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National **Zoo Biosecurity** Manual

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National Zoo Biosecurity Manual

A cooperative initiative between the Zoo and Aquarium Association, the Australian Wildlife Health Network, the Commonwealth Department of Agriculture, Fisheries and Forestry and the Australian Zoo Industry.

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Editors: Andrea Reiss and Rupert Woods

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DISCLAIMER

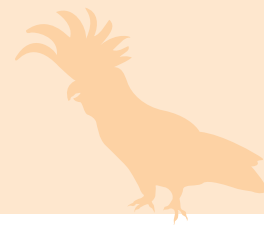
This National Zoo Biosecurity Manual is not intended to be prescriptive and is not a set of standards requiring compliance by zoo industry members. This Manual has been specifically designed as an industry resource to raise awareness of best practice in zoo biosecurity. The information and guidelines within the Manual should not be used for any other purpose, nor interpreted outside this context.

DEVELOPMENT AND REVIEW PROCESS

This Manual has been developed as a cooperative initiative between the Zoo and Aquarium Association (the Association), the Australian Wildlife Health Network (AWHN) and the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF), on behalf of the Australian Zoo Industry. The Zoo Animal Health Reference Group, the Board of the Zoo and Aquarium Association and Australia's Chief Veterinary Officer have endorsed this Manual for use by the zoo industry. The Manual is published as a working draft for 12 months from May 2011 to May 2012. During this period the Association welcomes feedback on the Manual from Association members and other stakeholders (send to NZBMreview@zooaquarium.org.au). Significant updates or changes to this document will be indicated by a change in Edition number and date of publication.

CONTEXT

The National Zoo Biosecurity Manual (NZBM) has been developed by veterinary leaders and advisors within the Australian zoo industry to document best practice biosecurity measures currently being adopted by the zoo industry. The Manual can be tailored by zoos to suit their individual circumstances and can also be utilised as a training tool, to assist zoos in educating staff on biosecurity measures. The Manual acknowledges the wide range of circumstances under which zoos within Australia operate in terms of geographic location, species and numbers of animals held, work practices and available resources. All zoos are encouraged to use the information in this Manual to assess their own biosecurity risks, and to develop and maintain an appropriate level of biosecurity for their premises.



INTRODUCTION

Biosecurity is the set of precautions taken to minimise the risk of introducing an infectious disease into an animal (or human) population.

Each zoo's unique characteristics will influence its biosecurity requirements. This Manual identifies areas of common risk to all zoos and outlines appropriate measures to minimise these risks. Individual zoos are encouraged to develop their own site-specific Biosecurity Plan.

Biosecurity is important for all zoos. Good biosecurity practices help to:

- Keep zoo animals safe and healthy
- Keep zoo staff and visitors safe and healthy
- Minimise costs associated with treating disease in zoo animals
- Keep zoos open and running if an infectious disease outbreak occurs within, or near a zoo
- Promote the good reputation of the individual zoo and the zoo industry as a whole
- Assist zoos in acquiring and managing exotic species.

The National Zoo Biosecurity Manual (NZBM) is intended to be used by individual zoos, including fauna parks, sanctuaries, aquaria and marine parks, holding native and/or exotic species, as a tool to help them to gauge their own biosecurity requirements and to assist them to develop a biosecurity plan suitable for their particular circumstances. It is not expected that every zoo will have a need to, nor be in a position to, implement all of the guidelines in daily practice.

Zoo Biosecurity includes but is not limited to:

- Appropriately constructed and maintained facilities
- Management of stray and pest species
- Management of drainage and waste products
- Good hygiene and work practices
- A preventative medicine program
- Appropriate quarantine of newly arrived and sick animals and
- Veterinary diagnosis and treatment of sick animals.

These guidelines complement and support the Australian Animal Welfare Standards and Guidelines: Exhibited Animals (Zoos) (AAWS), developed as part of the Australian Animal Welfare Strategy and should be read in conjunction with that document. Relevant standards from the draft AAWS document (November 2010, Version 7.1) are referenced throughout this Manual. Association member zoos should also refer to the ZAA Accreditation Standards <http://www.zooaquarium.org.au/Accreditation/default.aspx>.

Zoos must also comply with the legislation of relevant agencies and jurisdictions (local, federal and state/territory).



The development of Zoo-specific practices and institutional-specific Biosecurity Plans is fundamental to the success of improved biosecurity for the entire zoo industry. It is acknowledged that each zoo will have differing biosecurity challenges and operating environments, which should be addressed based upon the objectives identified within this Manual.

Each institution is encouraged to develop its own Zoo specific Plan to guide their biosecurity activities. An institution which does not develop a Zoo specific Plan can achieve best practice by meeting the guidelines within the National Zoo Biosecurity Manual.

A biosecurity self audit checklist for ongoing assessment and improvement is available, in electronic format, as a supplement to this Manual. The checklist can be downloaded from www.zooaquarium.org.au and adapted as needed by each institution.

Guidelines (numbered sequentially for each section) outline the recommended practices to achieve best practice zoo biosecurity outcomes.

The Manual outlines both **basic guidelines** and **higher level guidelines** for all zoos. Most guidelines are considered to be basic guidelines which will be relevant to most zoos in most circumstances. Some guidelines, marked **higher level guidelines** may not be applicable in all situations or in all zoos, but may be implemented in individual zoos according to their needs or in all zoos during periods of higher biosecurity risk.

Definitions and **abbreviations** are found at the end of this document and are mostly drawn from the AAWS document. Some defined words in this document are capitalised. Some important definitions are included in the main body of the document for clarity.



PRINCIPLES OF ZOO BIOSECURITY

Good biosecurity is integral to the successful management of all zoos.

GOOD ZOO BIOSECURITY AIMS TO:

- prevent the introduction of infectious disease and contaminants to zoo animals
- prevent the spread of disease from an infected area to an uninfected area within the zoo
- prevent the spread of infectious disease from zoo animals to animals outside the zoo
- prevent the spread of infectious disease from animals to humans or humans to animals.

Biosecurity is important for all zoos, regardless of size. Historically, Australia's larger zoos have been expected to maintain strong biosecurity practices, due to the perceived higher risks associated with importing and holding exotic species. With today's growing focus on biosecurity management, it is important that zoo biosecurity focuses on all risks, not just those arising from exotic species. All zoos (including smaller zoos and fauna parks holding few or no exotic species) need to be aware of, and address the biosecurity risks relevant to their circumstances. All zoo staff need to be aware of the principles of biosecurity and how this applies to their work at the zoo.

Biosecurity is the responsibility of everyone at the zoo.

Biosecurity is concerned with minimising the negative consequences of infectious disease introduction and spread. Infectious disease within the zoo collection impacts on individual health and welfare, and can have long term impacts on reproduction, longevity, behaviours and population and species viability. Subclinical and chronic diseases can exert their effects for years and even decades. Ill health, death and reproductive failure in collection animals leads to greater costs (husbandry, veterinary, acquisition) and reduces the financial viability of the zoo as a business. Infectious disease spread to humans or domestic animals can have serious social, economic and ethical costs. A zoo's ability to protect itself from a disease outbreak will be greatly improved if it has appropriate biosecurity arrangements.

Biosecurity is an insurance policy against disease outbreak and its consequences. Biosecurity is a prudent and necessary investment.

Biosecurity is concerned with recognising and managing risk. This Manual identifies areas of risk common to most zoos and appropriate measures to minimise those risks. Individual zoos can



achieve best practice by conducting an institution-specific **biosecurity risk assessment** to establish the level of risk that exists in each area of its operations, and by using this Manual as a guide to identifying and implementing appropriate control measures for their circumstances. Zoos are encouraged to develop their own institution-specific Biosecurity Plans.

It is important to consider **all factors that may impact on zoo biosecurity**, including:

- species, origin and number of collection animals
- location and layout of the zoo
- source of water supply
- source of food supply
- method of waste management
- disease status of collection animals
- disease status and proximity to animals in the surrounding area
- presence and type of wildlife and pest species
- zoonotic disease potential
- animal movements and transactions
- movement of staff, visitors, contractors and deliveries.

TYPICAL ZOO BIOSECURITY MANAGEMENT PRACTICES INCLUDE:

- a preventative medicine program for all zoo animals
- inspection, testing and quarantine of incoming animals, including species bred for release as part of a sanctioned recovery program
- isolation and treatment of sick animals
- veterinary investigation of illness and death in collection animals
- control of wild, stray and pest animals
- hygiene procedures for staff and visitors
- appropriately constructed and maintained facilities
- controlling drainage and waste disposal and
- ensuring food, water, equipment or work practices do not introduce or spread pests or disease.



MAJOR ROUTES FOR DISEASE AND PATHOGEN TRANSMISSION

An understanding of the major routes for disease and pathogen movement from, or into, a zoo is essential for assessing and managing risk and creating effective work practices. Managing risk is the key to good biosecurity.

Diseases and pathogens may enter or exit the zoo via many routes. Any animal, human or product entering or leaving the zoo should be seen as a possible route or vehicle for disease transmission. The management of inputs and outputs is discussed in greater detail in the relevant sections of this Manual (see Routine Biosecurity Procedures).

Inputs

Inputs refer to any human, animal, biological or non-biological product which enters the zoo. Inputs into zoos vary depending on the type of facility. Each input into the zoo should be assessed for its biosecurity risk. This Biosecurity Manual deals primarily with the recognition and management of the risks associated with these inputs. Each section is covered in greater detail in the document, but the following general principles apply:

I. ANIMALS

Animal inputs include: animals introduced from other institutions either from within Australia or imported from overseas; animals imported from commercial properties, including animals used as food items; sick, injured or orphaned wildlife brought in by members of the public, wildlife care groups or wildlife officers; animals confiscated by customs/quarantine officers; native animals caught from the wild for captive breeding purposes; free-ranging animals, (either native, feral or stray, including birds, rodents, cats and dogs) from adjacent areas; pet animals brought into the zoo grounds and disability animals accompanying visitors. It also includes insects and other invertebrates which may carry, or mechanically transmit, infectious diseases. Any animal input may pose a biosecurity risk.

II. FEED

Feed inputs include dry feed (concentrates, hay, pellets, seed) and wet feed (fresh fruit, poultry, fish, meat, vegetables, browse and pasture silage). Feed may carry pathogens, and may be contaminated by the raw materials used, post-production, during transport and storage or by exposure to rodents, birds, other pests, insects and other free-ranging species on or off the property. Bacteria and mould in poor quality or damaged feed may be a biosecurity concern.



III. BIOLOGICAL SPECIMENS

Biological specimens may be brought to zoos by researchers, wildlife officers, customs and quarantine officers or others. Wildlife carcasses may be brought to the zoo for post mortem investigation. Semen, embryos and other biological specimens may be brought to the zoo for reproductive or laboratory work. These inputs can pose a risk of disease and pathogen transmission.

IV. VEHICLES, MACHINERY, TOOLS AND OTHER EQUIPMENT

Vehicles moving into the zoo may transfer infectious agents, especially on contaminated tyres. Other equipment entering the facility includes tools, materials used for animal housing (straw, litter, mulch, sand and gravel), equipment used during the transportation of animals (hay, sawdust and crates), medicines and other veterinary products. Animal waste products may enter the facility with imported or transferred animals.

V. PEOPLE

Zoo staff, including volunteers and students, enter the premises for normal work purposes and may have contact with other animals (domestic pets/ rehabilitating or “pet” wildlife/ livestock or feral species) outside of work hours. Zoo personnel and family members may live on-site. Local and international visitors pass through the premises on a daily basis and may have close contact with zoo animals. Contractors, maintenance personnel and service people also visit the site regularly. Researchers, wildlife rehabilitators and wildlife officers may also visit the facility, often bringing animals with them. Disease agents can be transmitted from people to animals, for example, via hands, boots, clothing or equipment. Humans can transmit diseases from other animals they have been in contact with outside the zoo, or can transmit human diseases such as influenza, common colds and other zoonoses to zoo animals.

VI. AIR

Some disease agents can be transmitted on air-borne particles, including dust, aerosolised water and aerosolised faeces.

VII. WATER SUPPLY

Water supplies used for drinking, bathing and cleaning may carry pathogens to, or from, animals. Water may become contaminated with waste products or animal faeces, for example from feral or wild birds, rodents or native mammals which poses a risk to both animals and staff.



