

Sheep Diseases

The Farmers' Guide

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Government of South Australia
Department of Primary Industries
and Regions

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How to use this guide

This guide has been designed as a quick-reference tool to help farmers take action when faced with a broad range of sheep diseases on the farm. It will help you assess signs and symptoms and identify possible causes and provides information on diagnosis, treatment options, prevention and general sheep health management.

Printed and digital resources are referenced throughout to assist you with further, more detailed reading on a number of sheep diseases, conditions and best practice guidelines.

You will also find a list of useful contacts and websites on the back of this guide.



Photo credit: Animal Health Australia

Reporting serious or unusual animal disease signs

Always keep an eye out for serious or unusual signs and symptoms in livestock including:

- unexplained deaths
- sores or ulcers on feet or inside mouth (this may result in a reluctance to eat or move)
- excessive salivation (drooling should always be treated suspiciously)
- reduction in milk yield from cows and eggs from chickens
- diarrhoea, especially if it has blood in it
- excessive nasal discharge (unless you know what has caused it)
- staggering, head drooping or severe lameness, especially if more than one animal at the same time.

Serious animal diseases must be reported. Early reporting provides the best chance to contain and manage an outbreak before it spreads. If you notice any serious or unusual signs or symptoms with your animals, you can:

- call the 24-hour Emergency Animal Disease Hotline on 1800 675 888
- contact your local Department of Primary Industries and Regions (PIRSA) Animal Health office (see back cover for phone numbers)
- contact your local veterinarian.

Funding for disease investigations

Subsidies are available to support private veterinary investigations into animal diseases where an infectious agent is a potential cause. This is to help producers maintain and demonstrate South Australia's highly regarded animal health status.

The program covers all livestock species, companion animals, and wildlife (including feral animals) and is aimed primarily at early detection and diagnosis of emergency animal diseases.

For further information, contact your local veterinarian, who may access these funds through PIRSA.



Scan QR code to learn more
about disease surveillance
or visit [www.pir.sa.gov.au/
livestock-disease-surveillance](http://www.pir.sa.gov.au/livestock-disease-surveillance)

Key to disease diagnoses by signs and symptoms

Abscess

- Cheesy gland
- Foot abscess

Abortion/stillbirth

- Ovine brucellosis
- Listeriosis
- Vibriosis

Anaemia

- Oxalate poisoning
- Worms

Blindness

- Pinkeye
- Polioencephalomalacia

Convulsions

- Annual ryegrass toxicity
- Grass tetany
- Phalaris poisoning
- Phalaris staggers
- Polioencephalomalacia
- Pulpy kidney
- Perennial ryegrass staggers
- Tetanus

Coughing

- Lungworm
- Pneumonia

Downer sheep

- Annual ryegrass toxicity
- Botulism
- Exposure losses
- Grass tetany
- Lungworm
- Milk fever
- Oxalate poisoning
- Phalaris poisoning
- Phalaris staggers
- Polioencephalomalacia
- Pregnancy toxemia
- Pyrrolizidine alkaloid poisoning

Infected wound

- Malignant oedema

Infertility

- Ovine brucellosis

Ill thrift

- Cobalt deficiency
- Coccidiosis
- Copper deficiency
- Copper poisoning
- Lungworm
- Lupinosis
- Nitrate poisoning
- Ovine Johne's disease
- Oxalate poisoning
- Polioencephalomalacia
- Pyrrolizidine alkaloid poisoning
- Selenium deficiency
- Worms

Jaundice

- Copper poisoning
- Lupinosis
- Pyrrolizidine alkaloid poisoning

Lameness

- Acidosis
- Arthritis
- Foot abscess
- Footrot

Leg paddling

- Annual ryegrass toxicity
- Grass tetany
- Listeriosis
- Oxalate poisoning
- Phalaris poisoning
- Polioencephalomalacia

Nervous/neurological signs

- Annual ryegrass toxicity
- Botulism
- Copper deficiency
- Grass tetany
- Listeriosis
- Lupinosis
- Milk fever
- Oxalate poisoning
- Perennial ryegrass staggers
- Phalaris poisoning
- Phalaris staggers
- Pulpy kidney
- Tetanus

Salivation/frothing at mouth

- Botulism
- Grass tetany
- Listeriosis
- Phalaris poisoning

Scabs

- Cobalt deficiency
- Dermatophilosis
- Lupinosis
- Pyrrolizidine alkaloid poisoning
- Scabby mouth

Scours

- Acidosis
- Coccidiosis
- Copper poisoning
- Nitrate poisoning
- Pyrrolizidine alkaloid poisoning
- Worms

Sudden death

- Acidosis
- Annual ryegrass toxicity
- Copper poisoning
- Exposure
- Flystrike
- Grass tetany
- Listeriosis
- Milk fever
- Oxalate poisoning
- Phalaris poisoning
- Polioencephalomalacia
- Pregnancy toxaemia
- Pulpy kidney
- Ryegrass staggers
- Tetanus
- Worms

Wool abnormalities

- Copper deficiency
- Dermatophilosis

Key to disease diagnoses by season

Spring Sept/Oct/Nov	Summer Dec/Jan/Feb	Autumn March/April/May	Winter June/July/August
<ul style="list-style-type: none">• Annual ryegrass toxicity• Cobalt deficiency• Foot abscess• Lupinosis• Oxalate poisoning• Pyrrolizidine alkaloid poisoning• Selenium deficiency	<ul style="list-style-type: none">• Annual ryegrass toxicity• Cobalt deficiency• Lupinosis• Pneumonia• Pyrrolizidine alkaloid• Poisoning• Perennial ryegrass staggers• Selenium deficiency	<ul style="list-style-type: none">• Lungworm• Lupinosis• Phalaris poisoning• Phalaris staggers• Pneumonia• Pyrrolizidine alkaloid poisoning• Perennial ryegrass staggers	<ul style="list-style-type: none">• Exposure losses after shearing• Foot abscess• Lungworm• Nitrate poisoning• Oxalate poisoning• Phalaris poisoning• Phalaris staggers• Pneumonia

Key to poisoning or toxicity by plant

Annual ryegrass toxicity

- Annual ryegrass (*Lolium rigidum*)

Lupinosis

- Lupin stubble (*Lupinus* species)
- Lupin hay (*Lupinus* species)
- Lupin grain (*Lupinus* species)

Nitrate poisoning

- Capeweed (*Arctotheca calendula*)
- Oats (*Avena sativa*)
- Canola (*Brassica napus*)
- Wild turnip (*Brassica rapa*)

Oxalate poisoning

- Soursob (*Oxalis pes-caprae*)
- Sorrel (*Acetosella vulgaris*)

Phalaris poisoning

- Phalaris (*Phalaris aquatica*)

Phalaris staggers

- Phalaris (*Phalaris aquatica*)

Photosensitisation

- Salvation Jane/Paterson's curse (*Echium plantagineum*)
- Heliotrope/potato weed (*Heliotropium europaeum*)
- Caltrop (*Tribulus terrestris*)
- St John's Wort (*Hypericum perforatum*)
- Buckwheat (*Polygonum fagopyrum*)
- Hairy panic (*Panicum effusum*)
- Sweet grass (*Panicum laevifolium*)
- Lantana (*Lantana camara*)
- Fungus of facial eczema (*Pithomyces chartarum*)
- Fungus of lupinosis (*Phomopsis leptostromiformis*)
- Blue-green algae (*Anacystis cyanea*)

Pyrrolizidine alkaloid poisoning

- Salvation Jane/Paterson's curse (*Echium plantagineum*)
- Heliotrope/potato weed (*Heliotropium europaeum*)
- Caltrop (*Tribulus terrestris*)

Perennial ryegrass staggers

- Perennial ryegrass (*Lolium perenne*)

Exotic diseases



Exotic diseases

Exotic diseases don't always look spectacular. They often look the same as common diseases seen every day on South Australian farms.

Help protect the future of our livestock industry by seeking veterinary assistance as soon as you notice a problem and report your concerns to the **Emergency Animal Disease Hotline on 1800 675 888**.



This sheep has barbers pole (*Haemonchus*).



This sheep has bluetongue, **an exotic disease**.



These sheep have lice.



This sheep has scrapie, **an exotic disease**.

Source: National Animal Disease Information Service (NADIS)

Learn how to recognise emergency animal diseases

Use the new app to learn how to identify signs of emergency animal disease (EAD) in sheep.

Download to your mobile phone by searching 'Sheep EAD AR' in the app store.

The tool generates a flock of augmented reality sheep providing an opportunity for the user to identify the sick animal by looking for signs and symptoms.

The diseases included in the tool are:

- foot and mouth disease
- bluetongue
- scrapie
- sheep pox



Scan QR code to watch the demonstration video.



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Anthrax

Emergency animal disease, notifiable and zoonotic

If you suspect your stock have anthrax contact your local PIRSA Animal Health office immediately or report to the Emergency Animal Disease Hotline on 1800 675 888.

Problem

Anthrax has not been diagnosed in SA for many years, but occasional detections have occurred in NSW and as well as isolated outbreaks in WA and QLD.

Anthrax is caused by a bacteria that affects cattle, sheep, goats and humans. The bacterium produces spores when exposed to air that persist in soil for many years. The disease is spread by contact with infected animals or by feed and water that have been contaminated. An outbreak could be a possible cause of unexplained sudden death in livestock and can affect trading opportunities locally and internationally. More common in summer but can occur all year round.

Humans can contract anthrax by handling infected animals, carcasses, animal products and wool. Take care if handling animals suspected of dying from anthrax and contact your medical practitioner immediately if you have been exposed.

