Standard Operating Procedure

MANAGING DISEASE RISK IN WILDLIFE MANAGEMENT

Prepared by: Species and Communities Branch, Science and Conservation, Department of Biodiversity, Conservation and Attractions

Prepared for: Animal Ethics Committee

Version 1.1

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GOVERNMENT OF WESTERN AUSTRALIA

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Contents

1 Purpose

Managing fauna disease risk should be considered by all personnel working in research and wildlife management, including those conducting biological surveys, fauna monitoring programs, captive breeding programs, translocations and introduced predator control, and when handling sick, injured, orphaned and confiscated fauna. This document is designed to raise awareness of the potential for disease transmission and to provide advice in regards to minimising the risk of disease transmission between wildlife populations, and from wildlife to personnel and their families

This standard operating procedure provides advice on managing disease risk regarding fauna-related activities in research and wildlife management only.

2 Scope

This SOP has been written specifically for scientific and education purposes, and endorsed by the Department's Animal Ethics Committee. However, this SOP may also be appropriate for other situations.

This SOP applies to all activities involving fauna that are undertaken across the State by Department of Biodiversity, Conservation and Attractions (hereafter Department) personnel. It may also be used to guide fauna-related activities undertaken by Natural Resource Management groups, consultants, researchers and any other individuals or organisations. All Department personnel involved in fauna research and management should be familiar with the content of this document.

Projects involving wildlife may require a licence under the provisions of the *Wildlife Conservation Act 1950* and/or the *Biodiversity Conservation Act 2016*. Personnel should consult the Department's Wildlife Licensing Section and Animal Ethics Committee Executive Officer for further guidance. In Western Australia any person using animals for scientific purposes must also be covered by a licence issued under the provisions of the *Animal Welfare Act 2002*, which is administered by the Department of Primary Industries and Regional Development. This SOP complements the *Australian code of practice for the care and use of animals for scientific purposes* (The Code). The Code contains an introduction to the ethical use of animals in wildlife studies and should be referred to for broader issues. A copy of the code may be viewed by visiting the National Health and Medical Research Council website (http://www.nhmrc.gov.au). In relation to disease risk, Section 5 of The Code is particularly relevant:

- 5.1.7(iii) All materials and equipment used in the capture, holding, transport and manipulation of animals must be cleaned and maintained in a way that minimises the assessed risk of disease transmission.
- 5.4.3 Holding areas and containers must be safe, quiet and hygienic.
- 5.4.4(v) Close confinement devices such as bags and crates must minimise the risk of disease transmission.
- 5.7.1(i) Field techniques: Minor procedures…identification (e.g. leg banding, ear tagging, micro-chipping, radio-tracking devices),…and sampling (e.g. hair feathers,

scales, blood, stomach contents)…must be performed in an uncontaminated area by competent persons, using clean equipment in each instance.

3 Definitions

Animal handler: A person listed on an application to the Department's Animal Ethics Committee who will be responsible for handling animals during the project.

Anthroponotic: Diseases acquired by animals from contact with humans.

Disinfect: To cleanse something so as to destroy or prevent the growth of disease-carrying microorganisms.

Host: The animal or plant on which or in which a parasitic organism lives.

Pathogen: Any disease-producing agent, especially a virus, bacterium, or other microorganism.

Trapping session: For the purposes of this document a trapping session is the culminant of one or more days trapping at the same site and for the one purpose, using the same equipment.

Vector: An insect or other organism that transmits a pathogenic fungus, virus, bacterium, etc.

Wildlife: Free-living animals of native, non-indigenous or feral species.

Zoonotic: Diseases acquired by humans from contact with animals.

4 Understanding Disease and Disease Transmission

Some diseases have a relatively simple mode of transmission, while others go through a complex lifecycle and the symptoms may not appear for weeks or even months. Animals can also carry the agents of disease and can transmit disease, without displaying symptoms.

While there is growing knowledge about specific diseases in wildlife, there is still limited understanding of transmission processes and disease-specific precautions against infection and transmission. This is why the **basic principles of personal and equipment hygiene must be followed at all times to minimise the risk of exposure to disease agents and minimise the risk of spreading disease** (see Section 5.1).

Department personnel should make themselves aware of any diseases known to be associated with a particular species or region in which they work, including the:

- Biological agent that causes the disease such as a virus, bacterium, fungus or parasite (if known);
- Host or animal that carries the disease;
- Mode of transmission from the host to humans and to other animals;
- Clinical signs in animals;
- Symptoms in humans;
- General and specific principles of how to prevent the spread of disease;
- Relevant vaccinations that may be applicable.

It should also be noted that there is potential for diseases not yet recorded as occurring in Western Australia to be present in the environment. Generalised information on common zoonoses is provided in Appendix I. Other potential sources of information on zoonoses are provided in Section 10.

Diseases can be of particular concern for a number of conservation and health based reasons. A range of diseases are known, with many more unknown, which exhibit a variety of characteristics. Even healthy animals, including humans, carry bacteria on all parts of their body, which can potentially cause disease in humans or other animals. Transmission of pathogens can occur between animal populations both within and between species. Many zoonoses do not show symptoms in the host animal, but may be very debilitating and even fatal in humans. Anthroponotic diseases are those that may be transmitted from humans to animals, endangering the welfare of wildlife populations. Thus disease management is an important aspect of fauna management activities.

Sources of disease include animals themselves, and environments contaminated by animals. Diseases may be present in any living or dead animal material including faeces, fur, hides, blood, urine, other bodily fluids and carcasses. Disease can be transmitted via vectors, the air, dust, food, water and anything else that comes into contact with the animal. The main mechanisms through which transmission can occur include contact, droplet, airborne and vector-borne, and the same agent may be transmitted by more than one route:

- Vector transmission: Disease transmitted by vectors such as ticks, fleas, mites and mosquitoes.
- Droplet transmission: Droplets from the mucus membrane created by coughing, sneezing and vocalising are propelled through the air.
- Airborne transmission: Pathogens travel via the air and are inhaled by the host.
- Contact transmission: Pathogens enter a host via ingestion of contaminated food or water, mucous membranes, broken skin or from hands to the eyes and mouth. This can be transmitted through direct contact with an animal or a contaminated intermediary object (tagging and measuring equipment, traps and handling bags, food containers, water containers and bedding). Personnel involved in wildlife management related activities and any animals involved will likely be most susceptible to this transmission pathway.

