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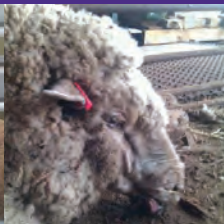
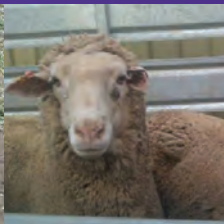
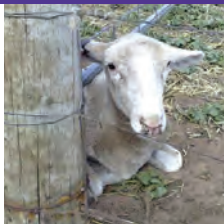
BIOSECURITY SA
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Sheep Diseases

THE FARMERS' GUIDE



SA Sheep Industry Fund



Sheep Diseases

THE FARMERS' GUIDE

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Acknowledgements and Further Reading

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Contents

Disclaimer	2	Copper Poisoning	21	Pinkeye	44
Acknowledgements	3	Dermatophilosis	22	Pneumonia	45
Contents	5	Exposure Losses	23	Polioencephalomalacia	46
Introduction	6	False Hydatid/ Bladderworm	24	Pregnancy Toxaemia	47
		Foot Abscess	25	Pulpy Kidney	49
Key to Diseases		Footrot	26	Pyrrrolizidine Alkaloid Poisoning	50
By Symptom	7	Grass Tetany	28	Scabby Mouth	51
By Season	9	Hydatid	29	Selenium Deficiency	52
By Stock Type	10	Large Lungworm	30	Sheep Measles	53
Poisonings/Toxicity	11	Listeriosis	31	Tetanus	54
		Lupinosis	32	Vibriosis	55
		Milk Fever	34		
Diseases of Sheep		Nitrate Poisoning	36	Management Guides	
Acidosis	12	Ovine Johne's Disease	37	Vaccination	56
Annual Ryegrass Toxicity	13	Oxalate Poisoning	39	Sheep Lice	61
Arthritis	14	Perennial ryegrass		Sheep Worms	66
Botulism	15	Staggers	40	Fly Strike	69
Brucellosis	16	Phalaris Poisoning	41		
Cheesy Gland	17	Phalaris Staggers	42		
Cobalt Deficiency	18	Photosensitisation	43		
Coccidiosis	19			Contacts	76
Copper Deficiency	20				

Sheep Diseases THE FARMERS' GUIDE

This guide is designed to help diagnose sheep diseases and provide information on sheep health management.

Reporting serious or unusual animal disease signs

Any unusual behaviour or symptoms observed in your livestock or birds should be reported to:

- the 24 hour Emergency Animal Disease Watch Hotline on 1800 675 888 (free call)
- your local veterinarian
- your nearest animal health officer

The sooner an incident is reported, the less chance it has to spread and the more likely it can be controlled and eradicated particularly if it's an exotic animal disease or pest.

Unusual signs and symptoms in animals

Always keep an eye out for unusual symptoms in livestock that can include:

- Unexplained deaths.
- Sores or ulcers on the feet or in the mouth (this may result in a reluctance to eat or move).
- Excessive salivation (drooling should always be treated suspiciously).
- A reduction in the milk yield from cows, and eggs from chickens.
- Any kind of discharge – diarrhoea especially if it has blood in it. Excessive nasal discharge is also something you should report unless you know what has caused it.
- Look out for staggering or head drooping or severe lameness, especially if it's more than one animal at the same time.
- Less dramatic signs should also be watched for, such as animals not eating properly and animals that are depressed and don't respond the way they should.

Key to Disease Diagnosis by Symptoms

Abscess

- Cheesy Gland
- Foot Abscess

Abortions / Stillbirths

- 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 Toxaemia
- Pyrrolizidine Alkaloid Poisoning

Infected Wounds

- 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

Key to Disease Diagnosis by Symptoms

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 Diagnosis by Season

Spring Sept/Oct/Nov

- Annual Ryegrass Toxicity
- Cobalt Deficiency
- Foot Abscess
- Lupinosis
- Oxalate Poisoning
- Pyrrolizidine Alkaloid Poisoning
- Selenium Deficiency

Summer Dec/Jan/Feb

- Annual Ryegrass Toxicity
- Cobalt Deficiency
- Lupinosis
- Pneumonia
- Pyrrolizidine Alkaloid Poisoning
- Perennial Ryegrass Staggers
- Selenium Deficiency

Autumn March/April/May

- Lungworm
- Lupinosis
- Phalaris Poisoning
- Phalaris Staggers
- Pneumonia
- Pyrrolizidine Alkaloid Poisoning
- Perennial Ryegrass Staggers

Winter June/July/August

- Exposure Losses After Shearing
- Foot Abscess
- Lungworm
- Nitrate Poisoning
- Oxalate Poisoning
- Phalaris Poisoning
- Phalaris Staggers
- Pneumonia

Key to Disease Diagnosis by Stock Type

Young Lambs to Weaners

- Arthritis
- Pulpy Kidney
- Cobalt Deficiency
- Coccidiosis
- Lungworms
- Pneumonia
- Selenium Deficiency
- Tetanus

Rams

- Ovine Brucellosis

Weaners to Hoggets

- Arthritis
- Pulpy Kidney
- Cobalt Deficiency
- Coccidiosis
- Lungworms
- Pneumonia

Pregnant or Newly Lambled Ewes

- Ovine Brucellosis
- Grass Tetany
- Milk Fever
- Pregnancy Toxaemia
- Vibriosis

All Stock

- Acidosis
- Annual Ryegrass Toxicity
- Botulism
- Cheesy Gland
- Cobalt Deficiency
- Copper Deficiency
- Copper Poisoning
- Dermatophilosis
- Exposure Losses
- False Hydatid
- Foot Abscess
- Lungworms
- Lupinosis
- Nitrate Poisoning

All Stock

- Oxalate Poisoning
- Phalaris Poisoning
- Phalaris Staggers
- Pinkeye
- Pneumonia
- Polioencephalomalacia
- Pulpy Kidney
- Pyrrolizidine Alkaloid Poisoning
- Perennial Ryegrass Staggers
- Scabby Mouth
- Selenium deficiency
- Sheep Measles
- Tetanus

Key to Poisonings/Toxicity

Annual Ryegrass Toxicity

- Annual Ryegrass (*Lolium rigidum*)

Lupinosis

- Lupin Stubble (*Lupinus*)
- Lupin Hay (*Lupinus*)
- Lupin Grain (*Lupinus*)

Nitrate Poisoning

- Cape Weed (*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*)

Acidosis (Grain Overload)

Cause

- Overconsumption of high risk grain such as wheat or barley.

Symptoms

- Signs occur within 24-36 hrs of changing to a grain rich diet.
- Mildly affected sheep may have diarrhoea but continue to eat.
- More severely affected sheep may stop eating, be tender footed, get up and down frequently, spend more time than usual lying down and grind their teeth.
- Some affected sheep die over 2-3 days and others slowly recover.
- Those that recover are often chronically lame (laminitis).

Diagnosis

- History of eating high risk grain without being acclimatised, clinical signs and post mortem findings.
- On post mortem, damage to rumen wall is often seen.

Treatment

- Remove animals from grain, feed good quality hay, and provide access to water.
- Treat with sodium bicarbonate (bicarb soda) at a dose of 10g/sheep.

Prevention

- Gradual introduction of high risk grains into the diet.
- Make sure sheep cannot get sudden access to a pile of grain.

