

**AUSTRALIAN VETERINARY EMERGENCY PLAN**

# **AUSVETPLAN**

## **Disease Strategy**

### **Sheep pox and goat pox**

**Version 3.1, 2011**

AUSVETPLAN is a series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.

**Primary Industries Ministerial Council**

**This disease strategy forms part of:**

**AUSVETPLAN Edition 3**

**This strategy will be reviewed regularly. Suggestions and recommendations for amendments should be forwarded to:**

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[www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/](http://www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/)

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**DISEASE WATCH HOTLINE**

**1800 675 888**

The Disease Watch Hotline is a toll-free telephone number that connects callers to the relevant state or territory officer to report concerns about any potential emergency disease situation. Anyone suspecting an emergency disease outbreak should use this number to get immediate advice and assistance.

# Preface

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This disease strategy for the management of an outbreak of sheep pox and goat pox (SGP) is an integral part of the **Australian Veterinary Emergency Plan**, or **AUSVETPLAN (Edition 3)**. AUSVETPLAN structures and functions are described in the **AUSVETPLAN Summary Document**. The disease strategy provides information about the diseases (Section 1); the relevant risk factors and their treatment, and the options for the management of a disease outbreak depending on the circumstances (Section 2); and the policy that will be adopted in the case of an outbreak (Sections 3 and 4).

This manual has been produced in accordance with the procedures described in the **AUSVETPLAN Summary Document** and in consultation with Australian national, state and territory governments and the sheep and goat industries.

SGP is included on the OIE (World Organisation for Animal Health) list of notifiable diseases as diseases of sheep and goats. This obliges OIE member countries that had been free from these diseases to notify the OIE within 24 hours of confirming the presence of SGP. OIE-listed diseases are diseases with the potential for international spread, significant mortality or morbidity within the susceptible species and/or potential for zoonotic spread to humans.<sup>1</sup>

The strategies in this document for the diagnosis and management of an outbreak of SGP are based on the recommendations in the OIE *Terrestrial Animal Health Code*<sup>2</sup> and the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*.<sup>3</sup>

In Australia, sheep pox and goat pox are included as Category 2 emergency animal diseases in the *Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses* (EAD Response Agreement).<sup>4</sup>

Text placed in square brackets [xxx] indicates that that aspect of the manual remains contentious or is under development; such text is not part of the official manual. The issues will be worked on by experts and relevant text included at a future date.

Detailed instructions for the field implementation of AUSVETPLAN are contained in the disease strategies, operational procedures manuals, management manuals and wild animal manual. Industry-specific information is given in the relevant enterprise manuals. The full list of AUSVETPLAN manuals that may need to be accessed in an emergency is shown below.

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<sup>1</sup> These criteria are described in more detail in Chapter 1.2 of the OIE *Terrestrial Animal Health Code* ([www.oie.int/index.php?id=169&L=0&htmfile=chapitre\\_1.1.2.htm](http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_1.1.2.htm)).

<sup>2</sup> [www.oie.int/index.php?id=169&L=0&htmfile=chapitre\\_1.14.10.htm](http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_1.14.10.htm)

<sup>3</sup> [www.oie.int/fileadmin/Home/eng/Health\\_standards/tahm/2.07.14\\_S\\_POX\\_G\\_POX.pdf](http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.07.14_S_POX_G_POX.pdf)

<sup>4</sup> Information about the EAD Response Agreement can be found at [www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ead-response-agreement/](http://www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ead-response-agreement/)

In addition, *Exotic Diseases of Animals: A Field Guide for Australian Veterinarians* by WA Geering, AJ Forman and MJ Nunn, Australian Government Publishing Service, Canberra, 1995 (to be updated) is a source for some of the information about the aetiology, diagnosis and epidemiology of the disease.

### **AUSVETPLAN manuals<sup>5</sup>**

#### **Disease strategies**

- Individual strategies for each of 30 diseases
- Bee diseases and pests
- Response policy briefs (for diseases not covered by individual manuals)

#### **Operational procedures manuals**

- Decontamination
- Destruction of animals
- Disposal
- Public relations
- Valuation and compensation
- Livestock management and welfare

#### **Wild animal manual**

- Wild animal response strategy

#### **Summary document**

#### **Enterprise manuals**

- Artificial breeding centres
- Dairy processing
- Feedlots
- Meat processing
- Poultry industry
- Saleyards and transport
- Zoos

#### **Management manuals**

- Control centres management (Parts 1 and 2)
- Animal Emergency Management Information System
- Laboratory preparedness

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<sup>5</sup> The complete series of AUSVETPLAN documents is available on the internet at: [www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/](http://www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/)

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# 1 Nature of the disease

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Sheep pox and goat pox (SGP) are highly contagious diseases of sheep and goats characterised by papules and pustules (rarely vesicles) on exposed body surfaces, and by fever, lacrimation, salivation and nasal discharge. Typical pox lesions appear on the skin and on the respiratory and gastrointestinal mucosa. There is high mortality in susceptible populations.

Currently, Australia is free from SGP. However, it is likely that any SGP virus that enters Australia would be infective for both sheep and goats. An uncontrolled outbreak of SGP in Australia would cause serious stock losses in the sheep and goat industries, and an epidemic would have the potential to cause continuing economic loss.

## 1.1 Aetiology and pathogenicity

The sheep pox, goat pox and lumpy skin disease viruses belong to the genus *Capripoxvirus* of the family *Poxviridae*. Genome sequencing has shown that the *Capripoxvirus* genus can be delineated into three distinct host 'clusters' – lumpy skin disease virus (LSDV), sheep pox virus (SPV) and goat pox virus (GPV) – despite the three sharing 97% nucleotide identity (Tulman et al 2002, Hosamani et al 2004). The geographic distribution of lumpy skin disease (LSD) differs from that of SGP.

The members of the genus *Capripoxvirus* are morphologically and serologically indistinguishable from each other. However, as all strains of *Capripoxvirus* of ovine, caprine or bovine origin examined so far share a major neutralising site, animals that have recovered from infection with one strain are resistant to infection with any other strain (Capstick 1961).

Field observations, such as Sheikh-Ali et al (2004) and Abu-Elzein et al (2003), support the long-held view that SPV and GPV are generally host specific, but numerous strains differ in host predilection and virulence. Instances of infection with the same strain in mixed sheep and goat flocks simultaneously have been recorded, although the strain will usually be more virulent in one of the two species (Abu-Elzein et al 2003).

No seroconversion has been demonstrated from infected sheep or goats to in-contact cattle, or from infected cattle to in-contact sheep or goats, although a Kenyan LSD outbreak may have been derived from natural infections of cattle with the endemic SPV (Davies 1991c). It appears that genes necessary for infection of bovine hosts are effectively absent from SPV and GPV genomes (Tulman et al 2002).

## **1.2 Susceptible species**

### **1.2.1 Goats and sheep**

Merino and European breeds of sheep are more susceptible to sheep pox than other breeds. Goat breeds also vary in susceptibility to goat pox, with breeds exotic to the source area more severely affected (OIE 2004).

### **1.2.2 Cattle**

The potential role of cattle in the epidemiology of these diseases under Australian conditions would be determined during an outbreak by field observations. Experience overseas is that cattle are unlikely to be significant in the course of an SGP outbreak.

### **1.2.3 Humans**

Humans are generally regarded as being nonsusceptible to SGP. In isolated incidents, mild lesions of small red papules followed by vesicles on the hands and arms have been reported in humans working with capripoxviruses in Sweden (von Bakos and Brag 1957) and India (Sawhney et al 1972). No generalised infection occurred.

## **1.3 World distribution and occurrence in Australia**

SGP occurs in Africa, mainly north of the equator; the Middle East; Central and Southeast Asia, including southern Russia and western China; and the Indian subcontinent as far east as Myanmar (Burma). The geographical distribution of sheep pox has been relatively stable.

