

Classical scrapie

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Contact information

If:

- you have any requests or inquiries concerning reproduction and rights; or
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AUSVETPLAN — Animal Health Australia

Executive Manager, Emergency Preparedness and Response
PO Box 5116
Braddon ACT 2612
Tel: 02 6232 5522
email: aha@animalhealthaustralia.com.au

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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.

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Sheep on hilly paddock.



1

Introduction

1.1 This manual

1.1.1 Purpose

This response strategy outlines the nationally agreed approach for the response to an incident – or suspected incident – of classical scrapie in Australia. It has been developed to guide decision making and so support the implementation of an efficient, effective and coherent response.

1.1.2 Scope

In this document, all references to ‘scrapie’ are to classical scrapie, unless stated otherwise.

This manual does not include a response policy for atypical scrapie, which is considered by the World Organisation for Animal Health (OIE) to be clinically, pathologically, biochemically and epidemiologically unrelated to classical scrapie. Atypical scrapie is a rare, sporadic, noninfectious disease that occurs spontaneously in sheep at a low incidence. It has a different pathology and incubation period from classical scrapie, and tends to occur in older animals. Laboratory testing to differentiate atypical scrapie and classical scrapie is important.¹

This response strategy provides information about:

- the disease ([Section 2](#))
- the implications for Australia, including potential pathways of introduction, social and economic effects, and the critical factors for a response to the disease ([Section 3](#))
- the default policy and guidelines for agencies and organisations involved in a response to an outbreak ([Section 4](#))
- declared areas and premises ([Section 5](#))
- quarantine and movement controls ([Section 6](#))
- surveillance and establishing proof of freedom ([Section 7](#)).

The key features of scrapie are described in the **Scrapie Fact Sheet** (under development).

1.1.3 Development

The strategies in this document for the diagnosis and management of an outbreak of scrapie are based on risk assessment. They are informed by the recommendations in the OIE *Terrestrial Animal*

¹ For example, the Australian and New Zealand Standard Diagnostic Procedures (www.agriculture.gov.au/animal/health/laboratories/procedures/anzsdp/transmissible-spongiform-encephalopathies)

Health Code (Chapter 14.8) and the *OIE Manual of diagnostic tests and vaccines for terrestrial animals* (Chapter 3.7.11). The strategies and policy guidelines are for emergency situations and are not applicable to policies for imported animals or animal products.

This manual has been produced in accordance with the procedures described in the **AUSVETPLAN Overview**, and in consultation with Australian national, state and territory governments; the relevant livestock industries; nongovernment agencies; and public health authorities, where relevant.

In this manual, 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.

1.2 Other documentation

This response strategy should be read and implemented in conjunction with:

- other AUSVETPLAN documents, including the operational, enterprise and management manuals; and any relevant guidance and resource documents. The complete series of manuals is available on the Animal Health Australia website²
- relevant nationally agreed standard operating procedures (NASOPs).³ These procedures complement AUSVETPLAN and describe in detail specific actions undertaken during a response to an incident. NASOPs have been developed for use by jurisdictions during responses to emergency animal disease (EAD) incidents and emergencies
- relevant jurisdictional or industry policies, response plans, standard operating procedures and work instructions
- relevant Commonwealth and jurisdictional legislation, and legal agreements (such as the Emergency Animal Disease Response Agreement – EADRA⁴), where applicable.

1.3 Training resources

EAD preparedness and response arrangements in Australia

The EAD Foundation online course⁵ provides livestock producers, veterinarians, veterinary students, government personnel and emergency workers with foundation knowledge for further training in EAD preparedness and response in Australia.

² www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents

³ www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/nationally-agreed-standard-operating-procedures

⁴ <https://animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement>

⁵ www.animalhealthaustralia.com.au/emergency-animal-disease-training-program

2

Nature of the disease

'Classical' scrapie (scrapie) is a progressive neurodegenerative disease of sheep and goats. It is one of the transmissible spongiform encephalopathies (TSEs) or prion diseases, and is invariably fatal in clinically affected sheep and goats.

World Organisation for Animal Health listing

Scrapie is a World Organisation for Animal Health (OIE)-listed disease. [with the following footnote - OIE-listed diseases are diseases with the potential for international spread, significant mortality or morbidity within the susceptible species, and/or zoonotic spread to humans. OIE member countries that have been free from a notifiable disease are obliged to notify the OIE within 24 hours of confirming the presence of the disease.]

2.1 Aetiology

TSEs are caused by an abnormal, protease-resistant isoform (PrP^{Sc}) of a normal cellular prion protein (PrP), which accumulates in the central nervous system (CNS). According to the prion hypothesis, PrP^{Sc} is the sole transmissible agent of scrapie. Different strains of scrapie (associated with different molecular forms of the prion protein) have been identified and may influence the likelihood of infection and expression of disease (Houston et al 2015, Moore et al 2016).

2.2 Susceptible species

Sheep and goats are susceptible to scrapie, as is mouflon (a species of wild sheep originating in Southeast Asia but introduced into many other countries). Variations in breed susceptibility to scrapie are well documented for sheep but less well understood for goats (see [Section 2.4.3](#)).

Natural infection of cattle has not been demonstrated. Experimental infection with scrapie has been demonstrated in rats, mice, hamsters, monkeys, and several other laboratory and wild animals (Spickler 2016).

2.2.1 Zoonotic potential

Although scrapie is not considered to pose a risk to human health, and no links between scrapie and human prion disease have been found in epidemiological studies (Spickler 2016), other prion diseases have possibly been transmitted from animals to people. This is an ongoing area of research.

2.3 World distribution

For the latest information on the distribution of scrapie, refer to The World Animal Health Information System.⁶

2.3.1 Distribution outside Australia

Scrapie is present in several European Union (EU) Member States (including the United Kingdom), Brazil, Canada, Iceland, India, Israel, Japan, Norway and the United States. There have been isolated reports of scrapie from a number of other countries, including New Zealand (1954) and South Africa (1972). In both these instances, the disease was confined to imported sheep and was eradicated by destruction of the affected group.

2.3.2 Occurrence in Australia

Australia is free from scrapie.

An isolated incident of scrapie occurred in Australia in 1952 in sheep imported from the United Kingdom. The disease was eradicated by destruction of the affected flock.

2.4 Epidemiology

2.4.1 Incubation period

The incubation period is long. It is influenced by the animal's genotype and potentially the strain of scrapie (Moore et al 2016). The incubation period is longer in animals with more resistant genotypes; clinical disease may not appear during the commercial lifespan of these animals.

Following natural perinatal exposure, scrapie usually occurs 2–5 years later, with a peak incidence at 3.5 years in sheep and somewhat less for goats.

OIE incubation period

For the purposes of the OIE *Terrestrial Animal Health Code*, the incubation period⁷ for scrapie is variable and usually measured in years.

2.4.2 Persistence of agent and modes of transmission

General properties

Prions are very resistant to physicochemical conditions that inactivate viruses and bacteria. They are resistant to freezing, desiccation, burial and degradation by certain proteolytic enzymes (Taylor DM 1996ab, Taylor K 1996). For example, the scrapie agent has been known to survive in a desiccated state for at least 30 months. Some infectivity remains after exposure to dry heat for 24 hours at 160 °C.

Prions are not inactivated by ultraviolet or gamma irradiation, normal autoclaving (120 °C at 15 psi (101 kPa)), aldehydes (glutaraldehyde, formaldehyde), boiling, dry heat sterilisation, ethylene oxide, acetone or alcohols.

⁶ www.oie.int/animal-health-in-the-world/the-world-animal-health-information-system/the-oie-data-system

⁷ In the OIE *Terrestrial Animal Health Code*, 'incubation period' means the longest period that elapses between the introduction of the pathogenic agent into the animal and the occurrence of the first clinical signs of the disease. See www.oie.int/en/international-standard-setting/terrestrial-manual/access-online.



Incinerator temperature gauge.

Recommended inactivation procedures (although they do not guarantee absolute inactivation and may not be suitable for all substrates) include:

- incineration (for disposable in-contact materials)
- gravity displacement or porous load (prevacuum) autoclaving – 134–138 °C at 30 psi (203 kPa), with a holding time at temperature of 18 minutes for a single cycle, or 3 minutes for six separate cycles; some authorities advise holding times at temperature of at least 1 hour
- gravity displacement autoclaving in the presence of sodium hydroxide (eg 121 °C for 30–60 minutes plus 1 M or 2 M sodium hydroxide) (Williams 2003)
- boiling in 1 M sodium hydroxide for at least 1 minute
- low-temperature treatment with gaseous hydrogen peroxide (Fichet et al 2007)
- repeated dosing of surfaces with 2% (20 000 ppm) available chlorine for 4 hours (Gough et al 2017).

Under laboratory conditions, composting has been found to reduce the load of prions in infected material but did not remove them completely (Xu et al 2013). Composting is not expected to eliminate scrapie prions under field conditions.

For further information, see the National Transmissible Spongiform Encephalopathies Surveillance Program *National guidelines for field operations*.⁸

⁸ https://animalhealthaustralia.com.au/wp-content/uploads/NTSESP-Field-Guidelines-2017-18_final.pdf

Environment (including windborne spread)

Scrapie prions are known to persist and retain infectivity in both the natural and built environments of previously infected farms. For example, sheep on a farm in Iceland with no report of scrapie for 16 years became infected after they were allowed into an old shed that had not been used since a previous outbreak (Georgsson et al 2006).

A number of studies have demonstrated binding of scrapie prion protein in soil and retention of infectivity for years (Johnson et al 2006, 2007; Seidel et al 2007). Other prion proteins (eg the prion of chronic wasting disease – CWD) have been found in plants and in environmental water samples (Nichols et al 2009, Pritzkow et al 2015). It has been suggested that the presence of humic acid (a soil organic compound) may reduce infectivity of the CWD prion protein (Kuznetsova et al 2018).

Other studies have examined the persistence of scrapie prion protein in the built environment of farms. Maddison et al (2010) found widespread contamination of the built farm environment, detecting scrapie prions on metal, plastic and wooden surfaces. The difficulty or impracticability of decontaminating an infected farm or premises was highlighted by Dexter et al (2009) and Hawkins et al (2015). In the latter study, transmission of scrapie to susceptible lambs was demonstrated even after decontamination (20 000 parts per million free chlorine solution for 1 hour) alone, or in combination with painting and full regalanisation or replacement of the metalwork within the pen.

Some windborne spread appears possible: Gough et al (2015) detected scrapie prion protein in circulating dust on a farm naturally contaminated with sheep scrapie. Infective dust was detected 30 metres, but not 60 metres, from the pen.

Live animals

The movement of live, asymptotically infected animals is considered to be the principal source of introduction of scrapie into new areas or countries (Detwiler & Baylis 2003).

Within flocks or herds, oral transmission is the main route of natural infection. Animals in either the preclinical or clinical phase of infection may shed the scrapie prion through their saliva, urine, skin, faeces, milk and parturient materials (summarised in Gough & Maddison (2010)). Ingestion of these materials (directly or through contaminated feed or water) is the likely route of natural infection.

Transmission of scrapie in utero has also been demonstrated (Foster et al 2013, Spiropoulos et al 2014).

The influence of host age, breed and genotype, and prion strain differences on infectious dose for different routes of transmission is not well understood. Understanding of the infectious load shed in different excretions and secretions is also incomplete. Higher levels of prion protein may be present in infected placenta and associated material (Dexter et al 2009), including blood (Andreoletti et al 2012), than in other tissues or fluids.

Animal products

Meat and meat products, and casings, including use as animal feed

CNS tissues of infected sheep and goats (including brain, eyes and spinal cord) carry significant levels of scrapie infectivity. A number of other peripheral tissues, including skeletal muscle, have also been identified as potentially infectious to susceptible animals (WHO 2010, Lacroux et al 2017).

Milk and dairy products, including use as animal feed

Konold et al (2013) concluded that the feeding of either colostrum or milk from scrapie-affected sheep may result in transmission to susceptible animals. Milk from goats in the preclinical stage of scrapie infection can also transmit scrapie, as demonstrated by Konold et al (2016).

Animal byproducts

Hides, skin, wool and other fibres

Although scrapie prions have been detected in the skin of naturally and experimentally infected animals (Thomzig et al 2007), in practice, hides, skin, wool and other fibres are not considered a risk for the transmission of scrapie (OIE 2017).

Swill and meatmeal

Since the scrapie agent is capable of surviving many procedures used to process animal products and byproducts, it cannot be ruled out that some agent may be present in the final products.

Semen and embryos from live susceptible animals

Whether the scrapie agent can be transmitted by semen and embryos is uncertain and continues to be debated internationally. From Australia's perspective, there is sufficient evidence to be concerned that scrapie may be transmitted by semen and embryos.

The scrapie agent has been detected in semen, but transmission of scrapie via semen has not been confirmed in controlled studies.

The International Embryo Technology Society (IETS) and the OIE consider the risk of scrapie transmission via sheep embryos to be negligible, provided that the transfer complies with the IETS Manual. However, the science supporting this position is equivocal. It is now known, for instance, that scrapie can be transmitted before birth (Foster et al 2013, Spiropoulos et al 2014) and may thus be transmitted at any time from egg formation onwards. Other studies have shown that the scrapie agent can breach fetus–maternal barriers and enter the conceptus. The scrapie agent has been found in trophoblast cells, which derive from the embryo rather than the mother (Andreoletti et al 2002, Tuo et al 2002, Alverson et al 2006, Lacroux et al 2007). More recently, scrapie has been shown to infect amniotic fluid and fetuses, but it was not possible to determine when the infection occurred (Garza et al 2011).

Specimens

Laboratory specimens have not been implicated in the transmission of scrapie to sheep or goats.

Waste products and effluent

Scrapie prions may be shed in the faeces and urine of asymptomatic and clinically affected animals, may be present in waste from lambing or kidding, and may be present in the waste or effluent from processing of infected animals. Because prion proteins are known to be resistant to many inactivation processes, wastes and effluent from infected or exposed animals may contain potentially infective material.