Outputs

Outputs refer to any human, animal, biological or non-biological product which leaves the zoo. Outputs will vary on the type of facility. Each output from the zoo should be assessed for its biosecurity risk. This Biosecurity Manual deals primarily with the recognition and management of the risks associated with both inputs and outputs. Each section is covered in greater detail in the document, but the following general principles apply:

I. ANIMALS

Animal outputs include: animals leaving the zoo for other institutions either within Australia or overseas; sick, injured or orphaned wildlife being moved to rehabilitation facilities or released into the wild; confiscated animals returned to owners or other authorities; captive-bred animals for release to the wild as part of a sanctioned recovery program; free-ranging animals (either native, feral or stray, including birds, rodents, cats and dogs) moving out from zoo properties. Any animal output may pose a biosecurity risk to humans, livestock and the environment.

II. WASTE PRODUCTS INCLUDING FAECES, URINE, WATER, BIOLOGICAL PRODUCTS, CARCASSES

Waste outputs including waste food products, faeces, animal bedding and biological products such as zoo animal carcasses often leave the zoo property for disposal at a remote site. Some of these waste products can transmit disease and pathogens. Waste management both on and off property is important for good zoo biosecurity.

III. BIOLOGICAL SPECIMENS

Biological specimens may leave the zoo for diagnostic or research purposes. Dead animals may go to independent facilities for post mortem investigation, research, taxidermy or skeletal preparation for study or display. These outputs can pose a risk of disease and pathogen transmission.

IV. VEHICLES, MACHINERY, TOOLS AND OTHER EQUIPMENT

Vehicles moving from the zoo may transfer infectious agents, especially on contaminated tyres. Other equipment leaving the facility includes tools, materials used for animal housing (straw, litter, mulch, sand and gravel), equipment used during the transportation of animals (hay, sawdust, crates), medicines and other veterinary products. Animal waste products may leave the facility with exported or transferred animals.



V. PEOPLE

Zoo staff, including volunteers and students, leave the zoo premises and return to the community each day, where they may have contact with other animals (domestic pets/ rehabilitating or “pet” wildlife/ livestock or feral species) outside of work hours. Researchers, wildlife rehabilitators and wildlife officers may have contact with non-zoo animals after visiting the facility. Disease agents can be transmitted from people to animals, for example, via hands, boots, clothing or equipment. Humans can transmit diseases to other animals they are in contact with outside the zoo.

LEVELS OF BIOSECURITY

ROUTINE BIOSECURITY PROCEDURES

The majority of biosecurity measures outlined in this document will be applied on a routine or daily basis by most zoos in most circumstances. Maintaining these levels of routine biosecurity will give a high assurance that disease agents are not carried into animal enclosures and will reduce the risk of disease transmission between enclosures.

HIGHER LEVEL BIOSECURITY PROCEDURES

Some biosecurity measures may not be a necessary part of routine practice in zoos, but may be implemented in situations or circumstances outside the normal. Higher level biosecurity procedures may be adopted by individual zoos, according to Zoo-specific circumstance and risk. Some higher level biosecurity guidelines are included in this document and may be adopted as needed, within the Zoo’s individual Biosecurity Plan.

In the event of an increased disease risk (e.g. infectious disease event in one enclosure, changed health status of individuals), an **increased** level of biosecurity should be implemented as determined by the circumstances.

EMERGENCY BIOSECURITY RESPONSE PLANS

In the case of an emergency animal disease and where applicable, standard operating procedures (SOPs) will be implemented in line with the relevant AUSVETPLAN disease strategy (see www.animalhealthaustralia.com.au). Zoos should also develop a Zoo-specific Emergency Biosecurity Response Plan, to increase biosecurity protection in the event of a suspected outbreak of an emergency disease or serious endemic disease.



ROUTINE BIOSECURITY PROCEDURES

1. Record keeping, animal identification, staff training and documentation

RECORD KEEPING

Objective

To record all the necessary and appropriate information essential for good biosecurity practices.

Records include individual animal or group identification, date and place of birth, medical history of individual, including preventative medicine program, breeding history and movements of animals both externally and within the facility. This information will allow tracing of movements and events.

Tracing, either forward or back, allows the pathway of disease introduction and spread to be identified in the event of a disease outbreak or a breakdown in biosecurity. Tracing facilitates risk identification and management.

RELEVANT AAWS STANDARDS

Section 12: Animal identification and records

S12.1, S12.4, S12.5, S12.6, S12.7, S 12.8, S 12.9, S12.10, S12.11

Guidelines

- G1.1 Records should be permanently maintained for veterinary and husbandry activities concerning individual collection animals, including acquisition and disposition of animals to and from the collection.
- G1.2 When a Zoo is managed with different Biosecurity Zones, records should be maintained of movement of animals from one biosecurity zone to another (see **Section 2 Property management – Biosecurity zones and compartmentalisation**).
- G1.3 Records should be kept of all significant animal illness and all collection animal deaths. (see **Section 7 Management of sick animals** and **Section 8 Animal deaths, post mortem examination and carcase disposal**).



G1.4 A **minimum** set of information should be recorded for each significant animal illness and all collection animal deaths:

- a. date
- b. location
- c. species
- d. clinical signs/ circumstance and/or syndrome
- e. tests performed and results
- f. diagnosis (definitive or suspected)
- g. response - any associated actions put in place as a result including reporting.

ANIMAL IDENTIFICATION

RELEVANT AAWS STANDARD

Section 12: Animal identification and records

S12.1

Guidelines

- G1.5 Whenever possible, individual animals should be permanently identified. Identification methods such as microchip or tattoo are recommended over other methods such as ear tags and leg bands (although these may be used in addition to microchips or tattoos).
- G1.6 Permanent identification should be verified whenever possible (i.e. confirm tattoo or microchip present, functional, with both site and number verified).

STAFF TRAINING AND DOCUMENTATION

RELEVANT AAWS STANDARDS

Section 1: Responsibilities

S1.1, S1.2, S1.3, S1.4, S1.7

Objective

To ensure all zoo staff are aware of the significance of biosecurity issues.

To ensure zoo management and staff working with animals have a good understanding of the major routes for disease and pathogen movement both from, and into, the zoo.



To ensure zoo management and staff working with animals have a good understanding of work practices which minimise the risk of disease and pathogen movement.

All personnel involved with the operations of the zoo require a basic understanding of biosecurity and biosecurity risks. **Staff working with animals**, in animal enclosures, or with animal products are expected to have a high level of knowledge of biosecurity as relevant to their work practices. Every staff member, including volunteers and students assisting in work practices, has a responsibility for zoo biosecurity. The biosecurity environment in Australia is rapidly changing. National, linked information networks allow rapid access to biosecurity information and new developments.

Definition: Staff - all persons who have been given a level of responsibility associated with the zoo and includes, but is not limited to, keepers, volunteers, researchers, students and contractors.

Definition: Staff working with animals – any staff member involved in work activities within the zoo, which involves direct or close contact with animals, animal enclosures or animal products.

Guidelines

- G1.7 Each zoo should keep a copy of the National Zoo Biosecurity Manual and a copy of a more detailed, site-specific document (the Institution's Biosecurity Plan) that encompasses the National Zoo Biosecurity Manual. These documents should be readily accessible to all staff.
- G1.8 All zoo staff should have an appropriate awareness of biosecurity and its importance to the zoo and to Australia.
- G1.9 Staff working with animals and other staff with biosecurity responsibilities should have an appropriate level of understanding of biosecurity risks and management procedures relevant to their work responsibilities.
- G1.10 Staff should receive regular training in the relevant aspects of the National Zoo Biosecurity Manual and the Zoo's site-specific Biosecurity Plan. Records of training should be maintained for the duration of the employment of the staff member.



2. Property management

Objective

To minimise the risk of spread of disease or contaminants into, from or within the zoo collection through effective use of daily zoo management practices and protocols.

INPUTS AND OUTPUTS

Objective

Inputs and outputs are managed to reduce biosecurity risks.

An understanding of the major routes for disease and contaminant movement from, or into, a zoo is essential for assessing and minimising biosecurity risk (see **Major routes for disease and pathogen transmission**).

Guidelines

- G2.1 Zoo management and staff working with animals should have a good understanding of the major routes for disease and contaminant movement into, from and within, the zoo.
- G2.2 Zoo management and staff working with animals should have a good understanding of work practices which minimise the risk of disease and pathogen movement.
- G2.3 Inputs and outputs should be assessed for potential biosecurity risks.
- G2.4 If the zoo runs a domestic animal (“petting zoo”), these animals should be sourced from low biosecurity risk facilities; risk assessment should occur and they should be housed and managed to minimise the biosecurity risk to other zoo animals.

See also **Section 6 Quarantine**.

PERIMETER AND ANIMAL ENCLOSURE SECURITY

Objective

To limit and control unauthorised access by people to zoo grounds and animal enclosures.

To prevent or minimise access by wild, feral, stray pet and other animals to zoo grounds and animal enclosures.

To ensure all zoo animals are safely and appropriately secured within their enclosures.

To have emergency response plans established in the event of animal escape or other emergency.



RELEVANT AAWS STANDARDS

Section 2: Security and Section 3: Enclosures

S2.1, S2.2, S2.3, S2.4, S2.5, S2.6, S2.7, S2.8, S2.9, S2.10, S2.11, S2.12, S2.13, S3.3, S3.4, S3.5, S3.6, S3.8, S3.11

Guidelines

- G2.5 The property should have a secure perimeter fence or otherwise well-defined boundary, establishing a clearly defined biosecurity zone.
- G2.6 Entrances to the property should be able to be closed and locked to vehicle and foot traffic. Entrances should be locked during all non-visitor hours.
- G2.7 All animal enclosures should be appropriately constructed and secured to prevent animal escape.
- G2.8 Each enclosure should be individually and permanently identified with a unique name, number or alphanumeric code for identification purposes.
- G2.9 Zoos should ensure that all animals are housed in appropriate enclosures with a suitable level of enclosure security for the species, including all species listed as either Extreme or Serious Threat species under the Vertebrate Pests Committee Guidelines (<http://www.feral.org.au/guidelines-for-the-import-movement-and-keeping-of-exotic-vertebrates-in-australia/>).
- G2.10 Zoos should have a written management action plan in the event of an escape or theft of an animal from the institution, including for all species listed as either Extreme or Serious Threat species under the Vertebrate Pests Committee Guidelines.

AN INSTITUTION-SPECIFIC BIOSECURITY PLAN

Objective

To develop and maintain an institution-specific, documented, Biosecurity Plan

The development of Zoo-specific practices and Zoo-specific Biosecurity Plans is fundamental to the success of improved biosecurity for the entire zoo industry. Because each zoo will have differing biosecurity challenges and operating environments, a site-specific Plan is the most effective way to achieve excellent biosecurity for each zoo.



Guidelines

- G2.11 Each zoo should develop and implement an effective, documented institution-specific Biosecurity Plan. Those zoos which chose not to develop their own Biosecurity Plan should implement the relevant guidelines within the National Zoo Biosecurity Manual.
- G2.12 Each zoo should have an up-to-date map of the property, showing identified enclosures, service buildings, veterinary and quarantine facilities, food sheds, access roads and gates.

See also **Section 10 A Zoo-specific Biosecurity Plan.**

BIOSECURITY ZONES AND COMPARTMENTALISATION

Objective

To identify and document different areas of the zoo, based on biosecurity risk.

Dividing a property into distinct biosecurity zones, based on differing levels of biosecurity risk, allows for more effective risk management and planning. For example, areas to which the public have access may require a different level of biosecurity management compared to working areas which are not accessible to the public. Biosecurity zones may also vary depending on the species held, their origin and differences in zoonotic disease transmission potential (see also Section 4 Prevention of transmission of disease between animals and people). Some typical biosecurity zones include: quarantine area; main zoo collection; domestic animal enclosures; public-animal interaction areas; mobile zoo; hospitalised zoo animals; wildlife hospital; confiscated animals and endangered species bred for release.

Higher Level Guidelines

- G2.13 Each zoo property should be divided into distinct biosecurity zones based on differing levels of biosecurity risk.**
- G2.14 There should be an up-to-date map of the property showing the different biosecurity zones, and a written plan, which documents the biosecurity requirements of each zone.**
- G2.15 If animals of lower biosecurity risk are housed with animals of higher biosecurity risk, they should be assumed to have a similarly high biosecurity risk profile.**

ENCLOSURE AND GROUND MAINTENANCE

Objective

To minimise the introduction and spread of disease agents and contaminants in the zoo grounds and enclosures and reduce the attraction of pest species which may transmit disease.