Signs and symptoms

- Sudden death usually first sign, preceded by rapidly worsening weakness and staggering.
- Bloody or tarry discharge from mouth, nose or anus of dead animals.
- Sudden drop in milk production, red-stained milk or urine.

Diagnosis

- If unexplained sudden death occurs and anthrax is suspected do not open or move the carcass. Seek advice from your local veterinarian or call your PIRSA animal health office for assistance diagnosing anthrax with a 'penside' test.
- Diagnosis is most likely in animals that have recently moved from eastern states.

- A lack of rigor mortis, with rapid decomposition of carcass. Pulpy kidney is often assumed to be the cause.

Treatment

- Treatment is rarely possible as affected animals die quickly.
- High doses of penicillin may be effective in early cases, however may interfere with anthrax vaccine.

Prevention

- Vaccination is effective, full protection takes 10-14 days to develop after administration.
- Vaccination may only occur with the approval of SA's Chief Veterinary Officer (Chief Inspector of Stock).

Bluetongue

Emergency animal disease, notifiable

If you suspect your stock have bluetongue contact your local PIRSA Animal Health office immediately or report to the Emergency Animal Disease Hotline on 1800 675 888.

Problem

Bluetongue virus (BTV) is spread by biting insects such as *Culicoides* midges, resulting in production losses and high death rates (up to 70% in sheep).

Many BTV strains that cause severe disease are exotic to Australia. Some BTV strains are present in northern and north-eastern parts of Australia, but SA is a transmission free area.

SA's reputation for high health status livestock plays a key role in accessing livestock export trade markets and provides significant economic benefits to rural communities. Some countries only source livestock from areas free of BTV, highlighting the importance of SA maintaining its BTV-free status.

Signs and symptoms

- Fever (40 to 41°C), nasal discharge, breathing difficulty.
- Lameness and reddening around the coronary band (top of the hoof).
- Swelling of the lips, tongue and head.
- Some animals have a swollen, blue-coloured tongue, but this isn't always seen and is not a reliable sign.
- Rapid weight loss and drop in production.
- Death rates of 20 to 40% common.

Diagnosis

- If unexplained sudden death occurs and bluetongue is suspected do not open or move the carcass.
- To prevent spread of disease it is critically important to seek advice from your local veterinarian or call Emergency Animal Disease Hotline on 1800 675 888 immediately.

Treatment

- No effective treatment for bluetongue.

Prevention

- Isolation - if an outbreak occurs, infected animals should be isolated.
- Insecticide - can be applied to reduce insect numbers and minimise further spread.
- Good hygiene - minimise the spread of BTV by not sharing needles between animals when injecting and thoroughly washing and decontaminating other equipment between animals.



Foot and mouth disease (FMD)

Emergency animal disease, notifiable

If you suspect your stock have foot and mouth disease contact your local PIRSA Animal Health office immediately or report to the Emergency Animal Disease Hotline on 1800 675 888.

Problem

Australia is free of foot and mouth disease (FMD). It is a highly contagious animal disease that affects cattle, sheep, goats, pigs, deer and camelids (all cloven-hoofed animals). An incursion of the virus would have severe consequences for Australia's animal health and livestock trade.

FMD is carried by live animals and in meat and dairy products, as well as in soil, bones, untreated hides, and vehicles and equipment used with infected animals. It can also be carried on people's clothing and footwear.

Signs and symptoms

The most overt sign in sheep may be lameness. This will appear similar to endemic disease causes of lameness

like footrot. Close inspection is required to see some of the other signs of FMD. Affected sheep may:

- seem depressed
- develop sudden lameness
- be reluctant to stand
- form blisters around top of foot and between claws
- have lesions on tongue and dental pad (hard to detect)
- result in significant deaths in lambs.

Diagnosis

- Report these signs immediately to your veterinarian or the Emergency Animal Disease Hotline on 1800 675 888.
- Samples will be collected from your animals and will be sent urgently to an appropriate animal health laboratory for diagnostic testing.

Treatment

- No effective treatment for FMD.
- Australia has detailed, well-rehearsed FMD response plans and arrangements in place should an outbreak occur.

Prevention

- Farm biosecurity - practice good farm biosecurity at all times to prevent the introduction and spread of FMD.
- Buying animals - only buy from properties with good biosecurity and disease control practices in place.
- Isolating animals - quarantine new animals before introducing into existing flocks.
- Traceability - keep National Livestock Identification System (NLIS) and property identification code (PIC) records up to date.
- Report signs immediately to the Emergency Animal Disease Hotline on 1800 675 888.



Scan QR code to learn more about FMD or visit www.pir.sa.gov.au/fmd

Sheep diseases & conditions



Acidosis (grain overload)

Problem

Sheep consume too much high-risk grain such as wheat or barley which damages their gut microflora. Some affected sheep die, others recover slowly but are often chronically lame.

Signs and symptoms

- Signs occur within 24-36 hours of changing to a grain rich diet.
- Mildly affected sheep may have diarrhoea but continue to eat.
- Severely affected sheep may stop eating, be tender-footed, get up and down frequently, lie down for extended periods and grind their teeth.

Diagnosis

- History of eating high risk grain without being acclimatised and clinical signs.
- On post mortem - damage to the rumen wall and large amount of whole grain in first stomach.

Treatment

- Diet - remove animals from grain, feed good quality hay and provide access to water.
- Consult veterinarian for a treatment plan – fluids and sodium bicarbonate (bicarb soda) can be helpful if given quickly after overconsumption.
- Antibiotics - often recommended for surviving sheep that have suffered rumen damage.

Prevention

- Diet - high risk grains should be gradually introduced. Avoid sudden ration change, including grain type and include grain buffering pellets with the grain. A provision of extra calcium is very important (see page 65).
- Access - take care when allowing sheep to graze newly harvested paddocks. Prevent sudden access to unharvested paddocks or spilled grain (e.g. around silos).



Annual ryegrass toxicity (ARGT)

Problem

Sheep graze annual ryegrass infested with a nematode carrying a toxin-producing bacterium. Severely affected sheep may die within hours to a week after symptoms show. Most deaths occur between October and December when infected plants have maximum toxicity.

Signs and symptoms

- Signs become obvious when a mob are driven 100-200 metres, affected sheep are unable to keep up and have a high-stepping gait.
- Sheep may go down for minutes or hours, then return to the mob appearing normal.
- Severely affected sheep lose coordination of hind limbs, fall over with convulsions.
- Arched neck, stiff legs or paddling legs sweeping the ground.

Diagnosis

- Signs develop four days to several weeks after sheep graze infected paddock or are fed infected hay.

- History of eating annual ryegrass (including toxic hay) and clinical signs.
- On post mortem - rumen, pasture, hay and grain can be tested for toxic bacteria.
- Blood test analysis of liver and brain can confirm the disease.

Treatment

- Access - remove animals from infected paddock as quietly as possible.
- Humane destruction - sheep unable to get up within 12 hours should be humanely euthanised (see page 67).

Prevention

- Plant management - reduce number of annual ryegrass plants by heavy grazing in late winter and early spring, with herbicide treatment and cutting hay before plants become toxic.
- Introduced feed - all bought feed should be accompanied by a vendor declaration.
- Stock monitoring - monitor stock daily during high-risk months in known ARGT areas. Early detection will minimise losses.



Annual ryegrass. Photo credit: DPIRD



Mature annual ryegrass. Photo credit: Andrew Storrie

Arthritis

Problem

Inflammatory condition of one or more joints causing pain, lameness and reduced animal productivity. Can affect carcass quality leading to trimming and condemnation.

Signs and symptoms

- First signs are heat and swelling around one or more joints, commonly knee and hock joints.
- Restricted and painful movement of affected joints, mild lameness developing to permanent lameness.

Diagnosis

- Mostly seen in lambs prior to weaning due to bacteria entering through broken skin (e.g. the umbilicus at birth, marking or mulesing wounds).
- Examining the joints for swelling and heat.
- On post mortem - bone changes in the joints, thickened joint fluid and tissue around the joint.

Treatment

- Consult veterinarian for a treatment plan - if detected early, antibiotic treatment can reduce the extent of damage.

Prevention

- Vaccination - given to ewes before lambing and lambs at marking to prevent one of the most common causes of arthritis, Erysipelothrix.
- Stress - keep stress to a minimum at lamb marking by avoiding extremes in temperature, keep droving to a minimum before and after marking and allow lambs to mother up as soon as possible.
- Good hygiene - at marking, avoid overcrowding or extended holding in yards and place lambs on their feet when releasing from the cradle.



Scan QR code to learn more on VR carcass feedback tool



Botulism

Problem

Sheep ingest a toxin produced by *Clostridium botulinum* causing gradual onset of paralysis and sometimes death.

Most common in pastoral areas in association with phosphorus deficiency as stock chew old bones for phosphorus. Can also occur when sheep ingest contaminated feed (e.g. rotting vegetable or animal matter).

Signs and symptoms

- Early signs are staggering, loss of appetite, drooling, mild excitability, nervous twitching and jaw champing.
- As the disease progresses sheep become dull, respiration becomes laboured and flaccid paralysis of limbs sets in.
- Affected sheep will go down and die quietly, generally within two to three days of initial signs.

Diagnosis

- Based on flock history and clinical signs.

Treatment

- Humane destruction – severely affected animals should be humanely euthanised (see page 67).
- Diet - provide food and water while the toxin runs its course.

Prevention

- Vaccination - vaccinate at risk sheep on properties where phosphorus deficiency or botulism is known to be a problem. Two doses of botulism vaccine one year apart provides lifelong prevention (see page 63).
- Nutrition - address nutritional deficiencies to prevent bone chewing.