Biological products (eg vaccines)

TSE agents can be spread by inoculation of biologically derived therapeutic products (iatrogenic spread). The two main situations when this may occur are when:

- biological products are derived from CNS extracts (in the same way as human pituitary gland extracts were contaminated with the agent for Creutzfeldt–Jakob disease)
- a contaminated ingredient has been used in manufacture of a therapeutic agent (eg contaminated brain–heart infusion broth used as a substrate for a bacterial vaccine).



Lamb waiting vaccination.

Spread of the agent by inoculation of a contaminated veterinary product is expected to be much more efficient than natural (oral) transmission and is therefore expected to affect many more animals in the flock or herd at the one time (Bertolini et al 2012).

Nonsusceptible animals

Movement of nonsusceptible animals is not documented as a route of natural transmission of scrapie.

People

People are not involved in the natural transmission of scrapie.

Crops, grains, hay, silage and mixed feeds

The role of contaminated plants in the natural transmission of scrapie remains unclear; however, there is potential for crops, grains, hay, silage and mixed feeds to be contaminated by potentially infective material, including soil. Other prion proteins may be taken up by plants and retain infectivity (Pritzkow et al 2015; see [Environment \(including windborne spread\)](#)).

Vehicles, including empty livestock transport vehicles

Scrapie prions may be shed by asymptotically infected animals and may persist on a range of farm equipment, particularly those made of metal (Maddison et al 2010, Hawkins et al 2015). Therefore, contamination of vehicles, with retention of infectivity, is possible. The prion load on different materials and the infectious dose of scrapie in different circumstances are incompletely understood. However, the limited time that animals are held in vehicles may make vehicles a low risk for transmission – in terms of both potential contamination of that environment and potential infection of subsequent animals.

Equipment, including personal items

Scrapie prions readily and tightly bind to stainless steel surfaces and retain infectivity (Flechsigt et al

2001). Consequently, the use of instruments for veterinary applications (including embryo transfer and surgery) may pose a high risk for transmission.

Scrapie prions may also persist on a range of other farm equipment (Maddison et al 2010, Hawkins et al 2015). These may be less feasible to decontaminate; they pose a lower risk than the use of contaminated veterinary instruments.

Arthropod vectors

There is no documented evidence that the scrapie agent can be transmitted by insect vectors.

2.4.3 Factors influencing transmission

The factors influencing the transmission of scrapie, and their interrelationships, are incompletely understood. These factors include:

- strain of scrapie prion protein – different strains of scrapie may differ in their incubation periods and ability to infect animals of different genotypes (Houston et al 2015, Moore et al 2016), and in their rates of spread (Detwiler & Baylis 2003)
- genotype – susceptibility in sheep is controlled by the gene encoding PrP (the *PRNP* gene; Detwiler & Baylis 2003). *PRNP* polymorphisms can be associated with differences in susceptibility to scrapie (see [Section 2.6](#))
- breed – the risk of scrapie in some *PRNP* genotypes can vary between sheep breeds (see [Section 2.6](#))
- age – lambs are more susceptible to infection than adult sheep (St Rose et al 2006); the risk of infection is highest in the first year of life, and lowest in sheep and goats more than 2 years old
- source of prion – parturient material is thought to contain higher levels of prion protein than other potentially infective material (eg faeces, urine) and is associated with a higher risk of disease (Dexter et al 2009)
- husbandry factors – lambing in the same area (rather than varying the lambing area) was associated with an increased risk of scrapie in sheep flocks (McIntyre et al 2006). Spread of scrapie is expected to be less efficient in Australia where the stocking densities are typically lower than in Europe and the use of housing is uncommon, resulting in lower infective loads, less frequent exposure and lower doses.

2.5 Diagnostic criteria

2.5.1 Clinical signs

The clinical signs of scrapie are not pathognomonic.

Early signs of disease include behaviour change, weight loss, pruritus and exercise intolerance. Animals may go to water frequently, but drink little. They may begin to rub, especially the poll, buttocks and rump. After about 2 months, animals start to lose condition, lose their balance and become rapidly fatigued. They are excitable, and signs of localised rubbing are obvious from loss of wool or hair. A nibbling response can be elicited by rubbing alongside the spine over the rump. Often a papular rash appears on haired parts of the skin. By 3–4 months after the first signs, animals are severely affected, showing marked muscle wastage, and are confused and agitated. Finally, during the next 2–4 weeks, they become unable to stand, and die.

2.5.2 Pathology

Gross lesions

There are no characteristic gross pathological changes.

Microscopic lesions

The characteristic histological TSE changes in the CNS are vacuolation of grey matter neuropil (spongiform change) and/or vacuolation of neurons, spread of astrocytes (cells that support neurones) and neuronal degeneration. In sheep with scrapie, these changes have a predilection for certain neuroanatomical nuclei, particularly within the brain stem, and are bilateral and usually symmetrical. Accumulation of PrP^{Sc} can be demonstrated within these lesions.

The characteristic lesion profile in sheep is the basis for routine histological screening for scrapie.

The pattern of histopathological changes in goats with scrapie is very similar to that in sheep.

Pathogenesis

Studies on the pathogenesis of scrapie in sheep and goats suggest that infection usually results from oral exposure. The disease agent initially accumulates in the lymphoreticular system, for approximately 2 years (Detwiler 1992). It has been mooted that spread into nervous tissues occurs either through haematogenous spread or through entry into the enteric nervous system (van Keulen et al 2000, Gonzalez et al 2010). Retrograde spread to the CNS is hypothesised, with subsequent centrifugal and anterograde spread from the CNS through afferent nerve fibres to sensory ganglia (van Keulen et al 2000).

2.5.3 Differential diagnosis

Scrapie is a progressive disease of the nervous system, and should be considered in the differential diagnosis of locomotor and neurological disorders of adult sheep and goats.

The following conditions should be considered in a differential diagnosis of scrapie:

- atypical scrapie
- trauma to brain or spinal cord
- brain or spinal abscess
- external parasites such as lice, mites, mange and sheep scab
- chronic enterotoxaemia (focal symmetrical encephalomalacia)
- maedi-visna
- polioencephalomalacia
- Aujeszky's disease
- louping ill
- listeriosis
- toxicity from plant and other toxins (Finnie et al 2011)
- malnutrition
- romulosis
- rabies.

Neurological diseases of grazing livestock in Australia were reviewed by Finnie et al (2011).

2.5.4 Laboratory tests

Routine surveillance for scrapie in Australia occurs through the National Transmissible Spongiform Encephalopathies Surveillance Program (NTSESP).⁹ This program helps demonstrate Australia's ongoing freedom from bovine spongiform encephalopathy and scrapie, and facilitates early detection of these diseases should they occur.

The NTSESP includes the testing of sheep showing neurological signs on-farm (clinically consistent animals), and the testing of fallen and casualty slaughter sheep at abattoirs. Testing is undertaken at the CSIRO-Australian Centre for Disease Preparedness (CSIRO-ACDP). For clinically consistent sheep, participating state and territory laboratories screen for scrapie using histopathology. They forward samples from animals with suspicious or inconclusive histopathology to CSIRO-ACDP for further investigation.

Samples required

Any animal with progressive neurological disease should be killed in a way that avoids damage to the cerebellum and brain stem. The brain, with the brain stem intact, must be removed from the skull as soon as possible after death. Detailed instructions for sample collection are provided in the NTSESP *National guidelines for field operations*.¹⁰

Essential specimens

It is essential to submit both formalin-fixed and unfixed (fresh) tissues from the CNS. Fixed brain tissue is used for histopathology and immunohistochemistry. Unfixed cervical spinal cord and cerebellum are collected in case testing of the fixed brain tissue cannot exclude TSEs. These tissues may be used for electron microscopy, immunoblot and mouse bioassay, as well as to further characterise a TSE (if detected). In particular, the cerebellum is collected to facilitate further differentiation of scrapie and atypical scrapie by western blotting, if required.

A fresh (unfixed) sample (3–10 g) of cervical spinal cord, and/or medulla (caudal to the obex) and dorsal cerebellum are frozen for possible detection of PrP^{Sc} by western blotting, or of scrapie-associated fibrils by transmission electron microscopy. Figure 2.1 illustrates the tissues to collect as unfixed samples.

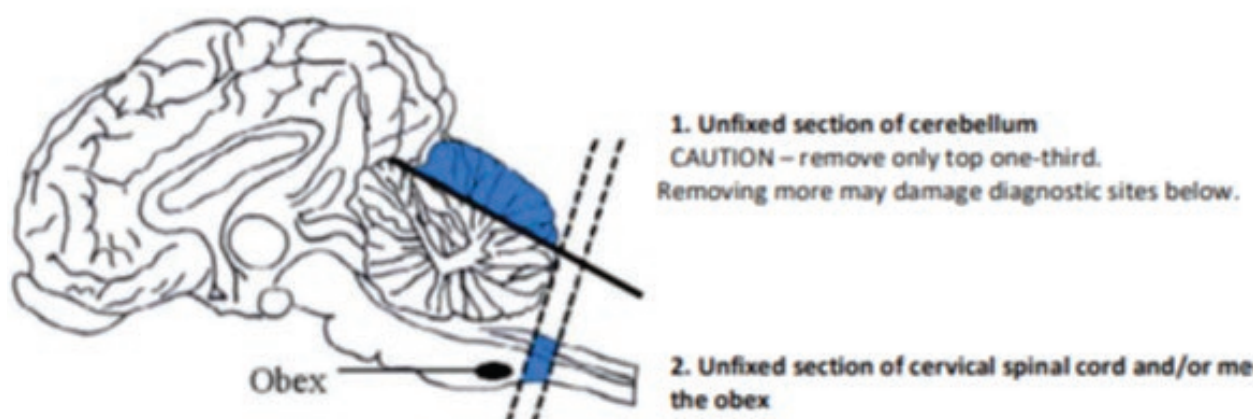


Figure 2.1 Location of tissues to collect as unfixed samples for scrapie exclusion
Source: AHA (2017)

⁹ www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/tse-freedom-assurance-program/surveillance-of-tses

¹⁰ www.animalhealthaustralia.com.au/wp-content/uploads/NTSESP-Field-Guidelines-2017-18_final.pdf

The rest of the brain (including residual cerebellum), after appropriate microbiological sampling, should be fixed without distortion in neutral-buffered 10% formal saline for histological examination.

Additional specimens

Additional specimens may be collected to aid the exclusion of differential diagnoses.

Transport of specimens

The relevant state or territory laboratory should coordinate sample packaging and consignment for delivery to CSIRO-ACDP, Geelong, for emergency disease testing. Specimens should be forwarded to CSIRO-ACDP after the necessary clearance has been obtained from the chief veterinary officer (CVO) of the state or territory of the suspect case, and after the CVOs of Victoria and Australia have been informed about the case and the transport of the specimens to Geelong.

For further information, see the **AUSVETPLAN management manual *Laboratory preparedness***.

2.5.5 Laboratory diagnosis

Samples submitted under the NTSESP are screened using the TSE ELISA, performed on fresh tissue. Any samples that are not clearly negative will be followed up using a western blot.

Diagnostic exclusion of scrapie is generally triggered by suspicious findings on brain histopathology. Immunohistochemistry is used to confirm or exclude the diagnosis. If fresh tissue is available, western blotting may be used to help resolve uncertainties. Other assays, such as detection of scrapie-associated fibrils or mouse inoculation, would only be used in very rare circumstances.

CSIRO-ACDP tests

The testing method used by CSIRO-ACDP is shown in Figure 2.2. Further details of tests currently available at CSIRO-ACDP are shown in Table 2.1.

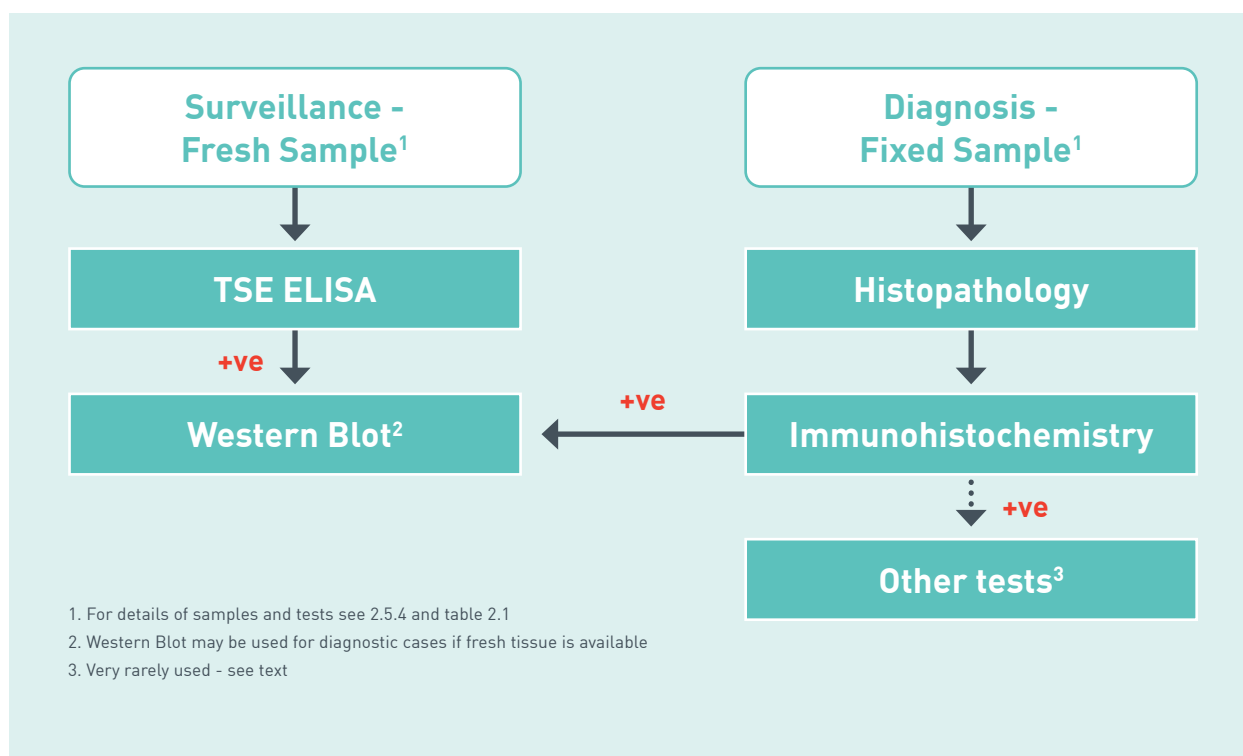


Figure 2.2 The current approach to diagnostic testing at CSIRO-ACDP

Table 2.1 Laboratory tests currently available at CSIRO-ACDP for diagnosis of scrapie

Test	Specimen required	Test detects	Time taken to obtain result
Initial testing			
Histopathology	Formalin-fixed brain tissue	Pathological changes in brain. Not preferred for asymptomatic animals	2 days
Immunohistochemistry	Formalin-fixed brain tissue or cervical spinal cord	Accumulation of prion protein	1 day
TSE ELISA	Unfixed brain tissue containing obex or cervical spinal cord	Abnormal prion protein	1 day
Confirmatory testing			
Immunochemistry – Prionics® Immunoblot	Unfixed brain tissue containing obex or cervical spinal cord	Abnormal prion protein	1 day
Rarely used tests			
Electron microscopy	Unfixed brain tissue or cervical spinal cord	Scrapie-associated fibrils	2 days
Isolation of agent by intracerebral inoculation into mice ^a	Unfixed brain tissue or cervical spinal cord	Scrapie agent	≥1 year

^a This test is used to confirm transmissibility of a spongiform encephalopathy and to strain-type the causative agent.