For the latest information on the distribution of SGP, refer to the website of the OIE World Animal Health Information Database.<sup>6</sup>

SGP has never been recorded in Australia.

## **1.4 Diagnostic criteria**

SGP should be considered when an acute disease with fever is accompanied by pox-like skin lesions, and when there is a high mortality rate in sheep or goats. However, some strains of low virulence may produce only mild clinical signs (Davies 1976).

### **1.4.1 Clinical signs**

Because sheep and goats in Australia are naive to capripoxviruses, the acute form of SGP would be expected. This prediction is based on field reports of high mortality in unprotected imported breeds of sheep and goats or indigenous breeds that have not had regular exposure to local capripoxvirus strains (OIE 2004).

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<sup>6</sup> [www.oie.int/wahid-prod/public.php?page=home](http://www.oie.int/wahid-prod/public.php?page=home)

A sudden onset of fever develops, which peaks at 40–42°C, with discharges from the nose and eyes and excessive salivation. The animal loses its appetite and is reluctant to move. Pox lesions erupt in 1–2 days and extend over all the skin, but are most obvious where wool or hair is shortest, such as on the face, ears, axillae, groin and perineum and under the tail. Lesions may be seen on the mucous membranes of the mouth, nostrils and vulva. Acute respiratory distress occurs if lung lesions are present.

The lesions follow the classical pox cycle, over about 2 weeks, of skin erythema (redness), papule (0.5–1.5 cm diameter), vesicle (rare), pustule with exudation, encrustation and scab formation. Exudate from ruptured pustules can cause the fleece to matt. Healing of skin lesions is slow, taking 5–6 weeks. Deaths may occur at any stage of the disease, with peak mortality occurring about 2 weeks after the appearance of lesions. Mortality may reach 50% in adults and approach 100% in young animals.

A peracute form of SGP is also seen in initial outbreaks in an area. This form is characterised by fever, generalised haemorrhages, widespread cutaneous ulceration and death.

A nodular form of SGP, called stonepox, can occur. Stonepox resembles LSD (of cattle), with skin lesions 0.5–3 cm in diameter; these are hyperaemic (engorged with blood), thickened and raised above the surrounding skin.

#### **1.4.2 Pathology**

##### **Gross lesions**

At postmortem examination, in addition to skin lesions, haemorrhagic ulcerations may be found in the linings of the trachea and gastrointestinal tract. Lung lesions consisting of small, pale grey nodules may be found.

##### **Microscopic lesions (histopathology)**

Histologically, pox lesions have extensive inflammatory, necrotic and proliferative changes. The presence of Borrel cells or 'cellules claveleuses' (epithelioid cells that infiltrate the lesions), and intracytoplasmic inclusion bodies similar to the inclusions found with all poxviruses, are characteristic of SGP. Electron microscopy reveals virus particles indistinguishable from the orthopoxviruses, and these can be readily differentiated from the virus particles of contagious pustular dermatitis.

#### **1.4.3 Laboratory tests**

##### **Specimens required**

Histopathology and virus detection are the essential laboratory tests. Virus detection will be possible within the first week of development of clinical signs, before the development of neutralising antibodies. Fresh tissue samples for electron microscopy, virus isolation and viral antigen detection should be taken, including whole blood in EDTA (to detect viraemia), skin lesion biopsies, and scrapings from skin lesions and lesions in the respiratory and gastrointestinal tracts during postmortem.

### Transport of specimens

Specimens should initially be sent to the state or territory diagnostic laboratory. From there, they will be forwarded to the CSIRO Australian Animal Health Laboratory (CSIRO-AAHL), Geelong, for emergency disease testing, after the necessary clearance has been obtained from the chief veterinary officer (CVO) of the state or territory of the disease outbreak and after the CVO of Victoria has been informed about the transport of the specimens to Geelong.

Unpreserved specimens and those preserved in glycerol-phosphate buffer should be chilled and forwarded with water ice or frozen gel packs. For further information, see the **Laboratory Preparedness Manual**.

### Laboratory diagnosis

#### *AAHL tests*

A rapid, tentative diagnosis of SGP can be made by electron microscopy and histopathology of tissue samples (see Section 1.4.2). Confirmation of the diagnosis is obtained by specifically identifying the virus in tissues from early lesions or in tissue culture using virus-specific tests, as well as by detecting viral DNA (deoxyribonucleic acid) in tissue samples by TaqMan® or conventional polymerase chain reaction (PCR). The diagnostic tests currently available at AAHL are shown in Table 1.1; however, AAHL cannot prepare positive controls for virus isolation in cell culture.

**Table 1.1 Laboratory tests currently available at CSIRO-AAHL for the diagnosis of SGP**

Test	Specimen required	Test detects	Time taken to obtain result
Electron microscopy (negative contrast)	Tissue samples	Virus particles	1–2 hours
Real-time (Taqman®) PCR	Tissue samples	Viral DNA	1 day
Histopathology	Formalin-fixed tissue	Characteristic pox lesions	2 days
Conventional PCR and gene sequencing	Tissue samples	Viral DNA	2 days
Virus isolation in cell culture	Tissue samples	Virus	4–14 days

Source: CSIRO-AAHL, 2006

#### *Other tests*

There is no good serological test for detecting SGP. Indirect immunofluorescence, serum neutralisation and immunodiffusion tests have been used for detecting antibody in sera; however, each of these tests has drawbacks.

Indirect immunofluorescence using immune sheep or goat sera is difficult to interpret and is subject to nonspecific reactions (OIE 2004).

Serum neutralisation is the test of choice for serosurveillance, but has low sensitivity due to the predominantly cell-mediated nature of immunity to capripoxvirus. Thus, a negative result, particularly after vaccination, does not indicate that the animal is not infected or protected (OIE 2004). The test is currently unavailable in Australia.

An enzyme-linked immunosorbent assay (ELISA) based on a specific capripoxvirus antigen (P32) has been developed (OIE 2004). The test is unavailable in Australia and is not currently used elsewhere.

#### **1.4.4 Differential diagnosis**

The following diseases should be considered in a differential diagnosis of SGP:

- contagious pustular dermatitis (scabby mouth);
- bluetongue;
- mycotic dermatitis;
- ectoparasites; and
- photosensitisation.

#### **1.4.5 Treatment of infected animals**

No treatment is available for infected animals.

### **1.5 Resistance and immunity**

Susceptible sheep and goats of all ages can be infected with SPV and GPV and develop serious clinical disease. The introduction of SGP into a totally susceptible population (in a country previously free from the disease) would probably result in high mortalities and rapid spread of the disease (OIE 2004).

#### **1.5.1 Innate and passive immunity**

Different breeds of sheep and goats show varying degrees of natural resistance to infection with SPV and GPV. Merino and European sheep breeds present in Australia are very susceptible to sheep pox.

Maternal immunity provides protection from SGP for up to 3 months (Kitching 1986).

#### **1.5.2 Active immunity**

Animals that have recovered from capripoxvirus infection do not remain carriers of the virus and have lifelong immunity.

#### **1.5.3 Vaccination**

Cell-cultured attenuated ('live') and inactivated vaccines have been used to prevent SGP. Inactivated vaccines do not provide long-term protection, due at least in part to their failure to induce a cell-mediated immune response, which is the predominant protective response to poxvirus infection (OIE 2004).

Attenuated vaccines have been shown to induce relatively extended protection, lasting from 12 months to lifetime (OIE 2004). Instances of live vaccine failure when GPV strains have been used in sheep have prompted a recommendation for the use of homologous vaccines (Agrawal and Soman 1997). However, a vaccine made from a sheep and goat pox virus, which affected both sheep and goats in Kenya, effectively immunised sheep, goats and cattle against infection with a

capripoxvirus. This vaccine was found to be stable and safe, and did not transmit horizontally or vertically (Kitching et al 1986, Davies 1991b).

Immunised animals may not seroconvert to the vaccine.