Cheesy gland (CLA)

Problem

Sheep affected with a bacterial infection that causes abscesses in the lymph nodes and lungs. Can affect wool production and occasionally cause ill-thrift and wasting. Affects carcass quality leading to trimming and condemnation.

Signs and symptoms

- Often no obvious signs, but readily detected in the carcass at slaughter.
- Recently formed abscesses containing creamy, greenish pus that hardens into layers, commonly found in lymph nodes on the shoulder point, groin and lungs.

Diagnosis

- Burst abscesses may be seen at shearing or CLA is detected in the carcass at slaughter. Occasionally abscesses can be found in the brain.

Treatment

- No effective treatment.

Prevention

- Vaccination - in combination with clostridial vaccine, ensure annual boosters are given one to six months before shearing (see page 63).
- Shearing - shear in age groups, youngest to oldest. Keep yard time to a minimum for recently shorn sheep.
- Dipping - wait until cuts have healed (two to four weeks post shearing), dip oldest animals last, use disinfectant in the dip.
- Good hygiene - if an abscess is ruptured at shearing or crutching, disinfect the handpiece, floor and anything else contaminated.



Scan QR code to learn more on VR carcass feedback tool

Cobalt deficiency

Problem

Most common in young sheep during spring and summer on properties with sandy, coastal soils. Affected sheep become deficient in vitamin B12, leading to reduced energy metabolism, ill-thrift and anaemia.

Signs and symptoms

- Reduced appetite, ill-thrift (poor doers), anaemic, sometimes scaley ears and nose.
- Sheep may have weepy eyes and photosensitisation (page 44).

Diagnosis

- A blood test can detect vitamin B12 deficiency.

Treatment

- Vitamin B12 injections, cobalt bullets and grinders, cobalt supplements in water or feed.

Prevention

- Vitamin B12 injections - in cobalt deficient areas, lambs should be injected at marking, and again two months later (often in conjunction with a clostridial vaccine, see page 63).
- Cobalt bullet - weaners remaining on cobalt deficient pastures can be given a cobalt bullet at three months old.



Coccidiosis

Problem

Most common in lambs before and after weaning and following transport stress or overcrowding. Caused by protozoan parasites that damage the intestinal wall, leading to severe dehydration, weight loss and death.

Can affect ewes from pastoral country relocated to higher rainfall areas and occasionally sheep in confinement feeding situations.

Signs and symptoms

- Loss of appetite and weight loss.
- Scouring - often a dark brown liquid containing flecks of blood or shreds of intestinal lining.
- Severely affected lambs are obviously weak, if driven will fall behind the mob and may go down.

Diagnosis

- Clinical signs.
- Faecal worm testing can detect coccidiosis but won't indicate the extent of damage to intestinal lining.
- On post mortem - examination of the intestines, particularly large intestine.

Treatment

- Sulphadimidine - given by injection or drench, two doses are recommended three days apart. Contact your local veterinarian.
- Hydration - acutely scouring animals will benefit from electrolyte therapy to replace fluids.
- Off label treatment (e.g. Baycox) - can be used under veterinary prescription.

Prevention

- Diet - feed weaners well with a high protein diet. Late lambs should not graze on pastures used by earlier lambs. Other treatments added to formulated rations could be considered.
- Stress - minimise stressful conditions.
- Good hygiene - coccidiosis is commonly associated with unhygienic living conditions.
- Disease management - control concurrent disease problems, especially worms.



Copper deficiency

Problem

Occurs when sheep have insufficient copper in their diet over a period of weeks, most common on coastal sandy soils, sandy loams and swamp land.

Leads to ataxia (uncoordinated movement) in young animals, steely wool, abnormal bone formation, ill-thrift and scours in severe cases.

Signs and symptoms

- Wool abnormalities, 'steely wool' - loss of crimp, hard feel to fleece, reduced tensile strength and elasticity, depigmentation of black fleece.
- Diarrhoea, anaemia, sway back and uncoordinated staggy gait
- Fragile bones that may fracture easily in young sheep, affected bones are thin but not deformed.

Diagnosis

- A blood test or tissue analysis - liver is the best sample to test.
- Pasture analysis.

Treatment

- Supplementation - options include copper oxide capsules, copper glycinate injections (e.g. Multimin) and in-water treatments.
- Pasture or fertilizer treatments.
- Sheep should not be treated with copper unless deficiency is confirmed – excess copper can be toxic. Consult your veterinarian.

Prevention

- Diet - copper absorption is compromised by a diet high in other competing minerals.
- Pasture - where concentration of copper is low, top dress with copper.
- Copper oxide capsules or copper glycinate injection - can be used in areas where copper deficiency is known.



Copper poisoning

Problem

Occurs when toxic levels of copper accumulate in the liver, with sudden death often the first indication, any survivors develop jaundice. The three types of copper toxicity include:

1. Acute copper poisoning - caused by supplementing sheep that already have normal to high copper reserves.
2. Chronic copper poisoning - occurs when excessive copper accumulates in the liver over a period of several months.
3. Pyrrolizidine alkaloid poisoning - certain plants such as heliotrope and Salvation Jane can cause copper to accumulate in the liver.

Signs and symptoms

- Acute copper poisoning - severe diarrhoea (often bluish in colour), red-brown urine, dehydration, death within two days of recumbency.
- Chronic copper poisoning - sheep are disinterested in surroundings, stand apart from the mob, stop eating, red-brown urine, jaundice. Death occurs between three to five weeks after early signs.

Diagnosis

- Based on flock history and clinical signs.
- On post mortem analysis of liver samples.

Treatment

- Contact your local veterinarian for acute cases – treatment is possible but unlikely to be available in time.
- No effective treatment for chronic copper poisoning.
- Reduce copper absorption - salt lick blocks containing molybdenum may reduce further copper absorption in the gut.

Prevention

- Diet - avoid feedstuffs and supplements with extra copper unless animal has confirmed copper deficiency.
- Stress - minimise stressful conditions when handling animals.



Salvation Jane



Heliotrope. Photo credit: DPIRD

Dermatophilosis and dermatitis ('dermo', lumpy wool)

Problem

A common skin infection caused by *Dermatophilus congolensis* bacterium, mainly in weaners and hoggets (especially Merinos). Causes elevated body temperature, hard scabs on skin under the wool and can lead to occasional deaths.

Can make shearing difficult and result in flystrike and wool damage. Occurs mostly in medium to high rainfall areas.

Signs and symptoms

- On non-woollen areas including face and ears - thin, flat scabs usually shorter than 1 cm.
- On wool producing skin - a thick discharge mats wool fibres together at the base of the staple and dries into a scab.
- Severely affected sheep have hard plates of scabs across their back.

Diagnosis

- Examining affected sheep.
- Laboratory confirmation is necessary for a definitive diagnosis.
- High protein feed may be a factor.
- Unusually wet or humid weather

Treatment

- Usually self-curing.
- Antibiotics - can speed recovery and minimise risk of flystrike. Contact your local veterinarian.
- Zinc - in some cases, zinc sulphate washes can be effective after shearing

Prevention

- Wet sheep - minimise contact between wet sheep and don't keep wet sheep in the yards any longer than necessary.
- Carrier sheep - sheep with mild lesions are the main source of infection, spreading the condition when fleece becomes wet for extended periods.
- Shearing - shear affected sheep last when dermatitis present to prevent significant spread via the hand piece comb.



Photo credit: Dr Will Berry

Exposure losses

Problem

Sheep experience body heat loss too quickly to maintain normal body temperature, resulting in collapse, becoming comatose and then death.

Most common within two weeks of shearing, especially with extreme cold, rain and windy conditions.

Signs and symptoms

- Sheep will seek shelter nearby and be reluctant to move.
- If body heat loss continues sheep will collapse, become comatose and die within hours.

Diagnosis

- Consider factors including time since shearing, available shelter, current weather, sheep size and body condition.

Treatment

- Shelter - protect stock from cold conditions and draughts. Move stock that have collapsed into a shed.
- Body temperature - if animal is down, provide body insulation and warmth.

Prevention

- Shelter - recognise high risk weather and move recently shorn animals to shelter as early as possible.



Foot abscess

Problem

Bacteria infects the toe or heel after a foot injury, resulting in severe lameness, reluctance to stand or move and sometimes damage to foot joints.

Common in heavier sheep, rams, and pregnant ewes.

Signs and symptoms

- Usually only one foot is affected - becoming hot and swollen.
- Toe abscess in front foot - normal infection site is a crack in the hoof.
- Heel abscess - more common in heavy adult sheep, starts as a skin infection between the toes and extends to the heel.
- Sheep are very lame and lose condition until the abscess bursts and pus drains out.
- Distinguishable from footrot due to the presence of swelling and pus and often lesions that burst above the coronet.

Diagnosis

- Based on foot examination of lame sheep - abscess contains light brown or green pus that will build up over time and then burst.
- Can be confirmed by laboratory analysis.

Treatment

- Hoof paring - toe abscesses respond well to hoof paring which provides drainage for the pus.
- Antibiotics - heel abscesses are generally deeper and may require antibiotic treatment. Contact your local veterinarian.
- Natural healing - once the abscess bursts, healing occurs without further treatment.

Prevention

- Muddy paddocks - keep susceptible sheep out of muddy paddocks where possible.



Footrot

Notifiable disease

If you suspect your stock have footrot contact your local PIRSA Animal Health office or report to the Emergency Animal Disease Hotline on 1800 675 888.

Problem

A highly contagious bacterial disease of one or more feet, resulting in reduced growth, ewe fertility, growth rates and productivity.

Flock outbreaks can cause significant economic loss and incur high costs associated with controlling and eradicating the disease.

Signs and symptoms

- Inflamed, red, moist skin and pasty scum between the digits.
- Chronic and severe lesions with foul smell.
- Loss of appetite, raised body temperature, extreme pain.