Source: Information provided by CSIRO-ACDP, 2019 (refer to CSIRO-ACDP for most up-to-date information)

Other tests

Tests to detect scrapie in live sheep and goats have been developed, but remain experimental and are not widely used. Although work is continuing, no test has yet been validated for scrapie diagnosis in individual live animals. The third eyelid test involves biopsy of the lymphoid tissue of the third eyelid and detection of abnormal prion material using immunohistochemistry techniques. Scrapie prions have been detected in this lymphoid tissue well in advance of development of clinical disease in the animal. Techniques for detecting PrPSc in tonsillar tissue have also been studied (Corbière et al 2013). Experimentally, biopsy of rectal mucosa has been used to detect early infection within Peyer's patches (St Rose et al 2006).

Other experimental techniques include PMCA (protein misfolding cyclic amplification), RT-QuIC (real-time quaking-induced conversion), e-QuIC (a variation on RT-QuIC) and SSCA (standard scrapie cell assay) (Saborio et al 2001, Orru et al 2012, van der Merwe et al 2015).

Genotyping

Genotyping of susceptible animals is a useful tool to inform understanding of the epidemiology of the disease and so assist with its control. Genetic susceptibility testing using a range of commercially available tests on a variety of tissue samples is now common in the EU. These tests are used by Australian sheep breeders wishing to provide genetic material to international markets that require such testing. A program is in place in the EU to reduce the prevalence of scrapie-susceptible genotypes by using these tests (Gubbins & Roden 2006). CSIRO-ACDP is able to perform genotyping.

2.6 Resistance and immunity

There is no acquired immunity to the scrapie agent.

In sheep, increased genetic resistance, influenced by *PRNP* gene polymorphism, is most often associated with a reduced risk of developing the disease (longer incubation period and reduced likelihood of disease expression) but may also influence the likelihood of infection (Detwiler & Baylis 2003, Spickler 2016). Resistance conferred by genotype is not absolute, and disease may still be seen in sheep with the most resistant (ARR/ARR) genotypes (de Andrade et al 2015, Leal et al 2015).

Breed differences in scrapie incidence may be partly explained by differences in the frequencies of *PRNP* genotypes between breeds (Westaway et al 1994, Hunter et al 1996, O'Rourke et al 1997).

In goats, polymorphisms in the gene encoding the PrP protein that are associated with resistance to scrapie are under study, but there is no international consensus on what constitutes a resistant genotype. Curcio et al (2016) summarised a number of studies that have explored potential polymorphisms in the *PrP* gene in goats.



Merino rams in shed.

2.7 Vaccination

Vaccines against scrapie are not available.

2.8 Treatment of infected animals

There is no treatment for animals affected by scrapie.

2.9 Control overseas

The few successful cases of scrapie eradication from a country after its introduction have involved a relatively small number of flocks with epidemiological links to imported livestock. Eradication has typically involved stamping out of all linked flocks (New Zealand Ministry of Agriculture and Forestry 1998, cited in Davidson 2002).

A number of countries (including Member States of the EU,¹¹ Canada¹² and the United States¹³) have implemented long-term control and eradication programs for scrapie. These typically involve genetic selection of sheep to increase the prevalence of alleles associated with resistance and reduce the prevalence of alleles associated with increased susceptibility to scrapie (Detwiler & Baylis 2003, Ortiz-Pelaez & Bianchini 2011, Jeffrey et al 2014). The use of genetically resistant rams is considered very important: reduced shedding of scrapie prions occurs from the placentas of fetuses derived from ARR/ARR males (irrespective of the genotype of the ewe) (Nodelijk et al 2011, Garza et al 2017).

Other elements of control programs include:

- individual identification of sheep and goats
- enhanced surveillance programs for neurological signs in sheep and goats
- culling of affected animals
- accreditation of individual farms linked to access to other markets, such as export and breeding
- in some programs, culling of nonresistant genotypes
- annual government audits, private veterinarian checks, and on-farm biosecurity measures and record keeping.

11 See www.gov.uk/guidance/scrapie#what-happens-if-you-suspect-scrapie

12 See www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/scrapie/eng/1329723409732/1329723572482

13 See www.aphis.usda.gov/animal_health/downloads/animal_diseases/scrapie/scrapieinsheepandgoats_proposedrule_fr-9-10-2015.pdf

3

Implications for Australia

3.1 Potential pathways of introduction

Potential routes for the introduction of scrapie into Australia include the importation of:

- live infected sheep and goats
- infected sheep and goat embryos and semen
- contaminated biological products
- contaminated veterinary equipment (such as that used for embryo transfer in sheep and goats)
- contaminated restricted animal material.

Because Australia has strict import conditions in place, the introduction of scrapie through the legal importation of these commodities is very unlikely.

3.2 Social and economic effects

The economic effects from an incident of scrapie in Australia would be due to mortalities, production losses (for sheepmeat, goat meat, dairy products and wool/mohair), domestic market disruptions, export market losses and disease control costs. Domestic market losses may occur if domestic consumers erroneously link scrapie with variant Creutzfeldt–Jakob disease (the human disease linked to bovine spongiform encephalopathy – BSE), with negative effects on local sales of sheepmeat, goat meat, dairy products and byproducts. There could also be collateral effects on beef sales if consumers mistakenly associate scrapie with BSE. The whole supply chain would probably be affected, not just the producers.

The economic effects of a hypothetical outbreak of scrapie in Australia were modelled by Hafi et al (2017). They acknowledged that the extent of export market disruption is uncertain and that eradication would take 8 years, on average, following detection. World Organisation for Animal Health (OIE) guidelines recommend a further 7 years before freedom from scrapie could be declared (with a return to negligible risk status). A range of scenarios were modelled, including eradication with a 3-month and 12-month loss of export markets for sheepmeat only, for both sheepmeat and beef, and for sheepmeat under an extended export ban. Under these scenarios, expected losses (in current monetary terms) were:

- \$35 million over 10 years for a 3-month sheepmeat-only export ban
- \$75 million over 10 years for a 3-month sheepmeat and beef export ban (comprising \$70 million of export market losses and \$5 million of expected costs of disease control)
- \$152 million over 10 years for a year-long ban on sheepmeat exports

- \$323 million over 10 years for a year-long ban on sheepmeat and beef exports
- \$2.2 billion over 50 years for a sheepmeat ban extended until Australia regained negligible risk status (15 years average).

The social effects of an outbreak may arise from loss of livelihood, loss of animals, uncertainty around future earnings and the stigma associated with disease. These factors may affect mental health and lead to loss of community cohesion in areas with a heavy reliance on sheep and/or goat production.

3.3 Critical factors for an Australian response

The critical factors for response to an outbreak of scrapie in Australia include the following:

- Because some prion diseases (eg BSE) are known to be zoonotic, public awareness about scrapie (including differentiating it from BSE) will be important to mitigate concerns about food safety, and support domestic markets for sheepmeat, goat meat and beef (the latter by association).
- Detection of scrapie in Australia is likely to affect export market access for sheep and goats, and their products. Export markets for beef could potentially be affected where trading partners require freedom from transmissible spongiform encephalopathies.
- There will be challenges in rapidly identifying all potentially infected animals, because scrapie has a long incubation period, early clinical signs may be nonspecific, cases can only be confirmed postmortem, and infection may not be detectable in the early months or years of infection.
- The genotype – which affects scrapie susceptibility – of the Australian flock/herd is not well understood.
- The susceptibility of Australian wildlife to scrapie and the potential role of wildlife in its epidemiology are unknown.
- Tracing and surveillance activities, and subsequent epidemiological assessment, may be more complicated when individual animals cannot be traced.
- The large volume of tracing, surveillance and epidemiological activities required in the initial response to a detection of scrapie in Australia may overwhelm resources without ongoing risk-based prioritisation.
- The significance of scrapie prion excretion other than at parturition (eg in faeces and urine) to environmental contamination and transmission risks is not fully understood.
- Scrapie infection in feral goat populations may potentially result in widespread environmental contamination.
- Prions may remain infective in the environment for long periods (years).
- Disinfection for prions is difficult, particularly on premises infrastructure (eg farm buildings, pens) and in the environment (eg paddocks).
- There will be challenges with resolving infected and potentially infected premises, possibly leading to long-term restrictions on land use. This may significantly affect producers if they are unable to conduct their existing business in the long term.
- In most instances, detection of scrapie in Australia will result in a prolonged response. According to the OIE, at least 7 years of surveillance in accordance with the OIE *Terrestrial Animal Health Code* is required to demonstrate freedom from scrapie.

4

Policy and rationale

4.1 Introduction

4.1.1 Summary of policy

The default policy is to control and eradicate scrapie in the shortest possible time while minimising economic impact.

Where the disease is limited to a manageable number of premises, and there is a high level of confidence that the known extent of spread represents the actual extent of spread, control and eradication of scrapie will be through a short-term stamping-out or modified stamping-out approach. The strategies implemented to achieve this may include:

- *categorisation of animals by risk* to guide tracing, surveillance and other response measures
- *epidemiological assessment* to guide tracing and surveillance activities, and response decision making, and to assess progress in disease control
- *tracing and surveillance* (supported by epidemiological assessment) to determine the source of infection; identify potentially infected animals (including, as necessary, in feral goats), and potentially contaminated items and premises; and provide evidence to support proof of freedom from the disease
- *quarantine and movement controls* on live sheep and goats, products and byproducts from sheep and goats, and potentially contaminated fomites (eg vehicles, equipment) to limit spread of infection
- *enhanced biosecurity* on all premises where sheep and goats reside or transit through
- *euthanasia, laboratory testing and disposal* of suspect (clinically affected) and equivalent-risk sheep and goats (see [Section 4.3](#) for definition of 'equivalent risk')
- *destruction and disposal or process slaughter* of asymptomatic exposed and lower-risk animals (based on risk assessment)
- *disposal* of contaminated or potentially contaminated animal products, byproducts, wastes and effluent
- *decontamination*, where practicable, of affected premises and vehicles
- *decontamination or disposal* of potentially contaminated equipment and other things
- *management of animal welfare* issues that arise from the disease or the implementation of control measures
- *public information and engagement*
- *industry engagement and support*
- *long-term management of contaminated and potentially contaminated premises* to prevent recurrence of disease.

Where a short-term eradication response is not appropriate (eg the number of affected premises is not manageable or the extent of spread is not known), a longer-term control and eradication program should be considered.

4.1.2 Case definition

For the purpose of this manual, a case of scrapie is defined as:

- a sheep or goat in which the presence of classical scrapie-specific forms of prion protein have been confirmed through laboratory investigation, whether or not clinical signs of scrapie were observed in the animal.

Notes:

- The case definition for classical scrapie is not met if laboratory investigation diagnoses atypical scrapie.
- At the time of an outbreak, revised or subsequent case definitions may be developed (with the agreement of the Consultative Committee on Emergency Animal Diseases (CCEAD)).

4.1.3 Cost-sharing arrangement

In Australia, scrapie is included as a Category 3 emergency animal disease in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (EAD Response Agreement).¹⁴ When cost sharing of the eligible response costs of an incident is agreed, Category 3 diseases are those for which costs will be shared 50% by government and 50% by industry.

4.1.4 Criteria for proof of freedom

Any approach to declaring proof of freedom should be based on the World Organisation for Animal Health (OIE) *Terrestrial Animal Health Code* sections on scrapie (Chapter 14.8) and general surveillance (Chapter 1.4).

See [Section 7](#) for further details on surveillance to provide evidence of freedom.

4.1.5 Governance

Governance arrangements for the response to emergency animal diseases (EADs) are outlined in the **AUSVETPLAN Overview**.

Information on the responsibilities of a state coordination centre and local control centre is available in the **AUSVETPLAN management manual *Control centres management, Parts 1 and 2***.

4.2 Public health implications

Although scrapie is not considered to pose a risk to human health, there has been potential transmission of other prion diseases to people. This is an ongoing area of research.

¹⁴ Information about the EAD Response Agreement can be found at www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

4.3 Control and eradication policy

Australia's governments, and sheep and goat industries have agreed that it is in the national interest for Australia to be free from scrapie. However, the long incubation period of scrapie, and normal movements of animals within the sheep and goat industries mean that the disease may be present across a wide area before it is identified, making short-term eradication challenging. The extent of disease spread, and confidence that the known extent of disease spread represents the actual extent of disease spread, will therefore be key factors influencing the approach to containment and eradication of scrapie in Australia.

For these reasons, the initial response to the detection of scrapie in Australia will be to:

- limit any potential further spread of disease
- determine the location of infected and potentially infected animals, and contaminated premises (the extent of spread).