Recipient species may react differently to attenuated vaccines. Vaccination of susceptible saanen goats from a disease-free area with a live GPV vaccine resulted in clinical goat pox with 100% morbidity and 41% mortality (Abo-Shehada 1990).

## **1.6 Epidemiology**

### **1.6.1 Incubation period**

The incubation period for SGP is usually 12 days but may vary from 4 to 14 days.

The OIE *Terrestrial Animal Health Code* gives a maximum incubation period, for regulatory purposes, of 21 days.

### **1.6.2 Persistence of agent**

#### **General properties**

Capripoxviruses are large, lipid-containing viruses that are susceptible to a range of disinfectants, including detergents. They are susceptible to lipid solvents and acids. Therefore, acids combined with detergents are the disinfectants of choice, particularly for areas where organic matter is prevalent. Hypochlorites and aldehydes are useful for disinfecting clean surfaces, and citric acid, alcohols and iodophors are suitable for personal disinfection. The viruses are inactivated after heating for 1 hour at 55°C.

#### **Environment**

Capripoxviruses are very stable in the environment and can remain viable for long periods, on or off the animal host. They are susceptible to sunlight, but may persist for up to 6 months in a cool, dark environment, such as in shaded animal pens (Davies 1981).

#### **Live animals**

The SGP viruses may remain viable for at least 3 months after recovery in the exudate from skin lesions that has accumulated in wool and hair (Davies 1981). No carrier state has been demonstrated in recovered animals.

#### **Equipment and personnel**

Virus persists for at least 3 months in the wool, hair and scabs of infected animals, and up to 6 months in the environment, including on fomites such as clothing and equipment.

### **1.6.3 Modes of transmission**

#### **Live animals**

Most transmission is by direct contact via the respiratory system through short-distance aerosol transmission from nasal secretions and saliva when sheep and goats are congregated. However, transmission on fomites and mechanical transmission by insects over short distances also occur (Kitching and Taylor 1985). Affected sheep and goats shed the virus at every stage of the disease. Virus is present in secretions and excretions of infected animals, including milk, and in scabs from skin lesions, but these are not considered to be important sources of transmission during an outbreak (Kitching and Taylor 1985).

Movement of infected animals is the main means by which SGP is spread to new premises or new areas.

Host/species susceptibility should be determined as soon as SGP is detected in Australia.

#### **Animal products and byproducts**

The SGP viruses are persistent and remain viable for at least 3 months in dry scabs on the fleece, skins and hair from infected animals.

There is no evidence of virus persisting in the meat of infected animals, but it may be isolated from the milk during the early stages of the fever (Davies 1991a, Williams 2003).

#### **Equipment and personnel**

These viruses are readily transported on fomites, including clothing and equipment.

#### **Vectors**

Insects may act as mechanical vectors of SPV and GPV over short distances. The stable fly (*Stomoxys calcitrans*) can transmit the viruses to a susceptible goat 24 hours after it is itself contaminated (Kitching and Mellor 1986). *Musca* species flies have also been implicated in mechanically transmitting the virus after feeding on exudate from lesions (Kitching and Mellor 1986). There is no evidence of the virus persisting longer than 4 days in insects.

#### **Semen and embryos**

Capripoxvirus is listed by Hare (1985) as one that is known to be excreted in semen and could be transmitted by semen. No information is available on the transmission of the virus in embryos. It should be assumed that the virus would be found in semen and embryos during the viraemic period. The closely related LSDV of cattle was reported by Weiss (Coetzer 2004) as being shed in the semen of clinically affected bulls for up to 22 days and for at least 12 days in subclinically affected bulls. The extremely resistant nature of the virus to the environment would make venereal transmission very likely (NRC 1993).

#### **1.6.4 Factors influencing transmission**

SPV and GPV are not highly infectious, and intimate contact assists transmission. This can occur during night herding or stabling in endemic areas (Davies 1981). The movement of infected animals is the main means of spread over a large area. In endemic areas, spread occurs mainly in summer.

### **1.7 Manner and risk of introduction to Australia**

Movement of infected animals is the main means by which SGP is spread to new premises or new areas. There is, however, little possibility of these diseases entering Australia by this way, as imports of live sheep, cattle or goats, or their semen or embryos, are not permitted from countries in which SGP or LSD is endemic.

There is considerable risk of introduction of sheep pox to Australia on fomites (such as in sheep vessels returning from the Middle East), and on clothing, equipment and unprocessed wool products brought in by people from endemic areas.

Transmission by biting insects seems to be mechanical rather than biological, so insects on planes are probably an insignificant risk.

### **1.8 Social and economic effects**

An uncontrolled outbreak of SGP would cause serious stock losses in the goat and sheep industries. The resulting financial losses would have a serious effect on the local economy in the area of the outbreak. Modelling of outbreaks of sheep pox of different levels of severity have indicated that a severe outbreak in regions such as northern Victoria and northern New South Wales might involve up to 50 infected premises, and that more than 50 000 sheep and goats might have to be slaughtered to achieve eradication (Garner and Lack 1995). This would involve huge disruption to the industries, irrespective of the trade consequences.

If SGP became endemic, continuing economic loss would occur as a result of loss of animals and the cost of preventative vaccination. Permanent loss of some export markets would also be expected, together with associated downturn in the rural economy and possibly increased rural unemployment. In the worst-case scenario, Australia's major wool, goat fibre and skin markets would be lost; however, this loss could be alleviated if zoning were accepted. It would therefore be necessary to act immediately to control and then eradicate SGP, and to quickly establish Australia's freedom from the disease so that the export trade in animal products could be re-established.

Movement restrictions within the restricted area and control area (see Section 4) would cause loss of market opportunities and associated financial losses to nonaffected properties in the area, as well as short-term losses to support industries, such as stock transport. Some industries not directly affected by SGP, such as the cattle industry, may also be subject to movement restrictions.

The use of a stamping-out policy may not lead to the loss of significantly more stock on infected premises than would be expected if the disease were not

controlled. Prevention of restocking until after the prescribed period has elapsed would impose serious problems on the cash flow of the infected premises and dangerous contact premises involved.

If the outbreak occurred late in the vector season, eradication would be helped if the cold weather killed the vectors, and the infected animals were destroyed and disposed of quickly.

## **1.9 Criteria for proof of freedom**

If a stamping-out policy were practised, Australia would be considered free from SGP 6 months after the destruction of the last affected animal. To demonstrate to Australia's trading partners that the disease has been successfully contained and eradicated, Australia must embark on a disease surveillance program during those 6 months.

As it is possible that the diseases may appear as subclinical or inapparent infections, appropriate laboratory testing will be necessary to survey for the presence of disease, as described in Appendix 1. Physical examinations of flocks and herds will help provide proof of freedom.

## 2 Principles of control and eradication

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### 2.1 Critical factors assessed in formulating response policy

Features of the disease:

- Sheep pox and goat pox (SGP) are highly contagious diseases, often with high mortality, so the disease should become apparent soon after introduction to a closely settled area.
- Acute cases (the most common type in naive populations) should be readily diagnosed clinically as sheep pox and goat pox.
- A rapid confirmatory diagnosis can be made.
- Recovered animals are solidly immune.
- There is no carrier state.
- The virus is stable in the environment, especially in cool, shaded areas; fomites are important in spread of the disease.
- Under Australian conditions, mechanical transmission of the virus by biting flies may be important.

Features of susceptible populations:

- Australian sheep and goat populations are naive to the viruses and would not be expected to produce mild or inapparent forms of the disease.
- Movement of infected animals is the main means of spread over a large area.
- The disease may establish in a feral goat population that is not easily identified.
- Market fluctuations due to public health perceptions or product withdrawals would reduce the value of the industry.
- Smallholder goat populations are not easily identified.