Annual Ryegrass Toxicity (ARGT)

Cause

- Grazing annual ryegrass infested with a nematode carrying a bacterium that produces toxins.
- Most deaths occur between mid-Oct. and mid-Dec. when infested seed heads have maximum toxicity and the pasture is drying off, or in late Dec. and Jan. when sheep are grazing infected stubbles.

Symptoms

- No signs for 2-6 days after the sheep go into an infected paddock.
- Signs seen most clearly when a mob of sheep are driven for 100-200m.
- Mildly affected sheep are unable to keep up with the rest of the mob and have a high-stepping gait.
- More severely affected sheep lose coordination of the hind limbs and fall over with convulsions, neck arched and legs rigidly extended.
- They may go down for several minutes or hours, then get up and go back to the mob appearing normal.
- The most severely affected sheep go down and are unable to get up and will lie on their sides, with convulsions and paddling legs sweeping the ground.
- Death can occur from a few hours to a week after signs first become apparent.

Diagnosis

- Based on a history of eating annual ryegrass and clinical signs shown by the animal.
- No characteristic features on post mortem.

Treatment

- Remove animals from infected paddock as quietly as possible.
- No practical treatment available.

Prevention

- Reduce the number of annual ryegrass plants on the property through herbicide treatment, heavy grazing in late winter and early spring or cut hay early before the plants become toxic.



Arthritis

Cause

- Bone surfaces in one or more joints become damaged by infection.
- The bacteria circulating in the blood stream settle out and multiply in the joints.
- Mostly seen in lambs prior to weaning.

Symptoms

- First signs are heat and swelling around one or more joints.
- The knee and hock joints are the most commonly affected.
- Movement of affected joints is restricted and painful and lambs are obviously lame.
- The heat and most of the swelling subsides over a few days but slight swelling, restricted movement and a mild lameness often remain permanently.

Diagnosis

- Examining the joints for swelling and heat.
- On post mortem there is often bone damage in the joints, the joint fluid becomes thicker and fibrous, the tissues around the joint are thickened and there can be pus within the joint.

Treatment

- Early antibiotic treatment can reduce the extent of joint damage.

Prevention

- A vaccination called Eryvac is available for the prevention of arthritis due to the most common bacteria and is given to ewes 4 weeks prior to lambing.
- Keep stress at lamb marking to a minimum by choosing a warm sunny day, keeping droving to a minimum before and after marking and allowing the lambs to mother up as soon as possible.
- Maintain good hygiene at marking.



Botulism

Cause

- Occurs when potent toxins are produced by the bacterium *Clostridium botulinum*.
- Most cases occur in the pastoral areas in association with phosphorus deficiency as stock chew old bones trying to get phosphorus.

Symptoms

- Early signs are uncoordination, loss of appetite, excessive salivation, mild excitability and 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 after 2-3 days of initial signs.

Diagnosis

- Based on flock history and clinical signs.

Treatment

- About 50% of sheep recover without treatment.
- Food and water should be provided while the toxin runs its course.
- All 'at risk' sheep should be vaccinated to prevent further cases.

Prevention

- Two doses of botulism vaccine one year apart provides life long prevention.
- Vaccination is only recommended on properties where phosphorus deficiency or botulism are known to be a problem.

Ovine Brucellosis

Problem

- Lowered lambing percentage and/or extended lambing period.

Cause

- Bacterial infection that occurs mainly in meat breed rams, however can occur in merinos but is less common.

Symptoms

Rams:

- Occurs mainly in the epididymis (the duct carrying the sperm from the testicles).
- The bacteria damage the lining of this duct, causing a soft painful swelling. Later the duct enlarges to twice the normal size and becomes hard.
- Once this occurs the duct is blocked so no sperm can leave the testicle.

Ewes:

- Show no signs of ill health but can cause a decrease in marking percentage due to abortions, stillbirths and the birth of small, weak lambs.

Diagnosis

- Feeling the testicles – a lump can often be felt in the epididymis (however lumps can also be from other causes).
- Blood test – a blood test can detect brucellosis 2-3 weeks after becoming infected.

Treatment

- No effective treatment in individual rams.
- Flock control by test and remove program. Contact your local vet for more information.

Prevention

- Take care when buying rams – check testicles for lumps and buy from accredited flocks.
- Don't borrow, lend or share rams, maintain secure boundary fences and check your own rams before mating.



Cheesy Gland (CLA)

Problem

- Affects carcase quality leading to condemnations and trimmings. Can affect wool production.

Cause

- A bacterial infection of sheep that causes abscesses in the lymph nodes and lungs.

Symptoms

- Most sheep with cheesy gland will show no obvious signs but it is readily detected in the carcase after slaughter.
- Recently formed abscesses contain a thick yellow-green pus.
- With time the pus dries out and the abscess looks like an onion with concentric layers of solid pus.
- The most common sites for abscesses are in the lymph nodes on the point of the shoulder, in the groin and in the lungs.

Diagnosis

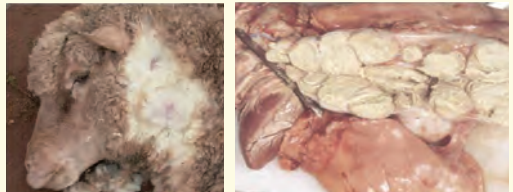
- Detected in the carcase after slaughter.

Treatment

- No effective treatment.

Prevention

- Vaccination – generally in combination with clostridial vaccine.
- Don't plunge or shower dip sheep without good reason and ensure good dipping hygiene.
- Keep time in the yards for recently shorn sheep to a minimum.
- If an abscess is ruptured at shearing or crutching ensure the handpiece, floor or anything else that is contaminated is disinfected.



Cobalt Deficiency

Cause

- Disease of young stock occurring mostly in spring and early summer.
- Generally occurs on sandy coastal soils.
- Cobalt is utilised by sheep in the form of B12.

Symptoms

- Sheep are ill-thrifty and anaemic.
- Sheep often have weepy eyes and photosensitisation (page 43).

Diagnosis

- Blood testing for B12.

Treatment

- Vitamin B12 injections.

Prevention

- In recognised cobalt deficient areas, lambs should be given an injection of vitamin B12 at marking and a second dose two months later (often in conjunction with a clostridial vaccine).
- Weaners remaining on cobalt deficient pastures can be given a cobalt bullet at 3 months of age.



Coccidiosis

Cause

- Generally a disease of young stock occurring in lambs just prior to or shortly after weaning and following transport stress.
- Caused by a parasite that live in and damage the intestinal wall.

Symptoms

- Loss of appetite and scouring.
- Scour is a dark brown liquid often containing flecks of blood or shreds of intestinal lining.
- Severely affected lambs are obviously weak and if driven will fall behind the mob and may go down.
- Can result in deaths generally with flock scours.

Diagnosis

- Clinical signs.
- Post mortem examination of the intestines at the laboratory.
- Faecal worm test results can indicate the presents of coccidiosis but it is a poor guide to the severity of damage to the wall of the intestinal tract.

Treatment

- Sheep with coccidiosis generally respond to treatment with a 'sulpha' drug given by injection or as a drench, two doses are recommended given 3 days apart. Contact your local vet.
- Acutely scouring animals will benefit from electrolyte therapy to replace the fluids lost.

Prevention

- Control concurrent disease problems especially worms, keep stress to a minimum and ensure weaners are well fed with a high protein diet.
- Late lambs should not graze on pastures previously used by earlier lambs.