The initial tracing, surveillance and epidemiological investigation will inform an assessment of the feasibility of (relatively) short-term eradication, and the appropriate strategies to implement.

A short-term emergency response (to eradicate scrapie by stamping out or modified stamping out) is only appropriate if the disease is limited to a manageable number of premises and there is a high level of confidence that the known extent of spread represents the actual extent of spread. The measures to support a short-term emergency response are discussed in more detail in the remainder of [Section 4.3](#).

If the disease is more widespread, or there is less confidence that the known extent of spread represents the actual extent of spread, attempting to eradicate scrapie (by stamping out or modified stamping out) in a short-term emergency response will not be appropriate. A longer-term control and eradication program will need to be developed through consultation between industries and governments (see [Section 4.4](#)).

Animal risk categories

The following animal risk categories have been developed to help prioritise early response activities based on risk. In particular, they are intended to help prioritise tracing and surveillance activities, and guide the allocation of premises classifications and selection of appropriate control measures on premises.

Given the long timeframes associated with scrapie infection, there may not be adequate information to determine which 'exposure' category animals fall into (ie equivalent risk, exposed or lower risk). In that case, all potentially exposed animals will need to be traced as a priority, and premises containing any risk animals will need to be prioritised for further investigation.

- Infected animals – sheep or goats confirmed as scrapie infected by laboratory testing. *Infected animals are deceased, because testing requires samples collected postmortem.*
- Suspect animals – sheep or goats (likely to be older than 12 months) showing clinical signs suspected to be due to scrapie once a scrapie outbreak has been confirmed. *Suspect animals require euthanasia and testing to confirm their status.*
- Equivalent-risk animals – live sheep or goats that are not showing clinical signs of scrapie but are considered to pose equivalent infection risk to animals confirmed as infected. This category includes dams, littermates and progeny of infected animals, or imported sheep or goats originating from the same overseas property as an infected animal. If imported genetic material, contaminated biological



Goats herded in outdoor pen.

products or contaminated feed are implicated in the outbreak, animals treated with or fed the same 'batch' are also equivalent risk. *Equivalent-risk animals have the highest likelihood of infection of all animals not showing clinical signs, and require euthanasia and testing. Premises containing equivalent-risk animals should be classified as dangerous contact premises.*

- Exposed animals – live sheep or goats that are not showing clinical signs of scrapie but are considered likely to have been exposed to scrapie prions in such a manner that transmission may have occurred. This category includes sheep or goats that:
 - have resided with, or have had physical contact with, an infected animal (but are not equivalent risk), such as animals that have been managed in the same mob/herd/group as an infected animal or shared transportation with an infected animal in the same section
 - are likely to have had contact with an infected animal at parturition, such as through a fence, or at a show or transport depot
 - have resided on a premises where an infected animal previously gave birth
 - were imported in the same group as an infected animal (but are not from the same property of origin – those would be equivalent-risk animals)
 - have been exposed to equipment (eg surgical, veterinary, lamb/kid marking or artificial breeding equipment) that has been used on an infected animal and is likely to have been contaminated with prions.

Exposed animals pose an unacceptable risk to the response, and ultimately all exposed animals require removal via destruction or process slaughter. Premises containing exposed animals should be classified as dangerous contact premises.

- Lower-risk animals – live sheep or goats that are not showing clinical signs of scrapie but could have been exposed to scrapie prions in such a manner that disease transmission is less likely or unlikely. This category includes animals that resided on a premises (including a transport depot) after an infected animal resided there temporarily but did not birth. Although this category could include animals that have had brief, limited contact with an infected animal, such as at a sale or show (provided the infected animal did not give birth), it is unlikely to be practical to trace these ‘limited contact’ animals. *Lower-risk animals ultimately require removal from the population (at least in a short-term eradication program); however, there may be greater flexibility in how this is achieved over time, depending on the outbreak size and enterprise type. Premises containing lower-risk animals should be classified as lower-risk contact premises.*

These categories are presented from highest to lower risk. If animals fit in multiple categories, they should be considered in the higher-risk category. The examples are intended to be a guide to assist in consistent use of the categories. Further guidance on the use of the categories should be provided in a response, as required.

4.3.1 Epidemiological assessment

Epidemiological investigation or assessment draws on multiple sources of information to build understanding of the disease and how it is behaving in an outbreak. This informs response decision making.

The key objectives for an epidemiological assessment will be to identify the:

- spatial distribution of infected/contaminated and free premises
- source of infection
- prevalence of infection
- pathways of spread and the likely size of the outbreak
- risk factors for the presence of infection and susceptibility to disease.

Epidemiological assessment, and tracing and surveillance activities (see [Section 4.3.3](#)) in an EAD response are interrelated activities. Early findings from tracing and surveillance will be inputs into the initial epidemiological assessment (eg considering the spatial distribution of infection). The outcomes of the initial epidemiological assessment will then guide decisions on subsequent tracing and surveillance priorities.

The outcomes of the epidemiological assessment will also be used to guide the selection of other appropriate response measures (eg application of movement controls) and to assess the progress of disease control measures.

Ongoing epidemiological assessment is important for any EAD response to aid evaluation of the continued effectiveness and value of response measures. It will consider the outcomes of tracing and surveillance activities, and will contribute evidence to support any later claims of disease freedom.

4.3.2 Quarantine and movement controls

Guidance on declared areas and premises classifications can be found in the **AUSVETPLAN guidance document *Declared areas and allocation of premises definitions in an EAD response***.

Quarantine

Quarantine will be immediately imposed on all infected premises (IPs), dangerous contact premises (DCPs) and lower-risk contact premises (LCPs). Individual IPs, DCPs and LCPs will remain under quarantine until disease control measures on the premises have been completed and the ongoing risk of disease has been assessed. Given the lower risk status of LCPs, the disease control measures applied on these premises may be less stringent than those applied on IPs and DCPs.

Quarantine will also be immediately imposed on suspect premises (SPs) and trace premises (TPs). These properties will remain under quarantine until their status has been clarified. The decision to release premises from quarantine will depend on their assessed status.

[Section 5.4](#) provides guidance on reclassifying premises.

The long-term management of contaminated land on quarantined premises will need to be considered (see [Section 4.3.17](#)).

Movement controls

Controls will be placed on the movement of infected (or potentially infected) animals and contaminated (or potentially contaminated) things to or from quarantined premises.

[Section 6.2](#) provides details on movement controls for live animals, reproductive material (semen and in vivo-derived embryos), animal products and byproducts, waste products and effluent, vehicles, equipment, people and other items that might be contaminated.

4.3.3 Tracing and surveillance

Guidance on tracing and surveillance can be found in the **AUSVETPLAN guidance document *Tracing and surveillance***.

Tracing

Epidemiological investigation of the index premises and all IPs is a very high priority activity, because it will provide information about when and how the premises is likely to have become infected. This will help guide forward and back tracing, and may indicate the most likely source(s) of infection for the premises.

Scrapie has a long incubation period (years), and tracing over the whole-of-life period for confirmed cases may be required. However, tracing over such long time periods could quickly result in a large number of traces, consuming considerable response resources. As a result, animals or items to be traced will need to be prioritised and the tracing workload carefully monitored.

Scrapie-infected animals can excrete scrapie prions into the environment, particularly during lambing/kidding, but also in faeces, urine and saliva. Therefore, as well as conducting tracing to identify potentially infected animals, tracing in a scrapie outbreak should identify locations where infected and equivalent-risk animals have resided, even if the risk animals or any susceptible stock are no longer present on the premises.

Tracing personnel should have a good knowledge of sheep and goat enterprises in the jurisdiction, and their typical movement and trading patterns. This knowledge will help focus tracing activities to identify the highest-risk animals and locations.

The age and class/sex of sheep or goats are particularly important to assess risk and classify premises. Tracing officers should ensure that this information is collected during initial tracing, using documentation such as National Vendor Declaration (NVD) or sales records.



Goat kid and mother outside birthing shed.

Tracing period¹⁵

It is important to estimate the date or year when scrapie is likely to have been introduced onto each IP, from which forward and back tracing will be undertaken. In the initial stages of an outbreak, if an estimated date of introduction to a premises is yet to be determined or the epidemiological investigation is inconclusive, the following tracing periods should be used:

- Back tracing should be conducted for the 5-year period before the oldest infected animal on the premises was born.
- Forward tracing should be conducted from 3 years before the oldest infected animal on the premises was born until the day movement controls were implemented on the premises.

Priority tracing activities in the early stages of an outbreak

Identify locations where infected animals have resided (particularly the birth property)

If an infected animal is not on its homebred property, identification of all premises where the animal has resided is a high priority. Identification of the birth property is particularly important because it is likely that the disease was transmitted around the time of the infected animal's birth. The property of birth of an infected animal should be classified as an IP, and an epidemiological investigation needs to be conducted to identify when and how the property may have become infected with scrapie.

Any other premises where an infected animal has resided that are identified through tracing are a high risk for disease spread and/or environmental contamination. These premises should be classified as DCPs (which will prioritise further investigation).

¹⁵ The Australian Government Department of Agriculture, Water and the Environment will work with export establishments to trace relevant exported animals and commodities whose status may be affected by the outbreak. The department will notify importing countries of any affected consignments and manage them as required by the importing government authority.

Back trace animals from IPs to identify the potential source of infection

Where the source of infection on an IP is not known, back tracing will be important to identify premises or products that may have been the source of infection, and identify other infected premises. The following items should be traced back, with the highest priority placed on animals. The epidemiological investigation on an IP will further guide the prioritisation:

- Animals
 - Sheep and goats introduced to the IP during the trace-back period should be traced (eg initially 5 years before the birth of the oldest infected animal, if time of introduction of scrapie is not known).
 - If there are imported sheep or goats on the IP, these are the highest priority.
 - Bought-in ewes/does that subsequently lambed/kidded on the IP should also be prioritised for trace-back.
- Equipment
 - High-risk equipment shared by the IP and other premises in the trace-back period should be traced back. High-risk equipment is equipment that could have been the source of exposure for the animals on the IP, such as surgical, veterinary, lamb or kid marking, or artificial breeding equipment (artificial vaginas, embryo transfer equipment).
- Genetic material
 - Ovine and caprine genetic material introduced onto the premises within the trace-back period should be traced to its source. Semen is a higher priority than embryos.
- Biologicals
 - Potentially contaminated biological products (eg vaccines, therapeutics) should be traced back if the epidemiological investigation indicates that they may be implicated.
- Feed and colostrum/milk products
 - Potentially contaminated feed ingredients, including bought-in sheep/goat colostrum/milk should be traced back if the epidemiological investigation indicates that they may be implicated.

Forward trace animals off IPs

Forward tracing of sheep and goats off IPs is important to identify premises where scrapie could have spread to from an IP, and to identify high-risk animals for surveillance and testing. This activity is potentially very large and should be prioritised according to the risk category of the animal.

1. Locate premises where equivalent-risk animals are residing or have resided. *Equivalent-risk animals include dams, littermates and offspring of infected animals (see full definition in Section 4.3).*

- Equivalent-risk animals are likely to be incubating disease and may have introduced disease to a new premises.
- These animals and locations will be found by tracing equivalent-risk animals forward from IPs. Given the incubation period of scrapie, many equivalent-risk animals that have moved off IPs will no longer be alive. Tracing should therefore focus on tracing sheep and goats sold within the trace-forward period (directly or indirectly, via sales) to enterprises where they are more likely to still be alive (eg enterprises sourcing breeding stock or animals for fibre or dairy production).
- If the outbreak involves imported animals, tracing equivalent-risk animals also involves tracing imported animals that originated from the same overseas farm.

2. Locate premises where exposed animals are residing. *Exposed animals include all sheep and goats that have resided with, or had physical contact with, an infected animal, except those that have the higher risk status (see full definition in [Section 4.3](#)).*

- Exposed animals may be incubating disease, and premises containing these animals (DCPs) require further investigation.
- Exposed animals will be found by tracing exposed sheep and goats forward off IPs. This will probably involve tracing most sheep and goats turned off IPs since the estimated date of scrapie introduction. Recently turned-off exposed animals are more likely to still be alive and residing on other premises, such as feedlots.
- Tracing exposed animals also includes tracing animals that have been exposed to infection from contaminated high-risk equipment, contaminated genetic material and/or milk products originating from IPs (see below).
- If the outbreak involves imported animals, tracing exposed animals also involves tracing animals that were imported in the same group as the source infected animal.

3. Locate premises where lower-risk animals are residing.

- These are a lower priority for tracing and follow-up, but ultimately will need to be traced and assigned to the LCP category for further investigation.

Forward trace equipment and relevant commodities

The following items and commodities may be contaminated and should be forward traced off IPs so that they can be identified for disposal or decontamination. This is a lower priority than tracing equivalent-risk and exposed animals off IPs:

- High-risk equipment
 - High-risk equipment is equipment used on infected animals that is likely to have been contaminated with prions (eg through contact with infected tissues, faecal material, saliva) and then used on other premises in a way that exposes sheep and goats to infection. Examples are surgical, veterinary, lamb or kid marking, and artificial breeding equipment (artificial vaginas, embryo transfer equipment).
 - High-risk equipment needs to be assessed and disposed of or decontaminated, as required.
 - Animals on which high-risk equipment has been used also need to be traced, because they are exposed animals.
- Colostrum and milk products
 - If the farm produces colostrum or milk products, these need to be traced to determine whether they could have been fed to sheep or goats on other farms – for example, through direct supply to another farm, or via a byproduct of processing – or if they could have been incorporated into a stockfeed product.
- Genetic material
 - Ovine and caprine semen and embryos supplied by IPs will need to be traced to identify animals on which the potentially contaminated genetic material was used.
 - The risk will vary with the scrapie status of the donor animal, and the measures used in the collection and processing of the genetic material.
 - Semen is a higher priority than embryos.

- Other potential fomites, such as crops, feed, other equipment and vehicles
 - If an IP has produced fodder from areas of the property likely to be heavily contaminated with prions, the fodder should be traced.
 - Other equipment, vehicles and so on are a low priority for initial tracing activity, unless the epidemiological investigation of an IP indicates otherwise.