Good hygiene and sanitation are vital components of a biosecurity plan.



RELEVANT AAWS STANDARDS

Section 3: Enclosures and Section 5: Health and wellbeing

S3.19, S3.20, S3.25, S5.3

Guidelines

- G2.16 Enclosures should be maintained at an appropriate level of cleanliness for the species, with the aim of minimising biosecurity risk.
- G2.17 Zoo grounds (including maintenance and holding areas) should be maintained at a suitable level of cleanliness.
- G2.18 Enclosure equipment and furnishings (including enrichment items) should be managed, using practices aimed at minimising disease and contaminant transmission, so as to minimise biosecurity risk.
- G2.19 All enclosures and furnishings should be cleaned regularly to maintain a level of hygiene appropriate for the species involved.
- G2.20 Enclosures should be adequately drained to prevent accumulation and stagnation of water.
- G2.21 Enclosures and zoo grounds should be designed and maintained in a manner which actively reduces access and attractiveness to pest species (see also Management of Pest and Stray Animals).
- G2.22 Water used for cleaning enclosures and waste products including faeces and urine should not drain into adjacent enclosures, other areas with animal access or waterways (see also Drainage and waste disposal and Water quality and supply).
- G2.23 Equipment, furnishings and enrichment items should be dedicated to one enclosure or management area. If equipment, furnishings and enrichment have to be moved to different enclosures, they should be thoroughly cleaned and disinfected before use in the new area, or appropriate consideration and management of biosecurity risks should occur prior to movement (e.g. use of faeces of one species for behavioural enrichment of another species).

DRAINAGE AND WASTE DISPOSAL

Objective

To minimise the risk of spread of disease or contaminants, through drainage and waste disposal.

Disposal of waste water, waste food and biological products including faeces and urine presents potential biosecurity risks. Waste products may need to be disinfected prior to disposal. Waste products may also need to be transported off-site for disposal. Waste management practices should follow biosecurity guidelines to minimise risks. Containment, transport and disposal of waste products and water must also comply with local, state/ territory and federal requirements.



RELEVANT AAWS STANDARDS

Section 2: Enclosures and Section 5: Health and wellbeing

S3.19, S3.20, S5.3

Guidelines

- G2.24 Zoo management should have a knowledge of drainage routes. Preferably, the zoo should maintain a map showing drainage routes.
- G2.25 Water and waste draining from enclosures and holding areas should be assessed for biosecurity risks.
- G2.26 Drainage from enclosures should not enter other enclosures or management areas or waterways.
- G2.27 Enclosures should be adequately drained to prevent accumulation and stagnation of water likely to attract wild birds, especially in the areas around collection waterfowl.
- G2.28 Substrate should be removed and replaced as needed to maintain good enclosure hygiene.
- G2.29 Waste products including substrate, food matter, faeces and other biological products should be assessed for biosecurity risks before disposal or subsequent use (e.g. zoo animal faeces composted and used within zoo or made available outside the zoo as a commercial product such as “Zoo Poo”).
- G2.30 Waste products should be disposed in a manner appropriate to the biosecurity risks of the product, species, enclosure and individual.
- G2.31 Containment, transport and disposal of waste products and water leaving the property should minimise disease transmission risks.
- G2.32 If necessary, waste products should be disinfected or destroyed, using methods such as:
- composting
 - autoclaving
 - chemical sterilisation
 - radiant sterilisation (UV, gamma irradiation)
 - incineration.

See also **Section 8 Animal deaths and carcase disposal.**

FOOD QUALITY AND SUPPLY

Objective

To ensure that animal food is procured, stored, prepared and presented to minimise biosecurity risk.

All food products entering the zoo have the potential to bring in disease and contamination and may pose a biosecurity risk. Food brought into the zoo should be assessed for biosecurity risks.

RELEVANT AAWS STANDARD

Section 4: Dietary and water requirements

S4.4

Guidelines

- G2.33 Food offered to zoo animals should be free from known disease risks and should at a minimum meet health and hygiene levels applicable to livestock or equivalent domestic animals.
- G2.34 Food storage, preparation and presentation practices, particularly those concerning food of animal origin, should consider and minimise the risks of introduction and spread of infectious disease and contaminants. Food should be stored under conditions (correct temperature and humidity) that minimise spoilage and contamination.
- G2.35 Feed offered to zoo animals should be procured, stored, prepared and presented in a manner to minimise or prevent accessibility by pest species.
- G2.36 Food that has been damaged by pest species or has obvious contamination from pests (e.g. rodent faeces) should not be fed out.
- G2.37 Staff should be trained in appropriate hygiene, including personal hygiene procedures, to ensure that hygiene in food preparation areas is maintained at an appropriate level.
- G2.38 Animal food storage and preparation areas should be physically separated from other functions such as the animal hospital, animal holding and staff and visitor food preparation areas.
- G2.39 Food should be sourced from reliable suppliers with good biosecurity practices, including appropriate pest management.
- G2.40 Written records should be maintained of food sources and delivery dates, or of the sources and delivery dates of food which may pose a biosecurity risk.
- G2.41 If the zoo offers whole animal carcasses as food items to zoo animals, the carcasses should undergo a regular assessment process for possible biosecurity risk. If necessary, the carcasses should be scrutinised by the zoo's veterinary service.
- G2.42 Collection, pest or stray animals which die within the zoo grounds (other than animals specifically culled for feeding out) should not be fed out to collection animals.



WATER QUALITY AND SUPPLY

Objective

To ensure that water used in enclosures for drinking, bathing, cooling and cleaning, is of a suitable standard for zoo animals and is of low biosecurity risk.

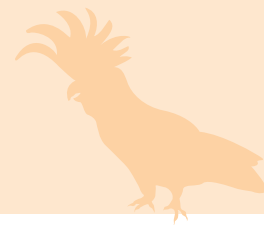
The use of a suitably treated water supply is critical to the maintenance of good biosecurity. Untreated water can spread infectious disease or contaminants and may be a risk to both animals and humans. Effective treatment of surface water to reduce pathogens and contamination is complex and a detailed discussion on water quality and water treatment is outside the scope of this document. It may be necessary to seek expert advice to ensure a safe water supply. A detailed document on water biosecurity for poultry farms, with information applicable to zoo animals can be found at www.daff.gov.au/birds and www.farmbiosecurity.com.au/toolkit.cfm.

RELEVANT AAWS STANDARDS

Section 4: Dietary and water requirements and Section 3: Enclosures
S4.5, S3.24

Guidelines

- G2.43 Fresh, clean drinking water should be supplied to all zoo animals.
- G2.44 Bowls and equipment used to provide drinking water to animals should be easily and regularly cleaned. They should be positioned so that the risk of contamination and soiling by animals (including pest species) and vegetation is minimised.
- G2.45 If drinking water for animals is from a source other than town water, the water should be tested on a regular basis for disease agents and contaminants and treated as appropriate to meet standards suitable for equivalent livestock consumption. The water source itself (e.g. dam, tank or river) should be inspected regularly for contamination such as carcasses, rubbish, algal blooms etc. Details of Australian and New Zealand guidelines for fresh and marine water quality (2000); primary industries, and livestock drinking water quality can be found at http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality and http://www.mincos.gov.au/_data/assets/pdf_file/0020/316127/wqg-ch4.pdf
- G2.46 Water used for cleaning and bathing of zoo animals should be clean and should not contain pathogens or contaminants which pose a health or biosecurity risk to the animals.
- G2.47 Where in-house water treatment is being used, the effectiveness of the treatment system should be validated before use. The water treatment system should be maintained and serviced on a regular, scheduled basis, with written records of the service and inspection history.



G2.48 Where in-house water treatment is used, there should be a regular program of testing and recording water quality to demonstrate the effectiveness of the treatment system. Microbiological validation of the efficacy of the treatment system should be conducted regularly.

G2.49 Aquatic and semi-aquatic zoo animals often have very specific water quality requirements. Zoos should be aware of the necessary water quality standards for all species in their care. Regular monitoring and recording of water quality should be performed and water quality should be maintained to appropriate levels. Water quality standards and guidelines for aquatic exhibited animals exist for several Australian states. As an example, water quality standards for captive seals can be found at www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/278075/standards-for-exhibiting-seals-in-nsw.pdf.

G2.50 If humans are in direct contact with water bodies used by animals (e.g. interaction with aquatic animals), water quality should be closely monitored and maintained.

MANAGEMENT OF PEST SPECIES

Objective

To minimise the potential for introduction or spread of disease and contaminants by pest animals.

Pest species include insects, feral rats, mice, cats, foxes, dogs and some bird species. In some situations native animals such as possums may become pests. Any pest species may introduce or spread disease or contamination.

RELEVANT AAWS STANDARDS

Section 4: Dietary and water requirements and Section 5: Health and wellbeing
S4.4, S5.9

Guidelines

G2.51 All zoo enclosures, facilities, waste and rubbish containers should be designed and maintained to limit access by pest species.

G2.52 Feed storage areas should be pest-proof. Feed spills should be cleaned up immediately.

G2.53 Rubbish should be collected and rubbish bins should be emptied frequently, and in an appropriate manner to minimise attraction of pest species.

G2.54 Food presented to zoo animals should be offered in a manner to discourage non-target consumption by pest and other species.

G2.55 Materials within the property that may harbour pest species should be cleaned up on a regular basis and should not be allowed to accumulate.



G2.56 A safe and effective program for the control of pest species should be developed and maintained.

G2.57 A safe and effective trapping and/or baiting program for rodents should be developed and maintained, if necessary.

G2.58 A staff member should be nominated as responsible for pest management (prevention and control) within the zoo. Regular training should be provided.

See also **Food quality and supply**.

MANAGEMENT OF STRAY AND DOMESTIC ANIMALS

Objective

To minimise the potential for introduction or spread of disease and contaminants by stray animals, including domestic species which are not a part of the zoo collection.

Zoo animals are susceptible to a number of diseases that also affect domestic and production animals. Stray domestic animals roaming on zoo grounds may directly or indirectly transmit disease to or from zoo animals.

Guidelines

G2.59 Domestic animals should not have access to zoo grounds unless:

- a. they are a part of the zoo collection
- b. they are part of public education programs
- c. they are disability animals (e.g. seeing-eye dogs accompanying their owners).

G2.60 If domestic animals are brought to the zoo for rescue or rehabilitation purposes, they should be maintained in isolation from zoo collection animals (see also **Section 6 Quarantine**).

G2.61 Perimeter fencing and security measures should be constructed and maintained so as to minimise the opportunity for stray animals to gain access to zoo grounds.

G2.62 The zoo should have a documented procedure for the management of stray animals on zoo grounds.

G2.63 Pets living with staff within the zoo should be confined to the immediate vicinity of the zoo accommodation and should not have access to zoo grounds.

G2.64 Each zoo should have a documented protocol for managing disability animals within the zoo. This may require disability animals to be housed in a designated area within the zoo facility, or may allow disability animals to accompany owners into the zoo grounds, if a risk assessment indicates this poses minimal biosecurity risk.



ANIMAL MOVEMENTS WITHIN ZOO GROUNDS

Objective

To minimise the risk of introduction or spread of disease through animal movements within the zoo, and outside the zoo.

Zoo animals may need to be moved from one enclosure to another for management reasons. Some zoo animals (e.g. elephants, domestic equids, camels, canids and felids) are routinely “walked” within the zoo grounds, outside designated enclosures, for purposes of exercise and interaction. Non-collection animals (e.g. rehabilitation wildlife) may need to be moved around the zoo and between different holding areas. The biosecurity risks associated with these movements should be assessed and managed.

RELEVANT AAWS STANDARDS

Section 2: Security

S2.4, S2.6

Guidelines

- G2.65 Managers and animal staff should consider and manage biosecurity risks before moving animals between enclosures.
 - G2.66 Enclosures should be cleaned, treated, or left empty for designated periods, if necessary, to minimise biosecurity risks when moving animals between enclosures.
 - G2.67 Rehabilitation wildlife and other non-collection animals (e.g. confiscation cases) entering or leaving the zoo should be physically separated from collection animals at all times. Appropriate quarantine procedures should be undertaken before such animals are permitted to enter the zoo collection (see **Section 6 Quarantine**).
 - G2.68 Biosecurity risks associated with walking animals outside of enclosures should be considered. Risk management procedures (e.g. choice of times and routes) should be documented.
- Details of animal transfers between zoos are discussed in **Section 9 Management of animals, vehicles and equipment during animal transport**.



