to be angled.
2. To center the tube to the grid in the Bucky tray press the Green button allowing lateral movement across the table, while holding it down press the corresponding button on the other side on the Light Beam Diaphragm that is marked ACS (Automatic Centre System). A little flashing LAT will appear on the screen between buttons, release the buttons and push tube back and forth until it locks into place. Now just move length ways down the table until the lights are central over Bucky – you need to line this up by sight.
3. The table top moves independently of the Bucky and its movement is controlled by the four arrowed buttons on the panel on the side of the table. There is also a red emergency stop button there that will deactivate the table if it is pressed (sometimes this happens accidently when operators lean over the table). If this happens you need to turn the whole machine off and on again at the control panel.
4. To move the Bucky tray there is a handle with a lock button on it. When putting cassettes in the Bucky tray push them in to the center of the tray before turning the locking device.
Positioning Aids

1. Sandbags, foam, string etc is found in the open cupboard in the x-ray room. Lead rubber shield and hand/arm shields are also found there.
2. Lead coats and thyroid shields are hung in the x-ray room and stored on the shelf under the II monitor. Be sure to hang them up and store them correctly after use.

Films and Cassettes

1. Please take care to always return cassettes to correct storage pile and to reload with the correct film. If you are unsure what film to reload a cassette with leave it closed on the darkroom bench and the radiographer will reload it in the morning.
2. All film is stored in the hopper in the darkroom. This is found under the bench and swing the door down to open. BEWARE it does bite so watch your fingers!! There is a chart on the wall above the bench in the darkroom showing where the different sorts of films are in the hopper.

General Cassettes

1. Are for exposures on areas greater than 10cms thick and are used in the Bucky. These cassettes have no special markings on them and we have a number of these cassettes in various sizes. These are all stored to the right of the control panel. The film for these cassettes are found in the bottom 3 layers of the hopper.

Chest Cassettes

1. Should be used in the Bucky for all Chests of medium to large animals. There are three of these cassettes and they are marked with “Chest” on the front of them. They are loaded with specific chest film. These cassettes are stored to the left of the control panel. The film for these cassettes is in the 2nd from the top layer of the hopper.

Mammo Cassettes

1. Are used on the table top (no grid) for extremities less than 10 cms thick. They are marked with S or SS and red tape lines. They have only one screen and are loaded with single sided film. Remember for these you must use the EXT setting on the control panel and the exposure chart with the red tape border.
2. The film for these cassettes is in the top layer of the hopper. Remember when loading these cassettes that it is Black to Black (ie. Black side of film to black inside of cassette).
3. Do not touch any of the boxes of film on the bench top.
Naming Films with Patient details:

1. This MUST be done for every patient for legal reasons.
2. On the window sill are paper slips, type or write patient details on these then slip them printed side down into the film ID labeler under the little Aluminum plate (top of machine). After exposure slide the cassette tube side down in to the identifier (bottom part) with the little window in the top left hand corner. This machine will open the window and expose the corner of the film with the patient details you have recorded. Hold in place until you hear the “click” sound.

In the Darkroom.

1. The darkroom has a double door entry for light safety. Always close the first door behind you before opening the next in case anyone is working in the darkroom. Just inside the first door are two light switches. One turns on an indicator light above the doorway to alert others that you are using the darkroom. The other is a two way master switch for all the lights in the darkroom.
2. Red safety lights are all switched individually. There is a switch for the overhead white light which is above the bench at the right hand end (near the wet developing tanks). This should never be switched on when developing films.
3. Feed film in to the processor lining them up with the Right hand side of the feed tray. A small red light will come on as a film is going through, this will switch off and a bell will sound when it is safe to feed the next film through. It is alright to feed two smaller films through side by side as long as they don't overlap.
4. You may exit the darkroom once the processor bell has sounded.
5. Films for use are found in the hopper. If the size you require becomes empty, there is film supply in cupboard next to the exit door. Only use these films when the hopper is empty. Storage of films in the hopper must fit the draw so that the unexposed films do not get creased or folded. Film boxes in the cupboard must be stored standing up, next to each other (no stacking of boxes). Use the boxes with the oldest date first when re supplying the hopper. If you accidently drop any film onto the bench or floor, DO NOT place back in to the hopper. Place them in the white shelf on the left side of the hopper to be used as clearing film at a later date.
Equipment:-

X-ray Equipment

A list of x-ray apparatus may be found in Attachment 1 of the Radiation Safety and Protection Plan (RSPP). Servicing and Compliance testing of this equipment must be completed as per the RSPP. The next due dates for such testing can be found in Attachment 1 of the RSPP and is covered in more detail in X-ray Apparatus Compliance and Service Standard Operating Procedure.

If you suspect any x-ray equipment to be faulty, you must:-

1. Switch equipment off with console switch
2. If possible switch off at mains power switch on wall
3. **Notify the Radiation Safety Officer (Meg Day 0434 638 624) IMMEDIATELY**

PPE Equipment

Gowns must be stored hanging in a position at all times. Thyroid collars and lead shields must be stored lying flat. All PPE equipment is to be checked thoroughly for damage annually during the Radiation Safety Audit.

If you suspect any PPE equipment to be faulty, remove it from the PPE storage area. Place it in LYING DOWN (not folded or dumped) on the radiographer’s desk with a quick note saying where you suspect the damage is and when this occurred. The radiographer will assess if it needs repair or is to be replaced.

Related Documents:-

- Radiation Safety and Protection Plan (RSPP) for the UQ School of Veterinary Science
- X-ray Apparatus Compliance and Service Standard Operating Procedure
- UQ Veterinary Medical Centre, Gatton, Small Animal Radiography Standard Operating Procedure
32. Radiation Safety and Protection Plan for the Radiography Practice of the School of Veterinary Science

Radiation Safety and Protection Plan

for the

Radiography Practice

of the

School of Veterinary Science

Signature

Date

(Possession licence nominee)
Radiation Safety and Protection Plan for Veterinary Diagnostic Radiography Practices

1. INTRODUCTION
2. SURVEILLANCE
3. ROUTINE PRACTICES
4. PERSONAL PROTECTIVE EQUIPMENT (PPE)
5. CLEANING AND DISINFECTION
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9. SAFETY OF CLINIC PERSONNEL
10. EQUINE CLINICS: GATTON, DAYBORO, GOONDIWINDI
11. LARGE ANIMAL AMBULATORY PRACTICES: GATTON, DAYBORO, GOONDIWINDI
13. Standard Operating Procedures (SOPs) for teaching activities involving horses.
14. UQ Veterinary teaching hospital and small animal clinic: Kennel Cough and infectious diseases.
15. Disinfectants – Virkon S
17. CLEANING & DISINFECTION POSTER
18. HAND HYGIENE POSTER
19. ISOLATION POSTER
20. PERSONAL PROTECTIVE EQUIPMENT (PPE) POSTER
21. Surgical Scrub Poster
22. Fire and emergency evacuation procedures
23. Procedure for handling of oxygen cylinders
24. Protocol for animal handling procedures/restraint
25. Standard operating procedures for equine facilities for undergraduates, visitors and staff
26. Protocol for handling and disposal of medical waste and sharps
27. UNIVERSITY OF QUEENSLAND RISK ASSESSMENTS
28. DRAFT Radiation Safety and Protection Plan for the Veterinary Nuclear Medicine Practice

30. UQ Veterinary Medical Centre, Gatton. Large Animal Radiography Standard Operating Procedures

31. UQ Veterinary Teaching Hospital & Small Animal Clinic, St Lucia. Small Animal Radiography Standard Operating Procedures

32. Radiation Safety and Protection Plan for the Radiography Practice of the School of Veterinary Science

33. UQ School of Veterinary Science, Gatton & St Lucia. Computer Tomography (CT) Standard Operating Procedures

34. UQ School of Veterinary Science, Gatton & St Lucia. X-ray Apparatus Compliance and Service Standard Operating Procedure
1. INTRODUCTION

(a) Purpose

The Radiation Safety Act 1999 requires that a radiation safety and protection plan be developed for every radiation practice. This plan has been formulated for the purpose of ensuring that all veterinary diagnostic radiography is conducted as safely as possible and in compliance with the Radiation Safety Act 1999 and the Radiation Safety Regulation 1999.