Surveillance

Surveillance in a scrapie outbreak will initially aim to:

- identify the source of infection and determine the extent of spread
- identify potential IPs in a timely manner
- provide data to inform risk analyses and selection of appropriate control measures.

Surveillance to provide evidence for scrapie freedom for a country or premises will be a lower priority in the early stages of a response, given that regaining freedom is a long-term process; however, where possible, samples should be collected opportunistically from animals destroyed as part of the response.

The surveillance aims will be achieved by prioritising:

- surveillance of premises found to be epidemiologically linked to the index animal (identified through tracing) to determine whether they may be infected
- surveillance to identify premises containing infected animals that have not been identified through tracing, for further investigation and testing.

Field surveillance should be prioritised based on risk, as indicated by the premises classification categories (SPs and DCPs are the highest priority for investigation). Further prioritisation may be required; it should take into account the likelihood of subclinical infection being present on the premises (as indicated by the animal risk categories), and the risks of further disease transmission and dissemination.

See [Section 7](#) for further details on surveillance procedures and prioritisation, and their contribution to providing evidence to support subsequent freedom from scrapie.

4.3.4 Zoning and compartmentalisation for international trade

Where it is not possible to establish and maintain disease freedom for the entire country, establishing and maintaining disease-free subpopulations, through zoning and/or compartmentalisation,¹⁶ may be considered.

In the case of a limited disease outbreak, a containment zone¹⁷ may be established around the areas where the outbreak is occurring, with the purpose of maintaining the disease-free status of the rest of the country outside the containment zone.

All zoning applications would need to be prepared by the Australian Government in conjunction with the relevant jurisdiction(s) and agreed to by the CCEAD. Compartmentalisation applications would require input from the relevant industries. Recognition of both zones and compartments must be

¹⁶ With zoning, disease-free subpopulations are defined primarily on a geographical basis. With compartmentalisation, disease-free subpopulations are defined primarily by management practices (such as the biosecurity plan and surveillance practices of enterprises or groups of enterprises).

¹⁷ The OIE defines a 'containment zone' as an infected zone within a previously free country or zone, which includes all suspected or confirmed cases that are epidemiologically linked and where movement control, biosecurity and sanitary measures are applied to prevent the spread of, and to eradicate, the infection or infestation. The Australian Government Department of Agriculture and Water Resources commissioned a report on what would be required for the establishment of containment zones in Australia. This report is available at www.ausvet.com.au/tools-resources.

negotiated between the Australian Government and individual overseas trading partners. Zoning and compartmentalisation would require considerable resources that could otherwise be used to control an outbreak. Careful consideration will need to be given to prioritising these activities, because the resulting competition for resources could delay the quick eradication of the disease and recognition of disease freedom.

Agreements between trading partners take time to develop, consider and finalise, because of the need to provide detailed information on activities such as biosecurity, surveillance, traceability and diagnostics to support the approach that is developed. An importing country will need assurance that its animal health status is not compromised if it imports from an established disease-free zone in Australia. Trading partners may not accept a zoning or compartmentalisation proposal, regardless of the information provided. Eradication of disease may be achieved before zoning or compartmentalisation applications are finalised.

General guidelines for zoning and compartmentalisation are in Chapter 4.4 of the OIE Terrestrial Code.

In the case of a short-term eradication, if scrapie is confined to one property or a few foci that can be readily isolated, zoning may not be necessary. Zoning might be considered if the extent of the disease is broader but still within an area(s) that can be defined geographically. Compartmentalisation (eg through an industry accreditation program) may be used as part of a long-term control strategy.

The OIE guidelines for zoning and compartmentalisation for scrapie are in Chapter 14.8 of the OIE Terrestrial Code.

4.3.5 Biosafety and biosecurity for personnel

Personnel involved in destruction, disposal and decontamination activities on quarantined premises (IPs, DCPs, LCPs, SPs and TPs) should wear appropriate personal protective equipment (PPE) to avoid contamination, and potential transmission of the disease to sheep and goats. Appropriate PPE includes disposable coveralls and footwear. These should remain on the premises and be incinerated on-site.

In addition, personnel carrying out postmortems and sampling of animals for laboratory testing (ie brain removal as part of surveillance activities on quarantined premises) should follow standard guidelines for use of PPE.¹⁸ Selection of PPE should consider the risk of prion contamination and options for disposal (eg by incineration on-site). Where disposable PPE is not available, the PPE should be decontaminated before removal from the site (see [Section 4.3.13](#)).

4.3.6 Biosecurity for equipment

Equipment to be used in destruction, disposal and decontamination activities, and for sampling of animals, on quarantined premises (IPs, DCPs, LCPs, SPs and TPs) should be considered contaminated and either disposed of on-site (see [Section 4.3.12](#)) or subject to decontamination (see [Section 4.3.13](#)).

4.3.7 Animal welfare

Guidance on managing livestock welfare can be found in the **AUSVETPLAN operational manual *Livestock welfare and management***.

As sheep and goats in Australia are more commonly raised in extensive (rather than intensive) production systems, welfare issues arising from disease control measures are not anticipated in the

¹⁸ Australian Veterinary Association Guidelines for veterinary personal biosecurity (www.ava.com.au/library-resources/other-resources/veterinary-personal-biosecurity)



Sheep in dry paddock on extensive property.

short term. However, the welfare of animals on premises affected by disease control measures should be monitored, and any issues that arise should be addressed.

4.3.8 Vaccination

No vaccines against scrapie are currently available.

4.3.9 Treatment of infected animals

Treatment of sheep or goats with scrapie is ineffective and not appropriate.

4.3.10 Treatment of animal products and byproducts

No treatment for animal products and byproducts is guaranteed to be effective in inactivating the scrapie agent under normal commercial operations.

4.3.11 Destruction of animals

Destruction plans should be developed for each premises on which animals may be destroyed. Guidance on destruction methods can be found in the **AUSVETPLAN operational manual *Destruction of animals***.

Suspect (clinically affected) and equivalent-risk animals should be euthanased, sampled for testing and disposed of on-site (see also [Section 4.3.12](#)).

Exposed sheep and goats should either be destroyed with disposal on-site (if the assessed risks are high) or sent for process slaughter under permit (if the assessed risks are low) (see [Sections 4.3.2](#) and [6.2](#)).

In a short-term eradication response, it is expected that lower-risk animals will require the same approach as exposed animals – that is, the disease risks are assessed (informed by surveillance and testing), and the animals are removed from the population through destruction and disposal or process slaughter. However, given the lower risk posed by these animals, these processes could potentially occur over a longer period, depending on the scale of the outbreak and the enterprise type.

Consideration may be given to collecting genetic material from rare and valuable animals to be culled (for potential later use should the animals return negative results for scrapie on laboratory investigation).

Destruction methods

Because brain material is required for diagnosis, animals should not be shot through the head. In addition, shooting will increase the risk of dissemination of the agent in the environment. It is recommended that animals be killed by administration of an intravenous euthanasia agent. Postmortem examinations and sampling for laboratory testing should be carried out as close to the site of disposal as possible.

4.3.12 Disposal of animals, and animal products and byproducts

Disposal plans should be developed for each quarantined premises. Guidance on disposal options and methods can be found in the **AUSVETPLAN operational manual *Disposal***.

Carcasses, animal products and byproducts, feedstuff, wastes and bedding that may have been contaminated on quarantined premises will be disposed of in a biosecure manner. The disposal method chosen will be influenced by the type of material to be disposed of, the resources available, the local environment, the prevailing weather, legislative requirements (including environmental protection legislation) and the risk of spreading the disease.

For scrapie, the risk of disease transmission during transport is low. It may be preferable to dispose of risk material at an approved disposal site to mitigate the risk of long-term contamination of sheep or goat production premises.

Decontamination of all equipment and machinery involved in on-site disposal will be required, even if complete decontamination cannot be guaranteed.

Disposal must be in accordance with the requirements in [Section 6](#), and auditable in terms of biosecurity, traceability and financial requirements.

A processing facility (ie abattoir) may be classified as a dangerous contact processing facility if it has recently processed cohorts of the index infected animal. In this case, it may be appropriate to complete decontamination of the premises and trace product to provide greater consumer confidence that product from animals that could be infected has not been supplied for human consumption (despite the lack of evidence that scrapie is zoonotic).

It may also be appropriate to destroy byproducts from recently processed equivalent-risk animals to reduce the risk of environmental contamination, such as through fertiliser, and provide greater assurance that sheep and goats will not be exposed to the material. This is in addition to Australia's existing ban on the feeding of animal material to ruminants (see [Section 4.3.17](#)).

4.3.13 Decontamination

Decontamination plans should be developed for each premises to be decontaminated. General guidance on decontamination can be found in the **AUSVETPLAN operational manual *Decontamination***.

Decontamination to inactivate the scrapie agent is difficult (see [Section 2.4.2](#)), but should be attempted for high-risk vehicles, equipment and premises. Surface disinfectants are available, but should be used with caution and an understanding that they may not be completely effective.

4.3.14 Wild animal management

If scrapie occurs in goats or sheep that have contact with feral goats, surveillance of feral goat populations will be needed to determine whether these animals have become a reservoir of the agent.

If feral goats are suspected in transmission of the disease, short-term eradication may not be possible.

4.3.15 Vector management

Vector management is not applicable to the control of scrapie.

4.3.16 Public awareness and media

Guidance on managing public information can be found in the ***Biosecurity incident public information manual***.

Key public information messages in an outbreak of scrapie should include the following advice:

- Scrapie is not the same as bovine spongiform encephalopathy (mad cow disease) and is not a public health issue. There have been no reports of human cases, despite the presence of scrapie in many countries for many years.
- Milk and meat from sheep and goats remain safe for human consumption.
- Consistent with standard food safety requirements, meat and products from diseased animals will not enter the food chain or be used in biological products (eg vaccines).
- Wool and mohair remain safe to use.
- Eradication of scrapie is typically a long-term process, taking many years.
- There is no treatment or cure for affected animals.
- Culling of affected animals is necessary to eradicate the disease.
- Culling of potentially exposed animals may expedite the eradication process and enable a faster return to scrapie freedom.
- Governments and industries are working closely together to address the issues.

Information should also be provided:

- to support early recognition and reporting of the disease
- on the trade importance of the disease, and therefore the benefits of eradicating scrapie from the national sheep and goat population
- on where more detailed information can be obtained.

National coordination of public information and engagement messaging in the event of a scrapie incident may occur through activation of the National Biosecurity Emergency Communication Network,¹⁹ to coordinate animal health information, and liaise with public health and environmental agencies.

¹⁹ Previously known as the Primary Industries National Communication Network (NCN). More information is available at www.outbreak.gov.au/about/biosecurity-incident-national-communication-network.

4.3.17 Other strategies

Because the scrapie agent may persist for many years in the environment, disease may recur if contaminated land is used for grazing susceptible species or for growing crops for feeding to susceptible species, even after prolonged fallowing. The long-term use of such land, and implications for owners, will need to be considered as part of the disease control program, including in the management plans for individual premises (see also [Section 5.4](#)).

To help prevent the introduction of prion diseases to Australia's livestock populations, Australia has prohibited the feeding to ruminants of meat, bonemeal and other compounded feeds containing vertebrate materials. Auditing procedures are in place nationally to ensure compliance with this legislation.

4.3.18 Stand-down

Guidance on the stand-down of EAD responses can be found in the **AUSVETPLAN management manual *Control centres management, Part 1***.

Stand-down of the response will occur once scrapie has been controlled or eradicated; when eradication is no longer considered feasible, cost-effective or beneficial; or when the National Management Group formally declares that the outbreak is over.

Relief and recovery activity will need to continue after disease control and eradication programs have wound down.

4.4 Other control and eradication options

If the eradication of scrapie through a short-term emergency response is not feasible or practicable (eg the disease is widespread, or there is low confidence that the known spread represents the actual spread), a long-term control and eradication program may need to be developed through consultation between Australian governments and the sheep and goat industries.

Any long-term control and eradication program will require considerable ongoing support and effort from both governments and industries, and should be carefully considered before implementation. An interim program (eg to limit further disease spread) should be considered while any long-term program is being planned.

4.5 Funding and compensation

Details of the cost-sharing arrangements can be found in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses.²⁰ Details of the approach to the valuation of, and compensation for, livestock and property in disease responses can be found in the **AUSVETPLAN operational manual *Valuation and compensation***.

²⁰ www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

5

Declared areas and premises

5.1 Declared areas

The use of legally declared areas is not required for the response to an incident of scrapie.

5.2 Other areas

Not applicable.

5.3 Declared premises

Detailed guidelines for declaring premises status are provided in the **AUSVETPLAN guidance document *Declared areas and allocation of premises classifications in an EAD response***.

5.3.1 Premises status classifications

For scrapie, the premises classifications to be used are:

- infected premises (IP)
- suspect premises (SP) – see modified definition below
- trace premises (TP)
- dangerous contact premises (DCP)
- dangerous contact processing facility (DCPF)
- lower-risk contact premises (LCP) – see definition in Section 5.3.3
- approved processing facility (APF)
- approved disposal site (ADS)
- premises of relevance (POR) – see modified definition below
- resolved premises (RP)
- unknown status premises (UP) – see modified definition below
- zero susceptible species premises (ZP).

The following modified definitions for premises status classifications will be used.

SP

Premises containing sheep or goats showing clinical signs suspected to be due to scrapie (ie suspect animals) should be considered an SP. SPs are a very high priority for investigation; for scrapie, this will

require euthanasia and testing of the suspect animal(s). If scrapie is confirmed, the premises would be classified as an IP. If testing is negative but an epidemiological link to the outbreak has been identified, the premises is unlikely to be able to be assessed negative without further rounds of testing as part of a premises surveillance plan.

POR

As restricted and control areas are not required to support movement controls in the response to scrapie, the classification at-risk premises (ARP) will not be used, and the classification POR will apply to premises with susceptible animals (sheep and goats) that do not meet other premises classifications, irrespective of their location. The definition of POR for a scrapie outbreak is modified from the standard AUSVETPLAN definition of POR (to remove reference to location), as follows:

A premises that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, suspect premises, trace premises, dangerous contact premises or dangerous contact processing facility.