ZOO ANIMAL FACILITY DESIGN AND CONSTRUCTION

Objective

To ensure that zoo animal facilities are designed and constructed to minimise the risks of introduction or transmission of disease and contaminants and to facilitate biosecurity risk management.

Appropriately designed and constructed zoo facilities, and in particular animal facilities, will greatly aid the prevention and management of biosecurity risks. Well designed and constructed facilities will help zoos to meet many of the guidelines in this Manual. For example, well designed catch-up facilities allow implementation of preventative medicine programs and facilitate investigation, monitoring and treatment of zoo animals. Well designed drainage facilities allow waste products to be managed in a manner which minimises biosecurity risks. Animal facilities must comply with relevant local, state/ territory and federal government regulations with respect to hygiene, sanitation and biosecurity.

RELEVANT AAWS STANDARDS

Section 3: Enclosures; Section 5: Health and wellbeing; Section 8: Capture and restraint and Section 4: Dietary and water requirements
S3.1, S3.3, S3.11, S5.5, S8.2, S4.5

Guidelines

G2.69 The design and construction of zoo facilities should incorporate features that allow for the prevention and management of biosecurity risks.

G2.70 Animal enclosures should be designed and constructed to:

- a. prevent animal escape
- b. prevent unauthorised access
- c. allow adequate staff and vehicle access (for cleaning, removal of substrates, waste, furnishings and animals both alive and dead).

G2.71 Animal facilities, structures and furnishings should be designed and constructed to allow thorough cleaning and disinfection. Attention should be given to areas such as surfaces and drainage.

G2.72 Drainage from enclosures or holding areas should not enter other enclosures or areas that can be accessed by other animals (see **Drainage and waste disposal**).

G2.73 All zoo facilities, enclosures, food storage and preparation areas, waste and rubbish containers should be designed and constructed to prevent access and attractiveness to pest species.



- G2.74 Animal feed containers and dispensers should be designed to prevent access by pest species.
- G2.75 Appropriate substrates should be chosen that do not harbour or allow the accumulation or growth of disease agents or contaminants and that can be readily cleaned, disinfected or changed as required.
- G2.76 Enclosures should be adequately drained to prevent accumulation and stagnation of water likely to attract wild birds, especially in the areas around collection waterfowl.
- G2.77 Property and enclosure perimeters should be designed and constructed with the intent to prevent access by stray and pest animals and prevent escape of zoo animals.
- G2.78 Facilities used for quarantine, hospital, post mortem examination, isolation and holding should be appropriately designed and constructed.
- G2.79 Animal facilities should have appropriate provision for safe capture and restraint.
- G2.80 Water filtration and sanitation systems should be capable of minimising contamination, accumulation and transmission of disease agents and contaminants.
- G2.81 Animal food storage and preparation areas should be designed and constructed to facilitate appropriate levels of hygiene.
- G2.82 Zoo facility design and construction should include the appropriate provision of hand washing or sanitising facilities for visitors and staff.
- G2.83 Wash bays for vehicles and equipment should be incorporated into animal facility design and construction, as appropriate.
- G2.84 Moats and water bodies should be designed and constructed to allow adequate cleaning, disinfection, drainage and avoid stagnation or accumulation of contaminants.
- G2.85 Display and holding facilities for animals should be designed and constructed with physical and/or spatial barriers, as appropriate, to manage risk of disease transmission between animals and people and *vice versa*.



3. Work and hygiene procedures for staff and visitors

Objective

To minimise, through hygiene practices, the risk of introducing or spreading disease or contaminants via movement of staff, volunteers, contractors and visitors.

Definition: Staff working with animals – any staff member involved in work activities within the zoo which involves direct or close contact with zoo animals, animal enclosures or animal products.

An understanding of routes of disease transmission is necessary to ensure that work practices minimise biosecurity risk. There is a risk of disease spread to, from, or between zoo animals through the movement of people, and particularly through the transfer of contaminants via footwear, clothing or equipment. All people who work in direct or close contact with zoo animals, animal products or animal enclosures (whether employed staff, volunteers, researchers or students) have the potential to transfer disease or contaminants between animals. These people may also be at risk of exposure to zoonotic disease from zoo animals or wildlife (see **Section 4 Zoonotic disease risk management**).

Much of the risk of disease transfer through movement of people can be minimised by using good work and hygiene practices. For example, removing organic material and thoroughly cleaning footwear and equipment between one enclosure and another will greatly reduce contaminant transfer, and hence reduce the risk of disease spread.

It is important that staff working with animals have a good understanding of biosecurity risk and management and the routes of disease transmission. Appropriate training, supervision, and written biosecurity guidelines help to ensure good work and hygiene practices. Records of both normal work practices and out-of-ordinary procedures or movements can facilitate tracing if disease concerns develop.

The biosecurity risks associated with movement of people and work equipment between animal enclosures, and outside the zoo will vary depending on the specific circumstances of the zoo and the enclosure. The species, husbandry practices, health status and geographic region, for example, will all influence the biosecurity risks, and will in turn influence the necessary biosecurity management practices. Each zoo is best placed to determine its own biosecurity needs. The guidelines below suggest **best practice** in work and hygiene protocols. It is not expected that all zoos will need to follow all these guidelines on a routine basis, however each zoo should have an awareness of biosecurity management practices, and should actively determine which practices are most appropriate for their unique workplace.

Variations in a staff member's individual circumstances will also influence the associated biosecurity risks. For example, a staff member who has regular contact with domestic animals or wildlife outside of the zoo may have a greater chance of transferring disease or contaminants into and from the zoo. These staff should be aware of these risks and alter their work practices



appropriately (e.g. change of clothing, footwear, excellent personal hygiene before arrival and departure from the workplace).

During times of increased biosecurity risk (e.g. a highly infectious disease situation), work and hygiene practices may need to be altered to manage associated risks. For example, work practices may require full protective clothing which is laundered or disposed on-site, and/or on-site showering before leaving the premises (See also **Section 11 Emergency biosecurity response plan**).

Zoos may also need to consider that different areas of the zoo, or species held may pose differing biosecurity risks and that work and hygiene procedures are best tailored to suit the circumstances of each situation. For example, keepers caring for macaques will likely wear greater personal protective equipment, and practice more rigorous hygiene practices than those caring for macropods in a walk-through exhibit.

RELEVANT AAWS STANDARD

Section 1: Responsibilities

S1.7

ZOO STAFF AND ALL PERSONNEL WORKING WITH ANIMALS

Objective

To minimise the risk of introducing or spreading disease or contaminants by zoo staff and other personnel who have contact with zoo animals.

Guidelines

- G3.1 Staff working with animals should be aware of the risk of disease transmission from their person, their clothing and their footwear to animals and humans.
- G3.2 Staff working with animals should wear a uniform, or other dedicated work clothing while at work in the zoo and should change out of their uniform or work clothes prior to contact with other animals outside of the zoo.
- G3.3 Staff working with animals should wear only dedicated footwear whilst on zoo grounds. Best practice is for footwear to be removed and remain at the zoo site at the end of each work day. Acceptable alternatives are that footwear is thoroughly cleaned and disinfected prior to leaving and on re-entering the zoo grounds. Dedicated work footwear should not be worn whilst working with or when in contact with domestic animals outside the zoo. If zoos allow staff working with animals to wear work footwear outside the zoo grounds, they should be aware of the biosecurity risks associated with these practices and should have measures in place to strengthen footwear biosecurity practices as needed. An acceptable alternative in some institutions will be to designate specific areas or species as “higher biosecurity footwear or practice” areas.



- G3.4 If staff work with zoo or wild animals off-site (e.g. animal shipment, *in situ* field work) their uniforms should be laundered and boots should be cleaned and disinfected prior to leaving and returning to the zoo.
- G3.5 Zoos should have documented protocols for minimising biosecurity risks associated with staff and other non-zoo personnel working in close or direct contact with zoo animals, enclosures or animal products.
- G3.6 Zoo managers should be aware of all personnel, including staff, volunteers, students, researchers and others who have regular close or direct contact with zoo animals, animal products and animal enclosures.
- G3.7 Staff working with animals should be trained and, if necessary, supervised to minimise risk of disease or contaminant transmission.
- G3.8 Volunteers, students, researchers and other personnel assisting zoo staff with work practices should be instructed and supervised in their work practices to ensure that appropriate biosecurity procedures are followed.
- G3.9 Staff working with animals should adopt work practices which minimise transfer of organic material and contaminants into or from enclosures, via their footwear, clothing and equipment. This may include (depending on biosecurity risks) removing organic material from footwear and use of disinfectant footbaths and protective clothing such as gloves, coveralls, dedicated gumboots or disposable footwear covers to minimise the risk of transferring disease and contaminants.
- G3.10 Equipment used as part of disease investigations, research or surveys outside of zoo grounds should be cleaned of organic matter and disinfected prior to usage and upon return.
- G3.11 Staff working with animals should be aware of biosecurity risks if they have contact with domestic animals or wildlife outside their workplace and should be encouraged to manage these biosecurity risks through appropriate procedures. For example, staff who have contact with animals outside the zoo may need to adopt appropriate hygiene practices, clothing and footwear changes.
- G3.12 Staff working with animals should be aware of the biosecurity risks of visiting multiple different enclosures and animals on a single day, and adopt work practices which minimise these risks. For example, work flow through animal enclosures could be made from areas of lower biosecurity risk to those of higher biosecurity risk.
- G3.13 Veterinarians should be aware of the biosecurity risks of examining multiple animals (some of which may be diseased) and entering different enclosures on a single day. They should assess each circumstance for its biosecurity risks and implement appropriate precautions, including appropriate personal hygiene and management of clothing and footwear.



G3.14 During time of increased biosecurity risk, work and hygiene practices should be altered to minimise associated risks. Work practices may require full protective clothing which is laundered or disposed of on site, or showering and a full change of clothing when moving from one biosecurity zone to another.

G3.15 During increased biosecurity risk, staff should clean and disinfect footwear when entering or leaving designated management areas.

CONTRACTORS

Objective

To minimise the risk of introducing or spreading disease or contaminants by contractors.

Definition: Contractor - any external person contracted to perform work on the zoo grounds.

Contractors such as trades people, maintenance and construction crews and specialist consultants may enter the zoo for work purposes. Because these people often travel between multiple sites, and may not have an understanding of biosecurity and its importance to zoos, they can pose a risk to the zoo's biosecurity processes. Simple precautions, such as scheduling enclosure maintenance when enclosures are empty of animals, can help to reduce biosecurity risks.

Guidelines

G3.16 Zoos should be aware of the biosecurity risks posed by contractors entering enclosures for work related matters and should have documented protocols for minimising biosecurity risks associated with contractors who come into contact with zoo animals, enclosures or animal products.

G3.17 Contractors working within the zoo should not enter enclosures nor have contact with zoo animals, unless it is a necessary part of their work.

G3.18 Zoo managers should be aware of all contractors in the zoo whose work requires close or direct contact with zoo animals, animal products and animal enclosures.

G3.19 Contractors who are in contact with zoo animals, enclosures or animal products should be instructed and, if necessary, supervised in their work practices to ensure that appropriate biosecurity procedures are followed.

G3.20 Enclosure maintenance by contractors should be scheduled, where possible, when enclosures are empty of animals.

G3.21 Any tools used by contractors in animal enclosures should be cleaned and disinfected, if necessary, before and after use at the zoo, and between use in different areas of the zoo.



- G3.22 Contractors working in close or direct contact with animals or their products should be briefed on the biosecurity risks they may pose to the zoo, and given assistance by zoo staff to determine appropriate measures to manage biosecurity risks. For example, contractors who have contact with animals outside of the zoo may need to adopt appropriate hygiene and clothing changes prior to their work in the zoo.
- G3.23 A standard risk assessment and briefing document should be developed to help manage contractor risk, if these events occur frequently.
- G3.24 The zoo should maintain a record of contractors who enter animal enclosures.
- G3.25 The entry of delivery personnel into the zoo grounds should be assessed for biosecurity risk.
- G3.26 There should be a system in place to allow tracing when delivery personnel enter the grounds (e.g. through delivery dockets and feed company records).

