Standard Operating Procedure

SC23-06 MANAGING DISEASE RISK AND BIOSECURITY IN WILDLIFE MANAGEMENT

Animal welfare is the responsibility of all personnel involved in the care and use of animals for scientific purposes.

Personnel involved in an Animal Ethics Committee approved project should read and understand their obligations under the *Australian code for the care and use of animals for scientific purposes*.

Version 1.2

June 2023

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

Department of Biodiversity, Conservation and Attractions
Locked Bag 104
Bentley Delivery Centre WA 6983
Phone: (08) 9219 9000
Fax: (08) 9334 0498

www.dbca.wa.gov.au

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This report/document/publication was prepared by Species and Communities Program, Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions.

Questions regarding the use of this material should be directed to:
Species and Communities Program
Department of Biodiversity, Conservation and Attractions
Locked Bag 104
Bentley Delivery Centre WA 6983
Email: animalethics@dbca.wa.gov.au

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Dr Martin Dziminski

Chair, Animal Ethics Committee

Department of Biodiversity, Conservation and Attractions

Contents

1 Acknowledgements

This standard operating procedure was compiled by Rebecca Bloomfield, with contributions from Manda Page, Mark Blythman, Kirsty Dixon, Neil Thomas, Juanita Renwick, Tom Hollinsworth, Simone Vitali, Michelle Rouffignac and Andrew Thompson. A previous procedural document developed by Tamra Chapman, Colleen Sims and Peter Mawson was also used.

2 Purpose

Managing biosecurity and animal disease risks 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 regard to minimising the risk of disease transmission between wildlife populations, and from wildlife to personnel and their families, or domestic animals.

This Standard Operating Procedure (SOP) provides advice on minimising and managing the risk of infectious disease spreading from one individual or population to another (including human or domestic animal to wildlife and vice versa) in research and wildlife management only.

3 Scope

This SOP has been written specifically for scientific and education purposes, and endorsed by the Department of Biodiversity, Conservation and Attractions' (DBCA) Animal Ethics Committee (AEC). However, this SOP may also be appropriate for other situations.

This SOP applies to all activities involving fauna that are undertaken across Western Australia by DBCA (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/authorisation under 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 *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 all AEC approved projects. A copy of the code may be viewed by visiting the National Health and Medical Research Council website Australian code for the care and use of animals for scientific purposes | NHMRC

This SOP also references information on Wildlife Disease and Biosecurity in Australia from various documents (including various disease and species specific Factsheets, *National Wildlife Biosecurity Guidelines* and *National Guidelines for Management of Disease in Free-ranging Australian Wildlife*), copies of which are available on the Wildlife Health Australia website (http://wildlifehealthaustralia.com.au). **All personnel engaging in fauna activities should make themselves familiar with the extensive information available from this valuable resource.**

4 Animal Welfare Considerations

When seeking approval from the DBCA AEC, departmental projects involving fauna must demonstrate an understanding and application of biosecurity and disease risk management principles and practices.

Poor or inadequate management of disease risks and biosecurity has the potential to result in very serious, negative animal welfare outcomes, both in terms of direct individual impacts and at the population and species levels. Conversely, risk management actions and procedures may also compromise the welfare of individuals and must be appropriately applied to achieve best welfare outcomes. The key animal welfare considerations that should be taken into account when managing disease risk are listed below and are highlighted throughout the document.

4.1 Injury and unexpected deaths

If adverse events including injury, unexpected deaths or euthanasia occur then it is essential to consider the possible causes and take action to prevent further issues. For projects approved by the department's Animal Ethics Committee, adverse events must be reported in writing to the AEC Executive Officer as soon as possible after the event by completing an *Adverse Events Form*. Guidance on field euthanasia procedures is described in the Department SOP for *Euthanasia of Animals Under Field Conditions*.

4.2 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, geographically separate populations or across species, via human hands and/or the surface of any equipment coming in contact with animals or through increased exposure to vectors such as ticks and mosquitoes in traps.
- Stress, which can increase susceptibility to disease. Stressed animals may have compromised immunity and excrete more infectious material into the environment, increasing the chances of disease transmission.
- Irritation of the skin and eyes 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.

5 Understanding Disease and Transmission

Disease is any impairment of the normal structural or physiological state of an organism. Infectious disease is caused by an agent (usually a microorganism such as bacteria, virus, fungus, or parasite) that can be transmitted from one animal to another via various pathways.

Some diseases have a relatively simple mode of transmission, while others go through a complex lifecycle and the symptoms may not appear for months (Woodroffe, 1999).