All animals should be handled with the presumption that they carry disease.

Overreaction to, or complacency in the presence of zoonoses and anthroponoses must be considered and personnel must meet an educated balance at the direction of the Chief Investigator (CI), Program Manager, or equivalent on an individual project/program basis where possible.

Exercise high levels of caution when translocating wildlife and releasing captive-bred animals. Animals should be subject to a basic health assessment prior to transporting any individuals in addition to risk assessment (see Section 7.3).

5 Procedure Outline

These procedures may be utilised as guidance in a range of wildlife activities such as those that involve fauna capture and associated procedures (e.g. application of tags or

microchips), in addition to unforeseen situations such as encountering an injured or ill animal. In order to reduce the risk of disease transmission from animals to humans (and vice versa) **staff must adhere to standard hygiene protocols and be able to recognise and deal with animals exhibiting signs of illness/disease**

5.1 Standard equipment hygiene protocols

Even if the highest standards of cleaning and disinfection are employed, some bacteria, fungal spores and viruses will still be resistant to common disinfectants. It is not possible to achieve complete sterilisation in the field. This is why the basic principles of personal and equipment hygiene must be followed at all times to minimise the risk of exposure to disease agents and minimise the risk of spreading disease.

5.1.1 Basic principles for cleaning and disinfection:

The methods used to clean and disinfect equipment must be determined by the CI (or equivalent), depending on the degree of risk and the availability of facilities and equipment. When selecting and using chemical disinfectants, ensure that they are:

- Broadly or universally effective;
- Non-irritant to skin and other tissues;
- Prepared in accordance with the manufacturer's instructions (e.g. concentrations, dilutions) and used as directed.

Disinfection must be employed in any situations of considerable disease risk; where many animals are closely confined together, equipment will come in contact with animals, where an animal is unwell or an outbreak of disease is known or suspected to have occurred.

5.1.2 General hygiene procedures:

The following general procedures are applicable to all activities that involve the handling and/or transportation of wildlife. Equipment and items that come into contact with wildlife such as traps, nets, pet packs, handling bags, bedding etc. should receive appropriate hygiene treatment, especially when an animal suspected of disease is encountered.

1. Mechanical Cleaning

This will remove much (but not all) of the biological contaminants and agents that can transmit disease

- Check all relevant equipment for ticks prior to cleaning and remove them.
- Remove any animal products or remaining food/bait if applicable.
- Wash and scrub equipment with soap/detergent and hot water to remove all dirt and faeces. A high pressure cleaner can be useful for removing stubborn materials from larger items provided it is used in a manner that doesn't contaminate personnel and their surroundings.

2. Chemical Disinfectants

Once equipment has been mechanically cleaned, application of various chemical disinfectants will kill most (but not all) of the remaining biological agents of disease.

When using chemical disinfectants, ensure that they are:

- Used on the surface of all equipment;

- Rinsed off in clean water so that no residue remains, as residue can cause irritation to animals and in some cases degrade equipment surfaces. The residue smell may also discourage animals from entering traps and/or cause stress while in bags.

3. Drying and Sunlight

Bacteria flourish in warm, moist environments with biological materials (blood, tissue and faeces). Drying and exposure to sunlight (UV radiation), will kill most (but not all) bacteria. Equipment should be placed in the sun following cleaning and disinfection until completely dry.

5.1.3 Disinfectant products

Ensure all chemical label warnings are adhered to and that products are stored appropriately. Refer to the *Material Safety Data Sheet* (MSDS). Ammonia and ammonium compounds are NOT recommended for equipment hygiene purposes.

1. Disinfectant products for traps and equipment

- Multi compositional products such as VirkonS®: Can be used to clean organic matter and disinfect in one step. This is effective against papilloma and polyoma viruses (e.g. causative agents of western barred bandicoot wart syndrome) at 1:100 dilution for 10 minutes. Always rinse equipment following use. DO NOT USE directly on animals, or equipment/hands in direct contact with face of animals. *Note: purchase of 1% solution or tablet form is recommended as pre-diluted powder is an irritant to skin, eyes and respiratory tract through dust release.*
- Multi composition product F10SC®: Veterinary Disinfectant - Not as effective as VirkonS® against resistant viruses, though it is more effective than most other disinfectants and is less of an irritant. Use at 1:500 dilution for 10 minutes is sufficient for ordinary applications and won't degrade trap material. Where highly resistant non-enveloped viruses are suspected, 1:125 dilution >20 minutes is recommended.
- Halogens such as chlorine bleach (e.g. sodium hypochlorite): Effective against bacteria, spores, fungi and many viruses. Causes irritation and can also be corrosive to metal and fabric. Use at 1:10 dilution for household bleach. Immersion is sufficient for standard (low risk) disinfection though soaking for 10 minutes will ensure more thorough disinfection. SHOULD NOT BE USED ON ANIMALS OR HANDS and must always be thoroughly rinsed off anything that is likely to come into contact with animals. This disinfectant tends to be ineffective in the presence of organic material, therefore thorough cleaning must be performed prior to application.
- Chlorhexidine (e.g. Savlon® or Hibitane®): Dilute as recommended for use on equipment. Useful against some viruses including rabies (and therefore probably bat lyssavirus), but less effective against some bacteria. This disinfectant is ineffective in the presence of organic material therefore thorough cleaning must be performed prior to application.

2. Disinfectant products for handling bags

- VirkonS®: Handling bags can be soaked for 10 minutes at 1:200 dilution.
- F10SC®: Handling bags can be soaked for 30 minutes at 1:250 dilution.

Wash handling bags and any other material items that have made contact with animals separately from personal clothing. Hand hygiene should be performed after handling used laundry items.

5.1.4 Detailed hygiene procedures

The general hygiene procedure described in Section 5.1.2 is applicable when undertaking any fauna-related activities that involve the use of traps. More detailed guidance is provided below for high and low disease risk situations where wire cage, aluminium box and soft cage traps are commonly used.