This plan addresses the use of veterinary X-ray equipment within the school of Veterinary Science and includes small animal practice, equine practice, wildlife, exotics and teaching. It is to cover activities at all university facilities and for field work. The plan applies to the veterinary X-ray equipment and premises in the possession of the possession licensee.

For the information of the reader, details of the equipment and premises are set out in Attachment 1. The details recorded are the equipment type, makes and models, serial numbers, location of the equipment (building and room numbers) and compliance certificate expiry dates. This attachment will be updated by the possession licensee when X-ray equipment is acquired, sold, disposed of, or relocated, or at an annual review.

Compliance with this radiation safety and protection plan will help ensure that the radiation doses to users are below the prescribed limits and are as low as reasonably achievable. It will also ensure that the number of people exposed to radiation and the likelihood of unexpected exposure to radiation are minimized. It is also to ensure that as a training facility, best practice is demonstrated to students and staff to promote the safe and responsible use of equipment.

This plan outlines the obligations of the possession licensee and persons who carry out a radiation practice for the possession licensee.

(b) Who must read this document:
All persons who carry out, or who are involved in carrying out, veterinary diagnostic radiography at the possession licensee’s premises must be familiar with this plan. All radiation practices must be conducted in accordance with this plan.

(c) Reference documents

In addition to the radiation safety and protection plan, the following documents must be complied with:

- **Radiation Safety Act 1999** and **Radiation Safety Regulation 1999**

- Radiation safety standard **NM003:1999 Standard for radiation apparatus used to carry out diagnostic radiography of animals**

- Radiation safety standard **PR005:1999 Standard for premises at which radiation apparatus is used to carry out veterinary diagnostic radiography or veterinary radiation therapy**

- ARPANSA RPS17 *Code of Practice for Radiation Protection in Veterinary Medicine* (2009)


- Radiation safety Standard **HR003 Standard for radiation apparatus used to carry out computed tomography** (1999)

- Radiation safety Standard **HR002 Standard for radiation apparatus used to carry out radioscopy** (2004)
2. **HAZARD ASSESSMENT**

Diagnostic radiation apparatus is portable or fixed equipment which incorporates an X-ray tube and is used for medical, dental and veterinary diagnostic radiography.

Radiation doses to users, other staff, patients and members of the public, depend on the type of X-ray equipment being used, the radiographic workload, the extent of compliance with work practices, and the extent of compliance of the X-ray equipment and the premises with relevant radiation safety standards made under the *Radiation Safety Act 1999*.

The *Radiation Safety Regulation 1999* prescribes an annual radiation dose limit of 20 mSv for persons involved in carrying out a radiation practice and an annual radiation dose limit of 1 mSv for other staff and members of the public. Also, if a female who is involved in carrying out the radiation practice becomes pregnant, her radiation dose limit is reduced to 1 mSv per annum for the term of the pregnancy.

The personal radiation monitoring results of persons involved in veterinary radiation practices in Queensland indicate that radiation doses typically do not exceed 1 mSv per year. By comparison, the annual natural background radiation dose to a person is 2 mSv per year. However, a radiation dose can become significant as a result of poor work practices (eg. if staff repeatedly hold animals without the use of adequate protective clothing) or if equipment does not comply with the necessary standards (eg. the X-ray beam is not properly collimated during an X-ray exposure).

In light of the normal occupational levels of exposure evidenced by historical measurements made in veterinary practices, pregnant staff do not need to alter their duties. However, how their duties are performed should be evaluated to ensure that the doses remain as low as reasonably achievable. Pregnant staff should avoid work which may result in higher radiation doses (eg. holding an animal).

**Hazards unique to digital imaging**

Digital imaging techniques have the potential to improve the practice of radiology but they also risk the overuse of radiation. The main advantages of digital imaging, which include wide dynamic range, the ability to post process images, multiple viewing options and electronic archiving and transfer possibilities, are clear, but over exposures can occur without an adverse impact on image quality. In conventional radiography, over exposure...
produces a non-diagnostic image. In digital systems, diagnostic images may be obtained for a wide range of doses. Dose optimisation is therefore critical to the proper functioning of a digital imaging system as higher patient dose often means improved image quality, so a tendency to use higher doses than normal can occur. This is referred to as ‘exposure creep’.

Poor image quality resulting from inappropriate post processing techniques may lead to compromised patient management.
3. RESPONSIBILITIES OF POSSESSION LICENSEE

The University of Queensland holds a licence to possess the veterinary X-ray equipment.

The university obtained this licence after demonstrating to the Chief Executive of Queensland Health that all of the radiation safety criteria set by the \textit{Radiation Safety Act 1999} have been satisfied.

Nevertheless, there are on-going obligations borne by the possession licensee. The possession licensee must take reasonable steps to ensure any person's health and safety is not adversely affected by exposure to radiation because of the way a person carries out the practice. To do this, the possession licensee must:

- ensure that the radiation doses arising from the radiation practice are kept below the limits specified in the \textit{Radiation Safety Regulation 1999} and are as low as reasonably achievable;
- hold a licence, issued under the \textit{Radiation Safety Act 1999}, with an authority to possess veterinary X-ray equipment for the purpose of veterinary diagnostic radiography;
- ensure that all users of veterinary X-ray equipment hold use licences appropriate to the categories of work they are required to perform. Categories of veterinary radiography for which users may need to be licenced include standard (small animal) veterinary radiography, veterinary radiography with CT equipment, veterinary fluoroscopy and radiography of large animals;
- ensure compliance with the \textit{Radiation Safety Regulation 1999} and with any conditions imposed by the Chief Executive of Queensland Health;
- provide personal monitoring devices to monitored persons as required by Section 9 of this radiation safety and protection plan;
- ensure that the version of the radiation safety and protection plan being used has been approved by the Chief Executive of Queensland Health;
- appoint a radiation safety officer under the \textit{Radiation Safety Act 1999};
• ensure that the radiation safety officer is carrying out his/her functions to permit the possession licensee to be adequately apprised of the radiation safety status of the practice at all times;

• ensure that adequate resources are provided to implement this radiation safety and protection plan (eg. provision of appropriate training in radiation safety to employees and adequate numbers of personal protective devices);

• ensure that the records, specified in this radiation safety and protection plan, are kept;

• ensure that the plane film X-ray equipment continues to comply with radiation safety standard NM003:1999 *Standard for radiation apparatus used to carry out diagnostic radiography of animals* and obtain certificates of compliance from an appropriately accredited person, before initial use and every three years thereafter;

• ensure that the CT X-ray equipment continues to comply with radiation safety standard HR003:1999 *Standard for radiation apparatus used to carry out computed tomography* and obtain certificates of compliance from an appropriately accredited person, before initial use and every three years thereafter;

• ensure that the fluorosopic X-ray equipment continues to comply with radiation safety standard HR002:1999 *Standard for radiation apparatus used to carry out radioscopy* and obtain certificates of compliance from an appropriately accredited person, before initial use and every three years thereafter;

• ensure that the premises where the X-ray equipment is used continue to comply with radiation safety standard PR005:1999 *Standard for premises at which radiation apparatus is used to carry out veterinary diagnostic radiography or veterinary radiation therapy*, and obtain certificates of compliance from an appropriately accredited person, before initial use and every five years thereafter;

• ensure that, if there has been a change in the location of X-ray equipment (including its location within a room), workload or use of an adjacent room, an appropriately accredited person performs an assessment of the premises for compliance with radiation safety standard PR005:1999 *Standard for premises at which radiation apparatus is used to carry out veterinary diagnostic radiography or veterinary radiation therapy*;

• ensure that the approval of the Chief Executive of Queensland Health is obtained before acquiring X-ray equipment;
 ensure that the approval of the Chief Executive of Queensland Health is obtained before relocating X-ray equipment outside Queensland;

 ensure that if X-ray equipment is sold or traded in within Queensland, that the to whom the equipment is sold or traded in has an approval to acquire the X-ray equipment;

 ensure that the Chief Executive of Queensland Health is advised in writing within 7 days of the disposal of failed or destroyed X-ray equipment (ie. the X-ray tube is irreparably damaged); and

 immediately notify the Chief Executive of Queensland Health after an incident, either orally or in writing. If the notice is given orally, written confirmation must be provided within seven (7) days. An incident is an event that may cause injury or harm to an individual.
4. RESPONSIBILITIES OF RADIATION SAFETY OFFICER

Functions

The radiation safety officer advises the possession licensee and employees on radiation safety matters associated with the practice. The name and contact details of the radiation safety officer are detailed in Attachment 2. Attachment 2 will be updated if the name or contact details of the radiation safety officer change.