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 (Jakob-Hoff, 2014). A large number of infectious diseases have recently emerged in wildlife or humans around the world (Daszak, Cunningham & Hyatt, 2000; Jones et al., 2007), and it should also be noted that there is potential for diseases not yet recorded in Western Australia to be present in the environment. Therefore, understanding and managing risk is the key to optimising biosecurity (Wildlife Health Australia, 2018).

Wildlife Health Australia produce fact sheets on some of the most significant diseases in native wildlife on their website: Fact Sheets (wildlifehealthaustralia.com.au). Generalised information on common zoonoses is provided in Appendix I.

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.

5.1 Pathways of transmission

There are several pathways of disease transmission that need to be considered when working with wildlife; and each may involve direct or indirect modes:

5.1.1 Human to wildlife (anthroponoses or ‘reverse – zoonoses’)
5.1.2 Domestic animals to wildlife
5.1.3 Wildlife to wildlife
5.1.4 Wildlife to human (zoonoses) and domestic animals

5.2 Sources of disease and mechanisms of transmission

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:

5.2.1 Vector transmission:

Disease transmitted by vectors such as ticks, fleas, mites and mosquitoes.

5.2.2 Droplet transmission:

Droplets from mucus membranes created by coughing, sneezing and vocalising are propelled through the air.

5.2.3 Airborne transmission:

Pathogens travel via the air and are inhaled by the host.

5.2.4 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 indirectly, via a contaminated intermediary object or 'fomite' (e.g., tagging and measuring equipment, traps and handling bags, food containers, water containers and bedding, boots, clothes and vehicles**). Personnel involved in wildlife management related activities and any animals involved will likely be most susceptible to this transmission pathway.

NB: *Some disease agents can survive in the environment (in soil, on fomites etc) for extended periods of time.*

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.

ANIMAL WELFARE: 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.

6 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 (i.e. application of ear tags), in addition to unforeseen situations, such as encountering an injured or ill animal.

ANIMAL WELFARE: To reduce the risk of disease transmission from animals to humans (and vice versa) personnel must adhere to standard hygiene protocols and be able to recognise and deal with animals exhibiting signs of illness/disease.

6.1 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.

ANIMAL WELFARE: 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.

6.1.1 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.

ANIMAL WELFARE: Irritations to the skin and eyes 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.

6.1.2 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 and bedding, 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 (where possible) 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.

NB: *Be aware of increased risks of airborne/droplet transmission that may be associated*

with shaking out handling bags or using high-pressure cleaners to remove faecal material, feathers etc.

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 or harm 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.

6.1.3 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 [BPCV1] of bandicoot wart syndrome) at 1:100 dilution for 10 minutes. Always rinse equipment following use. DO NOT USE directly on animals, handlers' skin, or equipment in direct contact with animals.

***NB**: purchase of 1% solution or tablet form is recommended as **undiluted powder** is an irritant to skin, eyes and respiratory tract through dust release and may be carcinogenic. In addition, the prepared solution is toxic to aquatic organisms, so care must be taken to dispose of used solutions in a safe manner.*

- Multi composition product F10SC®: Veterinary Disinfectant - Less effective than VirkonS® against some resistant viruses, though it is more effective than most other disinfectants and is much less irritant, toxic or carcinogenic. A 1:500 dilution with 10 minutes contact time is sufficient for most ordinary applications and won't degrade trap material. Where highly resistant non-enveloped viruses are suspected (e.g., Parvovirus, BPCV1, beak and feather disease virus (BFDV)), 1:125 dilution for >20 minutes contact time 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 1:100 dilution.
- F10SC®: Handling bags can be soaked for 20 minutes at 1:125 dilution.

NB. *Always ensure handling bags are rinsed well after soaking*.

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.

6.1.4 Detailed hygiene procedures

The general hygiene procedure (Section 6.1.2) 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.

ANIMAL WELFARE: 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.

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.

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

1. High disease risk situations

ANIMAL WELFARE: 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 Sections 6.1.2 and 6.1.3, all traps should be mechanically cleaned thoroughly then soaked in VirkonS® at 1:100 dilution (or equivalent product [e.g., F10SC at 1:125] depending on characteristics of any specific known or suspected infectious agents) before being rinsed and dried with UV exposure for 24 hours. In the case of soft/material traps and handling bags F10SC at 1:125 dilution may be the preferred disinfectant as it is less abrasive on material. Covers used on traps should also be treated with UV exposure for 24 hours (e.g., hanging hessian bags in sun).

NB: *Aluminium box traps should be fully opened during cleaning by removing the side pin and all surfaces cleaned.*

2. Low disease risk situations

ANIMAL WELFARE: 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. Best practice – inspect and clean trapping kits at the end of each day within a trapping session and start with fresh clean bags each day if possible.