### 2.2 Options for control or eradication based on the assessed critical factors

Managing the risk of SGP would be based on the identified critical factors and would involve:

- registration of all commercial and small sheep and goat holdings – this is essential to determine the location of small goat holdings;
- application of mandatory biosecurity programs;
- the early determination of the extent of infection through the rapid identification of infected and potentially infected premises using quickly instituted serosurveillance and animal tracing, based on an epidemiological assessment;

- the swift declaration and effective policing of control areas and the rapid imposition of quarantine and movement controls on infected and potentially infected premises, to prevent the movement of sheep, goats and fomites carrying virus or potentially carrying virus;
- minimising the exposure of susceptible animals by preventing direct and indirect contact of at-risk sheep and goats with infected sheep and goats, and potentially contaminated fomites;
- elimination of infection from infected premises and/or infected populations by the rapid destruction of sheep and goats, the sanitary disposal of carcasses and fomites, and decontamination;
- identification of vectors of concern as quickly as possible and application of appropriate treatments;
- the implementation of zoning and/or compartmentalisation;
- the possible use of vaccination with movement controls;
- the gaining of smallholder support; and
- feral goat population management.

The policy options for the control and eradication of SGP are:

- recognition of endemic status (especially if the disease is found in the feral goat population), using vaccination, and zoning/compartmentalisation;
- modified stamping out if the disease is widespread when diagnosed or spreads beyond available resources, using ring vaccination; and
- stamping out.

The policy to be implemented is described in Section 3.

## 3 Policy and rationale

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### 3.1 Introduction

Sheep pox and goat pox (SGP) are OIE-listed diseases that have the potential for rapid spread. SGP has implications for sheep and goat production and trade.

Sheep pox and goat pox are Category 2 diseases under the Emergency Animal Disease Response Agreement. Category 2 diseases are those for which costs will be shared 80% by government and 20% by industry.

The response policy is to eradicate SGP in the shortest possible period using *stamping out*, supported by a combination of strategies, including:

- ☞ *sanitary disposal* of destroyed animals and contaminated animal products, to remove the source of infection;
- ☞ *quarantine and movement controls* over animals, products and other potentially contaminated items to minimise spread of infection;
- ☞ *decontamination* of fomites (facilities, equipment and other items) to minimise the spread of the virus from infected animals and premises;
- ☞ *tracing and surveillance* to determine the source and extent of infection and to provide proof of freedom from the disease;
- ☞ *zoning and/or compartmentalisation* to define infected and disease-free premises and areas; and
- ☞ *an awareness campaign* to facilitate cooperation from the industry and the community.

*Ring vaccination* may be utilised as part of a *modified stamping-out* policy (for example, if feral goats are involved in the outbreak).

The chief veterinary officer (CVO) in the state or territory in which the outbreak occurs is responsible for developing an Emergency Animal Disease (EAD) Response Plan for the particular outbreak.

The Consultative Committee on Emergency Animal Diseases (CCEAD), convened for the incident, assesses the response plan drawn up by the CVO for technical soundness and consistency with AUSVETPLAN, and endorses or seeks modifications to it. Overall operational management of the incident rests with the CVO of the affected jurisdiction, with oversight by the CCEAD.

The National EAD Management Group (NMG), also convened for the specific incident, decides on whether cost sharing will be invoked (following advice from the CCEAD) and manages the national policy and resourcing needs.

For further details, refer to the **Summary Document**.

CVOs will implement disease control measures as agreed in the EAD Response Plan and in accordance with relevant legislation. They will make ongoing decisions on follow-up disease control measures in consultation with the CCEAD and the NMG, based on epidemiological information (see Section 1.6) about the outbreak(s).

For information on the responsibilities of the state or territory disease control headquarters and local disease control centres, see the **Control Centres Management Manual**.

## **3.2 Control and eradication policy**

The requirement for a quick return to international trade highlights the need for rapid eradication by stamping out, the need to combine this policy with quarantine of infected and suspect premises, and the need to quickly determine the source of infection and the extent of spread so that proper and adequate control measures can be applied.

Any animal disease eradication or control program must include close liaison and information exchange with industry, the media and the public.

### **3.2.1 Stamping out**

The policy for controlling SGP in Australia is to use stamping out. This will involve the destruction of susceptible animals on infected premises (IPs) and dangerous contact animals on dangerous contact premises (DCPs). Until further information is available, sheep and goats will be considered to be the susceptible species.

If a DCP contains relatively few susceptible animals in addition to the dangerous contacts, all animals will be destroyed. If, on the other hand, there is a large number of stock on the premises, only the dangerous contact animals will be destroyed, and the other animals will be quarantined and observed for 21 days for signs of disease. Such a strategy will depend to a large extent on the degree of separation able to be achieved between the groups of animals and the possibility of mechanical transfer by insect vectors or by other means.

Although experience overseas is that cattle are unlikely to be significant in the course of an SGP outbreak, any cattle in nose-to-nose contact with infected sheep or goats may need to be included in the stamping-out program.

### **3.2.2 Quarantine and movement controls**

As the main form of transmission is by direct contact with infected animals or contaminated products and things, quarantine and movement controls will prevent the rapid spread of disease. The IPs, DCPs and suspect premises (SPs) will immediately be declared.

A restricted area (RA), which will contain all IPs and DCPs and as many SPs as possible, will be determined following tracing and surveillance activities. The RA should have its boundary at least 5 km from the IP, with at least two stock-proof fences between the IP and the boundary. The size of the RA will be determined by the presence of possible vectors and feral animals within the RA and will probably be much larger than this.

A control area (CA) will be formed around the RA, with its boundary at least 5 km from the RA boundary. To be realistic, this area should be as large as possible to allow animals to be marketed and processed within the area. It would be preferable to try to include a meat- and skin-processing establishment within the area.

All movement of susceptible animals within the RA will be prohibited for an initial period of at least 21 days so that the animals within the area can be observed by direct physical examination and appropriate diagnostic tests. Animals on DCPs and SPs will be examined daily for the first 2 weeks and then at weekly intervals. Other properties in the RA will be examined weekly.

In the absence of any signs of disease during this 21-day period of observation, animals from the DCPs and IPs may be sent for slaughter, under permit, at approved abattoirs. They will not be held in the lairage any longer than the minimum time required for meat hygiene purposes. Movement controls within the CA may be less restrictive, but live animal movements out of the CA will be prohibited for the 21-day observation period.

See Section 4 for further details on declared areas and on quarantine and movement controls.

### **3.2.3 Tracing and surveillance**

Tracing of suspect animals, products, people and things must take in the period from at least 21 days before the first clinical signs were observed on the initial IP to the time the premises was placed under quarantine. Tracing must be thorough and detailed, because the SGP viruses may persist on inanimate materials and survive outside the host for some time.

Surveillance will include an epidemiological study of the possible vectors that may play a role in transmission of the virus and the ecological factors likely to influence the distribution and survival of the vectors. This information will help in determining the size of the RA by taking into consideration the possible spread of virus by insect vectors.

Susceptible animals on DCPs and SPs will be physically examined on a daily basis for the first 14 days and weekly thereafter, as will all susceptible animals in the RA (or a statistical sample if large numbers of susceptible animals are involved).

Sentinel animals may be introduced to the IPs and DCPs after stamping out and decontamination have been completed. These animals will be examined weekly and appropriately tested over a period of at least 6 weeks. Repopulation may occur after this time if all findings are negative. The repopulated animals will also be subjected to surveillance for at least a further 3 months.

See Appendix 1 for further details on surveillance.

### **3.2.4 Zoning and compartmentalisation**

Should stamping out be successful, the area defined by the CA will represent an infected zone for only a short period. This will eliminate the need for establishing and proposing free zones, which would only be considered if the disease established itself in a region without detection and was difficult to eradicate in the

short term. If this should occur, discrete subpopulations of susceptible species would need to be defined, risk assessments conducted and data collated to support and provide assurances for long-term biosecurity management of the free zone.