Diagnosis

- Based on examination of affected feet - consult your local PIRSA Animal Health office or veterinarian.
- Laboratory analysis - virulence test on bacterial swab.

Treatment

A treatment or eradication program for footrot involves three phases:

1. Control - footbathing or vaccination during the spread period to reduce level of infection in the flock to until eradication becomes feasible.
2. Eradication - remove all infected sheep during the non-spread period.
3. Surveillance - closely observe the flock to make sure the disease has been eradicated and to prevent reinfection.



Scan QR Code to learn more about 'Footrot' or visit www.sheepconnectsa.com.au/management/health/foot



Grass tetany (hypomagnesaemia)

Problem

Sheep develop low blood levels of magnesium and/or calcium, leading to a stiff gait, paddling convulsions and sudden death. Most common in prime lamb mothers within six weeks of lambing.

Can be caused by pasture application of excessive nitrogenous dressings and potassium fertilizers.

Signs and symptoms

- Excitable and uncoordinated sheep, throwing head about, grinding teeth and shaking with muscle tremors.
- Affected sheep will collapse within three hours, paddle their feet and froth at the mouth.
- Violent convulsions and death occurring four to six hours after initial signs.

Diagnosis

- Based on flock history, signs shown by affected sheep and the rapid response to treatment.
- On post mortem - fluids from inside the eye tested for magnesium levels.

Treatment

- Supplementation - ewes respond quickly to magnesium injections. Treated sheep will get up and walk away within minutes.
- Supplementation - as grass tetany is often seen in conjunction with low calcium, a solution containing both calcium and magnesium is recommended - this is readily available from most rural stores.
- Timing - treatment must be given as soon as possible after initial signs to be effective.

Prevention

- Stress management - ewes with young lambs should be handled as little as possible as physical stress can bring on grass tetany.
- Supplementation - magnesium supplements should be available, usually combined with calcium supplements during periods of greatest risk. Magnesium oxide can also be sprayed on to hay if needed.
- Diet - providing hay when there is lush, rapid pasture growth can reduce the risk of disease.



Photo credit: Dr Bruce Watts

Large lungworm

Problem

A parasitic worm that irritates the airway causing weight loss and in severe cases leads to pneumonia and death. Most common in cooler, wetter areas, in autumn or winter.

Lambs between four and six months are most at risk, but sheep of all ages can be affected.

Signs and symptoms

- Sheep affected by a moderate infestation will experience coughing, lethargy and weight loss.
- Severe infestation may cause breathing difficulty, nasal discharge, ill thrift, pneumonia, suffocation and death.

Diagnosis

- Lungworms identified in faecal egg count and culture.
- On post mortem - lungworms found in the airway and lungs.

Treatment

- Drenching - many sheep drenches are registered for lungworm treatment.

Prevention

- Drenching - a regular drenching program can prevent infestation.



Listeriosis (circling disease)

Notifiable disease

If you suspect your stock has listeriosis contact your local PIRSA Animal Health office or report to the Emergency Animal Disease Hotline on 1800 675 888.

Problem

A bacterial infection, causing encephalitis. Can lead to high death rate including abortion, stillbirth and neonatal death.

Mostly associated with sheep feeding on mouldy silage or spoiled hay but can be sporadic, with no obvious cause. Listeriosis can present health risks to humans.

Signs and symptoms

- First signs include depression, anorexia, disorientation, head tilt and circling. Animals usually die within a few days.
- Abortion in ewes in late pregnancy.
- Facial paralysis (often one-sided) causing droopy ear and eyelid, muzzle pulling to one side and lack of muscle tone in lip of the affected side.
- Profuse salivation.

Diagnosis

- Based on clinical signs.
- On post mortem - analysis of the brain and spinal cord with tissue cultures.

Treatment

- Antibiotics - recovery depends on early intervention with high doses of antibiotics, however death can occur despite treatment in severe cases. Contact your local veterinarian.
- Diet- remove suspect feed (e.g. spoiled silage).
- Isolation - separate ill sheep to prevent spreading the disease between animals.

Prevention

- Diet - take care to avoid feeding livestock spoiled silage.
- Pasture - avoid boggy pastures and areas where soil has a high pH level.



Lupinosis

Problem

Liver disease caused by eating lupin stubbles or lupin grain infected with a fungal toxin – any lupin stubble exposed to rain following harvest is potentially dangerous. Can lead to anorexia, collapse and many deaths.

Sheep that recover will have chronic liver damage and do poorly for months, ewes can be predisposed to pregnancy toxoemia the following season. Most common in summer and autumn.

Signs and symptoms

- Affected sheep will stop eating, stand apart or lag behind the mob and become staggy when driven.
- Membranes and skin become jaundiced and may show signs of photosensitisation (page 44).
- Some animals die within three days of eating contaminated lupins, others will slowly waste away over several weeks.

Diagnosis

- Based on a history of grazing lupin stubble or eating lupin grain and clinical signs.
- On post mortem - the animal will be jaundiced with yellowing fat, skin and liver.

Treatment

- No effective treatment - follow steps to minimise number of sheep affected and severity.
- Hydration and shelter - remove the mob from lupin stubble and grain and give access to good quality water and shelter.
- Diet - feed affected sheep a low protein diet of hay and low protein grains.

Prevention

- Monitoring - check sheep daily when grazing lupin stubble, drive the mob for 500 metres to identify any animals lagging behind.
- Rain - if rain occurs or there is a heavy dew, remove sheep from lupin stubble.
- Timing - graze lupin stubbles as soon as possible after harvest and remove stock once all the grain has been eaten.
- History - avoid grazing sheep with a history of liver damage.
- Quality and testing - feed sheep good quality lupin grain. Hay, grain and stubble can be tested to detect toxin levels at any livestock feed testing service.



Photo credit: Dr Belinda Edmonstone

Mastitis

Problem

Inflammation and infection of the udder causing heat, swelling and lumps leading to milk supply shutting down.

A common problem in ewes, usually sporadic, but in some years seems to affect more ewes than other times.

Signs and symptoms

- Heat and swelling of udder, usually when lambs are more than four weeks old, often twins, before weaning.
- Hard and lumpy udder, may be swollen, painful and hot in early stages
- Milk supply shut down.

Diagnosis

- History of ewes grazing in long stubbles, sometime long grass.
- Scabby mouth infection has been recorded as a cause.

Treatment

- Antibiotics - condition sometimes responds to antibiotic injections if detected early, but generally ewes with hard, lumpy udders will not return to function, and should be culled.

Prevention

- Weaning - if older lambs are suckling ewes, earlier weaning may assist in reducing cases.



Milk fever (hypocalcaemia)

Problem

Very low levels of blood calcium, most common in late pregnancy or the first few weeks after lambing.

Can quickly lead to paralysis and death. Often seen in conjunction with low blood magnesium (hypomagnesaemia or grass tetany). Confusion between milk fever and pregnancy toxaemia is common.

Signs and symptoms

- Early signs include staggy gait, muscle tremors, sheep move or struggle when approached.
- Affected sheep go down in a sitting position with head turned around to their flank or may appear very weak and unable to stand.
- Death will occur within 24-36 hours of initial signs.

Diagnosis

- Based on flock history, clinical signs and rapid response to treatment.

Treatment

- Supplementation - ewes respond quickly to calcium injections - treated sheep will get up and walk away within minutes.
- Supplementation - as milk fever is often seen in conjunction with low magnesium, a solution containing both calcium and magnesium is recommended – this is readily available from most rural stores.
- Timing - treatment must be given as soon as possible after initial signs to be effective. Consult your veterinarian.

Prevention

- Stress - ewes in last month of pregnancy or with young lambs should be handled as little as possible to avoid physical stress.
- Diet - avoid grazing late pregnant or lactating ewes on excessively lush pasture or cereal crops.
- Supplementation - supply a mix of two parts stock salt to one part stock lime throughout pregnancy and lactation. If ewes have been in confinement consuming over 50% grain-based diet, stock lime or calcium supplements should be continuously available.



Difference between pregnancy toxaemia and hypocalcaemia

Pregnancy toxaemia	Hypocalcaemia (milk fever)
Gradual onset	Sudden onset
Sheep appear dull	Sheep appear alert but may stagger or convulse
Sheep are unresponsive when approached	Sheep move or struggle when approached
Death occurs within 5-7 days	Death occurs within 24 hours
Poor response to treatment	Good response to treatment

Nitrate poisoning

Problem

Sheep consume plants containing high nitrate levels, leading to gut inflammation, reduced oxygen in the blood and death.

Most common when sheep graze lush pastures containing plants such as capeweed, oats, canola and wild turnip. Nitrate concentrations are usually higher in young plants and following the break of a drought in the first week after rain.

Signs and symptoms

- Main symptom of affected sheep is scouring that does not respond to worm drenches.
- Severely affected sheep may have brownish or dark discolouration of mucous membranes (e.g. gums).
- Breathing difficulty, due to changes in the blood's oxygen carrying capacity.

Diagnosis

- Based on a history of grazing plants with a high nitrate level.
- On post mortem - fluids in the eye may be seen.

Treatment

- No effective treatment.
- Diet - remove animals from high nitrate feed to stop the scouring.

Prevention

- Diet - avoid grazing pastures dominated by plants high in nitrate. Green feed stock blocks are a viable option on risky pastures.
- Reduce poisoning - provide access to well dried cereal hay to prevent further poisoning.
- Supplementation - supplement with high starch grain (seek expert advice).



Canola



Capeweed



Wild turnip

Ovine brucellosis (*Brucella ovis*)

Problem

Rams develop bacterial venereal infection leading to infertility and lowered lambing percentage due to abortions, stillbirths and birthing of small, weak lambs.