At the commencement of the practice and once every year thereafter, the radiation safety officer must check, and record, that:

- all users and staff have read, understood, and are complying with this radiation safety and protection plan;
- the details of the X-ray equipment are accurately stated in this radiation safety and protection plan;
- the person in possession of the X-ray equipment is appropriately licensed under the Radiation Safety Act 1999;
- all users of the X-ray equipment are appropriately licensed under the Radiation Safety Act 1999;
- compliance certificates for the X-ray equipment and premises have been obtained within the necessary time frames;
- area radiation warning signs, as required by the relevant radiation safety standard, and X-ray equipment warning signs are displayed and are in good condition;
- the safety devices and personal protective equipment required by this radiation safety and protection plan are available;
- the integrity of personal protective equipment is maintained (Note: if the integrity of any item is not able to be assured, the item must be replaced);
- all veterinary X-ray equipment complies with the relevant radiation safety standard; and

- the premises comply with radiation safety standard PR005:1999 *Standard for premises at which radiation apparatus is used to carry out veterinary diagnostic radiography or veterinary radiation therapy.*

Additionally, the radiation safety officer must:

- provide, or arrange for the provision of, training about radiation hazards and safe working practices (see section 7 of this plan).
- immediately report any radiation incidents to the Radiation Protection Adviser and statutory authority where this is required under the Radiation Safety Act or Regulation;

- report any contravention of this radiation safety and protection plan and/or relevant radiation safety standard to the Radiation Protection Advisor;

- assess radiation doses received by staff in the course of their work

*Reporting to the University Radiation Safety Committee*

The Radiation Safety Officer shall complete an annual audit and report the results to the University Radiation Safety Committee. The audit report shall address the items listed in section 4 (a) above and provide a summary of the following

- Details of any actions that need to be taken to achieve compliance with this radiation safety and protection plan or a relevant radiation safety standard;

- A report of the effectiveness and extent of compliance with this radiation safety and protection plan;

- Any recommendations about changes to the plan to ensure its continued effectiveness and that the information it contains is correct.
The Radiation Safety Committee may refer issues arising from the reports to the Head of School or to the possession licensee where further action is required.

5. RESPONSIBILITIES OF USERS

All users of veterinary X-ray equipment are responsible for ensuring that any radiation doses received by persons as a result of carrying out the practice are below the radiation dose limits prescribed by the Radiation Safety Regulation 1999 and are as low as reasonably achievable.

Users must take reasonable steps to ensure that a person's health and safety are not adversely affected by exposure to radiation because of the way the user carries out the practice. Users must:

- hold a use licence with an appropriate authority, issued under the Radiation Safety Act 1999. The categories of use licences issued to staff members will depend on their training and experience and may include the following:
  - veterinary diagnostic (or plane film) radiography - small animals
  - veterinary diagnostic (or plane film) radiography - small and large animals
  - veterinary computed tomography scanning
  - veterinary radioscopy

NB Currently enrolled Veterinary Science students are persons undergoing training at an educational institution in terms of the Radiation Safety Act and Regulation and as such are exempt from holding use licences provided their use is in the presence, and under the personal supervision, of a use licensee who is allowed, under their licence, to carry out that particular radiation practice.

- Before carrying out a veterinary diagnostic X-ray procedure, ensure that a veterinary surgeon has requested and approved the procedure.

- comply with the conditions of the licence issued under the Radiation Safety Act 1999;

- ensure that they are authorised by the possession licensee to use the X-ray equipment;
• comply with this radiation safety and protection plan;

• undertake and satisfactorily complete the training specified in this radiation safety and protection plan (see section 7);

• wear a personal monitoring device and use safety devices where required by this radiation safety and protection plan (see section 9);

• wear personal protective equipment where required by this radiation safety and protection plan (see section 10);

• report any contravention of this radiation safety and protection plan to the radiation safety officer;

• advise the radiation safety officer of any X-ray equipment which may be malfunctioning;

• report any incident which may adversely affect the health or safety of any person, including X-ray equipment malfunction, to the radiation safety officer;

• complete the register of examinations performed which includes the following information:

  (i) the name of the animal
  (ii) the name of the owner
  (iii) date the radiographic investigation is performed
  (iv) particulars of the radiographic examination performed
  (v) the name of the user of the X-ray equipment; and

• mark the radiograph with the following information:

  (i) the name or identifying mark of the possession licensee
  (ii) the name or identifying mark of the animal
  (iii) the date the radiograph is taken
  (iv) adequate information to enable the correct interpretation of the radiograph
6. **ACCESS CONTROL**

Only persons permitted by the possession licensee may operate the X-ray equipment.

Such persons must hold use licences with an authority appropriate to the radiography practice and the type of X-ray equipment to be used. This means that large animal radiography may only be performed by persons with a licence that specifically authorizes this practice.

The only exception to the requirement for use licences shall be in the case of persons undergoing training as provided for under section 13(2) of the Radiation Safety Act, in which case the use must be in the presence, and under the personal supervision, of a use licensee who is allowed, under their licence, to carry out that particular radiation practice.

The names of the persons permitted to use the X-ray equipment are listed in Attachment 4. The details required to be entered there include the purpose of the licence, the type of equipment that may be used, the licence number and its expiry date. Attachment 4 will be updated from time to time to reflect the current arrangement.
TRAINING

One of the duties of the radiation safety officer is to provide, or arrange for, appropriate training for staff members in radiation safety matters. The radiation safety officer must also ensure that users understand and comply with this radiation safety and protection plan.

**General training protocol**

Where it is relevant to their work, all new Veterinary School staff shall be given induction radiation safety training by the radiation safety officer on commencement of employment. Refresher training should be given annually unless otherwise determined by the radiation safety officer. This training shall also be provided to undergraduate students in the Veterinary Science course at an appropriate point in their studies.

The induction training shall address the following topics:

- General properties of ionising radiation and the associated hazards
- Nature of the hazards specific to the practice and the various types of veterinary X-ray equipment available there
- Access restriction requirements for areas in which veterinary X-ray equipment is used
- The system of authorisation (licensing) for users of veterinary X-ray equipment
- The facility radiation safety and protection plan
- Ways to minimise radiation doses to users and others in the workplace
- Correct use of personal protective and other safety equipment
- Procedures for using personal monitoring devices

Staff who have no involvement in radiography but who may be required to enter facilities in which X-ray equipment is located shall be advised of the access restriction requirements and the reasons for them.

**Additional training for staff directly involved in the use of veterinary X-ray equipment**
While staff members who are registered as Veterinary Surgeons are able to be granted a use licence to perform small animal (plane film) veterinary diagnostic radiography, they will be required to undergo induction training by the radiation safety officer. This is required to familiarise new staff with the operational procedures and safety measures particular to the University of Queensland practices.

**Additional training for large animal, CT and fluoroscopy (radioscopy) practice**

Persons in these categories must be given specific training to enable them to obtain appropriate use licences under the Radiation Safety Act 1999. Such training shall be given by the radiation safety officer and a person who holds a licence authorising the relevant practice. The supervision requirements shall be the same as those described in Sections 5 and 6 above, that is, the equipment may only be used in the presence, and under the personal supervision, of a use licensee.