### **3.2.5 Vaccination**

If a disease outbreak outstrips the resources available to control it through stamping out, a ring vaccination program will provide a buffer zone of immune animals around the disease area until the outbreak can be brought under control. It is unlikely that Australia will use vaccination except as a last resort – for example, where domestic animals are in contact with infected feral goats, and quick eradication in feral goats is not feasible.

See Section 1.5.3 for further details on vaccination, including the vaccines available and methods of vaccination.

### **3.2.6 Treatment of infected animals**

Infected or susceptible animals will not be treated.

### **3.2.7 Treatment of animal products**

Animals that have been cleared after the period of observation may be sent to slaughter and the meat released for human consumption.

Skins and fibre are high-risk products because the virus may remain viable on them for some months. Skins and fibre from IPs and DCPs will be destroyed on the premises. All wool, skins, and goat fibre that have left those premises within the 21-day period before the diagnosis will be traced and suitably treated or destroyed; other wool, skins, and goat fibre may be moved under permit for processing elsewhere. Bales of wool, for example, may be allowed to go to a processing plant if shearing occurred before the introduction of disease and there was no contact with susceptible animals. Skins of little commercial value will be destroyed on the premises.

Milk from susceptible species will be destroyed on the premises or moved under permit for processing elsewhere. Milk that has left the premises within the 21-day period before the diagnosis of disease will be traced and, if found, suitably treated by heat or chemicals or destroyed.

Crops and grains may be moved off IPs and DCPs, subject to decontamination procedures if it is considered likely that the material is contaminated. The material will not be used as bedding or fodder for susceptible animals.

Accumulated faeces, fibre and skin pieces around and under sheds where infected and suspect animals have congregated will be decontaminated and disposed of on the premises.

Semen and embryos will not be collected from animals that are subject to restrictions. An informed judgment on stored product will be made when all relevant information is available.

All persons leaving the quarantine area must undergo appropriate decontamination, including a change of clothing and footwear.

### 3.2.8 Disposal of animals and animal products

Animal product and byproduct disposal will follow the same principles as those for carcase disposal (see the **Disposal Manual**). Disposal methods (such as burning or burial) will prevent further spread of the disease through contact with susceptible animals.

If there may be a delay between destruction and disposal, the carcasses will be sprayed with phenol, covered with straw (kept wet with phenol), and guarded continuously to prevent interference from vermin or predators. Insects that are potential vectors will be controlled.

The disposal method chosen must be suited to the location and product at that particular time (see the **Decontamination Manual** and the **Disposal Manual** for more information).

### 3.2.9 Decontamination

A detailed and thorough decontamination program is required because of the persistence of the virus outside the host. Fomites play an important role in transmission of SGP, and all fomites will be decontaminated or destroyed. Decontamination will include pens and yards where infected or suspect animals have been held, with special attention paid to shearing and fleece-handling areas and to dairies. All potentially contaminated fleeces and woolpacks must be burned or buried.

Vehicles and people leaving the premises will be decontaminated.

Further information is available in the **Decontamination Manual** and in Geering et al (1995).

### 3.2.10 Wild animal and vector control

If the disease occurs in an area where there are feral goat populations, a goat culling or control program, combined with surveillance, will be established to determine whether the infection has entered the population. Control measures must be such that wild animal populations are not induced to disperse out of the RA. A range of options may be available, such as baiting, trapping and decoy feeding.

If SGP escapes into the feral goat population, a buffer zone around the goat population would be necessary to contain the disease. This buffer zone may be formed by depopulating the area of goats and sheep, or by ring vaccination. See the **Wild Animal Response Strategy** for more information on goat control.

Disposal of contaminated materials (including feedstuffs) and carcasses will be prompt to minimise exposure of susceptible feral species, wild predators and vermin to SGP virus.

The epidemiological investigation team, which will include an entomologist, will identify vectors that could play a role in the transmission of SGP and develop a targeted approach to vector control to block the transmission cycle.

It is possible that several vectors may be present that may be able to mechanically transmit the virus, and this may require a range of approaches to control. These

might include the aerial and ground application of insecticides as ultra-low-volume (ULV) fogs, and treatment of animals (within, say, 5 km of IPs) with either a systemic insecticide such as ivermectin, or a topical insecticide that will repel insects or reduce the population of target insects. Insect-proof housing for animals might also be considered.

Surveillance for vectors both in the free and infected areas will be ongoing to ensure that the disease is not being spread by this method.

#### **3.2.11 Public awareness and media**

A media campaign will emphasise the importance of inspecting sheep and goats for pox lesions, and of reporting suspicious lesions and unusual deaths promptly. The risks associated with raw wool and skins will be stressed.

Entry of the disease into highly susceptible sheep and goat populations is likely to result in high morbidities and mortalities. Many animals will need to be slaughtered if infection occurs in a number of herds or flocks, even if the disease is mild or subclinical. Industry will be made aware of the control measures, and regular liaison with industry will be undertaken. The media can play a role in conveying information to the public to help maintain confidence in the product and explain the need for the control measures.

#### **3.2.12 Public health implications**

There are no public health implications.

### **3.3 Other policies**

Modified stamping out, using ring vaccination, would be the policy implemented if the disease were widespread when diagnosed or had spread beyond the resources available for stamping out.

It is unlikely that an outbreak of SGP would not be eradicated. However, if SGP were not able to be contained through the above policies, recognition of endemic status may be necessary (especially if the disease were found in the feral goat population).

If SGP became established in Australia, the diseases in domestic animals would be controlled by vaccination, with an appropriate vaccine, of all susceptible animals in areas where the disease occurred. Vaccination of the entire susceptible population against SGP should result in the field virus dying out, allowing widespread vaccination to be discontinued after only a couple of years and replaced by ring vaccination.

Zoning/compartimentalisation would be used to prevent movement of susceptible animals and materials from the infected areas.

### 3.4 Funding and compensation

Sheep pox and goat pox are classified as Category 2 emergency animal diseases under the EAD Response Agreement between the governments of Australia and the livestock industries.

Category 2 diseases are emergency animal diseases that have the potential to cause major national socioeconomic consequences through very serious international trade losses, national market disruptions and very severe production losses in the livestock industries that are involved. Category 2 also includes diseases that may have slightly lower national socioeconomic consequences, but also have significant public health or environmental consequences. For Category 2 diseases, the costs will be shared 80% by governments and 20% by the relevant industries (refer to the EAD Response Agreement for details).<sup>7</sup>

Information on the cost-sharing arrangements can be found in the **Summary Document** and in the **Valuation and Compensation Manual**.

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<sup>7</sup> See [www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ead-response-agreement/](http://www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ead-response-agreement/)

## 4 Recommended quarantine and movement controls

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### 4.1 Guidelines for classifying declared areas

A declared area is a part of a country with defined boundaries that is subject to mandatory disease control measures (such as animal movement controls, animal destruction, decontamination) under emergency animal disease legislation. Types of declared areas include restricted area, control area, infected premises, dangerous contact premises and suspect premises, but not all classifications are relevant to all diseases.

#### 4.1.1 Declared premises

##### **Infected premises**

A premises classified as an infected premises (IP) will be a defined area (which may be all or part of a property) in which sheep pox and goat pox (SGP) or their respective disease agents exist, or are believed to exist. An IP will be subject to quarantine served by notice, and to eradication and control procedures.

##### **Dangerous contact premises**

Premises classified as dangerous contact premises (DCPs) will be those premises that contain animals, animal products, waste or other items that have recently been introduced from an IP (up to 21 days before the premises were declared infected) and are likely to be infected or contaminated, or any of these items that may have been in substantial contact with people, vehicles and equipment that have been associated with an IP within 21 days of visiting the DCP.

Premises classified as DCPs will be:

- all neighbouring properties on which susceptible animals have been sharing a common fenceline with infected animals on an IP and where it is considered necessary to impose disease control measures;
- all properties to which susceptible animals have moved from an IP within 21 days before the first appearance of clinical signs on the IP and where it is considered necessary to impose disease control measures; and
- all other properties owned or managed in conjunction with an IP, due to concerns with movement of people, equipment and vehicles within 21 days before the first appearance of clinical signs on the IP.