As per Section 6.1.2, 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 e.g., F10SC at 1:250 for >20min), 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.

NB: *Aluminium box traps should be fully opened during cleaning by removing the side pin and all surfaces cleaned.*

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 6.1.2.

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.

6.2 Standard personal hygiene protocols

ANIMAL WELFARE: Personnel should avoid working closely with fauna if they are unwell to protect their own safety and animal welfare. In particular, if personnel exhibit respiratory symptoms and/or are suspected or confirmed positive to Covid -19 infection, they should refrain from working with fauna until symptoms clear. At the very least, additional PPE such as gloves and masks must be worn. Covid-19 virus (SARS-CoV-2) has been transmitted to animals overseas (domestic pets, zoo animals and wildlife). Currently it is not known to be present in Australian wildlife, but it has the potential to become a reservoir of infection which could pose a future wildlife and public health risk. WHA have a Fact sheet with information on this topic Covid-2019.pdf (wildlifehealthaustralia.com.au).

6.2.1 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, as they are readily contaminated.

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 (e.g. 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

6.2.2 Disinfectant products

SAFETY: 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 it 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.

NB: *F10 is effective against SARS-CoV-2 (the Covid-19 virus) if a 1:100 dilution is sprayed on hands and surfaces and allowed to dry (>5mins).*

- 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 to inactivate most infectious agents.

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.

6.2.3 Detailed hygiene procedures

The general hygiene procedure 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 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.

SAFETY: 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 6.2.1). 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 6.1.3 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 6.1.3 for further details regarding use of the associated chemicals.

6.3 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.

6.3.1 Recognising diseased animals

Disease and ill health may not be obvious in wild animals. However, there are a few simple signs to look out for that may suggest an animal is not completely healthy:

- Poor body condition
- 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.

Wildlife workers should routinely monitor, observe and assess individual animals for signs of disease and should be aware when veterinary input is required. Wildlife Health Australia produces a series of Fact Sheets www.wildlifehealthaustralia.com.au/FactSheets.aspx that provide information on a range of diseases in Australian wildlife (Wildlife Health Australia, 2018).

In species where an infectious disease is already known to be present in some populations (e.g. Bandicoot Papillomatosis Carcinomatosis Virus 1 in Shark Bay bandicoots), it is important that personnel are familiar with the specific signs of the disease and the locations on the body where symptoms may present.

6.3.2 Decision making

Where disease is not suspected, and an animal is injured or orphaned, personnel 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 *Euthanasia of Animals Under Field Conditions*.

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 personnel must decide on whether the animal should be treated, taken into care or euthanased. This decision should be based first on the safety and competency of the personnel present. An animal should not be handled unless a person feels confident, and it is safe to do so.

If an animal is sick:

- Isolate the animal in a stress-free environment such as a dark, quiet place, preferably separate to other healthy animals.
- Handle or care for the animal only after processing all other healthy animals.

- Follow the personal hygiene procedures as described for high-risk situations (see Section 6.2.3).
- Undertake a preliminary assessment of the condition and clinical signs of the animal by written (Section 6.3.1) and photographic record where appropriate.
- Apply equipment hygiene procedures as outlined in Section 6.1.2 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.
- Transport live animals when instructed to do so to a specified institution (refer to the department SOP for *Transport and Temporary Holding of Wildlife*).
- Retain dead animals for post-mortem and pathology testing.
- 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.
- Biological samples should be stored as instructed by a relevant institution and guided by the generalised procedures outlined in Section 6.3.4.

6.3.3 Recording information on diseased animals

Assessment of disease cases requires consultation with a veterinarian who is experienced in native animal health (Wildlife Health Australia, 2018; Animal Health Australia ,2021). Collect and store the samples or preserve and store the animal as instructed (see Section 6.3.4).

Record relevant information (Appendix II) and submit the form to the Department of Primary Industries. You can assist in diagnosis by taking photographs of physical abnormalities. Recording environmental conditions and other field observations during an event 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.

Where disease is suspected or confirmed by veterinarians, it must be reported to biosecurity authorities. Personnel should report suspicion of a notifiable disease to the national Emergency animal disease hotline on 1800 675 888.

6.3.4 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 any contaminated material.

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 and leak proof. 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.

Further information on tissue preservation methods can be sought from the department SOP for *Tissue Sample Collection and Storage for Mammals.*

6.3.5 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 1 m. 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.

7 Competencies

A person who is competent has the knowledge, skills, and experiences that allow them to capture and handle animals successfully, and appropriately manage adverse events as required. 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 (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 animal welfare legislative obligations.