ZOO VISITORS

Objective

To minimise the risk of introducing or spreading disease or contaminants by zoo visitors, in particular through Contact Areas and Interactive Programs.

Definitions:

Visitor - any member of the public visiting the zoo grounds in order to view or interact with zoo animals.

Contact Area - area where there is direct physical contact between zoo animals and the visitor.

Interactive Programs - activities which encourage a visitor to touch, feed and/or have close contact with a zoo animal, either inside or outside the animal's enclosure.

Mobile Zoo - collection animals taken outside the zoo grounds for educational purposes.

In a traditional zoo visitor experience, a physical distance is maintained between visitors and zoo animals, and visitors do not enter animal enclosures. In this situation, biosecurity risks associated with visitors are minimal.

Many zoos now have **Contact Areas** and **Interactive Programs** which allow direct or close contact between visitors and animals, and where visitors may enter animal enclosures. Close contact between visitors and zoo animals may increase the biosecurity risks to the zoo and may also increase the risks of zoonotic disease spread from zoo animals to visitors (see **Section 4 Zoonotic disease risk management**). These types of programs provide valuable educational experience and in most instances the associated biosecurity risks can be minimised through appropriate risk assessment and management protocols.

It is important that all managers and staff working in Contact Areas and Interactive Programs have a good understanding of general biosecurity risks and risk minimisation practices, as well



as the specific biosecurity risks associated with close contact between visitors, animals and their enclosures. The biosecurity risks associated with visitors walking through an open macropod exhibit will differ significantly from those associated with visitors walking through an open primate exhibit. For these reasons, risk assessment and management practices should be tailored to the unique circumstances of each zoo and situation. These guidelines suggest best practice for typical situations.

RELEVANT AAWS STANDARDS

Section 1: Responsibilities and Section 10: Interactive programs

S1.7, S10.2; S10.3; S10.4; S10.5; S10.8, S10.9, S10.10

Guidelines

- G3.27 Zoo managers should be aware of the biosecurity risks if the visiting public enter animal enclosures or have contact with zoo animals.
- G3.28 Contact Areas and Interactive Programs should be assessed and managed appropriately for their specific biosecurity risks.
- G3.29 Zoos should have documented protocols for managing the biosecurity risks associated with visitors (in particular human-animal interaction) in Contact Areas and Interactive Programs.
- G3.30 Visitors to Contact Areas and Interactive Programs should be supervised by a staff member who has been trained in, and has a good understanding of, biosecurity risks and minimisation practices. The level of biosecurity supervision should be tailored to the risks of the particular circumstances (e.g. greater supervision with children handling reptiles, or visitors holding koalas than with public walking through macropod enclosure).
- G3.31 All staff working in Contact Areas and Interactive Programs should be trained in and have a good understanding of zoonotic risk and management.
- G3.32 When selecting species and individual animals for use in Interactive Programs, consideration should be given to minimising biosecurity and zoonotic disease risks.
- G3.33 Individual animals used in Interactive Programs should be regularly monitored for biosecurity and zoonotic disease risk.
- G3.34 Staff and visitors participating in Interactive Programs or Mobile Zoos should be discouraged from eating, drinking or smoking during the interaction.
- G3.35 Hand-washing or disinfection facilities should be available to all participants of Interactive Programs, and they should be made aware of the facilities and encouraged to practice good personal hygiene.
- G3.36 If necessary, visitors who enter enclosures or have close contact with zoo animals should receive a briefing beforehand on the biosecurity risks associated with the visit.



- G3.37 A standard risk assessment and briefing document should be developed to help manage visitor risk if these events occur frequently.
- G3.38 If visitors enter animal enclosures, consideration should be given to their need to wear suitable footwear (robust, enclosed shoes) which can be cleaned and disinfected if necessary.
- G3.39 Consideration should be given to the need for visitors who have entered animal enclosures to clean their shoes of organic material and disinfect the soles, using a chemical footbath, prior to leaving the area.

See also **Section 4 Zoonotic disease risk management.**

VEHICLE MOVEMENT WITHIN AND OUTSIDE ZOOS

Objective

To minimise the risk of disease or contaminant spread by vehicle movement.

Vehicles moving into, from and within the zoo can be a route for disease and contaminant transmission. Managing vehicle movements is an important part of ensuring good zoo biosecurity.

RELEVANT AAWS STANDARDS

Section 3: Enclosures

S3.12, S3.13, S3.14, S3.17, S3.18

Guidelines

- G3.40 The number of vehicles entering and leaving the zoo grounds should be minimised.
- G3.41 Zoos with drive-through enclosures should consider the biosecurity risks of driving vehicles through animal enclosures. These zoos should have a documented protocol for managing and reducing these risks. Documented routes should be established to minimise biosecurity risk.
- G3.42 The zoo should have methods to trace all non-zoo vehicles which enter enclosures or transport animals.
- G3.43 If vehicles enter animal holding areas, any organic matter or gross contamination, especially on wheels, should be removed prior to entry or exit.
- G3.44 If staff or visiting vehicles need to be brought onto zoo grounds, they should only be driven and parked in designated areas, chosen for their low biosecurity risk.

See also **Section 9 Management of animals, vehicles and equipment during animal transport.**



4. Zoonotic disease risk management

Objective

To minimise the risk of disease transmission between animals and people and vice versa.

Diseases that are spread from animals to humans are called zoonoses. Diseases spread from humans to animals are referred to as anthroozoonoses. Zoonoses may be spread through direct physical contact with animals and their products, or indirectly by sharing the same air space. Different zoonoses are transmitted in different ways. Faeces, saliva, urine and birth fluids generally pose the greatest risks. Some animals such as reptiles may carry bacterial contamination on their skin (notably *Salmonella* spp.) which can pose serious health threat to humans, and can be easily transferred if good personal hygiene (washing hands) is not practiced after animal handling.

Most zoonotic disease risks can be minimised through appropriate personal hygiene, good work practices, effective quarantine programs and routine disease screening of animals. Many of the work practices outlined in **Section 3 Work and hygiene procedures for staff and visitors** will greatly minimise the risk of zoonotic disease transmission. Hand washing or the judicious use of hand sanitisers is the single most effective personal protection against zoonotic disease spread for both staff and visitors.

In some circumstances, the risks of zoonotic disease transmission are increased. Some species or taxonomic groups of animals have a greater potential to transmit zoonotic disease (e.g. primates and reptiles). Work practices, such as close contact with animals and their products may increase the risk of acquiring, or transmitting a zoonotic disease.

Zoonotic disease risks will also vary according to the specific health profile of the individual animal and human. Children may be particularly susceptible to zoonotic disease risk due their undeveloped immune system and their generally poor personal hygiene (e.g. a tendency to put their hands in their mouth). They are often in closer proximity to the ground (faeces and urine) and are more likely to touch animals, if given the opportunity. Likewise, the elderly and people with a compromised immune system are at greater risk of zoonotic disease. An individual's susceptibility to infectious and other diseases will vary according to their individual health status. For instance, diseases such as diabetes, kidney disease, cancer and immunosuppressive diseases such as HIV-AIDS may alter the zoonotic disease risk for an individual (both animal and human). Because of the large number of factors that influence zoonotic risk, and the variability between zoos, it is recommended that each zoo conduct a site-specific zoonotic risk assessment, in conjunction with human health authorities.

It is important that keepers and other staff working with animals or animal products are aware of both general, and specific, zoonotic risks in their workplace and understand the practices necessary to minimise these risks.

In many situations, the risk to the visiting public of contracting zoonotic disease from zoo animals is minimal due to the physical distance maintained between visitors and animals. **Contact Areas** and **Interactive Programs** which allow direct or close contact between visitors and animals may



increase the risks of zoonotic disease spread. These programs provide a valuable educational experience and most zoonotic risks can be managed with reasonable precautions. However, it is particularly important that all managers and staff working in Contact Areas and Interactive Programs have a good understanding of zoonotic diseases, the particular zoonotic risks in their situation and the appropriate practices to minimise these risks (See **Section 3 Work and hygiene procedures for staff and visitors – Zoo visitors**). Detailed Infection Control Guidelines for Animal Contact can be found at www.health.qld.gov.au/ph/documents/cdb/zoo_guidelines.pdf.

RELEVANT AAWS STANDARDS

Section 1: Responsibilities and Section 10: Interactive programs

S1.1, S1.7, S10.2, S10.3, S10.4, S10.5, S10.8, S10.9, S10.10

Guidelines

- G4.1 Zoo managers should be aware of the risks of zoonotic disease spread from zoo animals, enclosures and animal products to staff and visitors.
- G4.2 Zoos should develop a documented protocol and management policy (seeking the assistance of human health authorities) for minimising zoonotic disease risks to staff, contractors and visitors. This should address risks associated with direct or close contact with zoo animals, animal enclosures or animal products.
- G4.3 Staff working in direct contact with animals and their products should have documented training in zoonotic disease risk management procedures (e.g.: use of personal protective equipment, appropriate hygiene and animal handling) and should have ready access to zoonotic disease minimisation protocols.
- G4.4 Zoos with “petting zoos” (close visitor contact with domestic animals) should refer to and develop biosecurity guidelines based on the considerations outlined at www.health.qld.gov.au/ph/documents/cdb/zoo_guidelines.pdf and www.public.health.wa.gov.au/cproot/2222/2/Petting%20Zoo%20Guidelines%202009.pdf
- G4.5 Zoos should have appropriate hand washing or hand disinfection facilities available for staff and visitors. Visitors coming into direct or close contact with zoo animals and their products should be encouraged to utilise these facilities.
- G4.6 Zoonotic disease awareness and risk management should be part of the zoo animal collection preventative medicine program, with the objective of preventing disease transmission from animals to humans and *vice versa*. These programs should be developed seeking input from a human health professional with knowledge of zoonotic diseases, their prevention and management and should include awareness of anthroozoonotic diseases and their management.



- G4.7 Zoos should have a staff health (occupational health and safety) program incorporating appropriate hygiene, education, training and procedures regarding zoonotic diseases. The staff health program should also incorporate, as necessary, pre-employment health and disease screening, vaccination programs and regular ongoing disease screening for staff placed at risk of zoonotic disease due to their work.
- G4.8 Suspected or confirmed zoonotic disease in staff or others within the zoo should be reported (through the zoo's occupational health and safety system) to zoo management and/or zoo veterinary staff.
- G4.9 If zoo staff are aware, or suspect they have a zoonotic disease, they should advise zoo management.
- G4.10 A document detailing the risks of zoonotic disease in a zoo setting should be provided to all staff (and others) who report suspected zoonotic disease, which they can take to their physician.
- G4.11 Zoo managers should be aware that the health status of an individual staff member may influence their susceptibility to zoonotic disease. Staff should also be made aware that changes in their health status can alter their risk of zoonotic disease.
- G4.12 Staff working with animals should be aware that they may transmit infectious disease to the animals in their care. For example many non-human primates are susceptible to human diseases, including common respiratory tract viruses such as colds and flu. These diseases may be transmitted indirectly through shared air space.
- G4.13 Zoo managers and staff should be aware of any taxonomic groups or species in their care with increased zoonotic risk potential. Examples of such taxa include:
- a. macaques - Herpes B virus
 - b. bats - Australian Bat Lyssavirus
 - c. reptiles - Salmonellosis.



5. Animal health and preventative medicine

Objective

To minimise the risk of introducing or spreading disease or contaminants within a zoo collection, by ensuring good veterinary care, diagnosis, treatment and the development and implementation of an effective preventative medicine program.

A comprehensive animal health and preventative medicine program is a cornerstone of good zoo biosecurity. It minimises the risk of disease entry and spread within the animal collection.

A zoo animal health program consists of both preventative medicine and accurate diagnosis and effective treatment of disease. An effective animal health program is reliant on professional veterinary expertise, excellent animal care and good communication. A preventative medicine and health program requires a detailed understanding of disease, in the zoo setting. Veterinary input is essential for the development and delivery of an effective animal health and preventative medicine program. A comprehensive preventative medicine program will address routine procedures such as appropriate methods of animal identification, quarantine procedures, routine vaccination programs, parasite monitoring and control, nutritional management, reproductive management and contraception, water quality management, pest management, routine testing for selected diseases of concern, health and disease surveillance and investigation of illness or death in all collection animals. Investigation, diagnosis and appropriate treatment of disease requires appropriate veterinary expertise. Significant biosecurity and business risks can occur if lay-staff attempt diagnosis and treatment beyond their capabilities.