UP

As restricted and control areas are not required to support movement controls in the response to scrapie, the standard AUSVETPLAN definition of UP is modified to remove reference to declared areas, as follows:

A premises where the current presence of susceptible animals and/or risk products, wastes or things is unknown.

Standard premises status classifications

The following standard premises status classifications are also used (specific guidance relevant to a scrapie outbreak is provided below the standard definition).

IP

A defined area (which may be all or part of a property) on which animals meeting the case definition are or were present, or the causative agent of the emergency animal disease is present, or there is a reasonable suspicion that either is present, and that the relevant chief veterinary officer or their delegate has declared to be an infected premises.

The property of birth of an infected animal and any premises where the infected animal resided should be classified as IPs, unless an epidemiological assessment indicates there are unlikely to be infected animals on the premises or significant environmental contamination of the premises.

TP

Temporary classification of a premises that contains susceptible animal(s) that tracing indicates may have been exposed to the disease agent, or contains contaminated animal products, wastes or things, and that requires investigation(s).

Every effort should be made to investigate and reclassify a TP as soon as possible. If infected animal(s) resided on the premises, it would be classified as an IP. If it contains suspect animals, it would be reclassified as an SP.

Given the nature of scrapie disease and testing options available, most premises initially identified through tracing (ie TPs) are likely to require in-depth surveillance and epidemiological assessment to allow them to be resolved.



Empty shearing shed.

To avoid having premises that pose different risks remaining as TPs for a long time, an initial assessment of a TP should reclassify it as a DCP or LCP.

DCP

A premises, apart from an abattoir, knackery or milk processing plant (or other such facility) that, after investigation and based on a risk assessment, is considered to contain a susceptible animal(s) not showing clinical signs, but considered highly likely to contain an infected animal(s) and/or contaminated animal products, wastes or things that present an unacceptable risk to the response if the risk is not addressed, and that therefore requires action to address the risk.

For scrapie, a premises that contains equivalent-risk and/or exposed animals should be classified as a DCP, unless it meets the definition of an IP. For example, a premises where an infected animal was born will usually be classified as an IP.

Other premises may be classified as DCPs if, based on risk assessment, they are considered highly likely to contain animals infected with scrapie or to be contaminated with prions that may lead to disease transmission. These premises require immediate further assessment.

DCPF

An abattoir, knackery, milk processing plant or other such facility that, based on a risk assessment, appears highly likely to have received infected animals, or contaminated animal products, wastes or things, and that requires action to address the risk.

For scrapie, the DCPF classification is likely to be relevant only if the facility has recently processed an infected animal or equivalent-risk animals from an IP.

ZP

A premises that does not contain any susceptible animals or risk products, wastes or things.

This classification should only be used where there are no sheep or goats and there is no known epidemiological link to the scrapie incident. (Note: a premises that has previously held infected animals may still have environmental contamination with scrapie prion and therefore should not be classified as a ZP.)

5.3.2 Qualifiers

The following qualifying category may be added to a property status:

- assessed negative (AN).

5.3.3 Other disease-specific classifications

LCP

LCP is a unique premises classification for use in a scrapie outbreak, with the following definition:

A premises, apart from an abattoir, knackery or milk processing plant (or other such facility) that, after investigation and based on a risk assessment, is considered to contain a susceptible animal(s) not showing clinical signs, but that could have been exposed and therefore could be incubating scrapie (ie a lower-risk animal) or land that could be contaminated with a low level of prions.

For scrapie, tracing may identify a large number of premises that contain lower-risk animals only. These premises pose a risk to the response and require action to address the risk, and so should be classified as LCPs (rather than remain as TPs in the long term).

However, resolution of these premises is likely to be of lower priority than resolution of high-risk premises. Depending on the scale of the response, LCPs may be resolved over a longer period, using strategies appropriate to the enterprise and the size of the outbreak (eg slaughter and testing of the highest-risk animals; surveillance of suspect, dead and fallen stock over a longer period).

5.4 Reclassifying premises and declared areas

5.4.1 Reclassifying premises

Premises epidemiologically linked to the outbreak – SPs, DCPs, TPs and LCPs

In premises epidemiologically linked to the outbreak, negative test results from initial targeted testing are unlikely to provide adequate confidence that the premises are not infected (as a result of low individual animal test sensitivity in asymptomatic animals and low expected herd prevalence). For example, the World Organisation for Animal Health (OIE) requires a surveillance program of at least 7 years before a country, zone, compartment or establishment can be considered free from scrapie.

Premises with negative results should be subject to an epidemiological assessment of the risk of infection, leading to recommendations for an appropriate premises classification and ongoing control measures for the premises, consistent with the response policy.

Premises reported as having animals showing signs of scrapie – SPs

If passive surveillance is working well, many reports will be received of premises containing sheep or goats showing signs consistent with scrapie (SPs).

There are many endemic causes of clinical signs similar to scrapie, and therefore many of these reported signs will not be due to scrapie. To ensure that producers are not discouraged from reporting, it is important to resolve these cases in as timely a manner as possible.

If surveillance on the premises examines and tests all animals showing (even vague) signs of scrapie with negative results, the premises can be considered AN (and then resolved), provided that diagnosis of an endemic disease is made that explains the neurological signs and an investigation has found no epidemiological links to the outbreak (see [Section 7.1](#)).

If, at a later date, an SP that has been previously resolved through this process is found to be epidemiologically linked to the scrapie outbreak, it should be reclassified as a DCP or LCP (as appropriate). As for an epidemiologically linked premises, the premises would then require further testing and would not be classified as AN in the short term.

IPs and DCPs

IPs and DCPs will be quarantined, and exposed animals on the premises will either be destroyed and disposed of or destocked via process slaughter (informed by risk assessment).

However, premises that have contained infected animals or are highly likely to have contained infected animals may have environmental contamination with prions. Prions are reported to persist in the environment and retain infectivity for years in a number of farm environments, even after attempted decontamination (see [Section 2.4.2](#)).

Although it appears that prion contamination may be highest in areas where infected animals have lambed or kidded, infected animals in the clinical or preclinical phase can shed scrapie prions in their saliva, urine, skin, faeces, milk and parturient materials. The relevance of these findings to Australian farming enterprises and conditions is not known.

Therefore, IPs and DCPs require a property assessment to determine the potential for environmental contamination. In most cases, they will require implementation of a long-term property plan ('grazing management plan') to minimise the risk of recurrence of scrapie. For example, long-term restrictions (years to decades) are likely to be required on grazing of sheep or goats in areas of the premises that are likely to be contaminated (see also [Section 4.3.17](#)).

These types of restrictions are likely to have very severe impacts on affected businesses. As part of longer-term eradication planning, it will be important to consider options and support for these businesses.

5.4.2 Reclassifying declared areas

Not applicable.

6

Movement controls

6.1 Principles of movement controls

General principles for movement controls for managing emergency animal diseases are provided in the **AUSVETPLAN guidance document *Movement controls***.

Key considerations for movement controls for managing scrapie are as follows:

- Declaration of restricted and control areas is not required to implement movement controls for scrapie.
- A national sheep and goat standstill is not recommended because any benefits are unlikely to outweigh the high regulatory burden and cost to the industries caused by implementation of a standstill.
- Movement controls will be applied to premises in quarantine (infected premises – IPs, dangerous contact premises – DCPs, lower-risk contact premises – LCPs, suspect premises – SPs, and trace premises – TPs).
- The risk associated with movements may vary considerably, depending on the type and duration of potential exposure to the scrapie agent. Risk assessment on a case-by-case basis will often be required.
- Control measures on affected properties may be long term because:
 - scrapie has a long incubation period, and validated live animal tests are not available
 - prions are very resistant to physicochemical conditions. The scrapie agent is known to persist and retain infectivity in both the natural and built environments of previously infected farms for a very long time.

6.2 Recommended movement controls

General permits (GPs) and special permits (SpPs) may not be available until the relevant chief veterinary officer gives approval for movements, and this approval may not be given in the early stages of a response.

SpPs are used for higher-risk movements. They require formal application and individual risk assessment by the relevant government veterinarian or gazetted inspector of stock. An SpP may only be issued if the assessed risk can be managed by the application of acceptable mitigation measures.

6.2.1 Live susceptible animals

Movements off quarantined premises (IPs, DCPs, LCPs, SPs and TPs)

Movements of live sheep and goats off quarantined premises will be informed by the risk category of the stock involved (see [Section 4.3](#)).

Suspect (clinically affected) and equivalent-risk animals will not be permitted to move off quarantined premises. These animals will be euthanased, and tissues will be taken for testing, before disposal of the animal by an approved method.

Proposed movements of exposed and lower-risk animals off quarantined premises will be assessed on a case-by-case basis. Until initial surveillance and targeted testing have been undertaken to determine whether the quarantined premises is likely to be infected, no sheep or goats will be permitted to move off the premises. Once this surveillance has been undertaken, exposed and lower-risk animals may be either euthanased on-site or allowed to move to an approved processing facility (APF) for slaughter for human consumption only, depending on the outcomes of risk assessment. The risks of proposed movements should be assessed on a case-by-case basis, taking into consideration:

- the proposed end use of the meat and products from these animals
 - Meat may be used for human consumption.
 - Meat, other products and byproducts should not be used in animal feed or fertiliser.
 - Movement of byproducts to other premises for further processing (eg for rendering) requires further risk assessment (see [Section 6.2.8](#)).
- biosecurity during transport
- biosecurity at the APF
 - Only animals of the same risk status (the same animal risk category or with the same agreed processing and decontamination requirements) should be processed in the same processing run.
 - The facility should be decontaminated following use (accepting that this is not guaranteed to remove all prion contamination).
 - Wastewater and organic waste materials generated by the APF that may be contaminated must be managed to prevent environmental contamination.

At the time of an outbreak, the removal (for disposal) of offal and central nervous system tissues from carcasses of exposed and lower-risk animals at the APF may need to be considered.

The potential impacts on the APF (eg for future eligibility for export market accreditation) should be considered as part of the risk assessment.

Where the movement of live animals to slaughter is permitted, subsequent movement of vehicles, meat, products, byproducts, waste or effluent may be subject to separate permit conditions (see below).

Movement of live sheep and goats off quarantined premises for any purpose other than slaughter is prohibited. For emergency, including welfare, movements, see [Section 6.2.18](#).

Movements onto quarantined premises (IPs, DCPs, LCPs, SPs and TPs)

Movement of live sheep and goats onto quarantined premises is prohibited, except under SpP, following risk assessment on a case-by-case basis. Because these premises are subject to a range of disease control measures, the introduction of additional susceptible stock is not recommended. However, it may be considered under exceptional circumstances, informed by risk assessment. The risk assessment should take into consideration the context of individual incidents and premises. For example, as part of a longer-term response, movements of animals onto these premises for short-term fattening or feedlotting may be considered.



Sheep loaded onto truck.

6.2.2 Carcasses

Movement of sheep and goat carcasses off quarantined premises (IPs, DCPs, LCPs, SPs and TPs) is prohibited, except under SpP to an approved disposal site (ADS) only. Producers should be reminded that any sheep or goats that die or are culled on quarantined premises (not as part of disease control measures) should be reported and sampled for scrapie testing (see also [Sections 4.3.3](#) and [7](#)).

Movement of sheep and goat carcasses onto quarantined premises is prohibited, except under SpP for biosecure disposal only. This should occur only under exceptional circumstances – for example, when no other appropriate disposal site has been identified.

Where permitted, the proposed movement of carcasses will be assessed on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the biosecurity of transport, the ADS or the quarantined premises. Vehicles and any disposal equipment should be decontaminated, acknowledging that complete inactivation of scrapie prions is not expected.

6.2.3 Semen and embryos from live susceptible animals

Movement of sheep and goat semen and embryos on or off quarantined premises is prohibited, except under SpP. Such movements may be considered on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the scrapie status of the donor animals, and the measures used to collect and process the genetic material.

For example, movements of genetic material from donor animals that have been assessed negative for scrapie on postmortem laboratory investigation may be considered, taking into account the age of the donor animal at testing, its links to known cases and the assessed probability that the laboratory results represent the actual status of the animal.

Where the movement of sheep or goat semen or embryos is permitted, any such material should have been collected and processed in a manner consistent with the recommendations of the International Embryo Technology Society.

If donor animals are already present on the property, collection of genetic material may continue. However, the genetic material will not be able to be used until the scrapie status of the donor is investigated through postmortem testing. Assessments of the scrapie status of the donor should consider the age of the donor, any links to known cases and the laboratory results (and their limited ability to be definitive – for example, if the animal is asymptomatic). The movement of equipment associated with artificial breeding, and the collection and processing of genetic material may also be subject to permit (see [Section 6.2.15](#)).

6.2.4 Meat and meat products

Movement from APFs of meat and meat products derived from asymptomatic exposed and lower-risk animals from quarantined premises (IPs, DCPs, LCPs, SPs and TPs) is allowed under GP on condition that they are for human consumption; they are not diverted to use as stockfeed or fertiliser; and records are kept of their origin, processing date, destination and end use. (See also [Section 6.2.1](#) for discussion of movement of exposed and lower-risk animals from quarantined premises to slaughter for human consumption.)

6.2.5 Milk and dairy products

Movements off quarantined premises (IPs, DCPs, LCPs, SPs and TPs) of milk, colostrum or dairy products from sheep or goats will be informed by the risk category of the stock involved (see [Section 4.3](#)).

Movements of milk, colostrum or dairy products from suspect (clinically affected) or equivalent-risk sheep and goats held on quarantined premises are prohibited except under SpP to an ADS. Proposed movements should be assessed on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the biosecurity of the transport and the ADS.