DCPs will be subject to quarantine and to eradication or control measures.

##### **Suspect premises**

Premises classified as suspect premises (SPs) will be those other than DCPs that contain animals that are showing clinical signs needing differential diagnosis.

SPs will be subject to quarantine and intensive surveillance.

'Suspect premises' is a temporary classification because the premises contains animals that are suspected of having the disease. High priority should be given to clarifying the status of the suspect animals so that the SP can be reclassified either as an IP and appropriate quarantine and movement controls implemented, or as free from disease, in which case no further disease control measures are required.

#### **4.1.2 Declared areas**

##### **Restricted area**

A restricted area (RA) will be a relatively small declared area (compared with a control area – see below) around IPs that is subject to intense surveillance and movement controls. Movement out of the area will generally be prohibited, while movement into the area would only be by permit. Multiple RAs may exist within one control area.

The RA can have an irregular perimeter, provided that the boundary is initially an appropriate distance from the nearest IP, DCP or SP. The boundary distance will vary with the size and nature of the potential source of disease agent, but will be at least a 5-km radius around the IP, depending on the density of premises. In addition, there should be at least two stock-proof barriers between the IP and the boundary of the RA. Where stock-proof barriers do not exist, the RA should also include an area substantially larger than the home range of any susceptible feral species that may come into contact with the IPs or DCPs. The boundary could be the perimeter fence of the IP if the IP is in an isolated location. The boundary in a densely populated area will take into account the distribution of susceptible animals; traffic patterns to markets, service areas and abattoirs; and areas that constitute natural barriers to movement.

##### **Control area**

The control area (CA) will be a larger declared area around the RA(s) and, initially, possibly as large as a state or territory, where restrictions will reduce the risk of disease spreading from the RA(s). The boundary of the CA will be adjusted as confidence about the extent of the outbreak increases; however, it must remain consistent with the OIE Terrestrial Code chapters on zoning and compartmentalisation (see Chapter 4.3 of the code)<sup>8</sup> and surveillance (see Chapter 1.4 of the code).<sup>9</sup> In general, surveillance and movement controls will be less intense than for the RA, and animals and products may be permitted to move under permit from the area.

The declaration of a CA also helps to control the spread of the outbreak from within the RA. The CA is a buffer zone between the RA and the rest of the industry. The boundary does not have to be circular or parallel to that of the RA but should be at least 5 km from the boundary of the RA, and there should be at

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<sup>8</sup> [www.oie.int/index.php?id=169&L=0&htmfile=chapitre\\_1.4.3.htm](http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_1.4.3.htm)

<sup>9</sup> [www.oie.int/index.php?id=169&L=0&htmfile=chapitre\\_1.1.4.htm](http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_1.1.4.htm)

least two stock-proof barriers between the two. In general, the movement of possibly contaminated items and materials within the CA is allowed, but movement out of the CA is prohibited without chief veterinary officer approval. This type of control area allows reasonable commercial activities to continue.

## 4.2 Movement controls for SGP

### 4.2.1 Declared premises

Table 4.1 shows the movement controls that will apply to IPs, DCPs and SPs in the event of an SGP incident.

**Table 4.1 Movement controls for declared premises**

Quarantine/movement controls	Infected and dangerous contact premises	Suspect premises
<i>Movement out of:</i>		
- susceptible animals	Prohibited, except after observation period of 21 days; may be allowed to go to slaughter under permit	As for IPs and DCPs
- nonsusceptible animals	Allowed under permit, subject to decontamination	Allowed under permit
- wool, fibre, skins, etc	Prohibited	Allowed under permit for processing, subject to decontamination
- milk products from susceptible species	Allowed under permit for processing using appropriate milk tankers	As for IPs and DCPs
- semen and embryos	Allowed under permit	As for IPs and DCPs
- crops and grains	Allowed under permit, subject to decontamination	Allowed
<i>Movement in and out of:</i>		
- people	Allowed under permit, subject to decontamination	No restriction, but must undergo decontamination if they have had contact with suspect animals
- vehicles and equipment	Allowed under permit, subject to decontamination	No restriction, but must undergo decontamination if they have had contact with suspect animals

<b>Quarantine/movement controls</b>	<b>Infected and dangerous contact premises</b>	<b>Suspect premises</b>
<i>Movement in of:</i>		
- susceptible animals	Prohibited, except for the movement of sentinel animals under permit	Allowed after observation period of 21 days

#### 4.2.2 Declared areas

Table 4.2 shows the movement controls that will apply to RAs and CAs (if declared) in the event of an SGP incident.

**Table 4.2 Movement controls for declared areas**

<b>Quarantine/ movement controls</b>	<b>Restricted area (if declared)</b>	<b>Control area (if declared)</b>
<i>Movement out of:</i>		
- susceptible animals	Prohibited, except after observation period of 21 days; may be allowed to go to slaughter under permit	As for RA
- vehicles and equipment	Allowed under permit, subject to decontamination	Allowed
- wool, fibre, skins, etc	Allowed under permit, subject to decontamination	Allowed under permit
- milk products from susceptible species	Allowed under permit, subject to decontamination	Allowed under permit
- semen and embryos	Allowed under permit	As for RA
- nonsusceptible animals, people	Allowed under permit, subject to decontamination	Allowed
<i>Movement within of:</i>		
- susceptible animals	Prohibited until end of 21-day observation period	Permit required until end of 21-day observation period
- wool, fibre, skins, etc	Allowed under permit	As for RA
- milk products from susceptible species	Allowed under permit	As for RA
<i>Movement through of:</i>		
- susceptible animals	Allowed under permit	As for RA
<i>Movement in of:</i>		
- susceptible animals	Allowed under permit	As for RA
<i>Movement of susceptible animals along stock routes, rights of way</i>	Prohibited	As for RA
<i>Risk enterprises:</i>		
- skin dealers and shearers	Prohibited	As for RA
<i>Sales, shows, etc</i>	Prohibited if susceptible animals are involved	As for RA

### **4.3 Criteria for issuing permits**

When conducting a risk assessment regarding the issuing of a permit, the officer should take into account the following:

- status of the originating and destination premises;
- species of animal;
- confidence in animal tracing and surveillance;
- destination and use of the animals or products;
- likelihood of contamination of the product or material (and ability to decontaminate); and
- security of transport.

## Appendix 1 Procedures for surveillance and proof of freedom

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Sheep pox and goat pox (SGP) must be notified at the first clinical signs of the diseases. Farmers, veterinarians and meat workers must be alert and report suspicion of disease.

According to the OIE Terrestrial Code, a country's claim for freedom from SGP cannot be made until it has been shown that the disease has not been present for at least the past 6 months after the slaughter of the last affected animal (for countries in which a stamping-out policy is practised with or without vaccination). All at-risk properties (see note 1) must therefore be kept under close surveillance for 6 months.

Detection of disease is to be from physical examination of flocks, as well as through appropriate laboratory testing.

On infected premises (IPs), and on dangerous contact premises (DCPs) that have been destocked, sentinel animals may be introduced after decontamination is completed. These animals should undergo weekly physical inspection with appropriate testing for 6 weeks, when restocking may occur (see note 3). The flock should be inspected at 1-month intervals for 3 months. If no suspicion of disease is detected by then (about 6 months after the completion of cleaning and disinfection), the property may be released from quarantine.

On other properties in the restricted area (RA), physical inspection surveillance visits (see note 2) should be made as soon as possible after the first IP is declared in the RA and then 1, 2, 3 and 6 weeks later.

A final inspection may be needed 6 months after the last case.