Veterinary medicines must, by law, only be prescribed by a registered veterinarian.

RELEVANT AAWS STANDARDS

Section 5: Health and wellbeing; Section 1: Responsibilities and Section 3: enclosures
S5.13, S1.1, S1.4, S3.1, S5.4, S5.9

Guidelines

- G5.1 Zoos should engage the services of a suitably qualified veterinarian with relevant experience in the species held. There should be an arrangement for regular veterinary attendance at the facility (to administer the preventative medicine program) and the service should have the necessary professional equipment to deal with zoo animals (e.g. administration of chemical restraint) and there should be a veterinarian available for emergency response at all times.
- G5.2 All zoos should establish and maintain a documented preventative medicine and health program, under the supervision of the veterinarian.

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- G5.3 If the institution is a ZAA member the veterinarian should be encouraged to become a member of the ZAA Veterinary Specialist Advisory Group list serve (<http://www.zooaquarium.org.au/Veterinary-SAG/default.aspx>).
- G5.4 The zoo should be encouraged to become a member of a linked network that enables rapid access to biosecurity information, such as the ZAA list serve and the AWHN (www.wildlifehealth.org.au/AWHN/home.aspx).
- G5.5 The veterinarian and key animal management staff should be familiar with the Australian Animal Welfare Strategy-Exhibited Animals (AAWS), the ZAA Accreditation Standards (for Association member zoos), AUSVETPLAN Zoos Enterprise Manual (www.animalhealthaustralia.com.au/fms/Animal%20Health%20Australia/AUSVETPLAN/zoofinal.pdf) and the AUSVETPLAN Wild Animal Response Strategy (www.animalhealthaustralia.com.au).
- G5.6 The veterinarian should have knowledge and understanding of the OIE disease list (www.oie.int/animal-health-in-the-world/oie-listed-diseases-2011/), the National and State/ Territory Notifiable Disease List and any other diseases considered important to Australia's biosecurity (www.daff.gov.au/animal-plant-health/pests-diseases-weeds/animal/notifiable).
- G5.7 The veterinarian should be aware of their state/ territory and national disease notification requirements and have a documented protocol for notification.
- G5.8 Animal management staff should be aware of their responsibilities for disease notification and should have protocols for informing the Zoo's veterinary service.
- G5.9 The veterinarian should be involved in developing any biosecurity procedures specific to the zoo they support. They should have a good working knowledge of the National Zoo Biosecurity Manual, the individual zoo's biosecurity procedures and any relevant local requirements with respect to biosecurity.

See also **Section 7 Management of sick animals.**



6. Quarantine

Objective

To minimise the risk or introduction of spread of disease or contaminants within or from a zoo collection, by imposing a period of isolation from other zoo animals for newly arrived animals or those suspected or confirmed as suffering from infectious disease.

Quarantine is a period of isolation for newly arrived animals and potentially diseased animals for the purpose of detecting and eliminating (where appropriate) disease. Quarantine is an important component of zoo biosecurity. The quarantine period allows an opportunity for acclimatisation, close observation of animals, animal health checks, preventative medicine programs, permanent identification and confirmation of medical history and provenance.

A zoo's quarantine, hospital, and isolation areas must comply with local, state/ territory and federal regulations. Quarantine of internationally imported zoo animals must also comply with Australia's legislated requirements.

RELEVANT AAWS STANDARDS

Section 5: Health and wellbeing; Section 1: Responsibilities and Section 3: Enclosures

S5.13, S1.1, S1.7, S3.1, S5.4, S5.5, S5.9

GENERAL QUARANTINE PRACTICES

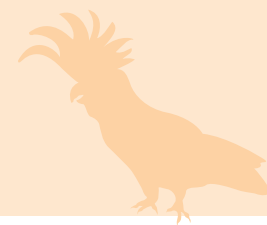
Objective

To minimise, through appropriate work practices, the risk of disease introduction or spread during the quarantine period.

Quarantine practices within zoos are generally applied to animals from four categories:

- a) Newly-arrived collection animals
- b) Sick/ injured collection animals
- c) Wildlife rescue cases
- d) Confiscation cases.

Although the principles of quarantine will apply to all four categories, the practical application may differ in each situation. Zoos are encouraged to develop separate, generic quarantine procedures for each of these four categories. Species-appropriate and circumstance-appropriate quarantine procedures can then be developed from these broader procedures.



Barrier keeping procedures (use of work practices which minimise the spread of infectious disease from one animal, group or environment to another) are a vital part of effective quarantine. If carefully utilised, barrier keeping practices can minimise the risks associated with working with different quarantine groups on the same day, or within the same treatment room or facility.

Guidelines

- G6.1 Species or circumstance-appropriate quarantine procedures should be developed, documented and implemented when required and should address:
- a) isolation of newly acquired animals to provide for examination, treatment, monitoring and acclimatisation
 - b) physical examination of all animals on or soon after arrival, including performance of appropriate clinical and laboratory diagnostic tests as required
 - c) veterinary treatment for existing illness, disease or injury
 - d) a defined, appropriate minimum period for quarantine to ensure animals are free from able disease and
 - e) veterinary care and treatment as necessary to protect against communicable diseases.
- G6.2 Each animal arriving at the zoo, whether a newly arrived collection animal, wildlife rescue case or confiscation case should be assessed for biosecurity risk, including zoonotic risk, by the zoo veterinarian or a Competent Keeper with a strong understanding of biosecurity. An appropriate biosecurity management procedure should be developed for each case. Documentation of the procedure is recommended if the risks are high, or the procedures vary significantly from standard quarantine protocols.
- G6.3 If animals arrive at the zoo as part of a planned transaction from another zoo, biosecurity risks and management plans should be developed between both zoos, prior to the transaction (see **Section 9 Management of animals, vehicles and equipment during animal transport**).
- G6.4 All biological products arriving at the zoo, such as semen, embryos, feathers and taxonomic preparations, should be assessed for biosecurity risk, including zoonotic risk, by the zoo veterinarian or a Competent Keeper with a strong understanding of biosecurity, and a biosecurity management procedure established for each case.
- G6.5 Newly arrived animals or biological products should remain in quarantine until such time as their biosecurity risk has been established and mitigated.
- G6.6 There should be adequate and appropriate signage to indicate areas of restricted access and quarantine status.



- G6.7 Quarantine work practices should be designed and documented to reduce the risk of cross transmission, introduction, and spread of potential pathogens.
- G6.8 All staff working with quarantined animals should be trained and familiar with the zoo's quarantine management protocols.
- G6.9 Staff working in quarantine situations should be trained in the principles and application of barrier keeping. In particular, barrier keeping practices should be applied to ensure effective isolation of rehabilitation wildlife cases and confiscation cases from collection animals.
- G6.10 The zoo should have physically separate, dedicated holding facilities for the quarantine of **newly-arrived collection animals**.
- G6.11 Where a biosecurity risk is suspected, **sick collection animals** and/or their social group should be physically separated from other collection animals. Appropriate facilities should be available for this isolation.
- G6.12 If dedicated quarantine or isolation facilities are not available, then protocols for management of **newly acquired or sick collection animals** should be implemented to ensure there is no direct or indirect contact (e.g. equipment, aerosol or drainage) between these and healthy collection animals.
- G6.13 If the receiving zoo lacks appropriate facilities for appropriate quarantine of a particular species, then consideration should be given to quarantine occurring at another institution with suitable facilities.
- G6.14 If the zoo accepts **wildlife for treatment and rehabilitation**, these cases should be housed, in a physically separate, dedicated facility and managed separately from collection animals. If dedicated wildlife rehabilitation facilities are not available, an acceptable alternative in low-risk situations is to ensure effective isolation of wildlife cases through work practices such as barrier keeping.
- G6.15 If the zoo receives and holds **confiscated exotic or native fauna** on behalf of regulatory authorities (often of unknown origin and high biosecurity risk), these animals, and any equipment used to house or care for them, should be maintained and managed in strict isolation from all other animals until an appropriate health assessment and quarantine process has been completed.
- G6.16 Keepers designated to care for quarantined, isolated, or confiscated animals should attend to these animals only after fulfilling other responsibilities for collection animals (i.e. work from low biosecurity area to higher biosecurity risk area) and/or should utilise barrier keeping practices.
- G6.17 Equipment and tools used in quarantine areas should be dedicated for use only within this area and should be cleaned and disinfected on a regular basis, and at the end of the quarantine period.



- G6.18 Footwear protocols within quarantine areas should follow best possible practices. By preference, staff in quarantine areas should wear dedicated footwear which is not worn outside the quarantine area. Alternatively, entry/ exit from quarantine areas should only be made through a footbath containing a suitable disinfectant, used in accordance with manufacturer's instructions, maintained and changed on a regular basis. There should be provision for scraping the soles of footwear before dipping to ensure organic material is removed and the disinfectant makes effective contact with the soles of the footwear. A second alternative involves the use of disposable footwear covers by all staff entering the quarantine area.
- G6.19 Facilities for hand sanitation using an appropriate antiseptic should be placed at the entry/ exit to each quarantine area. Hands should be thoroughly cleaned on entry /exit from quarantine areas.
- G6.20 Species appropriate quarantine procedures, once established, should be documented and readily available to staff at all times.
- G6.21 Waste products, including bedding, food, faeces, urine and water should be assessed for their biosecurity risk and managed and disposed of, using strict biosecurity practices, during quarantine.
- G6.22 Biological materials leaving the zoo during the period of quarantine (e.g. diagnostic samples) should be assessed and managed for their biosecurity risk.
- G6.23 If the zoo runs a domestic animal ("petting zoo"), these animals should be sourced from low biosecurity risk facilities, risk assessment should occur, and they should be housed and managed to minimise the biosecurity risk to other zoo animals.

VETERINARY CARE AND INVESTIGATION DURING QUARANTINE

A plan of health assessment and preventative medicine for the quarantine period should be developed and carried out under the supervision of the veterinarian. This generally includes physical examination, faecal testing for endoparasites and other appropriate clinical and laboratory diagnostic tests.

Species or taxon-specific protocols for vaccination and disease investigation may be accessed through the ZAA Vet SAG (for Association members).

RELEVANT AAWS STANDARDS

Section 1: Responsibilities; Section 3: Enclosures; Section 5 Health and wellbeing and Section 12: Animal identification

S1.1, S3.1, S5.4, S5.9, S5.13, S12.1



Guidelines

- G6.24 Only animals that have undergone appropriate quarantine or disease risk assessment should be allowed to enter the collection.
- G6.25 A plan of health assessment and preventative medicine for the quarantine period should be developed and carried out under the supervision of the veterinarian or as described in the quarantine protocol.
- G6.26 Complete medical records should be maintained for all newly-arrived collection animals during the quarantine period (see **Section 1 Record keeping**).
- G6.27 All newly-arrived collection animals should be permanently identified during the quarantine period. Any existing identification should be confirmed (see **Section 1 Animal identification**).
- G6.28 Any treatments required should be determined only by the supervising veterinarian, or by a Competent Keeper in consultation with the veterinarian. Veterinary medicines must, by law, only be prescribed by a registered veterinarian.
- G6.29 The cause of death of any animal that dies during quarantine should be established wherever possible. Every animal that dies during quarantine should have a post mortem examination performed under the supervision of a veterinarian and representative tissues should be submitted for histopathologic examination and other specific diagnostic tests (see **Section 8 Animal deaths and post mortem examination**).
- G6.30 No zoo animal should be released to the wild, unless deemed as suitable for release as part of rehabilitation or sanctioned recovery programs (with appropriate state/ territory or national authority and permits).
- G6.31 An animal should not be released from quarantine until all examinations and tests have been completed, the health status of the animal is determined and approval is given by the supervising veterinarian.

Higher level guideline

- G6.32** Where possible, blood should be collected and serum banked from animals undergoing quarantine. Either a -70°C freezer or a -20°C freezer (without cyclic defrost) should be available to bank sera. This may provide an important resource for retrospective disease evaluation.