Movements of milk, colostrum or dairy products from asymptomatic exposed or lower-risk animals held on quarantined premises are prohibited except under SpP following risk assessment on a case-by-case basis. Where permitted, movements may be to wholesale or retail premises (if processed on-site), or to an APF. The milk, colostrum or dairy products are only to be used for human consumption; their use or diversion to stockfeed is prohibited. The risk assessment should consider the biosecurity of transport and the APF, the potential impacts on the APF (eg for future eligibility for export market accreditation), the proposed end use of the product, and the potential for diversion of the product to use as stockfeed.

Any facility processing milk, colostrum or dairy products from quarantined premises should be decontaminated before being used to process milk, colostrum or dairy products from nonquarantined premises. Because decontamination is not guaranteed to remove all prion contamination, product from these premises should not be used for stockfeed.

6.2.6 Eggs and egg products

Not applicable.

6.2.7 Hides, skin, wool and other fibres

Hides, skin, wool and other fibres that are taken from quarantined properties are considered low risk. These products will not be subject to movement controls.

6.2.8 Other animal byproducts

Proposed movements from APFs of byproducts from animals held on quarantined premises (IPs, DCPs, LCPs, SPs and TPs) should be assessed on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the potential for the byproducts to contain infective material, the potential for spread of infective material during transport (such as through scavenging), the proposed end use of the byproduct and the risk of diversion to prohibited uses (stockfeed; fertiliser; products derived from tissues or body fluids, including blood products for diagnostic and therapeutic purposes).

Where the identified risks cannot be adequately mitigated, movements of these byproducts should only be to an ADS for biosecure disposal.

6.2.9 Waste products and effluent

Movement of waste products and effluent from quarantined premises (IPs, DCPs, LCPs, SPs and TPs) and APFs is prohibited except under SpP to an ADS.

Proposed movements should be assessed on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the potential for the waste products or effluent to contain infective material, the proposed method of disposal, any pretreatment of the waste products and effluent before disposal, and the biosecurity of transport and the ADS.

The use of waste products and effluent from quarantined premises as stockfeed or fertiliser is prohibited.

6.2.10 Vehicles, including empty livestock transport vehicles and associated equipment

Movements of empty livestock transport vehicles and associated equipment onto and off quarantined premises (IPs, DCPs, LCPs, SPs and TPs) are allowed under GP on condition that the vehicles and equipment are cleaned and decontaminated on exit from the premises (after the movement of livestock), and that records are kept of the cleaning, decontamination and movements (origin, date, destination and use).

Environmental contamination from runoff from decontamination activities should be avoided. In particular, runoff must be controlled such that it does not contaminate land where sheep and goats may be kept.

6.2.11 Nonsusceptible animals

Movement of nonsusceptible animals off quarantined premises (IPs, DCPs, LCPs, SPs and TPs) is allowed under GP on condition that records are kept of the identity, origin and destination of the animals, and the date of the movement. The vehicle to be used should be cleaned and decontaminated before stock are loaded onto the vehicle for movement off the premises, to mitigate the risk that it is potentially contaminated with infective material.

6.2.12 People

Movement of people involved in high-risk activities (see below) onto or off quarantined premises (IPs, DCPs, LCPs, SPs and TPs) is allowed on condition that:

- appropriate personal protective equipment (PPE) – including disposable coveralls and footwear – is worn to avoid contamination with infectious material

- the PPE is retained on the premises and destroyed or decontaminated
- records are kept of the identity of the people; the origin, date and destination of the movement; and the use and treatment of PPE.

High-risk activities include:

- collecting, processing, inseminating or implanting genetic material from sheep or goats
- assisting with the parturition or peri-partum period of sheep or goats
- slaughtering or butchering sheep or goats.

Biosafety and biosecurity for personnel involved in response activities are outlined in [Section 4.3.5](#).

Movement of people involved in other activities onto or off quarantined premises is allowed without restriction.

Concurrent movement of any vehicles or equipment may be subject to separate movement controls (see other parts of [Section 6.2](#)).

6.2.13 Specimens

Because there is no evidence of transmission of scrapie from laboratory specimens to affected animals, movement restrictions will not apply to laboratory specimens. Specimens should be collected, packed and transported according to [Section 2.5.4](#).

6.2.14 Crops, grains, hay, silage and mixed feeds

Crops, grains, hay, silage and mixed feeds could potentially be contaminated by infective material, including soil, on quarantined premises. Movement of these materials off quarantined properties is prohibited, except under SpP. Proposed movements should be assessed on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the potential type and duration of any exposure to infective material on the premises, the proposed processing of the products, and their proposed end use.

6.2.15 Equipment, including personal items

Movement of equipment off quarantined premises (IPs, DCPs, LCPs, SPs and TP) is prohibited except under SpP. Proposed movements should be assessed on a case-by-case basis, informed by risk assessment. The risk assessment should take into consideration the potential type and duration of any exposure to infective material on the premises, and the proposed destination and end use of the equipment.

High-risk equipment includes equipment that has had close contact with known or suspected infected animals or carcasses – for example, equipment used:

- for collection, processing, storage, insemination or implantation of genetic material
- in parturition (eg lambing or kidding, caesareans)
- for slaughter or butchery of sheep or goats on the premises.

These movements may be prohibited if the assessed risks are too high. Where the movement of high-risk equipment is permitted, the equipment should be subject to decontamination. Records should be kept of the movement and decontamination.

6.2.16 Sales, shows and other events

Sales, shows and other events involving the movement of susceptible animals should be postponed while tracing of affected animals is being undertaken and the extent of the outbreak is being determined. Resumption of these activities may be considered on a case-by-case basis when the epidemiology of the incident is better understood.

6.2.17 Stock routes and rights of way

Use of stock routes and rights of way for sheep and goats adjacent to quarantined premises should be prohibited.

6.2.18 Animal movements for emergency (including welfare) reasons

Movements of sheep and goats that are otherwise prohibited may be considered on a case-by-case basis, informed by risk assessment, for emergency (including welfare) reasons. Such movements may include movements for emergency veterinary treatment and movements to different premises under the same ownership to manage feed availability. If allowed, such movements will be under SpP.

6.2.19 Other movements

Movements of other risk materials will need to be considered on a case-by-case basis, informed by risk assessment.

7

Surveillance and proof of freedom

7.1 Surveillance

The key objectives and priorities for surveillance in response to an outbreak of scrapie are outlined in [Section 4.3.3](#).

7.1.1 Specific considerations

Specific considerations for surveillance for scrapie include the following:

- Scrapie diagnosis relies on laboratory testing of samples of the central nervous system taken postmortem.
- Live animal tests for scrapie will not be used as a screening test in a scrapie emergency response (unless they become validated and internationally accepted). However, early in the response, concurrent use of live animal tests and traditional (postmortem) diagnostic testing is likely to be beneficial to build understanding of the performance of the live testing techniques in the context of the outbreak. This may inform future decisions on the use of live testing techniques in Australia.
- Collection of relevant samples for genotype testing from animals to be culled should be considered because the results may inform the epidemiological understanding of the event.
- Scrapie is usually present at low prevalence in infected flocks or herds. For this reason, testing should target animals on the premises that are most likely to be infected and to test positive. Initially, this should be any sheep or goats showing (even vague) clinical signs consistent with scrapie, and any equivalent-risk animals on the premises (see [Section 7.1.2](#)).
- Even with targeted testing, a high proportion of the sheep and goat population on the premises may need to be tested before there is confidence in the true status of the flock or herd. Even then, testing of asymptomatic animals may not be sufficiently sensitive to confirm the premises as negative.
- Surveillance of the national herd/flock should be increased, if possible, to enable early detection of cases and increase trade assurance. This may be undertaken through an enhancement to the existing National Transmissible Spongiform Encephalopathies Surveillance Program, which coordinates scrapie testing of sheep showing neurological signs to maintain Australia's scrapie freedom.
- Surveillance of feral goat populations with epidemiological links to the outbreak will be important, because these animals may act as reservoirs of infection.

The types of surveillance that are most appropriate for scrapie are:

- active surveillance of premises identified through tracing, to determine whether they contain infected animals
- enhanced passive surveillance, to detect premises containing infected animals showing clinical signs (ie suspect premises) that were not identified through tracing. This will involve encouraging producers,

animal health professionals and other livestock supply chain members to report sheep and goats with signs consistent with scrapie

- active surveillance at congregation points, such as saleyards and abattoirs, to identify sheep or goats showing clinical signs that were not identified through tracing.

Active surveillance of healthy sheep or goats with no known links to the outbreak (eg at slaughter, during field visits to premises with sheep or goats) is unlikely to be an efficient way of detecting cases of scrapie, because of low test sensitivity. However, it could be considered in some situations – for example, if producer reporting is not adequate for the population at risk (eg feral goats), for a widespread outbreak or for proof of freedom.

7.1.2 Premises surveillance

Surveillance on premises epidemiologically linked to the outbreak – SPs, DCPs, TP and LCPs

For premises with identified epidemiological links to an infected animal (but where infection is yet to be confirmed), field surveillance should be conducted to determine whether the premises is infected.

Surveillance visits should be prioritised based on risk, as indicated by the premises classification – suspect premises (SPs) and dangerous contact premises (DCPs) are the highest priority. If the number of these premises is large and available resources are limited, further prioritisation may be required. This should take into consideration the likelihood that infection may be present (referring to animal risk categories), and the risk of further disease transmission and dissemination.

Field surveillance should identify the highest-risk animals on the premises, which should be targeted for testing. The initial approach to conducting surveillance on the premises should be as follows:

- All sheep and goats on the premises should be examined for clinical signs consistent with scrapie.
- All sheep and goats found to be showing (even vague) clinical signs should be euthanased and tested.
- Any equivalent-risk animals (see Section 4.3) should also be euthanased and tested.

If this initial approach does not return any test-positive animals, or if no suspect or equivalent-risk animals are present on the property, further testing is required.

The next categories of animals that should be euthanased and tested include exposed animals (depending on whether there has been adequate time for incubation), followed by older animals, cull stock, poorly doing stock and tail-end stock.

In premises epidemiologically linked to the outbreak, negative test results do not rule out infection of the premises, as a result of the low individual animal test sensitivity in asymptomatic animals and low expected herd prevalence (see Section 5.4).

Surveillance on premises reported to have animals showing signs of scrapie – SPs

As noted in Section 5.4, it is important to conduct surveillance to resolve cases of animals reported as showing signs consistent with scrapie.

Similar to surveillance on epidemiologically linked premises, the approach should be as follows:

- All sheep and goats on the premises should be examined for clinical signs consistent with scrapie.
 - All sheep and goats found to be showing (even vague) clinical signs should be euthanased and tested.
- A full sample set should also be collected to enable testing for differential diagnoses.

- An investigation should be conducted to determine whether the premises is epidemiologically linked to the outbreak.

For information about resolution of these premises, see [Section 5.4](#).

7.2 Proof of freedom

Providing confidence that scrapie is no longer present in Australia will be important to satisfy trading partners and regain access to international markets, and to underpin import controls to prevent the reintroduction of scrapie.

Chapter 14.8 of the World Organisation for Animal Health (OIE) *Terrestrial Animal Health Code* lists the criteria by which a country, zone, compartment or establishment may be considered free from scrapie. For a country to regain scrapie freedom, the OIE requires at least 7 years of testing to the level specified in the Terrestrial Code, and no new cases.

Modelling of the economic impacts of a hypothetical eradicable outbreak of scrapie in Australia found that Australia would meet the OIE requirements for scrapie freedom after an average of 15 years after detection of the first case (comprising 8 years for eradication and 7 years of surveillance after initial eradication) (Hafi et al 2017).

However, although the OIE provides guidelines for recovering scrapie-free status, acceptance of this status following an outbreak will have to be negotiated with individual trading partners.

To provide evidence to support a declaration of freedom, a comprehensive surveillance program will be required. This will build on the surveillance, tracing and diagnostic testing done during the control phase. It will include testing of sheep and goats showing clinical signs consistent with scrapie, as well as representative sampling of sheep and goats slaughtered, culled or found dead on farm, as per OIE requirements.

Specific recommendations for this surveillance will be developed, using the technical expertise of competent and experienced epidemiologists, and based on the characteristics of the outbreak. The design of this program will consider the recommendations in the OIE Terrestrial Code, and the general and specific considerations for scrapie surveillance outlined in [Section 7.1](#).

Glossary

Disease-specific terms

Allele	One of the alternative forms of a specified gene. Different alleles usually have different effects on the phenotype.
Biological products	Agents of biological origin (eg sera, hormones) for therapeutic use in the diagnosis or treatment of certain diseases.
Iatrogenic disease	A case of disease caused by medical or veterinary procedures (eg an infection spread by surgical procedures).
Index flock	<p>The first or original flock in which a case of the disease has been diagnosed.</p> <p><i>See also</i> Index case, Index property in 'Standard AUSVETPLAN terms'</p>
Mouflon	A species of wild sheep of the Caprinae family (goat-antelopes). Thought to be one of the two ancestors for all modern domestic sheep breeds.
Peyer's patches	Lymphoid organs in the small intestine.
Rendering	Processing by heat to inactivate infective agents. Rendered material may be used in various products according to particular disease circumstances.
Spongiform encephalopathies	A group of diseases affecting various animal species; all involve noninflammatory vacuolated (spongiform) degeneration of the grey matter areas of the brain and spinal cord.

Standard AUSVETPLAN terms

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, hoofs, bones, fertiliser).
Animal Health Committee	<p>A committee whose members are the chief veterinary officers of the Commonwealth, states and territories, along with representatives from the CSIRO Australian Centre for Disease Preparedness (ACDP) and the Department of Agriculture, Water and the Environment. There are also observers from Animal Health Australia, Wildlife Health Australia, and the New Zealand Ministry for Primary Industries. The committee provides advice to the National Biosecurity Committee on animal health matters, focusing on technical issues and regulatory policy.</p> <p><i>See also</i> National Biosecurity Committee</p>
Animal products	Meat, meat products and other products of animal origin (eg eggs, milk) for human consumption or for use in animal feedstuff.
Approved disposal site	A premises that has zero susceptible livestock and has been approved as a disposal site for animal carcasses, or potentially contaminated animal products, wastes or things.
Approved processing facility	An abattoir, knackery, milk processing plant or other such facility that maintains increased biosecurity standards. Such a facility could have animals or animal products introduced from lower-risk premises under a permit for processing to an approved standard.