Note: The following procedures are a guide only. Appropriate methods should be determined on an individual project basis by the project CI or equivalent.

1. High disease risk situations

Any monitoring or translocations between the mainland and islands or between populations that are known to have had diseases present that constitute a risk to the status of those populations represent a high disease risk situation.

Personnel and equipment should only work/travel from low to high risk areas to reduce likelihood of transporting/moving diseases between sites in these instances.

All equipment/materials used in high risk situations MUST be cleaned and disinfected at the end of the trapping session or in between sites. One handling bag is required for each individual animal and must be cleaned and disinfected prior to further use. Relevant trapping kit equipment should also be disinfected between animals.

If the risk of vector transmission is particularly extreme it may be necessary to incinerate bags, and to clean and disinfect traps between each entrapment (i.e. between each redeployment or rebaiting of traps within a trapping session).

As per Section 5.1.2, all traps should be mechanically cleaned thoroughly then soaked in VirkonS® at 1:100 dilution (or equivalent product) before being rinsed and dried via UV exposure for 24 hours. In the case of soft/material traps F10SC at 1:125 dilution may be the preferred disinfectant as it is less abrasive on material. Handling bags should be soaked in VirkonS® before being machine washed and dried via UV exposure for 24 hours. Covers used on traps should also be treated with UV exposure for 24 hours (e.g. hanging hessian bags in sun). Refer to Section 5.1.3 for further details regarding use of the associated chemicals.

Note: Aluminium box traps should be fully opened during cleaning by removing the side pin.

2. Low disease risk situations

Standard monitoring and translocation programs represent a low disease risk situation provided you follow the basic principles of personal and equipment hygiene at all times to minimise the risk of exposure to disease agents and to minimise the risk of spreading disease.

All equipment including traps, trapping kits and handling bags must be cleaned and disinfected at the end of the trapping session or in between sites. Handling bags only require hygiene measures in between individual animals when the animal is suspected of being ill or carrying disease, or the bag has been soiled.

As per Section 5.1.2, perform mechanical cleaning of wire traps where required (those that are contaminated with organic and/or biological matter) followed by immersion of all traps in 1:10 bleach solution (or equivalent), before being rinsed and dried via UV exposure. In the case of soft/material traps soaking in F10SC at 1:500 dilution is the preferred disinfectant as bleach is abrasive on material. Handling bags should be machine washed with standard laundry detergent and hot water, and can be either machine or air dried. Trap covers can also be aerated and treated with UV exposure as disinfection. Refer to Section 5.1.3 for further details regarding use of the associated chemicals.

Note: Aluminium box traps should be fully opened during cleaning by removing the side pin.

3. Specific procedure for funnel traps

There are many techniques used to capture fauna utilising a variety of trap and net based variants. As a general rule any piece of equipment coming into contact with fauna should be subject to standard hygiene measures as described in Section 5.1.2.

Funnel traps are generally considered to present lower disease transmission risk compared with cage and aluminium box traps due to differences in the nature of the types of animals targeted.

In all instances, funnel traps should be emptied by unzipping and shaking out any loose material before folding and transporting them to another site. Care needs to be taken not to transport faecal material or seeds caught in the mesh or shade cloth.

If wet faecal matter or other biological contaminants are present in traps, mechanical cleaning followed by UV radiation (24 hours exposure) to dry and disinfect traps should be employed at the end of the trapping session or between sites. Handling bags should be machine washed with standard laundry detergent and can be either machine or air dried.

If there is a greater cause for concern to increase disease risk measures (i.e. mammals are frequently entering traps and defecating), the chemical disinfectant step should also be employed.

5.2 Standard personal hygiene protocols

5.2.1 General hygiene procedures

The most important personal precaution when coming into contact with fauna or any surface that has been in contact with fauna is hand hygiene.

1. Mechanical Cleaning

Simple thorough washing and scrubbing of hands with soap/detergent and hot water to remove all dirt and faeces will remove much (but not all) of the biological contaminants and agents that can transmit disease. A mild liquid hand wash or skin disinfectants formulated for use without water (e.g. alcohol based hand rub) should be sufficient for standard routine hand hygiene where hands appear visibly clean. Dry hands with a disposable towel after washing. Bar soaps are not acceptable, especially in field situations.

2. Chemical Disinfectants

Once hands have been mechanically cleaned, application of various chemical disinfectants will kill most (but not all) of the remaining biological agents of disease where hygiene risk is considered greater than normal. Many disinfectant products are ineffective in the presence

of organic material and therefore mechanical cleaning must be performed followed by drying of the hands and prior to disinfectant application. This additional disinfectant step is only required in situations of high human health risk (i.e. skin contact with faeces or bodily fluids of animals and handling animals known to carry zoonoses).

When using chemical disinfectants, ensure that they are:

- Used on the surface of the hands
- Rinsed off so that no residue remains

5.2.2 Disinfectant products

Ensure all chemical label warnings are adhered to and products are stored appropriately (refer to the MSDS). Ammonia, ammonium and aldehyde compounds are NOT recommended for personal hygiene purposes.

1. Disinfectant products for use on skin
    - Swabbing alcohol: Useful as a mechanical cleaning product. This rapidly acting antiseptic disinfectant kills most bacteria and some viruses. Can be drying to skin and causes irritation to eyes and open wounds. Alcohol based hand rubs are available for use in the field.
    - F10 veterinary disinfectant can be applied at a dilution of 1:125 for >30 seconds on hands though is also available as wipes and in gel form for use on skin in the field. This product mechanically cleans and disinfects in one step.
    - Povidone iodine (e.g. Betadine®): A non-irritant that can be used on clean skin and wounds as an antiseptic disinfectant. It is effective against most bacteria, fungi and many viruses. Suitable as a disinfectant after mechanical cleaning.
    - Dilute Chlorhexidine (e.g. Savlon® or Hibitane®): Dilute as recommended for use on skin. Useful against some viruses including rabies (and therefore probably bat lyssavirus), but less effective against some bacteria. This disinfectant is ineffective in the presence of organic material and is therefore suitable as a disinfectant only after mechanical cleaning.
2. Disinfectant products for use on clothing and personal items
    - VirkonS®: Clothing can be soaked at 1:200 dilution for 10 minutes. A 1:100 solution will adequately disinfect footwear or other non-fabric surfaces that may be contaminated.
    - F10SC®: Clothing can be soaked at 1:250 for 30 minutes.