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

Table 1 Competency requirements for carrying out disease management procedures

Competency category	Competency requirement	Competency assessment
Knowledge	Broad understanding the framework governing the use of animals in research and environmental studies in Western Australia	Training (e.g., DBCA Fauna Management Course or equivalent training). In applications, provide details on the course provider, course name and year.
	Understanding species biology and ecology	Personnel should be able to correctly identify the likely species to be encountered at the site(s) being studied and understand the species' biology and ecology. This knowledge may be gained through sufficient field experience and consultation of field guides and other literature.
	Awareness of basic hygiene practices and biosecurity risks and protective measures	Personnel should be familiar with *National Wildlife Biosecurity Guidelines*.
	Safe and effective use of chemicals	Personnel should be familiar with all relevant *Material Safety Data Sheets* and understand the safety precautions required.
Disease risk management skills/experience required	Personal and environmental hygiene	Personnel should be able to apply the hygiene procedures outlined in this document.
	Experience recognising and dealing with animals exhibiting signs of illness/disease	Personnel should be able to recognise diseased animals. This knowledge may be gained through sufficient field experience and /or consultation of literature. Awareness of general disease risk management, and knowledge of the general and specific disease risks associated with particular species and/or environments. This can be gained through personal experience, other species experts and resources such as the *National Guidelines for Management of Disease in Free-ranging Australian Wildlife* and Wildlife Health Australia *Fact Sheets.*

8 Approvals

A licence or authorisation may be required under the *Biodiversity Conservation Act 2016* (examples below). Contact the department's Wildlife Licensing Section for more information. It is your responsibility to ensure you comply with the requirements of all applicable legislation.

- Fauna taking (scientific or other purposes) licence (Reg 25)
- Fauna taking (biological assessment) licence (Reg 27)
- Fauna taking (relocation) licence (Reg 28)
- Section 40 Ministerial Authorisation to take or disturb threatened species.

9 Occupational Health and Safety

Departmental personnel, contractors and volunteers have duties and responsibilities under the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996 to ensure the health and safety of all involved. Fieldwork is to be undertaken in line with the department's corporate guidelines, policies and standard operating procedures, including but not limited to, risk management and job safety analyses. Further information can be found at

https://dpaw.sharepoint.com/Divisions/corporate/people-services/HS/SitePages/SOPs.aspx

If department personnel or volunteers are injured, please refer to the departmental Health, Safety and Wellbeing Section's 'Reporting Hazards, Near-misses and Incidents' intranet page, which can be found at

https://dpaw.sharepoint.com/Divisions/corporate/people-services/HS/SitePages/Reporting-Hazards,-Near-Misses-and-Incidents.aspx

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

11 References

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National Health and Medical Research Council (2013) Australian code for the care and use of animals for scientific purposes, 8th edition. Canberra: National Health and Medical Research Council.

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Wildlife Health Australia (2018), 'National Wildlife Biosecurity Guidelines', Sydney NSW.

Wildlife Health Australia (2020), 'National Guidelines for Management of Disease in Free-ranging Australian Wildlife.' Sydney NSW.

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Weiss R.A., McMichael A. J. (2004). Social and environmental risk factors in the emergence of infectious diseases. Nat. Med. 10, S70– S76.

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12 Glossary of Terms

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.

Anthroponosis: Disease acquired by animals from contact with humans.

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

Fomite: Object or material which is likely to carry infection (e.g., Cloths, traps, bags, calipers, boots, ear punch).

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.

Zoonosis: Disease acquired by humans from contact with animals.

Appendix I: 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
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 personnel 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

NB: 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 (Animal Health Australia, 2021).

Appendix II: Wildlife disease incident submission form

(Developed by Wildlife Health Australia, 2018)

Submitter details

Name and how involved:	
Telephone:	
Email:	
Address:	

Details of other people in attendance

Names, role/s in the incident and contact details:	

Details of animal deaths/illness

What species?	
Where? (Include GPS or map reference if possible)	
How many animals?	
What signs or symptoms?	
When did this happen?	
Is it ongoing or has the incident stopped?	

Have you noticed anything which might account for the deaths?

Vectors of diseases (e.g., mosquitos)? Are there lots of insects around or very few?	
Water sources?	
Chemicals?	
Extreme or violent weather conditions	
Other comments?	

Who else has been notified of this incident?
For example, wildlife carers or environment department

Recommended contacts
Please give details (who)

PLEASE ATTACH ANY MAPS AND/OR PHOTOGRAPHS THAT COULD BE RELEVANT

PLEASE SUBMIT FORM TO YOUR STATE DEPARTMENT OF PRIMARY INDUSTRIES