Copper Deficiency

Cause

- Occurs when an inadequate amount of copper is absorbed from the gut over a period of weeks or months.
- Copper absorption is affected by high dietary intake of other minerals.
- Most cases occur on coastal sandy soils, sandy loams and swamp land.

Symptoms

- Wool abnormalities – loss of wool crimp, lack of wool character, develops a sheen, greatly reduced tensile strength and elasticity, depigmentation of black fleece and is known as 'steely wool'.
- Ill-thrift – the deficiency must be very severe before ill-thrift occurs.
- Fragile bones – young growing animals will have more bone fractures than normal, affected bones are thin and fragile but not deformed.
- Swayback – affected animals may have an un-coordinated staggery gait.

Diagnosis

- An analysis of blood or tissue samples is necessary to confirm diagnosis (liver is the best sample to test).

Treatment

- Sheep should not be treated with copper unless copper deficiency is confirmed.
- There are two treatment options - copper oxide capsules or copper glycinate injections.

Prevention

- Where the pasture concentration of copper is low, top dress with copper.
- Capsules or injections can be used in areas of known copper deficiency as a prevention.

Copper Poisoning

Cause

There are three different forms of copper toxicity:

1. Acute copper poisoning – caused by giving sheep with normal to high copper reserves a copper supplement.
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.

Symptoms

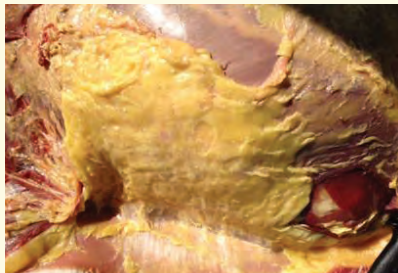
- Acute copper poisoning - severe diarrhoea, often bluish in colour, urine is red-brown in colour. Affected animals become dehydrated, weak and usually go down and die within 1-2 days and any that survive develop jaundice.
- Chronic copper poisoning- sheep are disinterested in their surroundings, stand apart from the rest of the mob and stop eating, urine is red – brown in colour. Animals are severely jaundiced and deaths may occur over a period of weeks with most sheep dying within 3-5 days of initial signs.

Diagnosis

- Diagnosis is based on history and clinical signs.
- An analysis of liver samples is necessary to confirm diagnosis.

Treatment

- There is no effective treatment for acute or chronic copper poisoning.
- Salt lick blocks containing molybdenum may help reduce further copper absorption by the gut.



Dermatophilosis (Dermo or Lumpy Wool)

Cause

- Dermo occurs mainly in weaners and hoggets but can affect sheep of all ages.
- Merinos are most susceptible.
- It is most prevalent in medium to high rainfall areas.

Symptoms

- On non-woollen areas such as the face and ears, the infection produces long thin flat scabs which are generally less than 1 cm in length.
- On wool producing skin, the infection produces a thick exudate which mats the wool fibres together at the base of the staple and dries into a scab.
- The most severely affected sheep have hard plates of scabs across their back.

Diagnosis

- Examining affected sheep however laboratory confirmation is necessary for a definitive diagnosis.
- Diagnosis can be made by looking at scab material under a microscope.

Treatment

- Usually self-curing however antibiotic treatment hastens recovery and minimises the risk of flystrike. Contact your local vet.

Prevention

- Keep contact between wet sheep to a minimum and don't keep wet sheep in the yards any longer than necessary.



Exposure Losses

Cause

- Occurs when the rate of heat loss from the body is so great that the sheep cannot maintain its normal body temperature.
- Generally occurs within two weeks of shearing especially with extreme cold conditions and high winds.

Symptoms

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

Diagnosis

- Based on history, considering factors such as time since shearing, available shelter, size of the sheep, body condition of the sheep and current weather.

Treatment

- Stock must be protected from the weather.
- Stock that are down should be provided with body insulation and warmth.
- Move stock that have collapsed into a shed and protect from draughts.

Prevention

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



False Hydatid / Bladderworm

Problem

- There are no clinical signs in live sheep, however, at slaughter infected carcasses may be trimmed or condemned.

Cause

- False Hydatids are the cystic stage of the dog tapeworm *Taenia hydatigena*.
- Despite the name, false hydatids or bladder worm are not hydatids.
- They occur in the abdominal cavity of sheep.

Symptoms

- Sheep will show no clinical signs.

Diagnosis

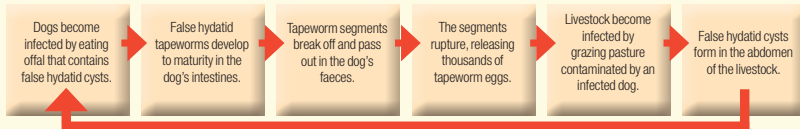
- Cysts cannot be detected on live animals but are readily seen by examining the animal at the abattoir.
- False hydatid cysts have a thin wall, are 1-6 cm in diameter and are filled with clear fluid.
- They occur on the liver, diaphragm and abdominal organs and tissues.
- Before cysts are formed, the migrating stages cause bloody tracts in the liver tissue.

Treatment

- There is no effective treatment for sheep with false hydatid cysts.
- Treatment is not necessary as the cysts cause no economic or production loss and are not a human health risk.

Prevention

- Monthly worming of farm dogs, restricting them from access to offal will help prevent false hydatids.



False Hydatid Life Cycle

Foot Abscess

Cause

- Generally occurs in winter or spring when paddocks are wet and muddy.
- Caused by bacteria infecting the toe or heel of the foot.
- Walking over muddy rocky areas may result in high numbers of foot abscesses.

Symptoms

- Generally see swelling in the affected area with or without pus bursting out.
- Toe abscess – occurs in the front feet, a crack in the hoof is the normal site of infection.
- Heel abscess – more common in heavy adult sheep, starts as an infection of the skin between the two toes and then extends into the tissues of the heel.
- A foot abscess will contain light brown or green pus which will over time build up and burst out at the point of least resistance.
- Sheep with foot abscesses are very lame and lose condition until the abscess bursts and the pus drains out.

Diagnosis

- Based on examination of the feet of lame sheep.
- Laboratory confirmation of diagnosis is possible.

Treatment

- Toe abscesses respond well to hoof paring which provides drainage for the pus.
- Heel abscesses are generally deeper and may require antibiotic treatment.
- Once the abscess bursts, healing occurs without further treatment.
- Some foot abscesses may result in damaged foot joints.

Prevention

- Keep susceptible sheep out of muddy paddocks where possible.



Footrot

Footrot is A Notifiable Disease

Cause

- Footrot is a highly contagious bacterial disease of sheep that affects one or more of their feet.
- In its virulent form it can cause significant economic loss through reduced wool growth, reduced ewe fertility, reduced growth rates and reduced returns from sale sheep.
- In infected flocks, there are significant costs associated with controlling and eradicating the disease.

Symptoms



Normal foot - There is normal skin between the claws, with no reddening or inflammation and no loss of hair. There is no exudate present.

Score 1 - Slight to moderate inflammation with some erosion between the claws. There is no underrunning or erosion of the skin or horn.

Score 2 - Skin between the claws is inflamed and raw, may involve part, or all, of the soft horn on the inside of the claws and there is no underrunning of the horn.

Score 3a - Separation of the skin horn junction, with underrunning extending no more than 5 mm.

Footrot

Footrot is A Notifiable Disease



Score 3b - Underrunning no more than halfway across the heel or sole.

Score 3c - More extensive underrunning of the heel or sole but not extending to the outside edge of the sole of the claw.