Wash handling bags and any other material items that have been in contact with animals separately from personal clothing. Hand hygiene should be performed after handling used laundry items.

5.2.3 Detailed hygiene procedures

The general hygiene procedure described in Section 5.2.1 is applicable when undertaking any fauna-related activities that involve the use of traps. More detailed guidance is provided below for high and low disease risk situations.

1. High disease risk situations

Any monitoring or translocations between the mainland and islands or between populations that are known to have had diseases present that constitute a risk to the status of those populations represent a high disease risk situation. **From a personal hygiene perspective high risk pertains to situations involving animals potentially harbouring disease of significant human health risk (e.g. bats) and any instance where animal faeces or bodily fluids contact the skin.**

Only personnel who need to be directly involved should remain in the immediate vicinity in high disease risk situations.

Hand hygiene must occur before animal handling commences and in between each individual animal (see Section 5.4.3). Gloves must be worn by handlers and changed in between individual animals in addition to performing hand hygiene. It may also be appropriate to wear a face mask.

All clothing and personal belongings that may have come into contact with an animal directly or indirectly via unclean hands must be bagged and disinfected as soon as practicable. Clothing should be soaked in VirkonS® or F10SC (or equivalent product) followed by machine wash and UV exposure. Refer to Section 5.2.2 for further details regarding use of the associated chemicals for these purposes.

2. Low disease risk situations

At minimum, personal hygiene must occur at the end of a trap clearing round and immediately after contact with faeces or other bodily fluids of an animal. Gloves may be used at the handlers' discretion. Clothing can be machine washed with standard laundry detergent and hot water, and machine or air dried. Refer to Section 5.2.2 for further details regarding use of the associated chemicals.

5.3 Dealing with fauna presenting signs of illness

There are instances where an animal may be afflicted with a particular disease that could potentially be a health risk to humans and/or other wildlife populations. There are procedures that should be followed in order to manage and report suspect disease cases and guidance is provided below.

5.3.1 Recognising diseased animals

Disease and ill health may not be obvious in wild animals because they hide signs of weakness (which would make them vulnerable to predation) by instinct. However, there are a few simple signs to look out for that may suggest an animal is not completely healthy:

- Thin (boney) and underweight
- Poor coat or feather condition (dry, harsh, matted, patchy)
- Signs of diarrhoea (soft wet faeces around tail, trap, bag, stuck to fur or feathers)
- Large numbers of external parasites (ticks, fleas, mites)
- Discharges from eyes or nostrils
- Sneezes, coughs, noisy breathing or heavy breathing (when animal is calm and not stressed)
- Open wounds present in large numbers (may look old and infected)
- Loose, unformed faeces

- Abnormal behaviour including unusual locomotion and movement, tremor, extreme aggression, loss of fear or remaining quiet and listless
- Abnormal growths, skin or scale discolouration.

5.3.2 Decision making

If an animal has signs of illness likely caused by disease agents, this animal should be treated differently to an animal that is injured or orphaned. In each scenario staff must decide on whether the animal should be released, treated, taken into care or euthanased. This decision should be based first on the safety and competency of the staff present. An animal should not be handled unless a person feels confident and it is safe to do so.

Where disease is not suspected, staff should refer to the Department SOP for *First Aid for Animals* and/or follow the decision making protocol and procedures set out in the Department SOP for *Humane Killing of Animals under Field Conditions*. Where you are unsure of how to proceed, refer to the Department's Science and Conservation Guideline for *Management of Fauna Mortality Events*. A written record of the outcome of the decision making must also be kept for each animal as this may be required for inclusion in an annual report to the Department's Animal Ethics Committee.

Where disease is suspected, staff should follow the guidance in the Department's Science and Conservation Guideline for *Management of Fauna Mortality Events*. Refer to the Department of Primary Industries and Regional Development website (www.agric.wa.gov.au) for a list of notifiable diseases.

If an animal is sick:

- Isolate the animal in a stress free environment such as a dark, quiet place.
- Handle or care for the animal only after processing all other healthy animals.
- Undertake a preliminary assessment of the condition and clinical signs of the animal by written (See Section 5.5.3) and photographic record where appropriate.
- Where first aid may be required refer to the Department SOP for *First Aid for Animals* and if an animal appears to be in pain and/or suffering refer to the SOP for *Humane Killing of Animals under Field Conditions*.
- Follow the personal hygiene procedures as described for high risk situations (see Section 5.2).
- Apply equipment hygiene procedures as outlined in Section 5.1 as appropriate. Primarily, ensure that food and water dishes, all trapping, handling, measuring and marking equipment (including nets, bags, scales, callipers, ear tagging/marking pliers, scissors etc.) is cleaned and disinfected after contact with the animal.
- Incinerate bags that have been used to handle sick animals.
- Retain dead animals for post mortem and pathology testing. Transport live animals when instructed to do so to a specified institution (refer to the Department SOP for *Transport and Temporary Holding of Wildlife*). All relevant information on the species, collector, date of collection and the location where the animal was collected must be recorded and included with the specimen (see Section 5.3.3). Biological samples should be stored as instructed by a relevant institution and guided by the generalised procedures outlined in Section 5.3.4.

5.3.3 Recording information on diseased animals

Assessment of disease cases requires consultation with a veterinarian who is experienced in native animal health. Collect and store the samples or preserve and store the animal as instructed (see Section 5.3.4). You can assist in diagnosis by taking photographs of physical abnormalities and recording the relevant information.

Photographs of the environmental conditions and other field observations during may also be relevant to diagnosing a situation, particularly during a mass mortality event. Other species that are present in the area but appear to remain unaffected are also important to note as some diseases infect a narrow host range. Note the location of any observed group of dead animals. This sort of information can contribute to the understanding of the disease ecology.

Write a report outlining the incident and the actions taken. Refer to the Department's Science and Conservation Guideline for *Management of Fauna Mortality Events* for further guidance on who to contact regarding the incident.