**Training within the Veterinary Science course**

While training in veterinary radiography is an integral component of the Veterinary Science degree and may be given by staff other than the RSO, the RSO has overall responsibility to ensure that the required supervision (see Sections 5 and 6 above) by a licenced person is in operation.
8. **SAFE WORK PRACTICES**

The three simple rules to minimise personal radiation doses are:

- **Time:** optimise number of exposures and the exposure time
- **Distance:** keep as far away as practicable from the X-ray equipment during an exposure
- **Shielding:** wear a radiographer’s gown and stand behind the protective shield (if provided)

Radiation doses to operators may be reduced by ensuring:

- Minimum X-ray field
- Appropriate grid ratio
- Fastest film/screen combination that will produce a satisfactory diagnostic image
- Correct animal positioning and immobilisation
- Correct darkroom processing

To ensure radiation doses to all persons are minimised, the following practices must be followed.

**Justification**

> Radiography should only be undertaken if there is a reasonable indication and justification for the procedure and if it can be performed without undue radiation hazard to the staff.

**Equipment and Premises**
- X-ray equipment may only be used if it is in compliance with radiation safety standard NM003:1999 *Standard for radiation apparatus used to carry out diagnostic radiography of animals*.

- CT X-ray equipment may only be used if it is in compliance with radiation safety standard HR003 *Standard for radiation apparatus used to carry out computed tomography* (1999)

- Fluoroscopic X-ray equipment may only be used if it is in compliance with radiation safety standard HR002 *Standard for radiation apparatus used to carry out radioscopy* (2004)

- For all practices, other than use at field sites, X-ray equipment may only be used in premises that are in compliance with radiation safety standard PR005:1999 *Standard for premises at which radiation apparatus is used to carry out veterinary diagnostic radiography*. 
**Users**

- The X-ray equipment is only to be used for veterinary diagnostic radiography, by an appropriately licensed person who is permitted to use the equipment by the possession licensee.

- All practical precautions must be taken to avoid repeat radiography.

- The user must ensure that the exposure is not made until the animal is properly restrained and positioned.

- The primary beam must be restricted to the area to be examined by means of the collimator.

- Only persons essential to the procedure are to be present during radiographic examinations.

- When performing radiography, the user and assistants must remain behind a protective screen or, if there is no screen, wear personal protective clothing and position themselves as far as practicable from the X-ray tube assembly, the animal and the path of the primary X-ray beam.

**Restraint of Animals**

- An animal **must not** be held during radiography unless, for clinical reasons, other means of immobilisation are not practicable. Immobilisation should be achieved by chemical means (see section 10), by tranquillisation or by anaesthesia whenever possible. Physical restraint should be used only when a combination of sedation/anaesthetic and positioning aids such as sandbags and foam blocks aren’t sufficient to achieve the required views.

- The same individual should not be asked to hold animals repeatedly.

- Where possible large animals should be restrained in a crush or similar restraint.

- If it is clinically necessary to hold an animal during X-ray examinations, the minimum number of people are to be used to restrain the animal. Additionally, the people:

  (i) should be over 18 years of age
(ii) should not be pregnant

(iii) should wear protective personal protective equipment.

**Radiography of large animals**

- The animal should be suitably tranquillised or anaesthetised whenever possible prior to radiography.
- All assistants shall wear sufficient protective clothing to give full protection from the source of radiation (for example, it may be necessary to protect the legs).
- All assistants not immediately required for the procedure shall remain at a safe distance.
- Film or digital imaging cassette holders must be used whenever a cassette cannot be supported on a table, on the ground or on another support. A person supporting a cassette holder must remain outside the primary beam. A person must not hold the cassette.

**Auxiliary Equipment**

- During radiography, a person **must not** hold the X-ray tube assembly.

- The X-ray tube assembly **must** be rigidly supported by a holder or stand which provides adequate stability.

- The fastest film and film/intensifying screen combination compatible with acceptable image quality must be used. In teaching, a variety of film/screen combinations may be used to educate students on the correct and most appropriate combinations to use.

- Cassette holders must be available for use whenever a film cassette cannot be supported on a table, on the ground or on another support.

**Additional digital imaging precautions**

- Although digital imaging systems have potential for dose reduction, over exposures can occur without an adverse impact on image quality. In conventional radiography, over exposure produces a non-diagnostic image. In
digital systems, diagnostic images may be obtained for a wide range of doses and users need to be vigilant regarding the exposure factors they select.

- Since it is very easy to delete images, users may tend to repeat exposure if the positioning is wrong or if there is motion blur. Thus digital imaging has the potential to increase the number of exposures and hence dose to both the patient and the radiographer and assistants.

**Radiography in defined Room or Area**

- The room or stall used for radiography is required to be certified in compliance with radiation safety standard PR005:1999 *Standard for premises at which radiation apparatus is used to carry out veterinary diagnostic radiography*.

- An examination table incorporating appropriate radiation shielding will be used.

- All doors to the X-ray room must be closed during an exposure.

- Only persons who are directly involved in the radiographic procedures and who have received training in radiation safety from the radiation safety officer may be in the X-ray room.

**Fluoroscopic procedures**

**General Procedures**

The possession licensee must ensure that:

- All persons assisting with fluoroscopic procedures will be provided with instructions by the radiation safety officer (or the licensed user who is carrying out the procedure) on radiation protection measures to ensure that radiation doses to all persons involved in the radiation practice are kept as low as reasonably achievable; also reference in training;

- When fluoroscopy X-ray equipment is not in use, it will be placed in standby mode to avoid accidental actuation of the equipment;
- staff working in close proximity to the primary beam should wear well fitting lead gowns (wrap around) and where appropriate, properly adjusted lead thyroid shields. Note: The personal protective equipment e.g. lead gowns should be at least 0.5mm lead equivalent at the front, 0.25mm lead equivalent, at the back.

- during exposures, all persons in the room should, wherever possible, stand as far away as possible from the X-ray tube and the patient. If possible, persons not directly involved in the procedure should stand behind a protective shield, if provided; and

- all non-essential staff must leave the room before the commencement of the fluoroscopic procedure.

Specific Procedures

During use of the radiation apparatus, the radiation dose to the patient and the operator may be optimised by adhering to the following:

**Patient Size:** The instantaneous intensity of radiation used to image a patient is directly related to the patient’s size. Therefore the mAs must be reduced in accordance with patient size. Larger patients involve the use of higher dose rates than do smaller patients.

**Radiographic Factors:** Use the lowest tube current and highest kVp possible while still maintaining a diagnostically acceptable image. In pulsed imaging modes, the lowest frame rate necessary to achieve the diagnostic result should also be used.

NB as described above, over exposures can occur with digital imaging systems without an adverse impact on image quality and users need to be careful regarding the exposure factors they select.

**Anti Scatter Grid:** If possible the anti scatter grid should be removed for small patients. This will result in an immediate 40% reduction in radiation dose to the patient and operators. Note: This may affect the image contrast due to increased levels of scatter in the image.

**Collimator Opening:** Collimate down to the minimum field size necessary to reduce radiation exposure to the operators and the patient.
**Beam on Time:** The X-ray beam on time should be kept to the absolute minimum. Initiate an exposure to provide only a real time dynamic image or when recording images for post acquisition analysis. The use of last image hold is strongly recommended when viewing an essentially static image.

**Filtration:** On systems that enable the operator to select the level of beam filtration, the use of additional levels of filtration will lead to a reduction in the patient and staff radiation exposure. It should be noted, however, that the use of added filtration might adversely affect image quality.

**Hands:** The operator should never allow their hand to enter the primary beam. Whenever possible, the operator should work on the beam exit side of the patient where the radiation exposures are significantly less.

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**Computed tomography procedures**

- Users should ensure that all CT slices acquired contain the diagnostic information required for the examination. A scout scan should be used to aid scan selection and limit the amount of subsequent cross-sectional scanning.

- Users should select lowest dose protocol consistent with optimal image quality.

- All animals undergoing CT exams are required to be anaesthetized.

- The necessity for the use of contrast agents should be assessed by the user in consultation with the veterinary surgeon to reduce the number of regions that are rescanned with contrast.

- Under no circumstances should the X-ray tube be energized for CT fluoroscopy procedures without the person carrying out the examination being ready for the procedure to begin. For biopsy procedures, needle should be placed and then all staff vacate the room while scanning is done.

- During interventional CT procedures, remote injection facilities or delayed scanning
should be available to enable staff to vacate the room while scanning is done.