Score 4 - The underrunning extends to the outside edge of the sole of the claw and involves hard horn.

Score 5 - This is a severe form of the disease involving the sole, with extensive inflammation and underrunning of the hard horn.

Diagnosis

- Diagnosis is made by examination of affected feet and can be confirmed by sending a bacterial swab to a veterinary laboratory.

Treatment

A treatment or eradication program for footrot involves three phases:

1. **Control phase** - before and during the spread period, to reduce the level of infection in the flock to the stage where eradication becomes feasible.
2. **Eradication phase** - involves the detection and removal of all infected sheep during the non-spread period.
3. **Surveillance phase** - involves surveillance of the whole flock to ensure the disease has been eradicated, and preventing reinfection.

If you suspect your stock have footrot please contact your local PIRSA Animal Health Officer.

Grass Tetany (Hypomagnesaemia)

Cause

- Occurs when the magnesium levels in the blood fall below normal.
- Often seen in conjunction with low blood calcium (hypocalcaemia).
- Most common in the first 6 weeks after lambing in prime lamb mothers.
- Application to pastures of excessive dressings of nitrogenous and potassium fertilizers can lead to a decline in magnesium blood levels in ewes.

Symptoms

- Excitable and unco-ordinated, throwing head about, grinding teeth and shaking with muscle tremors.
- Within 2-3 hrs affected sheep will collapse, paddle their feet and froth at the mouth.
- Death will occur within 4-6 hours of initial signs, often with violent convulsions.

Diagnosis

- Based on flock history, signs shown by affected sheep and the rapid response to treatment.
- To get a diagnosis on post mortem, the fluids from inside the eye must be tested for magnesium concentration.

Treatment

- Ewes will respond rapidly to magnesium injections with treated sheep getting up and walking away within minutes.
- As grass tetany is often seen in conjunction with low calcium, a solution containing both calcium and magnesium is recommended.
- Treatment must be given as soon as possible after initial signs to be effective.
- Calcium and magnesium solutions are readily available from most rural stores.

Prevention

- Ewes with young lambs should be handled as little as possible as physical stress can bring on grass tetany.
- Supplement sheep with magnesium every second day during periods of greatest risk.
- Providing hay when there is lush, rapid pasture growth can reduce the incidence of the disease.



Hydatid

Problem

- There are no clinical signs in live sheep, however, at slaughter infected carcasses may be trimmed or condemned.

Cause

- Hydatids are the cystic stage of the dog tapeworm *Echinococcus granulosus*.
- The tapeworm is tiny, only 3 - 6 mm long and lives in the intestines of dogs.
- The larval cyst forms in intermediate host animals such as sheep.

Symptoms

- Sheep will show no clinical signs.

Diagnosis

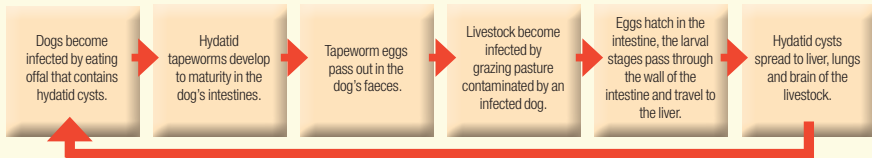
- Cysts cannot be detected on live animals but are readily seen by examining the animal at the abattoir.
- Cysts can occur on the brain, lungs or liver.

Treatment

- There is no effective treatment for sheep with hydatid cysts.

Prevention

- Monthly worming of farm dogs, restricting them from access to offal will help prevent hydatids.



Hydatid Life Cycle

Large Lung Worm

Cause

- There are two different types of worms that infest the lungs of a sheep, large lungworms and small lungworms.
- Large lungworms cause most of the disease seen in sheep.
- Lungworms are most prevalent in the cooler, wetter areas of southern Australia, generally in autumn or winter.
- Lambs 4-6 months of age are most severely affected however it can be seen in sheep of any age.

Symptoms

- A moderate to heavy infestation of lungworms causes irritation to the lining of the airways and a cough.
- A very heavy lungworm burden may cause breathing difficulty, nasal discharge, reduced milk yield, ill thrift, pneumonia, suffocation and death.

Diagnosis

- Lungworms can be identified in a faecal egg count and culture.
- On post mortem, lungworms can be seen in the airways and lungs.

Treatment

- Many of the sheep drenches are registered for the treatment of lungworms.

Prevention

- Ensure an adequate drenching program is carried out regularly.



Listeriosis (Circling Disease)

Cause

- Listeriosis is a sporadic bacterial infection that affects a wide range of animals, including humans.
- It is most commonly associated with the feeding of mouldy silage or spoiled hay.

Symptoms

- Some of the first signs include depression, anorexia (not eating), disorientation, head tilt, and circling.
- As the disease progresses, facial paralysis may develop usually affecting only one side of the face, causing the ear and eyelid to droop, the muzzle to be pulled to one side, and a lack of muscle tone in the lip of the affected side.
- Profuse salivation may also be observed.
- Abortion, stillbirths, and neonatal death may occur.
- There is usually a high death rate.

Diagnosis

- Diagnosis is based on clinical signs and post mortem samples sent to a veterinary laboratory.
- On post mortem there will be no significant findings however it is essential that the brain and a portion of the spinal cord are collected for laboratory testing.

Treatment

- Recovery depends primarily on early intervention with high doses of antibiotics, however in severe cases, death may occur despite antibiotic treatment (contact local vet).
- Any feed (spoiled silage) suspected to be the cause should be removed.
- Ill animals should be isolated from healthy animals to prevent the spread of disease between animals.

Prevention

- To prevent listeriosis, care should be taken to avoid feeding livestock spoiled silage.
- Avoid pastures that are boggy and areas where the soil has a high pH.

Listeriosis can occur in humans and is potentially life-threatening. If you suspect your stock has listeriosis please contact your local vet or PIRSA animal health officer.

Lupinosis

Cause

- Caused by the fungus *Phomopsis leptostromiformis*, which grow on lupin stubbles.
- If the lupin plants are infected before harvest, lupin grain can also cause lupinosis in sheep.

Symptoms

- Affected sheep will stop eating and stand apart from the mob.
- One of the first signs of lupinosis is sheep lagging behind the mob and becoming staggy when driven.
- The membranes and skin become extremely jaundiced and may shows signs of photosensitisation (page 43).
- Some animals die within 3 days of eating the contaminated lupins and others will slowly waste away and die over a period of weeks.
- Sheep that recover will have chronic liver damage and will do poorly for months afterwards.

Diagnosis

- Based on a history of grazing lupin stubble or eating lupin grain, signs shown by affected sheep and post mortem findings.
- On post mortem, the animal will be jaundiced with yellowing of the fat, skin and most importantly liver.



Lupinosis

Treatment

- There is no treatment for lupinosis, however steps can be taken to minimise the number of sheep affected and the severity of the outbreak.
- The mob should be removed from the lupin stubble and any access to lupin grain should be stopped.
- Affected sheep should be fed a low protein diet of hay and grains with low protein content.
- Affected animals should have access to a ready supply of good quality water and plenty of shelter.