5.3.4 Preserving dead animals

This advice refers to circumstances where personnel either come across a dead animal and disease is suspected or an ill animal is euthanased and the intact carcass or tissue removed from the carcass, parasites or faeces is to be used as supporting information for disease diagnostics. Where a mass mortality event has occurred involving many individuals or multiple species collect several representative specimens.

Always wear gloves (inverted plastic bags will suffice), full length clothing and rubber boots when handling anything that is potentially harbouring disease. Before leaving the site double-bag used gloves and protective clothing following disinfection of boots and the outside of the plastic bags containing contaminated material (see Section 5.4.3).

If specific advice is not available, collect the whole specimen and refrigerate. **DO NOT FREEZE**. Freezing of samples is only appropriate for the purposes of tissue culture or DNA analysis. Refrigeration is often the most practical preservation method and is sufficient where the specimen can reach a veterinarian for examination within 48 hours.

If access to a refrigerator is restricted, a selection of smaller samples from a specimen may be refrigerated or preserved in 10% buffered formalin solution. Formalin is the ideal preserving fluid, particularly where examination of a specimen is likely to be delayed beyond 48 hours. Formalin is hazardous and therefore it requires careful handling and containers used to hold samples must be well labelled. Where possible both formalin-fixed and refrigerated fresh tissue samples should be submitted.

Arrangements should be made to forward the specimen to the appropriate institution as soon as practicable. Specimens should be double-bagged prior to storage and transport. Transport specimens in such a way that they are isolated from contacting any other surfaces and fluid leakage is avoided.

Refer to the Department's Science and Conservation Guideline for *Management of Fauna Mortality Events* for further guidance. Further information on tissue preservation methods can be sought from the Department SOP for *Tissue Sample Collection and Storage for Mammals.*

5.3.5 Disposal

If the specimen is not required for diagnostic purposes, the body should be either buried at an appropriate site or disposed of at an approved refuse disposal site or via a veterinary clinic. Dead animals carry and shed infective agents, so appropriate care and hygiene must be maintained during handling, storage and transport of specimens and carcasses. Where disease risks are of particular concern it may be necessary to incinerate the carcass or cover it with lime before burial. The recommended minimum depth of burial is 1m. Contact the Local Government Authority to arrange disposal of animals' euthanased on Shire land. If the specimen is deceased and may be useful for vouchering purposes, refer to the Department SOP for *Vouchering Vertebrate Fauna Specimens* for further information.

6 Level of Impact

Fauna may be directly impacted when carrying out disease risk procedures and care should be taken to minimise the level of impact where possible.

Potential impacts include:

- Distress to animals during handling (refer to the Department SOP for *Hand Restraint of Wildlife* for further guidance).
- Physical injury to the animal (including creating open wounds which are susceptible to infection).
- Transmission of infectious agents between individual animals via human hands and/or the surface of any equipment coming in contact with animals and increased susceptibility to vectors such as ticks and mosquitoes in traps.
- Stress, which can increase susceptibility to disease. Stressed animals may also excrete infectious material into the environment, increasing the chances of disease transmission.
- Irritation of the skin, eyes etc. from contact with residual disinfectants used on equipment.

It is important to note that whilst these impacts are specifically associated with disease risk procedures, an animal may also experience impacts from associated activities such as trapping and marking.

7 Ethical Considerations

To reduce the level of impact of disease management procedures on the welfare of animals there are a number of ethical considerations that should be addressed. Department projects involving fauna will require approval from the Department's Animal Ethics Committee.

7.1 Animal handling

To ensure minimal stress to animals they should only be handled for as long as required to assess the animal (where disease is suspected) and determine a decision outcome. Improper restraint, especially when dealing with a stressed and frightened animal can lead to major physiological disturbances (hyperthermia, stress, shock, capture myopathy). Refer to the

Department SOPs for *Animal Handling and Restraint using Soft Containment* and *Hand Restraint of Wildlife* for further guidance where applicable.

7.2 Irritation and infection

Irritations to the skin, eyes etc. of animals can occur from contact with residual disinfectants used on equipment. It is important that any surface treated with disinfectants is subsequently rinsed with water to remove residual chemicals before drying.

7.3 Spread of disease

Personnel must be cautious of the possibilities of transferring disease or parasites from animal to animal as well as from one location to another when handling animals at multiple sites. Activities such as trapping can also expose animals to biting arthropods (disease vectors) while in traps. Good hygiene practices as described above must be maintained to reduce the risk of spreading pathogens between animals and sites. If equipment is being used at multiple sites, the potential to introduce a novel disease to a new native population is high and can result in local epidemics and even extinctions at a new site, despite relatively minor impacts of that disease at the original source site.

A number of risks to the health of individual animals and animal populations are associated with interacting with humans and it is important to follow the main points below:

- Do not release diseased animals
- Do not use the same equipment (i.e. handling bags) between animals where there are signs of disease
- Ensure hands/gloves of animal handlers are clean, and all trapping and handling equipment is clean and in good repair/working order before use.

All high risk disease situations such as translocations should be subjected to thorough disease risk management. Ideally a risk assessment should be carried out prior to any project to address the management of potential disease risks that may impact on the welfare of the wildlife populations involved and associated personnel health risks (see Section 10).

Disease risk assessment for Department fauna activities should generally take the following issues into consideration at the project level:

- What possible biological agents of disease may be relevant specific to the particular location and species likely to be encountered
- The mode of transmission and hosts involved in any known applicable diseases, and how to incorporate this knowledge into hygiene procedures
- What are the potential personnel safety and wildlife population welfare risks/consequences and how will these be mitigated and/or recognised in the field.

7.4 Injury and unexpected deaths

If injury, unexpected deaths or euthanasia occur then it is essential to consider the possible causes and take action to prevent further deaths. For projects approved by the Department's Animal Ethics Committee, adverse events such as injury, unexpected deaths or euthanasia must be reported in writing to the AEC Executive Officer on return to the office (as per 2.2.28 of The Code) by completing an *Adverse Events Form*. Guidance on field

euthanasia procedures is described in the Department SOP for *Humane Killing of Animals under Field Conditions.*

8 Competencies and Approvals

Department personnel, and other external parties covered by the Department's Animal Ethics Committee, undertaking fauna-related activities require approval from the committee and will need to satisfy the competency requirements detailed in Table 1. Other groups, organisations or individuals using this SOP to guide their fauna monitoring activities are encouraged to also meet these competency requirements as well as their basic animal welfare legislative obligations.