### Notes

- (1) Premises considered to be at risk are all premises within the RA with susceptible animals, IPs, DCPs and other properties considered to have had significant contact with an IP.
- (2) At physical inspection surveillance visits, every mob of susceptible animals must be inspected and numbers accounted for. In extensive grazing areas, where the degree of contact between groups of animals in a flock may be low, care must be taken to ensure that all groups of animals are present and healthy.
- (3) Animals dying within 12 months after repopulation of IPs must be autopsied and appropriate samples taken for virus testing.

**Table A1 Summary of surveillance program for SGP**

	<b>IPs and DCPs</b>	<b>Restricted area (other than IPs and DCPs)</b>
Day 0	Decontamination completed	
Week 1	Introduce sentinel animals	Clinical exam
Week 2	Clinical exam	Clinical exam
Week 3	Clinical exam	Clinical exam
Week 4	Clinical exam	
Week 5	Clinical exam	
Week 6	Clinical exam	Clinical exam + release from quarantine
Week 7	Clinical exam + restock	
Week 8	Flock inspection	
Month 3	Flock inspection	
Month 4	Flock inspection	
Month 5	Flock inspection	
Month 6	Flock inspection + release from quarantine	

## Appendix 2 Key features of sheep pox and goat pox

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### **Disease and cause**

Sheep pox and goat pox are highly contagious skin diseases of sheep and goats, characterised by papules and pustules (and rarely vesicles) on exposed body surfaces, often with high mortality. The diseases are caused by viruses of the *Capripoxvirus* genus of the family *Poxviridae*.

### **Species affected**

As the names imply, these diseases affect sheep and goats. The viruses are usually host specific for either sheep or goats, but some strains affect both species. Merino and European breeds of sheep are most susceptible. Humans are considered nonsusceptible.

### **Distribution**

Sheep pox and goat pox occur in Africa (mainly north of the equator), the Middle East, Central and Southeast Asia, and the Indian subcontinent as far east as Myanmar (Burma). Neither of these diseases has ever been recorded in Australia.

### **Key signs**

Both diseases are characterised by sudden onset of fever with nasal and eye discharges and excessive salivation. The diseases may be mild in indigenous breeds of sheep and goats from endemic areas, but are often fatal in newly introduced animals. In 1–2 days, classical pox lesions develop over all of the skin, but are most obvious where wool or hair is short. Lesions may occur on the mucous membranes of the mouth, nostrils and vulva. Acute respiratory distress occurs if lesions develop in the lungs. Fluid from the lesions causes matting of the fleece. Lesions also develop in the gastrointestinal tract, trachea and lungs. Deaths may result at any stage, but peak mortality usually occurs about 2 weeks after the development of lesions. Mortality may reach 50% in adults and approach 100% in young animals.

### **Spread**

Both diseases are highly infectious. The incubation period is usually 12 days, but ranges from 2 to 14 days. Virus is present in all secretions and excretions of infected animals at every stage of the diseases, including milk and scabs from skin lesions. Transmission is mainly via the respiratory system but may be through abraded skin. Movement of infected animals is the main way disease is spread to a new premises or area. Insects can act as mechanical vectors of the virus over short distances. Recovered animals do not remain carriers of the virus and have lifelong immunity.

### **Persistence of the virus**

The virus is very resistant to inactivation both on and off the host. It can persist for up to 3 months in wool and hair from infected animals, for up to 6 months in the environment, and for many years in dried scabs at ambient temperatures. There is no evidence that the virus persists in meat from infected animals.

## Glossary

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Animal byproducts	Products of animal origin that are not for consumption but are destined for industrial use (eg hides and skins, fur, wool, hair, feathers, hooves, bones, fertiliser).
Animal Health Committee	A committee comprising the CVOs of Australia and New Zealand, Australian state and territory CVOs, Animal Health Australia, and a CSIRO representative. The committee provides advice to PIMC on animal health matters, focusing on technical issues and regulatory policy (formerly called the Veterinary Committee). <i>See also</i> Primary Industries Ministerial Council (PIMC)
Animal products	Meat, meat products and other products of animal origin (eg eggs, milk) for human consumption or for use in animal feedstuff.
Australian Chief Veterinary Officer	The nominated senior veterinarian in the Australian Government Department of Agriculture, Fisheries and Forestry who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. <i>See also</i> Chief veterinary officer
AUSVETPLAN	<i>Australian Veterinary Emergency Plan</i> . A series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.
Chief veterinary officer (CVO)	The senior veterinarian of the animal health authority in each jurisdiction (national, state or territory) who has responsibility for animal disease control in that jurisdiction. <i>See also</i> Australian Chief Veterinary Officer
Compensation	The sum of money paid by government to an owner for stock that are destroyed and property that is compulsorily destroyed because of an emergency animal disease. <i>See also</i> Cost-sharing arrangements, Emergency Animal Disease Response Agreement
Consultative Committee on Emergency Animal Diseases (CCEAD)	A committee of state and territory CVOs, representatives of CSIRO Livestock Industries and the relevant industries, and chaired by the Australian CVO. The CCEAD convenes and consults when there is an animal disease emergency due to the introduction of an emergency animal disease of livestock, or other serious epizootic of Australian origin.

Control area	<p>A declared area in which the conditions applying are of lesser intensity than those in a restricted area (the limits of a control area and the conditions applying to it can be varied during an outbreak according to need). <i>See Section 4 for further details</i></p>
Cost-sharing arrangements	<p>Arrangements agreed between governments (national, state and territory) and livestock industries for sharing the costs of emergency animal disease responses. <i>See also Compensation, Emergency Animal Disease Response Agreement</i></p>
Dangerous contact animal	<p>A susceptible animal that has been designated as being exposed to other infected animals or potentially infectious products following tracing and epidemiological investigation.</p>
Dangerous contact premises	<p>A premises that may or may not contain a susceptible animal(s), including those not showing clinical signs, but, following a risk assessment, are considered highly likely to contain an infected animal(s) or contaminated animal products, wastes or things, which present an unacceptable risk to the response if not addressed. <i>See Section 4 for further details</i></p>
Declared area	<p>A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. Types of declared areas include <i>restricted area, control area, infected premises, dangerous contact premises and suspect premises</i>. <i>See Section 4 for further details</i></p>
Decontamination	<p>Includes all stages of cleaning and disinfection.</p>
Depopulation	<p>The removal of a host population from a particular area to control or prevent the spread of disease.</p>
Destroy (animals)	<p>To kill animals humanely.</p>
Disease agent	<p>A general term for a transmissible organism or other factor that causes an infectious disease.</p>
Disease Watch Hotline	<p>24-hour freecall service for reporting suspected incidences of exotic diseases – <b>1800 675 888</b></p>
Disinfectant	<p>A chemical used to destroy disease agents outside a living animal.</p>
Disinfection	<p>The application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses; applies to premises, vehicles and different objects that may have been directly or indirectly contaminated.</p>

Disposal	Sanitary removal of animal carcasses, animal products, materials and wastes by burial, burning or some other process so as to prevent the spread of disease.
Emergency animal disease	A disease that is (a) exotic to Australia or (b) a variant of an endemic disease or (c) a serious infectious disease of unknown or uncertain cause or (d) a severe outbreak of a known endemic disease, and that is considered to be of national significance with serious social or trade implications. <i>See also</i> Endemic animal disease, Exotic animal disease
Emergency Animal Disease Response Agreement	Agreement between the Australian Government and state or territory governments and livestock industries on the management of emergency animal disease responses. Provisions include funding mechanisms, the use of appropriately trained personnel and existing standards such as AUSVETPLAN. <i>See also</i> Compensation, Cost-sharing arrangements
Endemic animal disease	A disease affecting animals (which may include humans) that is known to occur in Australia. <i>See also</i> Emergency animal disease, Exotic animal disease
Enterprise	<i>See</i> Risk enterprise
Enzyme-linked immunosorbent assay (ELISA)	A serological test designed to detect and measure the presence of antibody or antigen in a sample. The test uses an enzyme reaction with a substrate to produce a colour change when antigen-antibody binding occurs.
Epidemiological investigation	An investigation to identify and qualify the risk factors associated with the disease. <i>See also</i> Veterinary investigation
Erythema	Superficial redness of the skin due to dilation of the capillaries.
Exotic animal disease	A disease affecting animals (which may include humans) that does not normally occur in Australia. <i>See also</i> Emergency animal disease, Endemic animal disease
Exotic fauna/feral animals	<i>See</i> Wild animals
Fomites	Inanimate objects (eg boots, clothing, equipment, instruments, vehicles, crates, packaging) that can carry an infectious disease agent and may spread the disease through mechanical transmission.
Immunodiffusion test	A serological test to identify antigens or antibodies by precipitation of antibody-antigen complexes after diffusion through agar gel.