Most common in meat breed rams, less common in Merinos. Can lead to extended lambing periods.

Signs and symptoms

Rams:

- Soft, painful swelling of the epididymis (the duct carrying the sperm from the testicles).
- Duct doubles in size and hardens, causing a blockage so no sperm can be released.

Ewes:

- No obvious signs of ill health.

Diagnosis

- Feeling the testicles - a lump can often be felt in the epididymis (however not all rams with brucellosis will have palpable lumps and lumps can be from other causes).
- A blood test can detect brucellosis two to three weeks after becoming infected.

Treatment

- No effective treatment in individual rams.
- Flock control by test and slaughter program - contact your local veterinarian for more information.

Prevention

- Buying rams - take care when selecting rams, check testicles for lumps and only buy from accredited ovine brucellosis-free flocks.
- Ram sharing - don't borrow, lend or share rams. Maintain secure boundary fences and check your own rams before mating.



Normal

Infected

Ovine Johne's disease (OJD)

Notifiable disease

If you suspect your stock have OJD report to the Emergency Animal Disease Hotline on 1800 675 888.

Problem

Incurable wasting disease with a very long incubation period, often resulting in death. Sheep can be infected at any age by consuming pasture or water contaminated with faeces.

Infected animals may carry and spread the disease without ever showing obvious clinical signs. Factors including age, breed, stress and the presence of other diseases can make sheep more susceptible to OJD.

Signs and symptoms

- The disease has a long incubation period - most infected sheep show no signs of illness before two years of age.
- Severe wasting, leading to death within six to 12 weeks from onset. Sheep continue to eat and drink normally until they are too weak to graze.
- Affected sheep will not respond to drenching (appear wormy).

- Chronic scouring may sometimes be seen but is not a common symptom.
- Classic symptom of the disease in a mob is a distinct 'tail' with sheep ranging in condition from good to very poor.

Diagnosis

- Faecal sampling - a pooled faecal sample from a selection of sheep over two years old. Contact your local veterinarian or PIRSA officer.
- On post mortem - affected animals will have thickened intestines and enlarged lymph nodes.

Treatment

- No effective treatment.

Prevention

- Purchase low risk stock - look for SheepMAP accredited properties, low-rainfall areas, approved vaccinate status.
- Vaccination - consider vaccinating your flock with Gudair® (see page 63).

- Mandatory requirements - completed National Vendor Declarations (NVD) and National Sheep Health Declarations (NSHD) are mandatory for all sheep entering and moving within South Australia.



Oxalate poisoning

Problem

Sheep consume plants with a high concentration of oxalates (e.g. soursob and sorrel), resulting in muscle tremors and a staggered gait, followed by exhaustion, coma and death.

Often seen from March to June in SA when soursobs are the only green feed available before the break of the season. A common cause of sudden death during this period.

Signs and symptoms

Acute oxalate poisoning:

- First signs occur within one to three hours of sheep eating high oxalate plants.
- Affected sheep have muscle tremors and a staggy gait, they go down but will be alert and struggle when handled. Leg paddling may occur.
- Within hours sheep become exhausted, stop struggling, sink into a coma and die soon after. Sheep will often be found dead without signs of struggling.

Chronic oxalate poisoning:

- Affected sheep are generally poor doers and are anaemic with pale membranes.
- Sporadic death occurs within an affected mob.

Diagnosis

- Based on a history of sheep grazing high oxalate plants and clinical signs.
- On post mortem - examining the kidney, pale white streaks may be seen, kidney may feel gritty when cutting and fluids in the eye.

Treatment

- Supplementation - can sometimes be treated with calcium solution (as for hypocalcaemia, page 36) but usually ineffective.
- No effective treatment for chronic poisoning.

Prevention

- Access - prevent hungry sheep accessing paddocks with large amounts of soursob or sorrel (e.g. around shearing sheds).
- Sheep yards - clear sheep yards of high oxalate plants before allowing sheep to enter.



Sorrel



Soursob

Perennial ryegrass staggers

Problem

Sheep consume perennial ryegrass plants contaminated with a toxin producing fungus, causing a staggers gait and leading to productivity losses.

Outbreaks most common during late summer and autumn months.

Signs and symptoms

- Signs develop slowly over days and severity greatly varies.
- Mildly affected sheep show trembling head, shoulder and flank muscles after exercise.
- Moderately affected sheep stop with muscle tremors, head shaking and a staggers, uncoordinated gait after being driven for 20-100 metres.
- Severely affected sheep will go down with convulsions and acute muscle spasms when disturbed.

Diagnosis

- Based on a history of sheep grazing toxic perennial ryegrass and clinical signs.

Treatment

- Diet - remove sheep from toxic pasture. Most animals will recover within four days once removed.
- Stress - avoid disturbing affected animals and move as quietly as possible.

Prevention

- Sheep yards - plant cultivars that are inoculated with non-toxic endophytes.
- Diet - monitor sheep on suspect pasture and remove quickly if symptoms develop.



Perennial ryegrass

Phalaris poisoning

Problem

Sheep consume new growth phalaris which contains a toxin, causing heart failure and sudden death.

Most commonly seen after the autumn break.

Signs and symptoms

- Sudden death, often with convulsions, within hours of sheep entering a paddock of young phalaris.
- Affected sheep collapse on their side, arching neck, paddling legs, champing jaw, with dilated pupils and profuse salivation.

Diagnosis

- Based on a history of sheep grazing rapidly growing phalaris pasture and clinical signs.

Treatment

- No effective treatment for phalaris poisoning.

Prevention

- Sheep yards - learn to recognise rapidly growing phalaris and prevent sheep from grazing on it.
- Access - remove sheep from affected paddocks immediately and keep off for two to three weeks (during the fast-growing phase when plant is most toxic).



Phalaris



Phalaris staggers

Problem

Sheep graze phalaris pastures that are cobalt deficient, causing difficulty eating leading to significant weight loss.

Most sheep will survive but never fully recover.

Signs and symptoms

- Affected sheep are uncoordinated with head nodding, muscle tremors and a stiff gait.
- If driven, sheep will go down with convulsions but will get up and walk away soon after.
- Some sheep can die while having convulsions, others may die from accidents caused by staggering.

Diagnosis

- Based on history of sheep grazing phalaris pasture for prolonged periods and clinical signs.
- On post mortem - by examining the brain under microscope.

Treatment

- No effective treatment - affected sheep should be culled from the mob.

Prevention

- Cobalt bullet - can be used to prevent phalaris staggers by stimulating production of toxin-fighting bacteria in the rumen.
- Vitamin B12 injections - are ineffective at preventing phalaris staggers.
- Pasture, crop and water supplements - may not be effective, and may be more costly.



Phalaris



Photosensitisation

Problem

Photosensitisation is a symptom of several diseases such as, liver damage and plant toxicity. Sheep consume immature forage causing Phylloerythrin production that results in skin that is overly sensitive to sunlight, impacting wool quality and growth rates.

Most common in spring, on fast growing lush pasture and sometimes associated with aphid infestations. Cases can be mild and recover quickly or severe, resulting in death.

Signs and symptoms

- Early signs include restlessness, seeking shade, shaking their head and rubbing eyes and ears.
- Later signs range from mild to severe sunburn, loss of appetite, jaundice and death.
- Areas of skin not covered by fleece are most affected, such as face, ears and vulva.
- Fluid can build up under the skin causing swelling of the face - swollen eyelids with tears dribbling down the cheeks and swollen ears may droop and be covered in fine scabs.

Diagnosis

- Based on examining affected sheep.

Treatment

- Identify cause - first step is to address the underlying cause of the condition.
- Shelter - protect affected animals from direct sunlight.
- Nursing - confine to shearing shed while recovery takes place and provide good quality hay.
- Medication - affected animals may benefit from antibiotic, anti-inflammatory or antihistamine injections. Consult your veterinarian.

Prevention

- Grazing - avoid long term or repeated grazing of pastures or stubbles containing toxic plants such as potato weed, which cause chronic liver damage.
- Diet - allow access to hay or straw when introducing sheep to immature, lush, green pastures. If symptoms seen, remove sheep immediately from this pasture.



Pinkeye

Problem

A common and painful bacterial eye infection that can cause blindness and affect weight gain.

Sheep are most at risk when exposed to hot and dusty conditions and flies.

Signs and symptoms

- Early signs include inflammation of eye membranes and clear tears running down the cheek.
- Cornea (clear eye surface) develops a blue haze, becoming cloudy and white over three to four days. Shallow ulcers may develop on cornea.
- Disturbed vision - if the disease spreads to both eyes, affected sheep will become blind and begin to lose weight.
- As the eye heals, blood vessels grow onto the cornea making the eye appear pink.

Diagnosis

- Based on examining the eye of affected sheep.

Treatment

- Most cases recover without treatment in two to three weeks.
- Inspection - inspect eye for irritants and remove if possible.
- Antibiotic spray or powder - two doses are recommended, 48 hours apart. Antibiotic spray or powder is readily available.
- Antibiotic ointment and injections - can be more effective than spray or powder, especially in severe cases, but must be used under veterinary advice.

Prevention

- Yarding - avoid yarding sheep as dust and flies can make the infection spread through the mob.
- Flies - manage flies in yards if possible.



Pneumonia

Problem

Inflammation of the lungs, causing breathing difficulties, leading to production losses and sometimes death. Caused by bacteria and viruses in sheep with compromised immunity (weaners are most susceptible).

Most common during summer through autumn, particularly in hot, dry and dusty conditions.