Prevention

- Check sheep daily when grazing lupin stubble, drive the mob around the paddock for at least 500m looking for any animals lagging behind.
- If rain occurs or there is a heavy dew, remove the sheep from the lupin stubble.
- Graze lupin stubbles as soon as possible after harvest.
- Remove all stock from the lupin stubble once all the grain has been eaten.
- Avoid grazing sheep that have a history of liver damage that may be more susceptible to lupinosis.
- Only feed good quality lupin grain to sheep. It is a good idea to have it tested before feeding it. This can be done through Agrifood Technology in Werribee Victoria.



Milk Fever (Hypocalcaemia)

Cause

- Occurs when the calcium levels in the blood fall below normal.
- Often seen in conjunction with low blood magnesium (hypomagnesaemia).
- Most common in the last few weeks of pregnancy or the first few weeks after lambing.
- There is often confusion between milk fever and pregnancy toxoemia.

Symptoms

- Initial signs include a staggery gait and muscle tremors and the sheep move or struggle when approached.
- Affected sheep then go down often in a sitting position with their head turned around to their flank.
- Death will occur within 24-36 hours of initial signs.

Diagnosis

- Based on flock history, signs shown by affected sheep and the rapid response to treatment.
- There are no characteristic features of milk fever on post mortem.



Milk Fever (Hypocalcaemia)

Treatment

- Animals will respond rapidly to calcium injections with treated sheep possibly getting up and walking away within minutes.
- As milk fever is often seen in conjunction with low magnesium, a solution containing both calcium and magnesium is recommended.
- Treatment must be given as soon as possible after initial signs to be effective.
- Calcium and magnesium solutions are readily available from most rural stores.

Prevention

- Avoid physical stresses on sheep in the last month of pregnancy, or with young lambs at foot.
- Avoid grazing late pregnant or lactating ewes on lush pasture or cereal crops.
- Keep calcium solution on hand while handling pregnant or lactating ewes.
- Supply a mix of 2 parts stock salt to 1 part stock lime next to the drinking water source for the mob during the last two weeks of pregnancy and early lactation.

Pregnancy Toxaemia	Hypocalcaemia
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

Cause

- A common disease when sheep graze lush pastures containing plants such as cape weed, oats, canola and wild turnip.
- Nitrate concentrations are usually higher in young plants and decrease as plants mature.

Symptoms

- The main symptom is a scour that does not respond to worm drenches.
- Severely affected cases can have a brownish to lead-coloured discolouration of the mucous membranes.

Diagnosis

- Based on a history of grazing plants with a high nitrate level and post mortem specimens being submitted to a laboratory.

Treatment

- There is no treatment for nitrate poisoning .
- The scouring should stop when the animals are removed from the high nitrate feed.
- Severe cases with discolouration of the mucous membranes can be treated with methylene blue.

Prevention

- Avoid grazing plants with a high nitrate level.
- Poisoning can be reduced by providing access to well dried cereal hay.
- Using green feed stock blocks are a viable option on risky pastures.
- High starch grain supplementation (seek expert advice).



Cape Weed



Oats



Canola



Wild Turnip

Ovine Johne's Disease (OJD)

OJD is A Notifiable Disease

Cause

- OJD is an incurable wasting disease of livestock.
- Sheep can become infected with OJD at any age by eating pasture or drinking water contaminated with faeces from infected animals.
- Susceptibility to disease can be influenced by age, breed, stress and the presence of other diseases.
- Many sheep infected with OJD may carry the disease in their intestines and spread the bacteria with their faeces without ever showing any obvious clinical disease.
- The disease has a long incubation period and most infected sheep do not begin to show any signs of illness until after two years of age.

Symptoms

- Clinically affected sheep show severe wasting which eventually ends in death.
- The average time from onset of clinical illness to death is about 6 to 12 weeks.
- Chronic scouring may sometimes be seen but this is not a common feature of the disease in sheep.
- The classic symptom of the disease in a mob is a distinct "tail" with sheep ranging in condition from good to very poor.
- The infected sheep continue to eat and drink normally until they are too weak to graze, and eventually die.



Ovine Johne's Disease (OJD)

OJD is A Notifiable Disease

Diagnosis

- Diagnosis is made by taking a pooled faecal sample from a selection of animals over two years old on the property.
- On post mortem, thickening of the intestines and enlarged lymph nodes will be seen in affected animals.



Treatment

- There is no effective treatment for OJD.

Prevention

- Purchase low risk stock only.
- Consider vaccination of your flock with Gudair (page 60).
- Ensure all purchased sheep are accompanied by a sheep health statement and meet the entry requirements for OJD in South Australia.

If you suspect your stock have OJD please contact your local PIRSA Animal Health Officer.

Oxalate Poisoning

Cause

- Occurs when sheep graze plants with a high concentration of oxalates such as soursob and sorrel.

Symptoms

- Acute oxalate poisoning:
 - The first signs occur within 1-3 hrs of sheep eating the high oxalate plants.
 - Affected sheep have muscle tremors and a staggy gait, they will go down but will be alert and struggle when handled. Leg paddling may occur.
 - Within hours the sheep will become exhausted, the struggling will stop, sink into a coma with death occurring soon after.
- Chronic oxalate poisoning:
 - Sheep with chronic oxalate poisoning are generally poor doers and are anaemic with pale membranes.
 - Sporadic death occurs within an affected mob.

Diagnosis

- Based on the history of sheep grazing high oxalate plants and clinical signs.
- Diagnosis can be made by examining the sheep's kidneys under a microscope.

Treatment

- Sheep with acute poisoning should be treated with calcium solution as for hypocalcaemia (page 34).
- There is no effective treatment for chronic poisoning.

Prevention

- Ensure hungry sheep do not have access to a paddock with large amounts of soursob or sorrel.
- Sheep yards are one of the most common places that sheep get acute oxalate poisoning so it is very important that yards are clear of these plants before sheep enter them.



Soursob



Sorrel

Perennial Ryegrass Staggers

Cause

- Caused by toxins produced by a fungus in perennial ryegrass plants.
- Outbreaks occur during late summer and autumn in stock grazing perennial ryegrass dominant pastures.

Symptoms

- Ryegrass staggers develop slowly over a number of days and the severity of signs that develop vary greatly.
- Mildly affected animals show trembling of the head, shoulders and flank muscles after exercise.
- More severely affected animals stop with muscle tremors, head shaking and a staggery uncoordinated gait after being driven for 20-100m.
- The most severely affected sheep will go down with convulsions and severe muscle spasms when disturbed.

Diagnosis

- Based on a history of grazing the toxic plants and clinical signs.

Treatment

- Most sheep will recover within 1-4 days of being removed from the toxic pasture without treatment.
- Affected animals should be disturbed as little as possible and should be moved as quietly and slowly as possible.

Prevention

- Sheep on suspect pasture should be under regular observation and removed from the paddock as soon as initial signs are seen.
- Plant cultivars that are inoculated with non-toxic endophytes.

Phalaris Poisoning

Cause

- Occurs in sheep grazing fresh phalaris growth after the autumn break.
- Young phalaris contains a toxin that interferes with the function of the heart causing sudden death.

Symptoms

- Sudden death due to heart failure will occur within hours of sheep being moved into a paddock of young phalaris.
- Severely affected sheep collapse, lie on their side with head and neck thrown back, legs paddling, pupils dilated, jaws champing and a profuse ropy salivation.
- Sheep often die while having a bout of convulsions.

Diagnosis

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

Treatment

- There is no effective treatment for phalaris poisoning.

Prevention

- The key is in the recognition of rapidly growing phalaris and preventing sheep from grazing on it.