It should be noted that details such as intensity of the study being undertaken will determine the level of competency required and Table 1 provides advice for basic monitoring only

Table 1 Competency requirements for carrying out disease management procedures

Competency category	Competency requirement	Competency assessment
General skills/experience	Safe use of chemicals	Understanding of *Material Safety Data Sheets* of any hazardous chemicals to be utilised and handling precautions required.
	High standard of personal and environmental hygiene	Understanding and ability to apply the procedures outlined in this document. Experience is required to apply disease management in a supervisory role. This is best obtained and demonstrated under supervision of experienced personnel in a senior role.

9 Occupational Health and Safety

Always carry a first aid kit, insect repellent and the appropriate disinfectants (as described above) in your vehicle. A secure and conveniently located sharps and contaminants disposal container should also be available in all field vehicles. You should be aware of your own safety and the safety of others as well as the animals when handling. Wear practical clothing and footwear, and beware of zips, buttons and jewellery that are likely to become caught in equipment.

A job safety analysis is recommended prior to undertaking any fauna-related activities where the management of disease risk may be a relevant factor to consider. This safety analysis should include the following considerations.

9.1 Animal bites, stings and scratches

Care should be taken when handling animals to avoid bites, stings or scratches. All inflicted injuries (even superficial ones) should be appropriately treated as soon as possible to ameliorate possible allergic reaction, prevent infection and promote healing.

Personal Protective Equipment (PPE), including clothing, footwear and gloves, may reduce the chances of injury when handling wild animals. However, the use of heavy glove decreases sensitivity and dexterity and may increase the risk of injuries to small animals. Consideration should be given to PPE that may be relevant for the types of animals likely to be handled. Provisions should be made to ensure that this equipment is accessible.

To improve safety, field personnel should be aware of the treatment for snakebite and carry appropriate pressure bandages. Personnel should also have up-to-date tetanus vaccinations. Department personnel must not capture bats unless fully vaccinated against Australian Bat Lyssavirus.

If Department personnel or volunteers are injured, please refer to the Department's Health and Safety Section's 'Report a Hazard, near-miss or incident' intranet page, which can be found at http://intranet/csd/People_Services/rm/Pages/ReportingHazards,Near-MissesandIncidents.aspxZoonoses.

9.2 Allergies

Some personnel may develop allergies when they come in contact with animal materials such as hair and dander. Personnel known to develop allergies should wear gloves when handling animals and long sleeved pants/shirt.

People with severe allergies associated with animals, with immune deficiency diseases or on immunosuppressant therapy should not engage in the handling of wildlife. Pregnancy can cause immunosuppression and so it is advisable to take additional hygiene and protective equipment precautions.

9.3 Zoonosis safety considerations

You can minimise personal risks of injury and being exposed to zoonoses by following three simple steps before handling wildlife:

1. Spot the Hazard
    - Review infection and injury control before and during animal handling procedures.
    - Be aware of sources of possible contamination or injury.
    - Ensure suitable safety and cleaning equipment is available and used correctly.
    - Ensure you are familiar with safe handling and disposal procedures for contaminated materials.
2. Assess the risk
    - Consider the likelihood of disease or harm occurring.
    - Assess whether existing safety procedures are working or need improving.
3. Make the changes
    - Follow the guidelines in this document to minimise the risk of infection or injury.

- Report any hazards or unsafe procedures to your CI or program manager and make the changes needed to minimise the risk.

Department personnel must take precautions to minimise the risk of disease transmission to protect themselves, their families (children, the elderly and pregnant women are particularly vulnerable to zoonoses) and wildlife populations.

In addition to the above procedures, to minimise the risk of disease transmission, Department personnel can take some simple precautions:

- Obtain an *Occupational Alert Card* from the Risk Management Section and carry the card at all times.
- Maintain high levels of personal hygiene such as washing hands with soap and warm water before and after handling animals and before eating.
- Do not eat, drink or smoke cigarettes while handling animals.
- Avoid rubbing eyes and ensure any open cuts on skin are covered. Disinfect and change any dressings after animal handling.
- Keep animals, animal products and animal waste away from food preparation and storage areas.
- Keep up to date with information about any specific diseases that may be encountered when working with wildlife.
- Wear long sleeve shirts and pants and use insect repellent in regions affected by Ross River Virus and other insect-borne diseases.
- Nails should be short and clean. Avoid wearing rings, artificial nails or chipped nail polish as it may contribute to microbial growth.
- Wear protective clothing including gloves, boots, overalls and a face mask if you are likely to come into contact with blood, waste or any other body fluids of animals.
- Note that gloves are not a substitute for hand hygiene and hands should be washed immediately upon their removal.
- Use disposable hygiene items where possible and dispose of them after use to reduce the risk of cross contamination, do not re-use (i.e. disinfectant dispensers, towels).
- Scrub down the work area and equipment, including the vehicle used to transport the animals, with disinfectant detergents after use.
- Where possible avoid contamination of personal items like mobile phones, pens and paper etc.

<u>Ectoparasites (ticks, fleas etc.)</u>

Prevention is better than cure. Insect repellent may help deter ticks, spray around the ankles, waist, neckline and sleeves. Tucking in your shirt and having pants tucked into socks may also help. At the end of each day check for such organisms and remove them with care to avoid infection i.e. where the tick's head is left in the wound. Tick removal devices should be available in field vehicles.

<u>Endoparasites</u>

All animals are known to carry a number of internal parasites such as various worms. Good hygiene as described in the above procedures is necessary to avoid infection and illness.

9.4 Incidents involving Department personnel

The *Occupational Safety and Health Act* 1984 (OSH Act) requires employers to identify potential hazards and to develop strategies to minimise the risk of injury or disease. The OSH Act also requires employees to ensure their own safety by following instructions and correctly using any safety equipment provided. Sections 19 and 20 of the OSH Act outline the duties of employers and employees.