Radiography in Open Area (field site)

- The practice must comply with all relevant safety provisions detailed in Section 8 above.

- Adequate precautions must be taken to prohibit unauthorised access to the area during radiography and to control the direction of the primary beam to ensure that it is not directed at anyone.

- The radiographer or veterinary surgeon conducting the radiography must ensure that doses to members of the public, i.e. persons passing by or in adjoining buildings or areas, is limited.

- Transport of equipment to field sites must be done with due care and any incident that may cause damage to the equipment must be reported to the Radiation Safety Officer so that it can be assessed and repairs arranged.

- Adequate supports for the X-ray tube assembly and cassettes must be provided. In no circumstances is any person to hold these directly.

- Means are to be provided to achieve the correct alignment of the X-ray beam to the cassette and to ensure that the X-ray beam is collimated to an area equal to or less than the cassette. High ambient light conditions may limit the usefulness of the light beam collimator.
9. PERSONAL RADIATION MONITORING

Persons with regular direct involvement in any type of veterinary radiography will be issued with a personal radiation monitoring device. In addition, all persons carrying out or assisting in the radiography of large animals or in fluoroscopy procedures will also be issued with a personal radiation monitoring device.

In the use of personal radiation monitoring devices, the following procedures are to be complied with:

- personal monitoring devices are to be obtained from, a service provider (see Attachment 3) who has a personal radiation monitoring service that uses reference sources directly traceable to the Australian National Standards as required by the National Measurement Act 1960;

- the personal monitoring device wearing period is a three month period;

- use licensees must wear a personal monitoring device provided by the possession licensee, in addition to any personal monitoring device they are required to wear as a condition of their use licence;

- during radiographic procedures, a personal monitoring device is to be worn at chest or waist height;

- if a protective apron is worn, the personal monitoring device must be worn underneath the apron (Note: there is no need to wear a personal monitoring device outside the apron);

- personal monitoring devices must not be tampered with or misused;

- when not being worn, the devices must be stored in a place away from X-ray sources and radioactive substances;

- personal monitoring devices are not to be worn if the wearer is undergoing a radiographic examination as a patient;
the control device\(^3\) is to be stored away from X-ray sources and radioactive substances in a specifically designated location at each of the University’s veterinary practices. Personal monitoring devices issued to staff will also be stored at this location when not in use. The radiation safety officer will advise staff members regarding these procedures as part of the general training protocol given in Section 7 above.

as soon as practicable after the assessment of the personal monitoring devices, the possession licensee is to:

- provide a copy of the results to the Chief Executive of Queensland Health (refer to contact details in Attachment 2)

- advise the monitored persons of their radiation assessment results by posting results on a notice board in the sorting room and then keeping records on file in the Radiology Department office.

- the radiation safety officer is to update the personal monitoring record for each monitored person;

the personal monitoring records are to be kept for the duration of the wearer's working life and for not less than 30 years after the last exposure assessment, and at least until the person has reached the age of 75 years;

the personal monitoring assessment reports are to be checked by the radiation safety officer to ensure the radiation doses are below the prescribed limits in the Radiation Safety Regulation 1999 and are as low as reasonably achievable. If any unusual doses are noted (not necessarily in excess of the prescribed limits), the work practices of the wearer are to be investigated and, if necessary, remedial action taken.

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\(^3\) The control device is the dosimeter used to detect background radiation and any radiation received during mailing. This dosimeter must be stored away from sources of radiation and extremes in environment at all times.
10. SAFETY DEVICES AND PERSONAL PROTECTIVE EQUIPMENT

Safety devices

The following safety devices are provided by the possession licensee which may be used by persons involved in carrying out the veterinary diagnostic practice to minimise their radiation dose.

- Film or digital imaging cassette holders or supports.
- Sandbags, cradles and foam blocks.

Personal protective shielding

A range of personal protective shielding is provided at the University’s veterinary practices which may be worn by people who are required to be near an animal being radiographed to minimise their radiation dose. These items include the following.

- Lead aprons with a lead equivalence of 0.25mm.
- Lead gloves, with lead equivalence of 0.5mm.
- Lead sleeves, with a lead equivalence of 0.5mm.
- Thyroid collars with a lead equivalence of 0.25mm.
- Curtain on the fluoroscopy unit with a lead equivalence of 0.5mm.
- Mobile lead shields
Personal protective shielding should be stored unfolded to prevent the formation of cracks. The gown should be hung on a coat hanger in the X-ray rooms on the coat hanger or on coat hangers in the tutorial areas. The gloves, arm shields etc should be laid flat on the bench.
11. RADIATION WARNING SIGNS ON X-RAY EQUIPMENT

Radiation warning signs must be placed on each control panel of the radiation apparatus to warn users and other persons of the radiation hazard.

Radiation warning signs must be placed at the entrance to X-ray rooms to warn users and other persons of the radiation hazard.

Illuminated radiation warning signs are to be connected to each CT and fluoroscopic X-ray unit and positioned at each doorway to the X-ray rooms.

12. REPAIRS AND MAINTENANCE

The following provisions detail the requirements for repair and maintenance of the X-ray equipment and associated devices.

Records of all repairs are to be kept in the equipment log book provided by the possession licensee at each of the Veterinary School facilities where radiography equipment is located. Maintenance procedures carried out at weekly or greater intervals shall also be recorded.

(a) X-ray equipment

All maintenance and repair work is to be conducted by a person qualified to perform such work. Typically, the person will hold a licence to use radiation apparatus during maintenance, repair and commissioning. If the equipment is used, the licence of the person engaged to perform this work is to be checked by the radiation safety officer prior to the commencement of work.
(b) Automatic film processing

All automatic processors have service and operations manuals provided by the manufacturer. These procedures must be followed for all starting up, closing down and maintenance procedures.

Major processor repairs and six monthly service calls should be handled by a qualified service person.

The daily, weekly and monthly maintenance procedures are to be undertaken in accordance with the manufacturer’s recommendations which are detailed in Section 13. These procedures will be performed by the persons mentioned in Attachment 5. These attachments will be updated to reflect the current arrangement.

c) Manual film processing

Processing chemicals will be changed six monthly. When changing chemicals, ensure that tanks are completely emptied and thoroughly cleaned and rinsed. The name of the person who is responsible for changing the chemicals is listed in Attachment 5. Attachment 5 will be updated from time to time to reflect the current arrangement.

d) Processor chemical disposal

Processor chemicals will be disposed of by contractors designated in Attachment 5
13. QUALITY CONTROL

There is increased awareness of the need to ensure that information of optimum quality is produced in veterinary radiography practices, taking the radiation doses into account. The benefits of a sound quality assurance program are:

- continued production of images with optimal diagnostic quality
- more effective and efficient use of the radiation delivered to the animal
- reduction of radiation dose to staff
- capacity for higher study throughput
- lower consumption of radiographic films, chemicals and other consumable items
- extended life of the X-ray tube

Details of the quality control checks are given in below.

Records of all quality control checks are to be kept in the equipment log book provided by the possession licensee at each of the Veterinary School facilities where radiography equipment is located.

Quality control checks

Weekly checks common to both digital and film-based radiography

- Retake/reject analysis is to be carried out, and the results reported to the radiation safety officer (note: retake/reject analysis is carried out to determine the reason for the retake or reject, the X-ray unit used and the operator involved).

Where film is used, the following checks are required

(a) Weekly checks
Bench, splash-backs, floors, accessories and equipment in the darkroom are dry and clean.

(b) Three monthly checks

The following checks are to be conducted once every three months:

- The darkroom and/or processing box must be checked to ensure that it is kept free from light leaks and that safelights are adequate (see Attachment 8).

- The cleanliness of the intensifying screens.

(c) Six monthly or regular servicing checks

The following checks are to be conducted once every six months or at regular servicing (i.e. whichever is the shorter interval):

- The darkroom is well ventilated.

- Unexposed X-ray film is stored in the location designated in this radiation safety and protection plan.

- X-ray film is correctly handled and rotated so that oldest film is used first.

- The fastest X-ray film/screen combination, consistent with providing the diagnostic information sought, is used.

- Instructions for mixing chemicals and processing film are readily available (see Attachment 6 for instructions for mixing chemicals and processing films).