Signs and symptoms

- Affected sheep may show signs of cough, nasal discharge and lag behind the mob.
- Mild cases can go unnoticed, but growth rates are affected.
- A large proportion of the mob can be affected with only a few deaths - feedlot conditions will often see higher number of deaths, very quickly.
- Signs may subside after four to six weeks, but lasting adhesions in the lungs and chest (pleurisy) are often detected at the abattoir and trimmed from the carcass.

Diagnosis

- Based on history and clinical signs.
- On post mortem - very dark and consolidated lungs.

Treatment

- Antibiotics - treatment can aid recovery. Contact your local veterinarian.

Prevention

- Driving - drive sheep slowly and allow sheep to walk slowly back to paddock after yarding.
- Yarding - avoid overcrowding and prolonged yarding. Avoid hot, dry and dusty conditions. If unavoidable, work early in the morning and hose yards to reduce dust.
- Stress - avoid mixing mobs and sudden diet changes. Provide shelter, good nutrition, appropriate vaccinations, drenching and supplements.
- Off label vaccination programs - cattle vaccines can be useful in some cases - consult your local veterinarian.
- Drenching - be careful not to lift a sheep's head too high and avoid plunge dipping thirsty sheep.



Scan QR code to learn more on VR carcass feedback tool

Polioencephalomalacia (PEM, star gazing disease)

Problem

A nervous disease of the brain, caused by thiamine (vitamin B1) deficiency, resulting in ear twitching, apparent blindness, star gazing and sometimes, death.

May occur in sheep on a high grain diet and diets including high thiaminases plants (such as, bracken). Most common in lambs in feedlots.

Signs and symptoms

- Early signs include listlessness and loss of appetite. Sheep will separate from the mob, appear blind and wander aimlessly, stand still, or be found up against a fence.
- Affected sheep will keep head lowered to the ground or appear to be 'star gazing' with a fixed stare into the sky over the horizon, or have front legs stretched out and head arched back.
- Severely affected sheep will go down and if startled, start galloping leg movements and have convulsions.
- If left untreated, sheep will get weaker, sink into a coma and die quickly.

Diagnosis

- Based on clinical signs and response to treatment in cases found early.
- On post mortem - by examining the brain.

Treatment

- Supplementation - sheep respond immediately to thiamine or vitamin B1 injections, available from most rural stores or veterinarians. Some sheep may require follow up treatment. Giving thiamine powder orally in water solution is also effective but slower.
- Humane destruction - sheep that are down and do not respond to treatment may have irreversible brain damage and should be humanely euthanised (see page 67).

Prevention

- Supplementation - thiamine powder should be added to drinking water in high-risk situations, or if cases occur. Contact your local PIRSA Animal Health office or veterinarian for advice.



Pregnancy toxaemia (twin lamb disease)

Problem

Very low blood sugar in ewes due to inadequate energy in feed and high energy demands of pregnancy, leading to lethargy, weight loss and often death.

Most common during last six weeks of pregnancy or immediately after lambing. If energy requirements are not met by feed intake, the ewe will break down her own body tissues - a rapid breakdown of tissue results in an accumulation of toxins.

Older ewes carrying multiples are most at risk, particularly if overfat or feed intake is suddenly interrupted in late pregnancy (e.g. by yarding). Often combined with calcium deficiency (hypocalcaemia) (see page 36).

Signs and symptoms

- In affected flocks, the disease usually appears as a continuing outbreak over two to three weeks.
- Early signs include dullness, loss of appetite and lagging behind the mob when driven.
- As the disease progresses, affected ewes will stand alone, appear doxy and not move when approached. If driven, will appear blind, stumble and collapse.
- Eventually, affected ewes will become comatose and die

Diagnosis

- Based on flock history, clinical signs and eye fluid examination.
- On post mortem - liver will be pale yellow, greasy and soft, carcass will have plenty of fat, usually full-term twin lambs inside.

Treatment

- Timing - treatment must be given as soon as possible after initial signs to be beneficial. Persistent and appropriate treatment may save some ewes, but success diminishes the longer they are left untreated and recumbent. Consult your veterinarian for treatment and management of an outbreak.
- Glucose and hydration - treatment can include glucose and rehydration solutions, such as Vytrate and Ketol (propylene glycol) administered orally - readily available from most rural stores. Repeated treatments may be necessary.
- Humane destruction - if recumbent ewes do not respond with three hours of treatment, euthanasia is recommended.

Prevention

- Diet - give pregnant ewes best paddock feed available during month prior to lambing. Provide supplementary feed during last few weeks if needed (take care if introducing grain, see page 64).
- Condition score - in flocks where multiple births are expected, ewes should be a minimum condition score 3, and no more than condition score 4. Consider scanning and segregating twins, singles and empties for better feeding outcomes.
- Stress - minimise physical stress by avoiding unnecessary mustering, yarding or time off feed.

Difference between pregnancy toxaemia and hypocalcaemia

Pregnancy toxaemia	Hypocalcaemia (milk fever)
Gradual onset	Sudden onset
Sheep appear dull	Sheep appear alert but may stagger or convulse
Sheep are unresponsive when approached	Sheep move or struggle when approached
Death occurs within 5-7 days	Death occurs within 24 hours
Poor response to treatment	Good response to treatment

Pulpy kidney (enterotoxaemia)

Problem

A clostridial (bacterial) disease that mostly affect lambs grazing lush feed, causing sheep to go down with convulsions and leading to rapid death. Can also occur in sheep of all ages, especially if consuming grain.

Most common in flocks with an inadequate vaccination program.

Signs and symptoms

- Affected sheep are usually found dead due to rapid onset of the disease.
- Death can occur within hours of initial signs - sheep will not survive longer than 24 hours.
- Initial signs include dullness followed by sheep going down with convulsions and frothing at the mouth.

Diagnosis

- Based on a history of sudden death while on a high-risk diet.
- On post mortem - by examining intestine contents and isolating the toxin brain and urine.
- Pulpy kidney is commonly assumed cause of sudden death in sheep where no investigation is conducted. Unexplained sudden deaths can also be caused by other diseases, including anthrax (see page 14).

Treatment

- No effective treatment.

Prevention

- Vaccination - effective in preventing pulpy kidney (see page 63). Vaccinate sheep at least 10 days prior to heavy grain feeding or introducing to a feedlot. Vaccination can be effective in the face of an outbreak.
- Diet - avoid sudden diet changes, ensure grain is introduced correctly (see page 64).



Pyrrrolizidine alkaloid poisoning

Problem

Sheep consume plants containing toxic alkaloids, such as Salvation Jane (Patterson's curse), heliotrope (potato weed) and caltrop, resulting in chronic ill-thrift, photosensitisation and permanent liver damage that is cumulative over the life of the animal.

Signs and symptoms

- Affected sheep will show signs of chronic copper poisoning (disinterested in surroundings, standing apart from the mob, loss of appetite, red-brown urine, jaundice - see page 26) or chronic ill thrift and photosensitisation (see page 44).

Diagnosis

- Based on a history of grazing the toxic plants and clinical signs.
- On post mortem - in cases of chronic copper poisoning, fat and skin of the carcass will be severely jaundiced.
- On post mortem - in cases of chronic ill-thrift and photosensitisation, the liver will be darker and harder with blunt or lumpy edges.

Treatment

- No effective treatment.
- Humane destruction - sheep that survive a severe poisoning incident will have irreversible liver damage and should be humanely euthanised (see page 67).

Prevention

- Access and weed management - prevent sheep accessing paddocks with the toxic weeds.



Salvation Jane



Caltrop



Heliotrope

Scabby mouth

Zoonotic disease

Precautions must be taken when handling infected sheep to prevent health risks to humans.

Problem

A highly contagious viral disease affecting the skin, particularly the mouth and nostrils, resulting in unwillingness to eat. It is a hardy virus that can survive on the ground for years. Also affects goats and humans.

Signs and symptoms

- Can affect multiple animals, infection is commonly seen on lips, in corners of the mouth.
- Can also be found on ewes' teats, skin around the coronet, bulbs of the heels and ears from wounds caused by ear tags.
- Infection begins with a clear sticky discharge, hardening into a thick brown scab, firmly attached to the skin. If the scab is not knocked or pulled off, it generally dries up and falls off in two to three weeks.

Diagnosis

- Based on examining infected sheep - scabby mouth scabs are quite distinctive. If necessary, diagnosis can be confirmed by submitting scab material to a laboratory.

Treatment

- Most cases recover without treatment within three weeks.
- Flystrike - put precautions in place against flystrike (see page 59).
- Diet - provide soft feed as affected sheep may be reluctant to eat dry coarse feed.

Prevention

- Vaccination - a scabby mouth vaccine containing the live virus is effective in preventing the disease (see page 63). Avoid vaccinating ewes with lambs at foot.



Selenium deficiency (white muscle disease)

Problem

Sheep suffer deficiency in selenium or vitamin E, impacting lifetime growth rates and can lead to starvation, heart failure and death from exposure or predation.

Most common in spring born lambs at three to four weeks old, on clover-dominant pastures. Deficiency may be subtle and result in several health issues in the flock, particularly in high rainfall areas with heavy red or dark clay soils.

Signs and symptoms

- Affected lambs walk with a stiff gait and appear weak.
- Severely affected lambs can die from starvation, exposure or predation.
- Some lambs show laboured breathing due to respiratory or cardiac muscle failure. Pneumonia is a secondary risk in these lambs.

Diagnosis

- Tentative diagnosis on post mortem - examining the carcass for pale muscle tissue.
- Blood and tissue tests can confirm the disease - biopsies in live animals can be performed by veterinarians.

Treatment

- Supplementation - selenium can be administered to affected sheep by injection or as a drench.
- **Note:** there is a very small safety margin when administering selenium. Treatment should only be given following muscle disease diagnosis and in strict accordance with manufacturer's advice.