Phalaris Staggers

Cause

- Occurs in sheep with prolonged access to phalaris pastures in areas that are cobalt deficient.

Symptoms

- Sheep will be uncoordinated with head nodding, muscle tremors and a stiff gait.
- If driven, affected sheep will go down having convulsions but will get up and walk away soon after.
- Some sheep may die while having convulsions but others will die due to accidents resulting from the staggering.
- Most sheep will survive but will never fully recover even once removed from the phalaris.

Diagnosis

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

Treatment

- There is no effective treatment for phalaris poisoning.
- Sheep with phalaris staggers should be culled from the mob.

Prevention

- Phalaris staggers can be prevented with the administration of cobalt bullets.
- The cobalt bullets stimulate bacteria production in the rumen that fight the phalaris toxin.
- Vitamin B12 injections are ineffective in preventing phalaris staggers.

Photosensitisation

Cause

- Occurs when the skin becomes abnormally sensitive to sunlight.
- It is a symptom rather than a disease and can be the result of several different diseases such as liver damage and the consumption of specific toxic plants.

Symptoms

- Affected animals are initially restless, they seek shade, shake their heads and may rub their ears and eyes.
- Later signs may range from mild to severe sunburn, loss of appetite, jaundice and death.
- Areas of skin not covered by fleece are the most affected such as face, ears and vulva.
- Fluid may build up under the skin causing swelling of the face and jaw.
- Eyelids may become swollen causing tears to dribble down the cheeks.
- Ears become swollen and droopy and are often covered in fine scabs.

Diagnosis

- A diagnosis can be made by examining affected sheep.

Treatment

- Identify and address the underlying cause of the disease.
- Protect affected animals from direct sunlight.
- Provide nursing care while recovery takes place.
- Affected animals may benefit from antibiotic, anti-inflammatory and antihistamine injections.



Pinkeye

Cause

- A common bacterial disease of sheep especially when conditions are dusty and there are large numbers of flies.

Symptoms

- The first sign of pinkeye is the inflammation of the eye membranes and the production of clear watery tears that run out of the corner of the eye and down the cheek.
- As the pinkeye progresses the cornea develops a blue haze that becomes more opaque and turns white over 3-4 days.
- Shallow ulcers may develop on the cornea.
- A sheep with pinkeye cannot see out of that eye so sheep with pinkeye in both eyes are totally blind and will lose weight.
- As the eye heals the blood vessels grow into the cornea making the eye appear pink.

Diagnosis

- Diagnosed by examining the eye of affected sheep.

Treatment

- Most cases recover without treatment in 2-3 weeks.
- Yarding sheep can make the situation worse as dust and flies can make the infection spread through the mob.
- Pinkeye antibiotic sprays and powders are readily available but a single use is generally ineffective.
- A second dose of the spray or powder should be administered 48 hrs after the initial dose.
- Antibiotic ointment and antibiotic injections can also be used with positive results but must be used under veterinary advice.



Pneumonia

Cause

- Most outbreaks of pneumonia occur in young animals during late summer and autumn.

Symptoms

- Affected sheep will develop a cough and may have a nasal discharge.
- A large proportion of the mob may be affected with pneumonia but few deaths should occur.
- Signs of pneumonia will subside after 4-6 weeks, however there may be lasting adhesions between the lungs and chest wall which could mean that sheep tire more readily if exerted in later life.

Diagnosis

- Based on history and clinical signs.

Treatment

- Antibiotic treatment may aid recovery .
- It is important to keep physical stress of a mob affected by pneumonia to a minimum.



Polioencephalomalacia (PEM or Star Gazing Disease)

Cause

- Caused by a deficiency of thiamine (vitamin B1) in sheep of all ages and both sexes.
- May occur in sheep on high grain diets, and diets that include plants high on thiaminases (e.g. bracken).

Symptoms

- The first signs are listlessness and a loss of appetite, affected sheep will separate from the rest of the mob, appear blind and either wander aimlessly or stand still.
- Sheep will adopt one of two stances:
 - Head lowered to the ground; or
 - 'Star gazing' with a fixed stare into the sky over the horizon.
- Later, affected sheep will go down and if startled may start galloping leg movements and have convulsions.
- A sheep that is down will generally have its head and neck arched back stiffly.
- If not treated sheep will get weaker, sink into a coma and die within 2-3 days.

Diagnosis

- Based on clinical signs and response to treatment in cases found early.
- Post mortem examination of the brain can be used to diagnose PEM.

Treatment

- Sheep respond to thiamine or B1 injections which are available from most rural stores.
- Mildly affected sheep will improve within 6-8hrs of treatment.
- Sheep that are down will have irreversible damage to the brain and should be destroyed on welfare grounds.

Prevention

- Thiamine or B1 injections will prevent more cases of PEM if multiple cases are occurring.



Pregnancy Toxaemia (Twin Lamb Disease)

Cause

- Common disease of ewes in the last 6 weeks of pregnancy and immediately after lambing.
- During late pregnancy, the ewe has a very high energy requirement to provide for her own needs and the growth of the lamb or lambs she is carrying.
- If the energy requirement is not met by feed intake, the ewe will break down her own body tissues.
- If the rate at which the ewe breaks down her tissues is too rapid, toxic wastes from the breakdown process accumulate and pregnancy toxaemia occurs.

Symptoms

- The initial signs are dullness and loss of appetite and affected sheep lagging behind the mob when driven.
- Later the ewe will stand alone, appear dopey and will not move when approached.
- If driven the ewe will appear blind, stumble and go down.
- The ewe will eventually sink into a coma and die within 5-7 days.

Diagnosis

- Based on flock history, signs shown by affected sheep and post mortem findings.
- On post mortem, the liver is generally tan to yellow in colour and is quite soft and there is often plenty of fat on the carcass.



Pregnancy Toxaemia (Twin Lamb Disease)

Treatment

- Treatment is usually unrewarding as most sheep die despite treatment.
- If treatment is to be given, the strategy is to give the ewe a readily absorbed source of energy.
- Treatment must be given as soon as possible after initial signs to be of any benefit.
- Oral and injectable glucose solutions are readily available from most rural stores.

Prevention

- Give pregnant ewes the best paddock feed available during the month prior to lambing.
- If necessary provide supplementary feed during the last few weeks of pregnancy.
- In flocks where multiple births are expected, ewes should be at least a condition score 3, however they should be no more than condition score 4. Consider scanning and segregating twins, singles & empties for better feeding outcomes.
- Keep physical stress on pregnant ewes to a minimum by avoiding unnecessary mustering or yarding or time off feed.

Pregnancy Toxaemia	Hypocalcaemia
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)

Cause

- It is a clostridial disease that mostly affects lambs grazing lush feed but can occur in all ages of sheep that are heavily grain fed.
- Most cases of pulpy kidney occur in flocks with an inadequate vaccination program.

Symptoms

- Most sheep with pulpy kidney are found dead as the disease develops very quickly and death will occur within hours of initial signs.
- The initial signs of pulpy kidney is dullness followed by sheep going down with convulsions and frothing at the mouth and then death.
- Adult sheep will last longer than young animals but they will not survive for longer than 24 hrs.

Diagnosis

- A tentative diagnosis is based on a history of sudden death while on a high risk diet.
- To confirm pulpy kidney requires laboratory testing of post mortem samples including portions of the intestines, kidneys and brain.
- On post mortem, the kidneys will putrefy rapidly after death.

Treatment

- There is no effective treatment for pulpy kidney.