7. Management of sick animals

Objective

To allow the early detection of illness and a prompt response to any potential biosecurity breach.

Appropriate management of sick animals allows timely investigation and diagnosis, which assists in identification of potential biosecurity risks. Early identification of illness allows appropriate, rapid response. Identification of sick animals relies on keeper observation, training and appropriate reporting. Effective management of sick animals relies on experienced veterinary input, with rapid and accurate investigation, diagnosis and treatment. Good record keeping is essential to these processes.

Significant biosecurity and business risks can occur if lay-staff attempt diagnosis and treatment beyond their capabilities.

IDENTIFYING AND REPORTING SICK ANIMALS

RELEVANT AAWS STANDARDS

Section 1: Responsibilities; Section 5: Health and wellbeing and Section 12: Animal identification
S1.5, S5.4, S5.9, S12.4, S12.5, S12.7

Guidelines

- G7.1 Animal staff should be trained to recognise signs of ill health in animals held in the zoo's collection and to report their findings appropriately to zoo management and/or the zoo's veterinary service.
- G7.2 The condition and health of the animals should be assessed daily by the keepers.
- G7.3 The zoo should have a documented procedure for reporting and recording, on a daily basis, all signs of injury or ill health in collection animals.
- G7.4 There should be a reporting mechanism that allows this information to be presented to the veterinary service in a timely manner and a documented process for requesting veterinary assistance.
- G7.5 Any animal showing signs of illness or injury should receive appropriate and timely attention.
- G7.6 Keepers and other animal staff should be aware of their limitations in diagnosing and treating disease and should refer to the zoo's veterinary service for appropriate professional assistance.



- G7.7 Keepers and other animal staff should not attempt to interpret signs of illness, reach a diagnosis nor prescribe treatment, beyond the limits acceptable to non-veterinary personnel. The responsibility for diagnosis and prescribing treatment should rest with the zoo's veterinary service.
- G7.8 A veterinarian should be available, including a 24 hour emergency service, to respond to reports of illness or injury in the zoo's animals.

INVESTIGATION PRIORITIES AND TRIGGER POINTS

Certain events may signal the need for action, investigation or implementation of higher level biosecurity practices. In order to ensure good biosecurity practices, zoo managers and veterinary staff must be aware of priorities for investigation and must understand which events may be considered as trigger points, which require urgent and prioritised investigation.

Each zoo should develop a Zoo-specific document recognising likely disease issues which would require prioritised action and investigation. Facilities and resources will vary between institutions, and if necessary, priority of investigation should be given to:

- a. exotic collection animals, animals in quarantine and animals under extended or lifetime quarantine surveillance (as defined by AQIS)
- b. any sudden or unexpected death
- c. mass illness or mass death (mass morbidity or mass mortality events)
- d. illness with evidence of infectious disease
- e. any unexplained deaths or mass morbidity or mortality event in wildlife within, or in close proximity to, the zoo grounds.

RELEVANT AAWS STANDARDS

Section 1: Responsibilities and Section 12: Animal identification

S1.1, S12.7

Guidelines

- G7.9 Unexpected and unexplained illness or death of zoo animals (including deaths suspected to be a result of infectious disease) should be assessed for biosecurity risks to animals and humans, including those outside the zoo. Any recent movements of animals, within or outside the zoo grounds, should be taken into account when assessing biosecurity risk.
- G7.10 All signs of illness and all deaths in zoo animals should be reported to zoo management or the zoo's veterinary service, recorded in the zoo's official recording system and investigated by zoo veterinarians or other suitably qualified staff.



- G7.11 Unexpected or unexplained illness and death in wildlife within the zoo grounds should be reported to zoo management or the zoo's veterinary service, recorded in the zoo's official recording system and investigated by zoo veterinarians or other suitably qualified staff.
- G7.12 Relevant authorities should be contacted if there is any suspicion of an emergency disease or an unexplained morbidity or mortality event.
- G7.13 Any biosecurity risks resulting from a disease incident should be addressed with an Emergency Biosecurity Response Plan (see **Section 11**).



8. Animal deaths, post mortem examination and carcase disposal

Objective

To investigate and determine the cause of animal deaths, so as to identify and therefore minimise biosecurity risks.

To minimise or eliminate the spread of disease or contamination via animal carcasses.

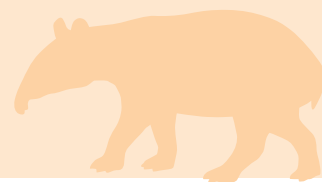
The death of any animal which is under AQIS imposed conditions, such as extended post entry or lifetime quarantine surveillance, must be reported to AQIS as stipulated in their conditions.

The disposal of carcasses must comply with local, state/ territory and federal regulations including environmental compliance requirements. The carcasses of imported animals under post entry quarantine or extended quarantine surveillance must be disposed of as directed by AQIS.

ANIMAL DEATHS AND POST MORTEM EXAMINATION

Guidelines

- G8.1 Each zoo should have a documented procedure for the investigation of collection animal deaths.
- G8.2 Each zoo should have a documented procedure for retrieval, storage and disposal of animal carcasses, which minimises biosecurity risks.
- G8.3 All collection animal deaths should be reported without delay to the appropriate authority (either the Zoo's veterinary service or Zoo management).
- G8.4 All deaths of animals within zoo grounds should be reported on a daily basis to the Zoo's veterinary service or Zoo management.
- G8.5 Dead animals within the zoo grounds should be handled and processed (including post mortem examination and disposal) using methods that minimise the risk of disease transmission to animals and people and also reduce any opportunity for scavenging.
- G8.6 Collection, pest or stray animals which die within the zoo grounds should not be fed out to collection animals.
- G8.7 Animals culled within the zoo grounds should not be fed out to other collection animals, unless the veterinary service has assessed the risk of transmissible diseases and the implications of state/ territory restrictions on swill feeding to minimise disease transmission.
- G8.8 Dead collection animals should be removed from their enclosure as soon as observed (and it is safe to do so). In rare instances there may be a social/ behavioural benefit in allowing the carcase to remain for a period of grieving.



- G8.9 Dead pest, stray and wild animals within the zoo grounds should be collected and brought to a designated area for inspection, post mortem examination (if deemed necessary) or disposal as soon as possible.
- G8.10 A thorough post-mortem examination should be conducted on all dead collection animals to determine the cause of death.
- G8.11 If immediate examination is not possible, dead animals should be stored in a designated cool room or refrigerator until post mortem examination or disposal. If examination is delayed, it may be necessary to freeze the carcass. This should be done only after consultation with the zoo's veterinarian.
- G8.12 Carcasses should be placed in leak-proof, labelled plastic bags or containers until post mortem examination or disposal.
- G8.13 The refrigerator, cool room or freezer should not be used to store animal or human food stuffs and should be located in an area away from live animal housing, and all food storage and preparation. The storage facility should have sufficient capacity to hold all carcasses prior to examination and/ or disposal and should be cleaned and disinfected regularly.
- G8.14 Post mortem examinations should be performed by a veterinarian whenever possible. Other, appropriately trained staff can perform post mortem examinations, collect samples and record observations. However, interpretation of post mortem examination findings is the responsibility of the veterinarian.
- G8.15 If resources are limited, priority of post mortem investigation should be given to animals that fit the categories outlined in **Section 7 (Investigation Priorities and Trigger Points)**. A thorough post mortem examination, by the zoo's veterinary service, should be conducted in all cases falling into these categories.

CARCASS DISPOSAL

Guidelines

- G8.16 Transport and disposal of carcasses should use methods that minimise biosecurity risk and minimise the opportunity for scavenging.
- G8.17 If carcasses leave the property for disposal, procedures should be followed to ensure that the carcasses are suitably contained (e.g. rip proof plastic bags).
- G8.18 Carcasses should be collected regularly from the property.
- G8.19 The vehicle collecting carcasses should not enter the area of the zoo which houses collection animals.
- G8.20 All containers used for collecting dead and storing dead animals must be washed and disinfected before re-use.



9. Management of animals, vehicles and equipment during animal transport

Objective

To minimise the risk of introduction and spread of disease or contaminants during movement of animals between zoos.

This Manual addresses best practice for transfer of zoo animals within Australia. International transfer of zoo animals is subject to complex requirements which are outside the scope of this document.

Transfer of animals from one zoo to another poses biosecurity risks. Infectious disease may be introduced from another zoo or the animal, vehicle or equipment may be exposed to infectious disease or contaminants during transport. Appropriate biosecurity measures will help to prevent the spread of disease or contamination from one zoo to another. Disease transfer can occur via people, vehicles, equipment and transport crates. Appropriate protocols should be followed at every step of the transfer, by all involved in the operation, in order to minimise biosecurity risks.

In the majority of animal transfers, the sending zoo is responsible for boxing and transport to the receiving zoo. The sending zoo is responsible for ensuring that all involved are fully aware of the biosecurity requirements and that the appropriate protocols are implemented. The receiving zoo is responsible for managing post-arrival biosecurity risks, primarily through appropriate quarantine procedures. Best practice involves both zoos discussing and planning biosecurity management and other aspects of the transfer, well in advance of the event.

RELEVANT AAWS STANDARDS

Section 11: Transportation and Section 12: Animal identification

S11.1, S11.2, S11.3, S11.4; S11.5, S11.6, S11.7, S11.8, S11.10, S11.11, S12.8

Guidelines

- G9.1 Zoos should have a plan for biosecurity management during animal transfers.
- G9.2 All transport crates, equipment and, if necessary, vehicles, used to transfer animals between zoos should be thoroughly cleaned and disinfected before and after use.
- G9.3 Staff accompanying animal transfers should employ the highest biosecurity work practices and personal hygiene, at minimum meeting protocols for zoo quarantine management (See **Section 6 Quarantine**).
- G9.4 A Competent Keeper and/ or veterinarian may be required to accompany some animal transfers, to assist in management of biosecurity and other concerns.



- G9.5 Zoos should be aware of and comply with relevant state/ territory requirements for movement of animals in general and the movement of animals between particular states/ territories.
- G9.6 Waste products, including bedding, food, faeces and urine should be managed with strict biosecurity practices during transfer. If necessary, these products should be securely bagged until arrival, and disposed of through the receiving zoo's established biosecurity management processes.
- G9.7 If zoo animals are transferred using commercial transportation companies, best practice requires that zoo animals are not transported in vehicles containing other (domestic) animals. If it is necessary to transport zoo animals in the same vehicle as domestic animals, an appropriate biosecurity risk assessment should be undertaken.

See **Appendix 1: Roles and responsibilities for sending and receiving zoos in zoo animal transactions.**



10. A Zoo-specific Biosecurity Plan

Objective

To provide a detailed framework for each individual zoo that allows rapid identification of biosecurity breaches and minimises the risk of introducing or spreading a disease within the collection,

To provide detailed contingency plans for biosecurity breaches.

Guidelines

G10.1 Individual zoos are encouraged to develop Zoo-specific biosecurity procedures, which should incorporate and build on the guidelines presented in this Manual and clearly demonstrate the biosecurity arrangements in place at the zoo.

G10.2 In developing these Plans, detailed consideration should be given to minimising the risk of disease entering into, spreading within or escaping from a facility.

G10.3 These Plans should align with any National (AUSVETPLAN and AAWS Standards) and local contingency and management plans, including those for zoonoses or incidents that may impact upon human health.

G10.4 Minimum areas for inclusion in a Zoo-specific Biosecurity Plan are:

- a. a health program for all animals held at the facility;
- b. inspection, testing and quarantining of newly arrived animals;
- c. control of pest, wild and stray animals;
- d. hygiene procedures for staff and visitors;
- e. isolation of sick animals;
- f. drainage and waste disposal and;
- g. ensuring machinery and equipment does not introduce pests or disease.



11. Emergency Biosecurity Response Plan

Objective

To adopt high risk management procedures and thereby increase biosecurity protection in the event of a suspected outbreak of an emergency disease or serious endemic disease.

During any outbreak of an emergency animal disease, specific operating procedures will be available from Animal Health Australia in accordance with AUSVETPLAN (www.animalhealthaustralia.com.au/programs/eadp/ausvetplan/ausvetplan_home.cfm).