Prevention

- Supplementation - vaccination, drenching and slow-release pellets are effective in preventing deficiency.
- Seek expert advice - if you suspect selenium deficiency in your flock you can discuss diagnosis, sampling and management with your local PIRSA Animal Health office or veterinarian.
- **Note:** care must be taken to not overdose by supplementation with repeat vaccination and drenching.



Tapeworm cysts (bladder worm, sheep measles, hydatids)

Zoonotic disease

Precautions must be taken to prevent serious health risks to humans.

Problem

Numerous diseases occur in sheep due to different tapeworm species, including bladder worm (*Taenia hydatigena*), sheep measles (*Taenia ovis*) and Hydatids (*Echinococcus granulosus*).

In all cases sheep show no clinical signs and tapeworm goes undetected until slaughter when affected organs are condemned. If sheep measles is found with five or more cysts present, the carcass is condemned. Hydatids has been detected in kangaroos in some areas in SA.

Care must be taken treating working dogs in these areas due to health risks present to humans.

Symptoms

- Affected sheep show no clinical signs of tapeworm.

Diagnosis

- Cysts on organs (liver, lungs and brain) and muscles indicate tapeworm - usually not identified until slaughter.

Treatment

- No effective treatment.

Prevention

- Worming - all dogs on farm should be wormed monthly with a tapewormer (must contain praziquantel).
- Contact your local PIRSA Animal Health office for information on hydatid detections in SA.
- Raw meat - don't feed raw meat or offal to dogs. Instead, cook through or freeze at -10°C for ten days.
- Carcass management - burn or bury carcasses to prevent scavenging.



Scan QR code to learn more on VR carcass feedback tool



Tetanus (lockjaw)

Problem

A clostridial (bacterial) disease that mostly affects lambs within three weeks of marking (sheep of any age are at risk following a wound), causing muscle spasms, restricted jaw movement, usually resulting in death within three to four days.

Most cases occur in flocks with an inadequate vaccination program. The bacteria is widespread in the environment and can survive in the soil for many years.

Signs and symptoms

- Early signs include walking with a stiff gait.
- Muscle spasms including head tremors, tightly closed jaw and pricked ears.
- The tail is generally held out and legs appear stiff - known as the 'sawhorse' posture.
- As disease progresses sheep will go down with intermittent convulsions and die within three to four days.

Diagnosis

- Based on clinical signs.

Treatment

- No effective treatment.

Prevention

- Vaccination - is highly effective in preventing tetanus. (See page 63 for more information on best practice vaccination programs).
- Good hygiene - at lamb marking is important in preventing tetanus.



Vibriosis (Campylobacteriosis)

Zoonotic disease

Precautions must be taken when handling foetuses and sheep to prevent health risks to humans.

Problem

Campylobacteriosis is the most common cause of abortion outbreaks in sheep. Sheep are infected by a bacterium (campylobacter), shed in faeces, resulting in abortion from three months of pregnancy and can result in significant lamb losses. It can be introduced to susceptible flocks by carrier sheep showing no symptoms and birds.

Outbreaks may re-occur every few years due to lack of immunity in replacement stock. In some intensive management situations, abortions 'storms') have occurred, such as in pregnant ewes confined after fires.

If abortion storms occur, immediately report to local PIRSA Animal Health office.

Signs and symptoms

- First signs of an outbreak are abortions in the yards or ewes with blood-stained breech wool. Early abortions can go unnoticed as foetuses are only centimetres in length.
- Most aborting ewes show no signs of ill health and develop strong immunity and subsequent fertility is good.

Diagnosis

- Based on flock history and examining the aborted foetus and placenta (foetus may have yellow and white 1-2 cm patches on the liver).
- Can be confirmed by testing aborted foetus and bacterial culture in laboratory.
- Blood tests on ewes suspected of having aborted.

Treatment

- No effective treatment - seek advice from your local PIRSA Animal Health office or veterinarian. It is essential to collect and dispose of aborted lambs hygienically.

Prevention

- Separate pregnant ewes - aborting ewes are the main source of infection for other ewes. Keep pregnant ewes as far away from infection by mid-late pregnancy and reduce stocking rates as much as possible.
- Mixing infected ewes - if a diagnosis is confirmed, infected ewes can mix with ewes that have already lambed but not pregnant ewes.
- Observing low lambing rates - if lambing rates are below expected, this condition could be operating in a low grade, subclinical manner - seek advice from your veterinarian.
- Vaccination - is effective in preventing vibriosis (see page 63).



Other conditions



Sheep lice

Problem

Sheep body louse or chewing lice (*Bovicola ovis*) is a small insect that is responsible for the majority of lice infestations in Australian sheep.

An infestation of lice can reduce clean fleece weight by up to 1 kilogram and causes cotted, yellow wool, resulting in price discounting.

Wool shedding sheep can still become infested with sheep lice, despite their wool shedding traits.

Signs and symptoms

- Lice, in low numbers, can be extremely difficult to detect on sheep.
- Affected sheep can show signs of rubbing, often indicated by wool pieces on fences and yards.

Diagnosis

- Close inspection of sheep, often requiring a magnifying glass is the only accurate method to detect lice.

Treatment

- Chemical treatment - directly on the sheep via backliner, plunge dipping and jetting.

Prevention

- Good biosecurity - avoid introducing lice into your property, be prepared with a biosecurity plan.
- Learn about common sources of infection (including, infested stray sheep entering your property, purchased sheep, sheep that may have missed previous lice treatments).
- Fencing - stock proof all boundary fences.
- New stock - closely inspect all introduced stock.
- Treatment and control plan - implement a lice treatment and control plan.



Scan QR code for the 'Liceboss' online resource or visit www.liceboss.com.au

Sheep worms

Problem

The most important roundworms (nematodes) in sheep in Australia are Barber's pole worm (*Haemonchus contortus*), black scour worm (*Trichostrongylus colubriformis* and *T. vitrinus* spp.) and brown stomach worm (*Teladorsagia circumcincta*), causing scouring, ill thrift resulting in weight loss and occasionally death.

Signs and symptoms

- Key signs include bottle jaw, humped back from abdominal pain, coughing and pneumonia, anaemia, lethargy, scours, weight loss and occasionally death.

Diagnosis

- Faecal egg count to detect presence of and type of worms present.
- Worm count at post mortem.

Treatment

- Treatment is dependent on the type of worm present, the class of sheep and the region in which the sheep are located.
- Drenching - typical treatment is a chemical drench, applied orally.

Prevention

- Treatment and control plan - including preparing low worm-risk paddocks, grazing and nutrition management, breeding and using chemical treatments.
- Tailored solution - the most effective approach is a solution tailored to your specific situation, using the tools and information available at wormboss.com.au.



Scan QR code for the 'Wormboss' online resource or visit www.wormboss.com.au



Flystrike

Problem

Flystrike in sheep is caused by *Lucilia cuprina* resulting in significant loss of productivity and in severe cases, death.

Signs and symptoms

- Sheep appear generally sick and restless and often become separated from the flock.
- Flystrike affected wool becomes dark, moist and foul smelling.
- In severe cases, maggots will be found at the affected area with visible trauma to the skin.

Diagnosis

- Identifying maggots on the skin under close inspection.

Treatment

- Shear and dress - remove wool from around the strike area close to the skin and apply registered flystrike dressing.
- Remove sheep - remove affected sheep from the flock as struck sheep can attract more flies.
- Culling - cull struck sheep from the flock - susceptibility to flystrike is heritable.

Prevention

- Planning - plan shearing, crutching and lambing dates to minimise potential flystrike occurring.
- Genetics - select genetics for low wrinkle and flystrike resistant sheep.
- Treatment plan - develop a strategy for chemical treatment, managing potential chemical resistance and maintaining accurate treatment records to avoid chemical residues in wool sold.



Scan QR code for the 'Flyboss' online resource or visit www.flyboss.com.au

Management guides



Good biosecurity

On-farm biosecurity involves proactively managing and preventing risks caused by weeds, pests and diseases entering, emerging, establishing or spreading.

Good biosecurity principles

- **Principle 1:** Record all livestock movements, purchases, sales and treatments.
- **Principle 2:** Always buy livestock from reputable sources.
- **Principle 3:** Make sure all purchased livestock have an animal health certificate from the vendor.
- **Principle 4:** Develop a treatment program for new livestock (e.g. drenching, lice treatment, vaccination).

Farm visitors

Visitors to your farm pose a potential risk of introducing diseases and pests. It is important to do a risk assessment of visitors including whether they have recently been overseas.

- **Principle 1:** Keep visitors (friends, agents, etc) out of livestock production areas.
- **Principle 2:** If people need to access production areas, clean all tools, equipment, and footwear.
- **Principle 3:** Visitors returning from overseas travel should avoid contact with livestock and farms for 7 days.

Boot wash procedure



Remove excess foreign material from the sole of your boots away from the production zone and washing area - you may do this by banging boots together or using a tool to scrape out the boot tread.



Finally, rinse clean boots/footwear and tools in a separate bucket of disinfectant or use a spray bottle containing disinfectant.



Wash boots/footwear in a bucket filled with water and use a scrubbing brush if required to remove all excess foreign material. Clean any tools or equipment in the same bucket of water.



Carefully and mindfully dispose of dirty water and waste disinfectant.

One Biosecurity

What is One Biosecurity?

The One Biosecurity program is free for South Australian livestock producers and has been designed to help producers register, manage, and promote on-farm biosecurity. The platform can also be used as a resource for guidelines and advice on livestock diseases.

Developed in collaboration with key industry groups, One Biosecurity recognises the important role producers have in protecting and growing our state's livestock industry.