Prevention

- Vaccination is the key to prevention of pulpy kidney.
- See the 'vaccination program' section for a detailed description of best practice for vaccinations.
- Avoid sudden changes of diet, such as introduction to large amounts of grain.



Pyrrrolizidine Alkaloid Poisoning

Cause

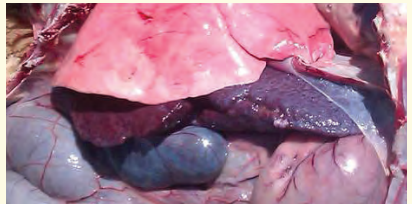
- Pyrrrolizidine alkaloids are toxic compounds found in a number of Australian plants, the most common of which are Salvation Jane (Patterson's Curse), heliotrope (potato weed) and caltrop.

Symptoms

- Poisoning will show up in sheep as either chronic copper poisoning (page 21) or chronic ill thrift and photosensitisation (page 43).
- The toxins in the plant cause permanent liver damage that is cumulative over the life of the animal.

Diagnosis

- Based on a history of grazing the toxic plants and clinical signs.
- Diagnosis is confirmed by post mortem.
- In cases of chronic copper poisoning, the fat and skin of the sheep will be severely jaundiced or yellow.
- In cases of chronic ill-thrift and photosensitisation, the liver of the sheep will be darker and harder with blunt or lumpy edges.



Treatment

- There is no effective treatment, however animals that survive a poisoning incident should be culled at the earliest opportunity as they will have permanent liver damage.

Prevention

- Prevention revolves around weed management and preventing stock from having access to the toxic weeds.



Salvation Jane



Potato Weed



Caltrop

Scabby Mouth

Cause

- A viral disease that affects sheep, goats and humans.
- It is a hardy virus that can survive on the ground for years.

Symptoms

- Multiple animals may be affected, with the most common site for infection being on the lips, especially in the corners of the mouth.
- Scabby mouth scabs can also be found on the teats of ewes, on the skin around the coronet and around the bulbs of the heels.
- Infection begins with a clear sticky exudate which then hardens into a thick brown scab firmly attached to the skin beneath it.
- Provided the scab is not knocked or pulled off, it generally dries up and falls off in 2-3 weeks.

Diagnosis

- Scabby mouth scabs are quite distinctive and a diagnosis can be made by examining infected sheep.
- *CAUTION* Scabby mouth is transmissible to humans so precautions must be taken when handling sheep with Scabby mouth.
- If necessary a firm diagnosis can be made by submitting scab material to a laboratory for examination.

Treatment

- Most cases recover with no treatment within 3 weeks.
- Precautions against flystrike should be taken.
- Sheep with scabs on the mouth should be given soft lush feed as they may be reluctant to eat dry coarse feed.

Prevention

- A Scabby mouth vaccine is commercially available which contains the live Scabby mouth virus.
- Avoid vaccination of ewes with lambs at foot.



Selenium Deficiency (White Muscle Disease)

Cause

- Selenium deficiency generally occurs in spring and early summer on clover-dominant pastures.
- There are selenium deficient areas in all parts of Australia.

Symptoms

- Generally seen in spring born lambs at 3-4 weeks of age.
- Affected lambs walk with a stiff gait and appear weak.
- Severe cases die of starvation, exposure or predation.
- Some lambs die of cardiac failure and others recover but suffer a growth setback.

Diagnosis

- A tentative diagnosis can be made by examining the animals for pale muscle tissue on post mortem.
- A definitive diagnosis can be made by taking a blood sample from the animal and submitting it to the laboratory.

Treatment

- Selenium can be administered to affected sheep by injection or as a drench.
- There is a very small safety margin in regards to selenium so treatment should only be administered where muscle disease has been diagnosed and treatment should be strictly given in accordance to manufacturer's advice.

Prevention

- Selenium supplements are available as vaccines and drenches as well as slow release pellets.
- Care must be taken to not overdose by supplementation with repeat vaccination/drenching.



Sheep Measles

Problem

- There are no clinical signs in live sheep, however, at slaughter infected carcasses may be trimmed or condemned.

Cause

- Sheep measles are the cystic stage of the dog tapeworm *Taenia ovis*.
- The cysts occur in the muscles of the sheep.
- Sheep measles do not cause any ill health to affected sheep but can cause economic loss due to carcase condemnation at slaughter.

Symptoms

- Affected sheep show no clinical signs of sheep measles.

Diagnosis

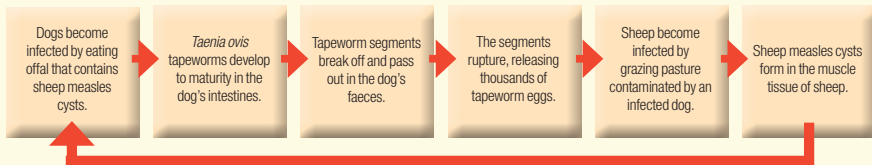
- Sheep measles is detected by examining the muscles after slaughter.

Treatment

- There is no effective treatment for sheep measles.

Prevention

- Sheep measles can be prevented through monthly dog worming with a wormer that controls tapeworm and by restricting dog access to raw sheep meat and offal.



Sheep Measles Life Cycle

Tetanus

Cause

- Tetanus is a clostridial disease that mostly affects lambs within three weeks of marking.
- Most cases of tetanus occur in flocks with an inadequate vaccination program.

Symptoms

- The main signs are muscle spasms including head tremors, restricted jaw movements, dilated nostrils and pricked ears.
- The tail is generally held out and there is stiffness in the legs.
- Initially lambs can walk with a stiff gait but as the disease progresses they will go down and have intermittent convulsions.
- Sound and sudden movements are likely to set off bouts of convulsions.
- Most cases die within 3-4 days.

Diagnosis

- Based on clinical signs shown by affected sheep.

Treatment

- There is no economic and effective treatment for tetanus.

Prevention

- Vaccination is the key to prevention of tetanus.
- See the 'vaccination program' section for a detailed description of best practice for vaccinations.
- Good hygiene at lamb marking is important in preventing tetanus.



Vibriosis (Campylobacteriosis)

Cause

- Vibriosis is the most common cause of sheep abortion outbreaks in Australia , caused by the bacteria *Campylobacter*.

Symptoms

- The main symptom of vibriosis is abortions from 3 months of pregnancy onwards.
- Early abortions go unnoticed in paddocks as foetuses are only centimetres in length.
- Abortions in the yards or ewes with blood stained breech wool are generally the first signs of a vibriosis outbreak.
- Most aborting ewes show no signs of ill health.

Diagnosis

- Based on flock history and an examination of the aborted foetus and the membrane.
- A foetus aborted from vibriosis will often have yellow/white patches on the liver 1-3cm in diameter.
- The diagnosis is confirmed with a bacterial culture in a laboratory.

Treatment

- There is no effective treatment for vibriosis.
- By the time it is noticed, the abortion will have already occurred.

Prevention

- Aborting ewes are the main source of infection for other ewes.
- Consider vaccination.

Sheep Vaccination

Vaccination is the key to preventing many of the diseases of sheep.

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, by exposing sheep to either the live organism presented in a safe form (e.g. Scabby mouth or anthrax vaccines), or to a killed or inactivated organism or part of an organism (e.g. the clostridial vaccines).

What Vaccines are available?