- A time/temperature chart, a timer and a thermometer are available for manual processing (Note: a time/temperature chart may be obtained from the supplier of the processing chemicals).

- The processor shows no sign of leakage or chemical build up, and the tanks, roller racks, crossovers and splash guards are free from grime.
- Replenishing tanks are at the correct level and show no sign of leakage.

14. RECORDS

A range of records are required to be maintained by the possession licensee. The following records are maintained by the University Radiation Protection Adviser on behalf of the possession licensee:

- Current possession licence issued under the *Radiation Safety Act 1999*

- Approvals to acquire the X-ray equipment

The following record are maintained by the Radiation Safety Officer on behalf of the possession licensee:

- The current radiation safety and protection plan approved by the Chief Executive of Queensland Health

- Compliance assessment reports of X-ray equipment and premises

- Reports by the radiation safety officer to the Radiation Safety Committee

- Personal monitoring records and dose assessment reports

- Equipment maintenance and repair log book – see Section 12 above

- Results of all quality control procedures performed

- Register of examinations performed

- Inventory and location of X-ray equipment – i.e. Attachment 1

- Incident reports.
15. FILM HANDLING AND DARKROOM PROCEDURES

(a) Basic film handling techniques
Radiographic film is stored in film storage cupboard in the darkroom of the relevant facility

All persons involved in handling film must:

➢ ensure that hands are clean and dry (note: use of hand cream can be a problem as any residue left on the film may interfere with the processing of the film);

➢ handle films only on edges and ideally at a corner;

➢ check film boxes on delivery to ensure that they have not been damaged in transit;

➢ check the expiry date on each box as it is added to or removed from stock;

➢ avoid using outdated film by making sure stock is rotated i.e. use oldest film first;

➢ store film away from light, chemicals, heat and radiation sources;

➢ store film boxes upright, never stack them "flat"; and

➢ not "draw" film across the screen as this can cause static discharge.

(b) Instructions for mixing chemicals and processing

(i) Mixing Chemicals for manual processing for teaching purposes.

Improperly mixed developer can lead to precipitation of the ingredients, erratic film intensities and/or rapid oxidation of the solution. Further, improperly mixed fixer can result in poor film drying and/or films with a milky appearance. When manually mixing solutions, the following procedure should be followed:
**Materials/instruments required**

- two mixing paddles
- graduated measuring cylinder
- protective clothing and rubber gloves
- protective eye wear

**Procedure**

1. Always mix the developer and fixer in separate tanks and use different paddles for stirring. Fixer is a contaminant to developer, and even in small quantities less than 0.05% (0.5 millilitre/1 litre) erratic film intensities will result. Always mix developer after fixer.

2. Follow the manufacturer’s mixing directions exactly. Never add ingredients out of sequence or before the dilution water has been added to the mixing tank.

**Fixer**

- The fixer should be stirred before use with a “fixer only” stirrer.
- Low fixer level must be topped up with freshly mixed replenisher.
- The fixer should be changed when the clearing time is over 2 minutes.
- The volume of the tank should be checked and the fixer be mixed strictly to the manufacturer’s instructions. Always mix fixer before developer.

**Developer**

- The developer should be stirred before use with a “developer only” stirrer.
• Low levels must be topped up with freshly mixed replenisher. Total replenishment should not exceed twice the volume of tank - replace developer after this.

• The developer should be changed as it is exhausted or contaminated.

• The volume of the tank should be checked and the developer be mixed strictly to manufacturer's recommendations.

Note: All solutions should be at approximately the same temperature, although only the developer temperature is critical.

When solutions are changed, the tanks must be thoroughly cleaned with separate cloths. Steel wool and abrasive powders should not be used.

(ii) Processing

Note: The first six steps must be carried out under safe-light conditions.

1) Check developer temperature, set timer for the recommended time, and place the film in hanger into the developer.

2) Agitate the film without lifting film out of solution using a vertical motion when first placed into the solution, and agitate three or four times during the developing period.

3) When the timer sounds, quickly remove the film and allow it to drain over the wash tank - not over the developer.

4) Rinse the film for fifteen seconds in the wash tank and allow to drain back into wash tank.

5) Place the film in the fixer tank and again agitate several times - particularly during the first minute of fixing.
6) Leave the film in the fixer for the time recommended by the manufacturer (normally 4 - 6 minutes), or at least twice the time it takes to clear the unexposed sections. The film should not be left in the fixer for more than 15 minutes.

7) Allow the fixer to drain back into the fixer tank, and then place the film in the wash tank.

8) Films should be washed in clean running water. The water should be renewed at a rate of approximately 8 times per hour.

9) After 30 minutes, drain the films and hang to dry in a dust free area - warm moving air is most effective.

Additional processing hints

- Keep hands dry when handling films.
- Avoid splashing chemicals - causes contamination and corrosion.
- Cover tanks with lids when not in use - retards oxidation of the developer and keeps dust from all solutions. For large developer tanks, a floating lid is desirable.

(c) Routine automatic processor maintenance

Routine processor checks are necessary to ensure consistent processor performance.

Materials/instruments required

- Bi-metallic or solid state thermometer
- Spare water filters
- Lint-free towels
- Green Scotch Brite cleaning pads
- Protective clothing

Procedures - Daily
1) Make sure water is turned on prior to processing film. If processor is not a cold water unit, make sure the water temperature is at least 3 to 6 °C below processor development temperature.

2) Check the solution level in the developer and fixer tanks at the beginning of each day.

3) If the level is below the weir (overflow), add enough chemical to bring the level up to the weir.

4) Check the developer temperature. If it is not within ± 2 °C of the desired temperature, adjust as necessary until the desired temperature is reached on a thermometer (not the processor's thermostat). To properly maintain sensitometry, the temperature should remain within ± 1 °C of the desired temperature.

5) Run a few unprocessed films to clean the rollers. Check for artefacts on the film surface. Repeat as necessary until films exit the processor clean. Do not use processed film because chemicals retained on them may contaminate the developer bath.

6) At the end of the day, turn off the processor and remove the crossovers. Rinse them with warm water and towel dry. Place them back in the processor and leave the cover on top of the processor slightly ajar so chemical vapors can escape.

Procedure – At servicing by service engineer.

1) Properly clean the tanks and racks.

2) Check all rollers and gears for unusual wear.

3) Check the developer and fixer replenisher rates.

4) Check the film travel time through the processor.

5) Replace the developer filter.

6) Fill the processor with fresh developer and fixer.
7) Check the wash water flow.

8) Check all three tanks for proper circulation.

9) Conduct quality assurance testing and discuss the results with the Radiographer.

**(d) darkroom light leakage and safelight monitoring**

Safelights and light leakage cause one of the major darkroom problems, fogged film. Particular safelight conditions which cause fogging include:

- a safelight filter which is inappropriate for the film in use - consult your film supplier
- a safelight that contains a bulb with the wrong wattage - consult your film supplier
- a safelight too close to the loading bench or processing area - safelights should be greater than 1.5m from the work area
- a safelight that has white light leaks due to cracks or chips - replace

**Safelight Test**

1) If there is more than one safelight in the darkroom, each safelight must be tested with the others turned off and then a test should be made with all safelights on.

2) Because film is more sensitive after exposure, half of the test film should be sensitised. Using a 24 x 30cm cassette, cover half of the film longitudinally with a piece of lead or lead rubber and use an exposure of 40kVp, 3 mAs at a FFD of 2 metres.

3) With all lights off place the sensitised film on the bench under the light to be tested and cover all but 3cm with a piece of cardboard. The edge of the cardboard to be placed parallel to the side of the film with the shortest dimension.

4) Turn on the safelight and after 15 seconds move the cardboard to expose another 3cm of film.

5) Continue moving the cardboard at 15 second intervals another six times.

6) Turn off the safelight and process the film.
7) Label the film according to the times of exposure.

8) The first section exposed will have received the longest safelight exposure (2 minutes) while the last section will have received no safelight exposure.

9) The resultant film will show the level of fog affecting both exposed and unexposed film. An increase in optical density of 0.2 above base fog determines the maximum "safe" time under the safe light.