Treat injuries immediately, seek medical advice if you or members of your family become ill, and report the incident to the Risk Management Section:

- If Department personnel or volunteers are injured, please refer to the Department's Health and Safety Section's 'Report a Hazard, near-miss or incident' intranet page: http://intranet/csd/People_Services/rm/Pages/ReportingHazards,Near-MissesandIncidents.aspx
- Flush bites, cuts and scratches immediately with running water and skin disinfectant (e.g. dilute Betadine®). Bites from seals or bilbies, for example, carry highly pathogenic bacteria which can cause severe infection/illness if not treated immediately, and in this instance warrants medical attention.
- Cover exposed wounds with a waterproof dressing.
- Report unexplained or persistent illness (e.g. intestinal, respiratory or skin problems) to a medical practitioner.
- Seek medical attention and alert the practitioner to the potential for exposure to zoonoses by presenting your *Occupational Alert Card*.

Reporting

Department employees, their managers and witnesses to the incident must complete the following forms and submit them to Department's Health and Safety Section within the required times shown on the forms:

- Form 1B: *Employer's Report – Worker's Compensation*
- Form 2B: *Employee's Report Form*
- Form 5A: *Witness Statement Form – Worker's Compensation*
- Form 4: *Travel Accident Claim – Worker's Compensation* (if the incident involved a travel accident)

Remember that many diseases have a long incubation period and symptoms may take a long time to develop, in Department personnel or their families, so every incident must be reported within the time shown on the forms.

9.5 Chemicals

Personnel should be aware of the dangers of the chemicals they use in the field. Refer to *Material Safety Data Sheets* (MSDS) relevant to the chemical(s) being used.

Formalin:

Personnel must be aware of the safety precautions and transport guidelines relevant to this chemical as advised on the MSDS before use. Ensure contact to the skin and inhalation is prevented.

10 Further Reading

The following SOPs have been mentioned in this advice regarding disease management and it is recommended that they are consulted when proposing to undertake fauna-related activities:

- Department SOP *Vouchering Vertebrate Fauna Specimens*
- Department SOP *Tissue Sample Collection and Storage for Mammals*
- Department SOP *Animal Handling and Restraint using Soft Containment*
- Department SOP *Hand Restraint of Fauna*
- Department SOP *Transport and Temporary Holding of Fauna*
- Department SOP *First Aid for Animals*
- Department SOP *Humane Killing of Animals under Field Conditions*

The Department Science and Conservation Guideline for *Management of Fauna Mortality Events* should also be consulted when proposing to undertake faun-related activities, particularly with regards to diseased animals.

The following institutions and links may be of further assistance:

- Australian Registry of Wildlife Health, Taronga Conservation Society Australia: http://arwh.taronga.net.au/common-diseases
- Australian Wildlife Health Network: http://www.wildlifehealthaustralia.com.au
- Australian and New Zealand Council for the Care of Animals in Research and Teaching: http://www.adelaide.edu.au/ANZCCART
- WA *Occupational Safety and Health Act* 1984: https://www.commerce.wa.gov.au/worksafe/occupational-safety-and-health-act-1984
- WA Department of Health: http://www.health.wa.gov.au
- Worksafe SafetyLine Institute: http://institute.safetyline.wa.gov.au
- Animal Health Australia disease strategies: https://www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents/
- Wildlife Disease Association: http://www.wildlifedisease.org
- Conservation Breeding Specialist Group: http://www.cbsg.org
- AVA Biosecurity Guidelines: http://www.ava.com.au/biosecurity-guidelines
- DAFWA Reportable Animal Diseases: https://www.agric.wa.gov.au/livestock-biosecurity/reportable-animal-diseases
- DAFWA Diagnostic Laboratory Services - Animal Pathology: https://www.agric.wa.gov.au/ddls-animal-pathology

11 References

Animal Health Australia (2011). *Australian Veterinary Emergency Plan (AUSVETPLAN) Operation Procedures Manual: Wild Animal Response Strategy (version 3.3).* Canberra, ACT: Primary Industries Ministerial Council. Retrieved from: http://www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents/

Animal Science College (n.d.). *Animal Care Topics: Animal Science Students*. Retrieved from: http://www.animalsciencecollege.com.au/administration/docs/AnimalCare.pdf

Armstrong, D., Jakob-Hoff, R. and U.S Seal (Eds.) (2002). *Animal Movements and Disease Risk: A Workbook* (4th ed.). Minnesota, USA: Conservation Breeding Specialist Group. Retrieved from:

http://www.cbsg.org/cbsg/content/files/Disease_Risk/disease.risk_manual.pdf

Australian Veterinary Association (AVA). (2013). *Guidelines for Veterinary Personal Biosecurity* (2nd ed.). Retrieved from: http://www.ava.com.au/biosecurity-guidelines

Blyde, D. (1999). Update on Zoonotic Diseases. In *Wildlife in Australia: Healthcare and Management*, *Proceedings 327* (pp. 491-500). Sydney, NSW: University of Sydney.

Canon, M. (1999). Emerging Avian Diseases: Their Diagnosis and Treatment. In *Wildlife in Australia: Healthcare and Management*, *Proceedings 327* (pp. 569-586). Sydney, NSW: University of Sydney.

Cromie, R.L., Lee, R., Delahay, R.J., Newth, J.L., O'Brien, M.F., Fairlamb, H.A., Reeves, J.P. and Stroud, D.A. (2012). *Ramsar Wetland Disease Manual: Guidelines for Assessment, Monitoring and Management of Animal Disease in Wetlands (Ramsar Technical Report No. 7).* Gland, Switzerland: Ramsar Convention Secretariat.

Deem, S.L., Karesh, W.B. and Weisman, W. (2001). Putting theory into practice: wildlife health in conservation. *Conservation Biology* 15: 1224-1233.

Delahay, R.J., Smith, G.C. and Hutchings, M.R. (2009). *Management of Disease in Wild Mammals*. Tokyo, Japan: Springer.

Department of Environment and Conservation (n.d.). W*oylie Conservation Project Field Operations Handbook* (Draft Internal Document). Perth, WA: Department of Environment and Conservation.