In-contact animals	Animals that have had close contact with infected animals, such as noninfected animals in the same group as infected animals.
Incubation period	The period that elapses between the introduction of the pathogen into the animal and the first clinical signs of the disease.
Indirect immunofluorescence	A technique in which the presence of antigen or antibody in a sample can be detected by binding of a specific antibody bound to a fluorescent marker molecule, which is visible under a fluorescence microscope.
Infected premises	A defined area (which may be all or part of a property) in which an emergency disease meeting the case definition exists or is believed to exist, or in which the causative agent of that emergency disease exists or is believed to exist. <i>See Section 4 for further details</i>
Lairage	Shed or outdoor enclosure for the temporary housing of animals; for example, on the way to market, or when they are being transported for export.
Local disease control centre (LDCC)	An emergency operations centre responsible for the command and control of field operations in a defined area.
Movement control	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
National management group (NMG)	A group established to direct and coordinate an animal disease emergency. NMGs may include the chief executive officers of the Australian Government and state or territory governments where the emergency occurs, industry representatives, the Australian CVO (and chief medical officer, if applicable) and the chairman of Animal Health Australia.
Native wildlife	<i>See Wild animals</i>
OIE Terrestrial Code	OIE <i>Terrestrial Animal Health Code</i> . Reviewed annually at the OIE meeting in May and published on the internet at: <a href="http://www.oie.int/international-standard-setting/terrestrial-code/access-online/">www.oie.int/international-standard-setting/terrestrial-code/access-online/</a>
OIE Terrestrial Manual	OIE <i>Manual of Diagnostic Tests and Vaccines for Terrestrial Animals</i> . Describes standards for laboratory diagnostic tests and the production and control of biological products (principally vaccines). The current edition is published on the internet at: <a href="http://www.oie.int/eng/normes/mmanual/a_summry.htm">www.oie.int/eng/normes/mmanual/a_summry.htm</a>
Operational procedures	Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.

Owner	Person responsible for a premises (includes an agent of the owner, such as a manager or other controlling officer).
Premises	A tract of land including its buildings, or a separate farm or facility that is maintained by a single set of services and personnel.
Primary Industries Ministerial Council (PIMC)	The council of Australian national, state and territory and New Zealand ministers of agriculture that sets Australian and New Zealand agricultural policy (formerly the Agriculture and Resource Management Council of Australia and New Zealand). <i>See also</i> Animal Health Committee
Quarantine	Legal restrictions imposed on a place or a tract of land by the serving of a notice limiting access or egress of specified animals, persons or things.
Restricted area	A relatively small declared area (compared with a control area) around an infected premises that is subject to intense surveillance and movement controls. <i>See</i> Section 4 for further details
Risk enterprise	A defined livestock or related enterprise, which is potentially a major source of infection for many other premises. Includes intensive piggeries, feedlots, abattoirs, knackeries, saleyards, calf scales, milk factories, tanneries, skin sheds, game meat establishments, cold stores, artificial insemination centres, veterinary laboratories and hospitals, road and rail freight depots, showgrounds, field days, weighbridges and garbage depots.
Sensitivity	The proportion of affected individuals in the tested population that are correctly identified as positive by a diagnostic test (true positive rate). <i>See also</i> Specificity
Sentinel animal	Animal of known health status that is monitored to detect the presence of a specific disease agent.
Seroconversion	The appearance in the blood serum of antibodies (as determined by a serology test) following vaccination or natural exposure to a disease agent.
Serosurveillance	Surveillance of an animal population by testing serum samples for the presence of antibodies to disease agents.
Serotype	A subgroup of microorganisms identified by the antigens carried (as determined by a serology test).
Serum neutralisation test	A serological test to detect and measure the presence of antibody in a sample. Antibody in serum is serially diluted to detect the highest dilution that neutralises a standard amount of antigen. The neutralising antibody titre is given as the reciprocal of this dilution.

Specificity	The proportion of nonaffected individuals in the tested population that are correctly identified as negative by a diagnostic test (true negative rate). <i>See also</i> Sensitivity
Stamping out	Disease eradication strategy based on the quarantine and slaughter of all susceptible animals that are infected or exposed to the disease.
State or territory disease control headquarters	The emergency operations centre that directs the disease control operations to be undertaken in that state or territory.
Surveillance	A systematic program of investigation designed to establish the presence, extent or absence of a disease, or of infection or contamination with the causative organism. It includes the examination of animals for clinical signs, antibodies or the causative organism.
Susceptible animals	Animals that can be infected with a particular disease.
Suspect animal	An animal that may have been exposed to an emergency disease such that its quarantine and intensive surveillance, but not pre-emptive slaughter, is warranted. <i>or</i> An animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.
Suspect premises	Temporary classification of a premises that contains a susceptible animal(s) not known to have been exposed to the disease agent but showing clinical signs that require investigation(s). <i>See</i> Section 4 for further details
Tracing	The process of locating animals, persons or other items that may be implicated in the spread of disease, so that appropriate action can be taken.
Vaccination	Inoculation of healthy individuals with weakened or attenuated strains of disease-causing agents to provide protection from disease.
- ring vaccination	Vaccination of susceptible animals around a focus of infection to provide a buffer against the spread of disease.

Vaccine	Modified strains of disease-causing agents that, when inoculated into an animal, stimulate an immune response and provide protection from disease.
- attenuated	A vaccine prepared from infective or 'live' microbes that have lost their virulence but have retained their ability to induce protective immunity.
- inactivated	A vaccine prepared from a virus that has been inactivated ('killed') by chemical or physical treatment.
Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A <i>biological</i> vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A <i>mechanical</i> vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. <i>See also</i> Epidemiological investigation
Wild animals	
- native wildlife	Animals that are indigenous to Australia and may be susceptible to emergency animal diseases (eg bats, dingoes, marsupials).
- feral animals	Domestic animals that have become wild (eg cats, horses, pigs).
- exotic fauna	Nondomestic animal species that are not indigenous to Australia (eg foxes).
Zoning	The process of defining disease-free and infected areas in accord with OIE guidelines, based on geopolitical boundaries and surveillance, in order to facilitate trade.
Zoonosis	A disease of animals that can be transmitted to humans.

# Abbreviations

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AAHL	Australian Animal Health Laboratory
AUSVETPLAN	Australian Veterinary Emergency Plan
CA	control area
CCEAD	Consultative Committee on Emergency Animal Diseases
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	chief veterinary officer
DCP	dangerous contact premises
EAD	emergency animal disease
EDTA	ethylenediaminetetraacetic acid
ELISA	enzyme-linked immunosorbent assay
GPV	goat pox virus
IP	infected premises
LSD	lumpy skin disease
LSDV	lumpy skin disease virus
NMG	national management group
OIE	World Organisation for Animal Health (formerly Office International des Epizooties)
PCR	polymerase chain reaction
PIHC	Primary Industries Health Committee
PIMC	Primary Industries Ministerial Council
RA	restricted area
SGP	sheep pox and goat pox
SP	suspect premises
SPV	sheep pox virus

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## **Video/training resources**

See the **Summary Document** for a full list of training resources.