**Darkroom Light-Proof Test**

1. Stand in the darkroom with the door closed and all lights off.
2. Allow your eyes to adjust to total darkness for about five minutes.
3. Check thoroughly for white light leaks around doors, hatches, window blinds etc.
4. Any gaps allowing light to leak into the darkroom must be covered to exclude light leaks.
16. ACQUISITION, SUPPLY, DISPOSAL AND RELOCATION OF X-RAY EQUIPMENT

This section outlines the legislative requirements associated with the acquisition, supply, disposal and relocation of X-ray equipment. Attachment 2 provides the contact details for Radiation Health and the Chief Executive of Queensland Health.

(a) Acquisition

The approval of the Chief Executive of Queensland Health must be sought and obtained prior to acquiring X-ray equipment. Application forms are available from Radiation Health.

(b) Supply

If the X-ray equipment is to be sold to another person in Queensland, the possession licensee must ensure that the proposed new owner has:

- a licence to possess the type of X-ray equipment to be purchased; and
- an approval to acquire the X-ray equipment.

(e) Disposal

To dispose of X-ray equipment, the X-ray tube must be destroyed (ie. physically broken). Following this, the possession licensee must give the Chief Executive of Queensland Health written notice of the disposal within seven (7) days of the disposal.
(d) Relocation

The approval of the Chief Executive of Queensland Health must be sought and obtained prior to the relocation of the X-ray equipment outside Queensland. Application forms are available from Radiation Health. The Chief Executive must be notified within seven (7) days after the device has been relocated.
17. REMEDIATION PROCEDURES

The following procedures must be observed in the event of actual or suspected malfunction of X-ray equipment causing, or suspected of causing, unexpected exposures:

- The user is to switch off the X-ray equipment as quickly as possible at the main supply.

- The user is to take precautions to prevent the unauthorised or inadvertent energising of the malfunctioning X-ray equipment by:
  1. posting a sign which states that the X-ray equipment is not to be used
  2. removing the key to the operation controls or taking other appropriate actions if there is no provision for locking the controls

- The X-ray equipment is not to be used until the unit is repaired and the possession licensee authorises its use.

- The radiation safety officer must assess the radiation doses to persons involved in an incident in which there is a potential for radiation exposure.

(a) Incident notification

A written incident report is to be produced by the radiation safety officer and submitted through the possession licensee to the Chief Executive of Queensland Health at the address shown in Attachment 2 within seven (7) days of the occurrence of an incident. This report is to include:

- incident description including details of the X-ray equipment involved and its location;

- estimates of radiation doses to individuals (if applicable);
 action taken; and

 proposals to prevent a recurrence.

Note: A radiation incident means an incident adversely affecting, or likely to adversely affect, the health or safety of any person because of the emission of radiation.
## ATTACHMENT 1

### X-RAY EQUIPMENT DETAILS 18.2.08

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<th>No.</th>
<th>Equipment Type</th>
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<td>Trophex</td>
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<td>69348</td>
<td>Fixed in Dental/Trauma Room</td>
<td>2.6.2008</td>
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<td>Due every 3 years</td>
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<td>9</td>
<td>DGN</td>
<td>Econet</td>
<td>Ultra 60HF</td>
<td>E-F3200-070902</td>
<td>7C0084</td>
<td>Portable (Gatton) 31/1/08 awaiting delivery from Radincon. Aquisation approved by Radiation Health 14/1/08</td>
<td></td>
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</tbody>
</table>

**Equipment Type**
- DEN: intra-oral dental radiography unit
- CTS: Computed tomography X-ray unit
- DGN: Diagnostic X-ray unit
- FLR: Diagnostic fluoroscopy X-ray unit
ATTACHMENT 2

CONTACT DETAILS

Possession Licensee

The University of Queensland, Nominee: Executive Director (Operations)

Contact: Michael Williamson,
Radiation Protection Adviser,
OH&S Unit,
Phone 3365 4504

Radiation Safety Officer

Meg Day
Radiographer,
School of Veterinary Science. (Gatton)
Work Phone 07 5460 1911/3365 2064
After Hours 0434 638 624

Radiation Health

Radiation Health Adviser
Radiation Health
450 Gregory Terrace

FORTITUDE VALLEY 4006

Telephone: (07) 3406 8000 (9am to 5pm Monday to Friday)
Facsimile: (07) 3406 8030

Personal Radiation Monitoring Device Provider
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)
619 Lower Plenty Road
YALLAMBIE, VICTORIA 3085
Telephone: 1800 678 112
Facsimile: (03) 9432 1835
**ATTACHMENT 3**

**Example:** X-RAY REGISTER

<table>
<thead>
<tr>
<th>Date</th>
<th>Owner's Name</th>
<th>Patient's Name</th>
<th>Species</th>
<th>Particulars of examination</th>
<th>Weight or Thickness</th>
<th>Exposure Parameters</th>
<th>X-ray Operator</th>
<th>Comments</th>
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ATTACHMENT 4

LIST OF STAFF ALLOWED TO USE THE X-RAY EQUIPMENT

NB details of the specific class of work permitted must also be included

<table>
<thead>
<tr>
<th>Name</th>
<th>Licence authorities</th>
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ATTACHMENT 5

PERSONS PERFORMING MAINTENANCE AND QUALITY CONTROL CHECKS

Toshiba (Australia) Pty Ltd., Medical Division, Service Department.
Phone: 3902 7810
Address: 4/20 Smallwood Place, Murrarie, Qld. 4172
Contract Details: Annually renewed contracts to provide full 6 monthly services to general/flouroscopy room and 3 monthly to CT scanner. Calibration of this equipment to Queensland Radiation Health standards is also done by Toshiba Medical Division engineers.

Hanimex Medical Division.
Phone: 3552 6700
Address: 12B Windorah Street, Stafford, Qld. 4053
Engineer: subcontracted to Robert Dilworth of Queensland Technical Engineering to provide full services to automatic processors

Regular servicing of Mobil x-ray Units by
Southern Electrotech or other Radiation Health recommended engineering services. Calibration of this equipment to Queensland Radiation Health standards is also done by these engineers.
33. UQ School of Veterinary Science, Gatton & St Lucia. Computer Tomography (CT) Standard Operating Procedures

**Purpose**

To provide high quality CT images to Clinicians in a manner that reduces radiation exposure risk to staff and maintains safety of the animal at all times.

**Definitions**

CT - Computer Tomography. An advanced imaging modality that allows cross sectional visualisation of anatomical structures.

Contrast - Iodine based liquid pharmaceutical designed to highlight the vascular system in diagnostic imaging procedures. Some patients may suffer allergic reaction with contrast media.

**Procedures**

**Radiation Safety:-**

18. Before using any equipment in this department you should read the UQ School of Veterinary Science’s Radiation Safety and Protection Plan.

19. CT is an advanced imaging modality and as such **ONLY THOSE who have a specific CT User’s licence for Veterinary purposes** may use this equipment. **NO EXCEPTIONS.**

20. UNDER NO CIRCUMSTANCES, should any staff or students be in the CT room whilst scanning is performed. It is the responsibility of the person performing the CT scan to ENSURE that all personnel have departed the CT room prior to scanning.

21. Patients **must** have a general anaesthetic for all CT examinations. The examination may be paused or terminated at any point should the Anaesthesia team deem the patient to be unstable.

22. **Emergency contact is Meg Day the Radiographer/Radiation Safety Officer for Diagnostic Imaging. Phone 0434 638 624**

**Patient Safety:-**
1. The patient’s safety must be maintained at all times. Patients must be supported on the CT table with positioning aids such as sand bags and foam blocks for small animal cases.

2. The Equine CT table at Gatton must support the weight and position of the horse with the appropriate foam pads, supporting stands and strapping devices provided. Care must be taken when hoisting the horse from the knock down room onto the table that all mechanical functions work properly and all staff present are aware of the potential for injury to both staff and patient via mechanics.

3. The Equine CT table MUST be supervised by a minimum of 6 staff when hoisting, transporting and aligning the table to the CT machine.

4. The wheels of the Equine CT table must face the correct position in order to travel in the direction required.

5. Prior to CT scanning a test table move should be performed to ensure that all intubation equipment and patient stability can be maintained throughout the scan.