Once registered, you will be self-guided through two core online components:

- Biosecurity Practices Questionnaire (score 1-5 stars)
- Endemic Disease Risk Rating modules (Risk Rating for a series of diseases including Ovine Johnes, footrot, lice, pestivirus and ovine brucellosis).

Why register?

All producers in Australia must have a farm biosecurity plan (Livestock Production Assurance requirement). One Biosecurity will generate an approved biosecurity plan in a simple, free, online process.

Other benefits include:

- generating an Animal Health Declaration
- assisting with purchasing decisions
- providing credible assurance to existing domestic and international markets
- improving government and industry disease surveillance and early detection of animal health emergencies.

Contact

For help registering your property and completing your risk assessment contact 1BSupport@sa.gov.au or call 08 8429 3300.



Scan QR code to learn more about One Biosecurity or visit www.onebiosecurity.pir.sa.gov.au

Vaccination

Vaccination is the key to preventing many sheep diseases.

Why vaccinate?

Sheep are vaccinated to protect against some of the common serious infectious diseases.

Vaccination stimulates the body's defence system to build immunity to a particular disease or combination of diseases.

Vaccinations should be administered to livestock as part of an annual management plan.



Scan QR code to learn more or visit sheepconnectsa.com.au/management/health/vaccination

What vaccines are available?

Vaccine	Diseases	Vaccine program
3-in-1 clostridial + CLA	Tetanus, pulpy kidney and cheesy gland	Two doses at least four weeks apart, annual boosters (sheep and lambs)
5-in-1 clostridial	Pulpy kidney, tetanus, blackleg, malignant oedema, black disease	Two doses at least four weeks apart, annual boosters (sheep and lambs)
6-in-1 clostridial + CLA	Pulpy kidney, tetanus, blackleg, malignant oedema, black disease + cheesy gland	Two doses at least four weeks apart, annual boosters (sheep and lambs)
8-in-1 clostridial	5-in-1 (plus, helps prevent lamb dysentery and post parturient gangrene in ewes)	Two doses at least three to four weeks apart
Arthritis (e.g. Eryvac)	Erysipelas arthritis	Two doses at least three to four weeks apart
Scabby mouth (e.g. Scabigard)	Scabby mouth	Single dose for life
OJD (e.g. Gudair)	Ovine Johne's disease (OJD)	Single dose for life
Footrot	Footrot	Two doses at least six weeks apart. (Only through vets with CVO approval).

Source: MLA <https://www.mla.com.au/globalassets/mla-corporate/research-and-development/program-areas/animal-health-welfare-and-biosecurity/210517-vaccination-in-sheep-flocks.pdf>

Note: clostridial vaccines are available with or without added B12 and selenium.

Grain introduction

Steps for heavily supplementing diet with grain or introducing grain to sheep in a feedlot situation.

1. Background feeding

Early background feeding in the paddock is important. Use the same type of grain that will be fed in the feedlot to aid digestion and help sheep adjust to the new, predominantly grain, diet.

2. Vaccinate

Administer 3-in-1 or 6-in-1 vaccine at least ten days before heavy feeding or introducing to the feedlot to prevent serious risks, including pulpy kidney. Apply best practice methods to treat and prevent lice and flystrike, drench as required and supplement with vitamin B12, A, D and E as needed.

3. Gradually introduce grain

Gradually introduce grain over a period of two weeks. Feed good quality hay, not straw. The digestibility of the hay is important.

4. Ration additives

Ensure grain rations are balanced and consider a good composite premix. Premixes can have mineral and trace element supplements, buffers and anti-coccidials. Seek nutritional advice.

5. Shade and shelter

Protect sheep from the elements and provide shade.

6. Quality cereal hay

After implementing the changeover strategy, a lamb's diet should be made up of at least 10% good quality cereal hay.

7. Observe and record

Observe sheep and keep good records of any deaths (include as much information as possible). Feedlot problems can escalate quickly and involve large numbers of stock - seek help and veterinary advice early.

NLIS obligations

The National Livestock Identification System (NLIS) is Australia's system for identifying and tracing cattle, sheep and goats. The database records the lifetime location data and movement of all livestock in Australia using individual identification (cattle) and flock identification (sheep and goats). All physical locations are identified by a Property Identification Code (PIC).

When livestock are moved to another PIC, being sold, adjusted or relocated to another property, this movement must be recorded on the NLIS database.

Who is responsible?

Depending on the livestock movement that is occurring, different parties are responsible for recording livestock movements on the NLIS database, as either mob-based movements with visual NLIS tags or individual animal movement with electronic RFID NLIS tags.

How do you do this?

- All livestock movements to a different PIC must have a national vendor declaration (NVD) and National Sheep Health Declaration, even if the owner of the livestock does not change.
- The NLIS database must be notified when one or more sheep are moved to a different PIC.
- The NVD details are included on the livestock transfer on the NLIS database.
- Access the NLIS database at www.nlis.com.au

Support

Call Integrity Systems Company (ISC) Support on 1800 683 111 for database issues, LPA, eNVDs or PIRSA NLIS Help Desk on 1800 654 688.



Fit to load

It is an offence to load or transport an animal in a way that causes it unnecessary harm. The person in charge of the animal is responsible - if in doubt, leave it out.

An animal is not fit to load if it:

- is not strong enough to undertake the journey
- cannot walk normally, bearing weight on all legs (e.g. old or new fractures, injury, deformity, foot abscess, joint infection)
- is severely emaciated or visibly dehydrated
- is suffering from severe visible distress or injury (e.g. swollen pizzle, exhaustion, panting, flystrike)
- has a condition that could cause it increased pain or distress during transport (e.g. ingrown horn, cancer (vulva, udder, ear), swollen testicles, advanced mastitis)
- is blind in both eyes
- Is within two weeks of lambing and the estimated journey time or time off water is likely to exceed four hours.

Maximum time off water

It is recommended to take sheep off green feed and water at least 12 hours prior to transport. Dry feed, such as hay, can be offered prior to loading even if water has been withheld.

Class of animal	Maximum time off water (includes mustering/time in yard prior to loading)	Required spelling period (to rest + food and water when maximum time off water has been reached)
Sheep over 4 months	48 hours	36 hours
Lambs under 4 months	28 hours	12 hours
Ewes known to be more than 14 weeks pregnant, but not in the last 2 weeks	24 hours	12 hours



Scan QR code to learn more or visit www.mla.com.au/isitfittoload



Scan QR code for 'Australian Animal Welfare Standards and Guidelines for Sheep' or visit www.animalwelfarestandards.net.au

Humane destruction

Using a firearm or captive bolt:

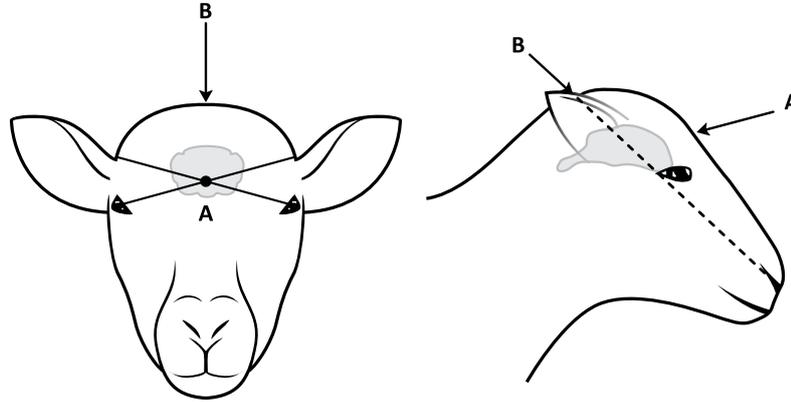
- the poll method (B) is preferable to the frontal shot (A) for killing sheep.

Bleeding out by neck cut:

- can be used to destroy sheep if a firearm or captive bolt is not available. Ensure both jugular veins and carotid arteries are severed using a suitable and sharp knife. It is not advised to sever the spinal cord or break the neck.

Confirming death after any method of destruction is essential:

- check for loss of consciousness and deliberate movement, dilated pupils, absence of the 'blink' reflex when the eyeball is touched and absence of breathing, jaw tone and tongue tone.



Acknowledgments & further reading

Acknowledgments & further reading

The information in this publication has been collected from:

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Unless stated otherwise, photos have been sourced from PIRSA Biosecurity Animal Health staff and NSW DPI Primefacts.

Notes

Notes

Useful contacts and online resources

Emergency Animal
Disease Hotline
1800 675 888

PIC Registration Office (SA)
1800 654 688 or 08 8207 7919

LPA NVD Helpline
1800 683 111

NLIS Database Helpdesk
(National)
1800 654 743

NLIS Hotline (SA)
1800 654 688

RSPCA SA (Welfare)
1300 477 722

Livestock SA
08 8297 2299

Local PIRSA Animal Health Offices

Glenside	08 8207 7900
Clare	08 8842 6222
Mt Gambier	08 8735 1300
Kingscote	08 8553 4949
Pt Augusta	08 8648 5160
Murray Bridge	08 8539 2110
Nuriootpa	08 8568 6400
Pt Lincoln	08 8688 3400
Struan	08 8762 9100

Local Veterinary Clinic

Name/clinic:

Contact number:

One Biosecurity
www.onebiosecurity.pir.sa.gov.au

Biosecurity SA
www.pir.sa.gov.au/animal-health

ParaBoss
(WormBoss, LiceBoss, FlyBoss)
www.paraboss.com.au

'Is It Fit to Load' Guide
www.mla.com.au/isitfittoload

SheepConnect SA
www.sheepconnectsa.com.au

Livestock SA
www.livestocksa.org.au



Government of South Australia

Department of Primary Industries
and Regions