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At-risk premises	A premises in a restricted area that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, dangerous contact premises, dangerous contact processing facility, suspect premises or trace premises.
Australian Chief Veterinary Officer	The nominated senior veterinarian in the Australian Government Department of Agriculture, Water and the Environment 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	Australian Veterinary Emergency Plan. Nationally agreed resources that guide decision making in the response to emergency animal diseases (EADs). It outlines Australia's preferred approach to responding to EADs of national significance, and supports efficient, effective and coherent responses to these diseases.
Carcase	The body of an animal slaughtered for food.
Carcass	The body of an animal that died in the field.
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
Compartmentalisation	The process of defining, implementing and maintaining one or more disease-free establishments under a common biosecurity management system in accordance with OIE guidelines, based on applied biosecurity measures and surveillance, to facilitate disease control and/or trade.
Compensation	The sum of money paid by government to an owner for livestock or property that are destroyed for the purpose of eradication or prevention of the spread of an emergency animal disease, and livestock that have died of the emergency animal disease. <i>See also</i> Cost-sharing arrangements, Emergency Animal Disease Response Agreement

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Consultative Committee on Emergency Animal Diseases (CCEAD)	The key technical coordinating body for animal health emergencies. Members are state and territory chief veterinary officers, representatives of CSIRO-ACDP and the relevant industries, and the Australian Chief Veterinary Officer as chair.
Control area (CA)	A legally declared area where the disease controls, including surveillance and movement controls, applied 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 incident according to need).
Cost-sharing arrangements	<p>Arrangements agreed between governments (national and state/territory) and livestock industries for sharing the costs of emergency animal disease responses.</p> <p><i>See also</i> Compensation, Emergency Animal Disease Response Agreement</p>
Dangerous contact animal	A susceptible animal that has been designated as being exposed to other infected animals or potentially infectious products following tracing and epidemiological investigation.
Dangerous contact premises (DCP)	A premises, apart from an abattoir, knackery or milk processing plant (or other such facility) that, after investigation and based on a risk assessment, is considered to contain a susceptible animal(s) not showing clinical signs, but considered highly likely to contain an infected animal(s) and/or contaminated animal products, wastes or things that present an unacceptable risk to the response if the risk is not addressed, and that therefore requires action to address the risk.
Dangerous contact processing facility (DCPF)	An abattoir, knackery, milk processing plant or other such facility that, based on a risk assessment, appears highly likely to have received infected animals, or contaminated animal products, wastes or things, and that requires action to address the risk.
Declared area	A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. There are two types of declared areas: restricted area and control area.
Decontamination	Includes all stages of cleaning and disinfection.
Depopulation	The removal of a host population from a particular area to control or prevent the spread of disease.

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Destroy (animals)	To kill animals humanely.
Disease agent	A general term for a transmissible organism or other factor that causes an infectious disease.
Disease Watch Hotline	24-hour freecall service for reporting suspected incidences of exotic diseases – 1800 675 888.
Disinfectant	A chemical used to destroy disease agents outside a living animal.
Disinfection	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.
Disinsectisation	The destruction of insect pests, usually with a chemical agent.
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	<p>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.</p> <p><i>See also</i> Endemic animal disease, Exotic animal disease</p>
Emergency Animal Disease Response Agreement	<p>Agreement between the Australian and state/territory governments and livestock industries on the management of emergency animal disease responses. Provisions include participatory decision making, risk management, cost sharing, the use of appropriately trained personnel and existing standards such as AUSVETPLAN.</p> <p><i>See also</i> Compensation, Cost-sharing arrangements</p>
Endemic animal disease	<p>A disease affecting animals (which may include humans) that is known to occur in Australia.</p> <p><i>See also</i> Emergency animal disease, Exotic animal disease</p>
Enterprise	<i>See</i> Risk enterprise

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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
Epidemiology	The study of disease in populations and of factors that determine its occurrence.
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.
General permit	A legal document that describes the requirements for movement of an animal (or group of animals), commodity or thing, for which permission may be granted without the need for direct interaction between the person moving the animal(s), commodity or thing and a government veterinarian or inspector. The permit may be completed via a webpage or in an approved place (such as a government office or commercial premises). A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. <i>See also</i> Special permit
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 a pathogen into an animal and the first clinical signs of the disease.

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Index case	The first case of the disease to be diagnosed in a disease outbreak. <i>See also</i> Index property
Index property	The property on which the index case is found. <i>See also</i> Index case
Infected premises (IP)	A defined area (which may be all or part of a property) on which animals meeting the case definition are or were present, or the causative agent of the emergency animal disease is present, or there is a reasonable suspicion that either is present, and that the relevant chief veterinary officer or their delegate has declared to be an infected premises.
Local control centre	An emergency operations centre responsible for the command and control of field operations in a defined area.
Monitoring	Routine collection of data for assessing the health status of a population or the level of contamination of a site for remediation purposes. <i>See also</i> Surveillance
Movement control	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
National Biosecurity Committee	A committee that was formally established under the Intergovernmental Agreement on Biosecurity (IGAB). The IGAB was signed on 13 January 2012, and signatories include all states and territories except Tasmania. The committee provides advice to the Agriculture Senior Officials Committee and the Agriculture Ministers' Forum on national biosecurity issues, and on the IGAB.
National Management Group (NMG)	A group established to approve (or not approve) the invoking of cost sharing under the Emergency Animal Disease Response Agreement. NMG members are the Secretary of the Australian Government Department of Agriculture, Water and the Environment as chair; the chief executive officers of the state and territory government parties; and the president (or analogous officer) of each of the relevant industry parties.
Native wildlife	<i>See</i> Wild animals

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OIE Terrestrial Code	OIE <i>Terrestrial Animal Health Code</i> . Describes standards for safe international trade in animals and animal products. Revised annually and published on the internet at: www.oie.int/international-standard-setting/terrestrial-code/access-online .
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: www.oie.int/en/standard-setting/terrestrial-manual/access-online .
Operational procedures	Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.
Outside area (OA)	The area of Australia outside the declared (control and restricted) areas.
Owner	Person responsible for a premises (includes an agent of the owner, such as a manager or other controlling officer).
Polymerase chain reaction (PCR)	A method of amplifying and analysing DNA sequences that can be used to detect the presence of viral DNA.
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.
Premises of relevance (POR)	A premises in a control area that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, suspect premises, trace premises, dangerous contact premises or dangerous contact processing facility.
Prevalence	The proportion (or percentage) of animals in a particular population affected by a particular disease (or infection or positive antibody titre) at a given point in time.
Proof of freedom	Reaching a point following an outbreak and post-outbreak surveillance when freedom from the disease can be claimed with a reasonable level of statistical confidence.
Quarantine	Legally enforceable requirement that prevents or minimises spread of pests and disease agents by controlling the movement of animals, persons or things.

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Resolved premises (RP)	An infected premises, dangerous contact premises or dangerous contact processing facility that has completed the required control measures, and is subject to the procedures and restrictions appropriate to the area in which it is located.
Restricted area (RA)	A relatively small legally declared area around infected premises and dangerous contact premises that is subject to disease controls, including intense surveillance and movement controls.
Risk enterprise	A defined livestock or related enterprise that 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 truly positive units that are correctly identified as positive by a test. <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.
Slaughter	The humane killing of an animal for meat for human consumption.

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Special permit	<p>A legal document that describes the requirements for movement of an animal (or group of animals), commodity or thing, for which the person moving the animal(s), commodity or thing must obtain prior written permission from the relevant government veterinarian or inspector. A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements.</p> <p><i>See also</i> General permit</p>
Specificity	<p>The proportion of truly negative units that are correctly identified as negative by a test.</p> <p><i>See also</i> Sensitivity</p>
Stamping out	<p>The strategy of eliminating infection from premises through the destruction of animals in accordance with the particular AUSVETPLAN manual, and in a manner that permits appropriate disposal of carcasses and decontamination of the site.</p>
State coordination centre	<p>The emergency operations centre that directs the disease control operations to be undertaken in a state or territory.</p>
Surveillance	<p>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.</p>
Susceptible animals	<p>Animals that can be infected with a particular disease.</p>
Suspect animal	<p>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.</p> <p>or</p> <p>An animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.</p>
Suspect premises (SP)	<p>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 similar to the case definition, and that therefore requires investigation(s).</p>

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- Swill** Also known as ‘prohibited pig feed’, material of mammalian origin, or any substance that has come in contact with this material; it does not include:
- milk, milk products or milk byproducts, either of Australian provenance or legally imported for stockfeed use into Australia
 - material containing flesh, bones, blood, offal or mammal carcasses that is treated by an approved process¹
 - a carcass or part of a domestic pig, born and raised on the property on which the pig or pigs that are administered the part are held, that is administered for therapeutic purposes in accordance with the written instructions of a veterinary practitioner
 - material used under an individual and defined-period permit issued by a jurisdiction for the purposes of research or baiting.

Refer to jurisdictional legislation for approved processes. Jurisdictions may have approved processes that meet the following minimum standards:

- rendering in accordance with the Australian Standard for the Hygienic Rendering of Animal Products
- under jurisdictional permit, cooking processes subject to compliance verification that ensure that an internal temperature of at least 100 °C for a minimum of 30 minutes, or equivalent, has been reached
- treatment of cooking oil that has been used for cooking in Australia, in accordance with the National Standard for Recycling of Used Cooking Fats and Oils Intended for Animal Feeds
- under jurisdictional permit, any other nationally agreed process approved by the Animal Health Committee for which an acceptable risk assessment has been undertaken and that is subject to compliance verification.

This definition was endorsed by the Agriculture Ministers’ Council through AGMIN OOS 04/2014.

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Swill feeding	<p>Also known as 'feeding prohibited pig feed', it includes:</p> <ul style="list-style-type: none"> • feeding, or allowing or directing another person to feed, prohibited pig feed to a pig • allowing a pig to have access to prohibited pig feed • the collection and storage or possession of prohibited pig feed on a premises where one or more pigs are kept • supplying to another person prohibited pig feed that the supplier knows is for feeding to any pig. <p>This definition was endorsed by the Agriculture Ministers' Council through AGMIN OOS 04/2014.</p>
Trace premises (TP)	Temporary classification of a premises that contains susceptible animal(s) that tracing indicates may have been exposed to the disease agent, or contains contaminated animal products, wastes or things, and that requires investigation(s).
Tracing	The process of locating animals, people or other items that may be implicated in the spread of disease, so that appropriate action can be taken.
Unknown status premises (UP)	A premises within a declared area where the current presence of susceptible animals and/or risk products, wastes or things is unknown.
Vaccination	Inoculation of individuals with a vaccine to provide active immunity.
Vaccine	A substance used to stimulate immunity against one or several disease-causing agents to provide protection or to reduce the effects of the disease. A vaccine is prepared from the causative agent of a disease, its products or a synthetic substitute, which is treated to act as an antigen without inducing the disease.
– adjuvanted	A vaccine in which one or several disease-causing agents are combined with an adjuvant (a substance that increases the immune response).
– attenuated	A vaccine prepared from infective or 'live' microbes that are less pathogenic but retain their ability to induce protective immunity.
– gene deleted	An attenuated or inactivated vaccine in which genes for non-essential surface glycoproteins have been removed by genetic engineering. This provides a useful immunological marker for the vaccine virus compared with the wild virus.

Cont'd

– inactivated	A vaccine prepared from a virus that has been inactivated ('killed') by chemical or physical treatment.
– recombinant	A vaccine produced from virus that has been genetically engineered to contain only selected genes, including those causing the immunogenic effect.
Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A biological vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A mechanical vector is one that transmits an infectious agent from one host to another but is not essential to the lifecycle of the agent.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. <i>See also</i> Epidemiological investigation
Viraemia	The presence of viruses in the blood.
Wild animals – native wildlife – feral animals – exotic fauna	Animals that are indigenous to Australia and may be susceptible to emergency animal diseases (eg bats, dingoes, marsupials). Animals of domestic species that are not confined or under control (eg cats, horses, pigs). Nondomestic animal species that are not indigenous to Australia (eg foxes).
Wool	Sheep wool.
Zero susceptible species premises (ZP)	A premises that does not contain any susceptible animals or risk products, wastes or things.
Zoning	The process of defining, implementing and maintaining a disease-free or infected area in accordance with OIE guidelines, based on geopolitical and/or physical boundaries and surveillance, to facilitate disease control and/or trade.
Zoonosis	A disease of animals that can be transmitted to humans.

Abbreviations

Disease-specific terms

ADS	approved disposal site
BSE	bovine spongiform encephalopathy
CNS	central nervous system
EU	European Union
LCP	lower-risk contact premises
NTSESP	National Transmissible Spongiform Encephalopathies Surveillance Program
PRNP	the gene encoding PrP in sheep
PrP	prion protein
PrP^{Sc}	protease-resistant isoform of PrP
TSE	transmissible spongiform encephalopathy

Standard AUSVETPLAN abbreviations

ACDP	Australian Centre for Disease Preparedness
AN	assessed negative
ARP	at-risk premises
AUSVETPLAN	Australian Veterinary Emergency Plan
CA	control area
CCEAD	Consultative Committee on Emergency Animal Diseases

Cont'd

CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	chief veterinary officer
DCP	dangerous contact premises
DCPF	dangerous contact processing facility
EAD	emergency animal disease
EADRA	Emergency Animal Disease Response Agreement
EADRP	Emergency Animal Disease Response Plan
EDTA	ethylenediaminetetraacetic acid (anticoagulant for whole blood)
ELISA	enzyme-linked immunosorbent assay
GP	general permit
IETS	International Embryo Transfer Society
IP	infected premises
LCC	local control centre
NMG	National Management Group
OA	outside area
OIE	World Organisation for Animal Health
PCR	polymerase chain reaction
POR	premises of relevance
RA	restricted area
RP	resolved premises
SCC	state coordination centre
SP	suspect premises
SpP	special permit
TP	trace premises
UP	unknown status premises
ZP	zero susceptible stock premises

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