Field, H. (1999). Emerging Viral Diseases of Bats. In *Wildlife in Australia: Healthcare and Management*, *Proceedings 327* (pp. 501-514). Sydney, NSW: University of Sydney.

Friend, M. and Franson, J.C. (Eds.) (1999). *Field Manual of Wildlife Diseases: General Field Procedures and Diseases of Birds (Information and Technology Report 1999-001)*. Wisconsin, USA: U.S. Department of the Interior and U.S. Geological Survey.

National Occupational Health and Safety Commission (1989). *Diseases acquired from animals*. Canberra, ACT: Australian Government Publishing Service.

NHMRC (2004). *Australian code of practice for the care and use of animals for scientific purposes* (7th ed.). Canberra: National Health and Medical Research Council.

Rose, K. (1999). Common Diseases of Urban Wildlife. In *Wildlife in Australia: Healthcare and Management*, *Proceedings 327* (pp. 365-430). Sydney, NSW: University of Sydney.

Woodford, M.H. (1994). Chapter 9 Disease risks associated with wildlife translocation projects. In *Creative Conservation: Interactive management of wild and captive animals* (pp. 178-198). London, UK: Chapman & Hall.

Woodroffe, R. (1999). Managing disease threats to wild mammals. *Animal Conservation* 2: 185-193.

12 Appendix I: Common Zoonoses

Table 2 Common zoonoses found in wildlife

Disease and causative organism	Animals involved in transmission	Method of transfer	Human symptoms	Possible method to reduce risk of transmission
BACTERIA LEPTOSPIROSIS *(Leptospira interrogans)*, Gastrointestinal pathogenic bacteria, including CAMPYLOBACTER and SALMONELLA, ERYSIPELAS (*Erysipelothrix rhusiopathiae),* BRUCELLOSIS (*Brucella abortis)*	Birds, reptiles, terrestrial mammals; particularly rodents Also marine mammals and fish, feral pigs	Handling sick animals, carcasses, contaminated food or water, faecal-oral route. Contact with urine of infected animals via broken skin, mouth or nose, inhalation. Also via ticks and mites.	Abdominal pain, diarrhoea, gastroenteritis, meningitis, pericarditis, headache, fever chills, muscle or joint pain, stiff neck, jaundice, sensitivity to light, kidney malfunction, rash, lesions, septicaemia	Strict personal hygiene, avoid contact with infected urine or contaminated water or soil. Disinfection of equipment and cages, protect food and water from contamination by excreta
MYCOBACTERIOSIS and NOCARDIOSIS *M. avium, M. marinum* etc. Atypical Bacteria	Marine mammals, fish, marsupials, reptiles, birds	Aerosol or skin contact with infected animal or carcass, abrasions when swimming, faecal exposure	Cough, chest pain, chills, fever, fatigue, ulcers, abscesses on hands and fingers	Strict personal hygiene, avoid skin contact with infected animal or carcass, disinfect equipment and cages, wash hands after contact
Q FEVER *Coxiella burnetti* Bacteria-like organism	Terrestrial mammals; bandicoots, kangaroos, wallabies	Contact with infected animals, placental tissues, faeces, contaminated straw, wool, hair and hides, inhalation in aerosols or dust from infected animals	Chills, fever, sweating, headache, loss of appetite, muscle soreness	Do not inhale or handle contaminated material (especially if you have open wounds) A vaccination is available for humans
PSITTACOSIS (ORNITHOSIS) *Chlamydia psittaci* Bacteria-like organism	Birds (especially parrots)	Inhalation of faecal dust in aviary, transport boxes	Loss of appetite, chills, fever, headache, sensitivity to light, throat irritation, breathing difficulty, weight loss	Avoid contact with infected birds, aviary dust, disinfect aviary and transport boxes
MURRAY VALLEY ENCEPHALITIS and ROSS RIVER VIRUS Arboviruses involving insect vectors	Carried by birds, terrestrial mammals, marsupials, dogs	Spread by mosquito bites	Headache, fever, stiff neck, loss of appetite, giddiness, drowsiness, brain damage Rash, rheumatism, swelling and pain in joints, chronic fatigue	Avoid mosquito bites, insect repellent, wear long pants and sleeves, stay indoors at dusk

Disease and causative organism	Animals involved in transmission	Method of transfer	Human symptoms	Possible method to reduce risk of transmission
AUSTRALIAN BAT LYSSAVIRUS Virus related to rabies	Insectivorous bats and fruit bats	Contact with exposed tissue, nerves or mucus membrane from bites and scratches and blood and urine of infected animals, long incubation period (e.g. a case of 27 months delay has been recorded)	Headache, malaise, sensory change around bite or scratch site, fever, excitability, an aversion to fresh air and water, weakness, delirium, convulsions and coma	Avoid contact with animals, wear bite proof gloves, facemask and full protective gear, cover open wounds, scratches, sores All staff working with bats must be vaccinated
ASPERGILLOSIS *Aspergillus spp.* Fungal mould	Of particular risk to immunosuppressed people	Inhalation from air, feather dust etc.	Difficulty breathing, cough, meningitis, skin infections	Strict personal hygiene, immunosuppressed people should not engage in the handling of wildlife
TOXOPLASMOSIS *Toxoplasma gondii* Protozoan	All mammals and birds can have cysts in muscles, or other tissues Cats excrete in faeces	Ingestion via contact with objects contaminated by cat faeces or cysts in raw meat of non-felid mammals and birds.	Strict personal hygiene, wear gloves when handling raw meat or items suspected to be contaminated by cat faeces	Strict personal hygiene, avoid skin contact with infected animals/faeces, wear gloves when handling raw meat
GIARDIA and other protozoal endoparasites	Mammals, birds and reptiles	Acquired from faeces, animals coat or the environment.	Commonly no symptoms though may include stomach cramps, nausea, mucoid diarrhoea	Strict personal hygiene when in contact with animals and their immediate environment

Note: Other fungal infections such as ringworm or parasites such as scabies mite *Sarcoptes scabeii* can be transmitted to humans and require similar precautions when handling wildlife. Any open wound can also result in tetanus from infection with *Clostridium tetani*, which is prevalent in the environment. All Department personnel working with animals should maintain vaccination coverage against tetanus and those working with bats must be vaccinated against lyssavirus