Guidelines

- G11.1 Each zoo should establish and document a clear Emergency Biosecurity Response Plan for use if an emergency animal disease alert is raised (e.g. an unusual increase in mortality or illness).
- G11.2 The Emergency Biosecurity Response Plan should include protocols for work practices, restriction on animal, staff and visitor movement and should detail the agencies and authorities which need to be informed.



References and other reading

Australian and New Zealand guidelines for fresh and marine water quality (2000); primary industries, and livestock drinking water quality

http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality

and

www.mincos.gov.au/__data/assets/pdf_file/0020/316127/wqg-ch4.pdf

Australian Animal Welfare Standards and Guidelines: Exhibited Animals (Zoos)

AUSVETPLAN

www.animalhealthaustralia.com.au/programs/eadp/ausvetplan/ausvetplan_home.cfm

AUSVETPLAN Wild Animal Response Strategy

www.animalhealthaustralia.com.au

AUSVETPLAN Zoos Enterprise Manual

www.animalhealthaustralia.com.au/fms/Animal%20Health%20Australia/AUSVETPLAN/zoofinal.pdf

Australian Wildlife Health Network

www.wildlifehealth.org.au/AWHN/home.aspx

Beale, Fairbrother, Inglis and Trebeck 2008. One biosecurity: a working partnership. The independent review of Australia's quarantine and biosecurity arrangements report to the Australian government. Commonwealth of Australia Barton ACT, Australia 298pp.

Infection Control Guidelines for Animal Contact

www.health.qld.gov.au/ph/documents/cdb/zoo_guidelines.pdf

National Farm Biosecurity Manual Poultry Production

www.daff.gov.au/birds

and

www.farmbiosecurity.com.au/toolkit.cfm

National Notifiable Disease List

www.daff.gov.au/animal-plant-health/pests-diseases-weeds/animal/notifiable



OIE disease list

www.oie.int/animal-health-in-the-world/oie-listed-diseases-2011/

Petting Zoo Guidelines

www.public.health.wa.gov.au/cproot/2222/2/Petting%20Zoo%20Guidelines%202009.pdf

Vertebrate Pests Committee Guidelines

www.feral.org.au/guidelines-for-the-import-movement-and-keeping-of-exotic-vertebrates-in-australia/

Water Biosecurity Manual for poultry farms

www.daff.gov.au/birds

Water quality standards for captive seals

www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/278075/standards-for-exhibiting-seals-in-nsw.pdf

ZAA Veterinary Specialist Advisory Group list serve

<http://www.zooaquarium.org.au/Veterinary-SAG/default.aspx>

Abbreviations

AQIS	Australian Quarantine Inspection Service
AUSVETPLAN	Australian Veterinary Emergency Plan, an agreed management plan and set of operational procedures, which would be adopted in the event of an emergency animal disease outbreak in Australia. The procedures are briefly outlined in the Summary Document and details are given in the individual Disease Strategies. The manuals are written with specific reference to certain animal industries where a greater than normal risk of harm could be expected from an emergency disease outbreak. The Enterprise Manual for zoos (zoological gardens, circuses and animal theatres) forms part of the Australian Veterinary Emergency Plan, or AUSVETPLAN Edition 2.
AWHN	Australian Wildlife Health Network (“The Network”)
AAWS	Australian Animal Welfare Strategy
CBSG	Conservation Breeding Specialist Group
CVO	Chief Veterinary Officer



DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
IUCN SSC	International Union for the Conservation of Nature, Species Survival Commission
NZBM	National Zoo Biosecurity Manual
OIE	Office International Des Epizooties (World Organisation for Animal Health)
WHO	World Health Organisation
ZAA	Zoo and Aquarium Association The Association (previously known as ARAZPA) was established in 1990 to link zoos and aquariums in Australia, New Zealand and the South Pacific in a cooperative regional network for wildlife conservation. The Association now links over 70 institutions, all working together to protect and conserve the world's wildlife. Their mission is: "To harness the collective resources of zoos and aquariums to conserve biodiversity in the natural environment". Association member institutions support the principles outlined in the World Zoo and Aquarium Conservation Strategy, and aim to further develop zoos and aquariums as centres of excellence in wildlife conservation, environmental education and research. The Zoo and Aquarium Association's Accreditation Program offers a framework for assisting zoos and aquariums to achieve established Association standards of zoo and aquarium operation. The general standards of relevance to all aspects of zoo and aquarium operation include general operations, collection management, animal husbandry, animal health care, education and conservation. Many of these accreditation standards are relevant to zoo biosecurity.
ZAHRG	Zoo Animal Health Reference Group is a committee formed by DAFF to represent zoos on Animal Health issues and comprises members from the following institutions: DAFF, the Association, ZAA Veterinary SAG, Australia Zoo, Zoos South Australia, Perth Zoo, Sea World Australia, Taronga Conservation Society Australia and Zoos Victoria. AWHN provides secretariat for this group.
ZAA Vet SAG	ZAA (previously ARAZPA) Veterinary Specialist Advisory Group The ZAA Veterinary Specialist Group was established for the promotion of communication and collaboration between veterinarians employed by ZAA member institutions. By this means the group aims to enhance the ability of ZAA institution vets to remain informed of and respond to zoological veterinary issues and to provide a collective voice for consultation with ZAA and other organisations when the need arises. The group is convened as an electronic discussion group which is open to all veterinarians working for ZAA member institutions and has been running since 2001.



Definitions

Animal staff: all employees and volunteers coming into contact with zoo animals, includes keepers, veterinarians, veterinary nurses and education staff.

Animal Transaction: acquisition or disposal of an Animal by a Facility. Does not include short-term removal from the Facility for temporary purposes such as veterinary treatment or to give a presentation off-site.

Anthropozoonosis: a Disease spread from humans to animals.

Barrier keeping: use of work practices which minimise the spread of infectious disease from one animal, group or environment to another.

Biosecurity: the set of precautions taken to minimise the risk of introducing an infectious disease into an animal (or human) population.

Biosecurity Plan: a plan that minimises the risk of Disease or infectious agents, chemical and environmental contaminants entering into, spreading within or escaping from the Facility.

Biosecurity Zone: distinct management zone within the zoo, based on differing levels of biosecurity risk. Creating different biosecurity zones allows for more effective risk management and planning.

Contact Area: refers to those areas in which there is direct physical contact between animals and people (usually the public).

Disease: any condition suffered by an Animal such that normally accepted parameters of health are not met.

Domestic Animal: is a species the keeping of which is not restricted in the relevant Australian state or territory.

Drive-through Enclosure: an enclosure into which Vehicles containing members of the public may enter.

Enclosure: any accommodation or structure in which an Animal is contained or can be contained. Includes the grounds of a Facility surrounded by a Perimeter Fence or contained by a building.

Exhibit: any Enclosure or Facility used to display Animals to the public.

Exhibition Purposes: public display, conservation, public education and public entertainment or other prescribed purposes.

Facility: any premises used for Animal Exhibition Purposes, and includes:

any land or place (whether or not wholly or partly built upon or covered by water);

a tent, stall or other structure, whether permanent or temporary; and a Vehicle.



Furniture: any structure or thing within an Enclosure that the Animal has access to. This includes perches, shelter, troughs, ropes, pools, Enrichment toys, trees, vegetation and logs.

Government Authority: a federal, state or territory regulatory body responsible for pest control, conservation, or regulation of Animal exhibition and/or Animal welfare.

Health Program: a preventative and curative program for the care of Animals.

Individual Permanent Identification: a marker that allows a specimen to be distinguished from conspecifics by a third party and includes:

- a. ear tags, leg bands and micro-chips;
- b. drawings or photographs for specimens that have unique, readily distinguishable, permanent markings and/or colourations;
- c. physiological traits such as unusual or unique physical traits that are permanent and are not likely to manifest in a conspecific in such a way as to render such identifier ineffectual.

Interactive Program: activities supervised by one or more Keepers which encourage a member of the public to touch, feed and/or have close contact with an Animal, either inside or outside the Animal's normal enclosure. It is not considered to be an Interactive Program when members of the public enter a designated walk-through animal enclosure such as a macropod walk-through or a walk-through aviary.

Isolation: the segregation of an Animal from its conspecifics for veterinary, husbandry or introduction purposes.

Keeper: a person employed or engaged under the direction of the Operator or the Operator's appointed agent who has a responsibility towards an Animal or group of Animals.

Management Area: A group of enclosures and associated facilities which are managed as one area, with respect to biosecurity risks e.g. feeding, cleaning and waste management procedures.

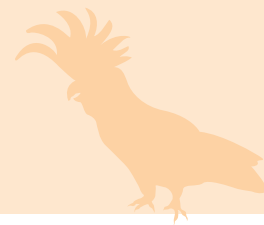
Off-exhibit Enclosure: any Animal Enclosure, other than a Short-term Enclosure, that is not an Exhibit. This includes, but is not limited to, quarantine and Isolation Enclosures, holding areas, Animal health facilities, and breeding Enclosures.

Operator: any person or organisation who has overall responsibility for the Facility.

Perimeter Fence: a permanent structure that discourages unauthorised entry to a Facility and acts as a barrier for Terrestrial Animals.

Quarantine: a period of isolation, for the purpose of detecting and eliminating infectious disease.

Restraint: any method, (whether physical, chemical or behavioural) of preventing an Animal from performing an act or movement.



Staff: all persons who have been given a level of responsibility associated with the zoo and includes, but is not limited to, keepers, volunteers, researchers, students and contractors. *(NB this definition is drawn from the AAWS definition but differs slightly in wording).*

Staff working with animals: any staff member involved in work activities within the zoo, which involves direct or close contact with animals, animal enclosures or animal products.

Substrate: the material that covers the ground or floor, for example bedding or litter placed on the flooring of a cage, box, stall or Enclosure, or the soil or grass covering of an outdoor ground surface.

Vehicle: a means of transport, including, but not limited to, a car, truck, bus, aircraft, boat, trailer, train, and tram.

Veterinarian: a registered veterinarian.

Visitor: any member of the public visiting the zoo grounds in order to view or interact with zoo animals.

Wild Animal: An animal that is free-living and not confined to a Facility by an Enclosure, a leash or by management practices,

Zoo: includes fauna parks, sanctuaries, aquaria and marine parks holding native and/or exotic species.

Zoonosis/ Zoonotic Disease (Plural Zoonoses): Diseases that are transmissible between Animals and humans.

All definitions cover the singular, plural and all variations of the word.



APPENDIXES

Appendix 1: Roles and responsibilities for sending and receiving zoos in zoo animal transactions.

Task/ action	Responsibility	Staff responsible
Pre-shipment quarantine (where required)	Sending Zoo	Veterinary and/ or keeping staff
Pre-shipment health checks	Sending zoo	Veterinary staff
Cleaning of crates, boxes, bags before use	Sending zoo	Keeping staff
Cleaning machinery and equipment, vehicles, trucks, forklifts etc. Before loading/use	Sending zoo	Keeping and/ or maintenance staff
Disinfecting footwear and hands at start and conclusion of work	All involved including contractors	Each person involved in the animal transport
Dedicated clean clothes and boots	Both zoos	Each person involved in the animal transport
Post arrival quarantine procedures and preventative medicine programs	Receiving zoo	Veterinary staff
Post arrival health checks	Receiving zoo	Veterinary staff
Disposal of waste material, food, bedding in animal crates	Receiving zoo	Keeping staff
Cleaning of crates, boxes, bags after use	Receiving zoo	Keeping staff
Cleaning machinery and equipment, vehicles, trucks, forklifts etc. after unloading/transport	Receiving zoo	Keeping and/ or maintenance staff



Appendix 2: An example of the biosecurity self audit checklist.

A biosecurity self audit checklist for continuous improvement, which zoos can download and adapt to their requirements, is available from www.zooaquarium.org.au

An example of one page is inserted here.

2.0	Property Management	Guideline reference	YES	NO	N/A	CORRECTIVE ACTION
2.1	Perimeter and animal enclosure security					
	Does the property have a secure perimeter fence or otherwise well defined boundary establishing a clearly defined biosecurity zone?	G2.5				
	Are entrances to the property able to be closed and locked to vehicle and foot traffic? Are entrances locked during all non-visitor hours?	G2.6				
	Are all animal enclosures appropriately constructed and secured to prevent animal escape?	G2.7				
	Is each enclosure individually and permanently identified with a unique name, number or alphanumeric code for identification purposes?	G2.6				