Prior to Scanning
- Each day the CT machine must be switch on at the generator and full warm up performed. This will help to maintain the tube life.
- The tube temperature MUST be above 20% before a CT scan can commence. Warm up the tube by selecting Utility, Maintenance Utility, Emergency Warm up.

CT Scans & Protocols
- Protocols for each species and anatomy have already been programmed into the CT machine. You shouldn’t have to adjust any of the properties. Except for mAs if you require more dose to attenuate larger patients. Reducing the scan pitch can also help in these cases.
- The 16 Slice Asteion at Gatton will provide a volume set for each scan in the MPR function. This volume can be changed to different windows if required. Coronal and sagittal images can be obtained from these data sets.
- Use of contrast should be determined prior to the scan. It must be warmed up by placing the bottle in a mug of hot water. Contrast is administered at 2mL per Kg. Omnipaque 20mL and Ultravist 50mL bottles are available depending on the amount required. Consult the Radiologist prior to injecting contrast media. Patients must be closely monitored during and post contrast injection to ensure no reaction has occurred.

To scan:
- Enter patient ID number (*CLV number ie CLV13) is very important
- Enter patient name (Client’s surname with capital letters, the Patient’s name in First name box and breed in the middle name box).
- Enter DOB and any other comments (ie Right carpus etc)
- Label if contrast was used.
- Select the protocol to be scanned (ie Dog Brain, Equine lower limb).
- Scan using the pre set parameters and check post scanning to ensure all the anatomy of interest has been scanned (using image selector).
- Scan post contrast if required.
- Inform anaesthesia they may depart with the patient.
- Wait for all the data boxes (top left hand side) to count to 0.
- Perform MPR/3D reconstructions (see Meg).
- Axial (transverse images) automatically send to the PACS system. Any MPR/3D images you perform will need to be transferred to PACS using the image selector.

**PACS (Synapse)**

- Is a computer system used to store patient’s images.
- X-ray, Ultrasound, CT, Nuclear Medicine, II images can be found on the PACS (named Synapse) system. It DOES NOT store any information about the patient or client.
- If patient details are incorrect on Synapse it is very difficult to search for patients and also to correct the mistakes. **Please ensure patient number is correct and name is spelt correctly when performing examinations on Fuji CR.**
- You will need to supply Meg with your UQ Login username to gain access to Synapse. To access Synapse simply log on (with UQ username) to the PACS computer (last one in Small Animal control room), any computer in the radiology tutorial room or large screen in Radiologist’s room. Synapse is found on the desk top. Double click it to open.
- A number of folders should appear. All patients, all recent studies etc. There should be a folder with your name as well.

**To search for patient’s images**
- Click open the ALL RECENT STUDIES folder.
- Search for the patient’s name by entering it in the box underneath Patient name and hit enter.
- If you can’t find your patient either search in ALL PATIENTS or use PATIENT ID to find.
- If you can’t find your patient’s images check to see that you have sent your images from the Toshiba scanner to PACS.
- All other problems with PACS should be directed to Meg the Radiographer or Amanda Russell (ITS) BEFORE contacting Fuji. This applies during business hours and After Hours.

To exit Synapse, simply close the window. You MUST log off after using Synapse so other users cannot change your settings.

**Filming (St Lucia only)**

- Copies of films must be printed to film at St Lucia. One copy of axial (bone + soft tissue) plus Coronal and Sagittal images if substantial pathology is noted.
- Print the thicker slice series if possible to reduce the amount of films.
- These are to be stored in the appropriate patient file, labelled by date accordingly.

**Equine Protocol**

1. In parked position, insert plug into wall outlet.
2. Flip switch on computer box to up position.
3. Press green POWER switch on.

Allow compressor to run for approximately 5 minutes to fill air tank.
4. With POWER switch still on, and AUTO/MANUAL switch set to MANUAL, drive CARRIAGE to rear of table.
5. Install HEAD support and lock into place.
6. Remove pad from couch.
7. Place curved magnet plate onto couch over indicated markers.
8. Lower COUCH to (000mm) to allow clearance for table.
10. Flip switch on computer box to down position.
11. Remove plug from wall outlet.
12. With horse suspended from hoist, move table under horse.
13. Position pads and dorsal recumbency supports as needed.
14. Lower horse onto table.
15. Move table into room, guiding right front wheel onto track.
16. Continue moving table and guide right rear wheel onto track.
17. Table will stop when right front wheel meets plate.
18. Attach parking cable to loop at right front wheel.
19. Swing orange lock handle to lock position.
20. Install leg and rump supports as needed.
21. Insert plug into wall outlet.
22. Flip switch on computer box to up position.
23. Press green POWER switch on.
24. Raise COUCH to (035 mm) to establish magnetic connection, as indicated by GREEN light on back of magnetic transducer.
25. Move COUCH so that black line is at nose of couch frame.
26. With AUTO/MANUAL switch in MANUAL position, drive horse “IN” until the carriage stops, then, drive it “OUT” about 2 inches (5cm).
27. Set AUTO/MANUAL switch to AUTO.
28. Set technique at CT operator console and start scouts and scans.
CT Shutdown

At the end of the day, ensure Equine CT table is removed from the Toshiba table. On the screen select Utility. Scroll down to shutdown. Wait until the computer screen says it is safe to turn off the machine. Turn switch to off position on the generator.

Equipment:-

X-ray Equipment

A list of x-ray apparatus may be found in Attachment 1 of the Radiation Safety and Protection Plan (RSPP). Servicing and Compliance testing of this equipment must be completed as per the RSPP. The next due dates for such testing can be found in Attachment 1 of the RSPP and is covered in more detail in X-ray Apparatus Compliance and Service Standard Operating Procedure.

If you suspect any x-ray equipment to be faulty, you must:-

7. Switch equipment off with console switch
8. If possible switch off at mains power switch on wall
9. Notify the Radiation Safety Officer (Meg Day 0434 638 624) IMMEDIATELY

PPE Equipment

Gowns must be stored hanging in a position at all times. Thyroid collars and lead shields must be stored lying flat. All PPE equipment is to be checked thoroughly for damage annually during the Radiation Safety Audit.

If you suspect any PPE equipment to be faulty, remove it from the PPE storage area. Place it in LYING FLAT (not folded or dumped) on the radiographer’s desk with a quick note saying where you suspect the damage is and when this occurred. The radiographer will assess if it needs repair or is to be replaced.

Related Documents:-

- Radiation Safety and Protection Plan (RSPP) for the UQ School of Veterinary Science
- X-ray Apparatus Compliance and Service Standard Operating Procedure
34. UQ School of Veterinary Science, Gatton & St Lucia. X-ray Apparatus Compliance and Service Standard Operating Procedure

**Purpose**

To ensure proper maintenance of radiation producing apparatus and reduce the risk of radiation exposure to staff as per the UQ School of Veterinary Science’s Radiation Protection & Safety Plan.

**Procedure**

**CT scanner:** The CT scanner is serviced 3 times a year under contract to Toshiba Medical and compliance tested each year.

The services should be scheduled for March, July and November with calibration at the July service each year.

**General Rooms/Fluoroscopy:** Servicing twice a year under contract to Toshiba Medical and compliance testing each year.

The services should be scheduled for January and July with calibration done at the January service each year.

**Mobile Machines:** Should be serviced every 2 years and compliance tested every year if used for teaching otherwise every 5 years.

**Processor:** Service contract with Fuji Medical (subcontracted to Robert Dilworth of QTE) covers 3 routine services per year for the machine at Small Animal Clinic & Veterinary Teaching Hospital, St Lucia.

The services should be scheduled for January, May and September each year.

The benchtop processor at Gatton should be serviced and set up at the start of each teaching year by Robert Dilworth of QTE, then decommissioned at the end of teaching.

Wet developing tanks should be cleaned and fresh chemicals mixed ready for the start of the teaching year.

**X-ray/CT Rooms:** Are compliance tested every 5 years as per the National Standard.

**PPE:** Must be check annually either by x-ray or manual inspection during the Radiation Safety Audit. Any protective equipment found damaged must be repaired or replaced.