- 3 in 1 for sheep and lambs
 - Cheesy gland
 - Pulpy kidney
 - Tetanus
- 5 in 1 for sheep and lambs
 - Pulpy kidney
 - Tetanus
 - Blackleg
 - Malignant Oedema
 - Black Disease

What Vaccines are available?

- 6 in 1 for sheep and lambs
 - Pulpy kidney
 - Tetanus
 - Blackleg
 - Malignant Oedema
 - Black Disease
 - Cheesy gland

What Vaccines are available?

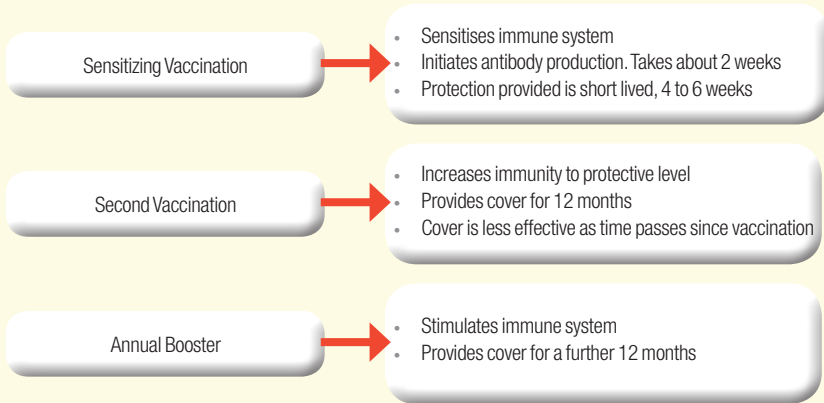
- Eryvac
 - Arthritis
- Scabigard
 - Scabby mouth
- Gudair
 - Ovine Johne's Disease (OJD)

The clostridial vaccines, 3 in 1, 5 in 1 and 6 in 1, are available with or without added B12 and/or selenium

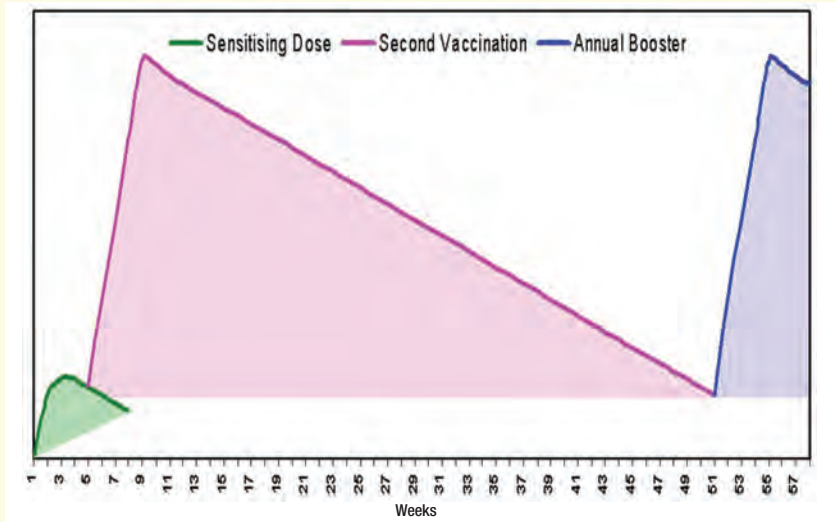
When To Vaccinate – Clostridial Vaccines

Vaccination Program – Clostridial Vaccines

All lambs should be given a clostridial vaccination at lamb marking and a second dose 4-6 weeks later. The first dose sensitises the immune system and the second dose starts antibody production. Without the second booster dose, the initial vaccination only protects the animal for 4-6 weeks. The booster vaccination prolongs the protection period so the sheep is covered for 12 months. An annual booster is then required to provide cover for a further 12 months.



The Protection Period Provided By Each Dose of Clostridial Vaccine



Sheep Vaccination – Other Vaccines

Eryvac

- Control of arthritis in lambs through vaccination of their dams.
- Ewes vaccinated as recommended will transfer passive immunity to their lambs through the colostrum or first milk.
- Ewes:
 - Give previously unvaccinated ewes a first dose at the time of joining; give a second dose about 4 weeks before the expected date of lambing.
 - Previously vaccinated ewes need only to be vaccinated 4 weeks before the expected date of lambing.
- Ewes properly vaccinated should pass temporary immunity to their lambs in the colostrum.
- Such lambs should be protected for the first 6 to 8 weeks of their lives.

Scabigard

- A living vaccine for the control of scabby mouth disease in lambs and sheep which induces immunity by producing a mild, “controlled” form of the disease at a protected vaccination site.
- All lambs should be vaccinated at marking where the disease is common.
- When beginning a vaccination program it is advisable to vaccinate all sheep and lambs, as vaccinated sheep can act as a source of infection for non-vaccinates.
- When lambs are examined one week after vaccination, a line of pustules should be visible along the track of the scratch made on the skin indicating successful vaccination.
- Immunity develops in about 2 weeks.

Sheep Vaccination – Other Vaccines

Gudair

- Gudair® is Australia's only vaccine for the control of Ovine Johne's Disease (OJD).
- It offers protection against the development of clinical OJD and a reduction in faecal shedding of the organism in sheep.
- Following whole flock vaccination, producers should see:
 - Significant decrease in the number of clinically affected animals over time.
 - Decrease in the number of mortalities associated with OJD.
 - Gradual decrease in the prevalence of infection within the flock.
 - Notable decrease in faecal shedding of OJD.
- It is an inactivated (killed) vaccine and will not introduce the disease into the flock.
- A single 1mL dose provides life long immunity.
- People administering the vaccine must be accredited and have received training.
- The vaccine is only available from PIRSA (see page 76 for contact details).

Sheep Lice

Sheep lice facts

The sheep body louse or chewing louse (*Bovicola ovis*) is the species responsible for most infestations of lice on sheep in Australia.

It is a small insect, less than 2 mm in length, with a broad reddish head. Adult lice have reddish-brown stripes across the body whereas young lice (nymphs) are smaller with cream bodies.



Where do lice come from?

Most new infestations start from contact with other infested sheep and can be sourced two ways:

Stray sheep - Good fences are the most effective method of preventing lice. Lice do not cross fence lines but stray sheep do. Even if the neighbouring property's sheep have lice, it is unlikely that they will spread to your property if fences are sheep proof.

Purchased sheep - Even if lice cannot be found, these sheep could still be infested e.g. if purchased off-shears. All purchased sheep should be kept isolated for a minimum of six months and treatment should be considered if lice are detected. Take note of the period expected for a complete kill of lice when selecting your chemical treatment.

Sheep Lice

Can lice live away from sheep or on other animals?

Lice are very sensitive to changes in temperature and humidity and most die soon after being removed from sheep. However, under favourable conditions some lice can survive for up to a month. Sheep can become infested if held in facilities where lousy sheep have recently been penned, but the risk is low.

Sheep lice will reproduce only on sheep and possibly sometimes on goats, but it is unlikely that goats act as a source of infestation under paddock conditions. Sheep lice will not breed on birds, people, cattle, kangaroos or other animals.

Lice infestations are more common in scrubby areas, not because lice breed on kangaroos or other animals as is sometimes thought, but because infested sheep are missed at muster and not treated.

Although lice cannot breed on humans, they can transfer onto clothing or footwear when shearers or stock handlers are in close contact with sheep. Precautions should be taken to prevent lice being spread between infested and clean mobs.

How do lice move from sheep to sheep?

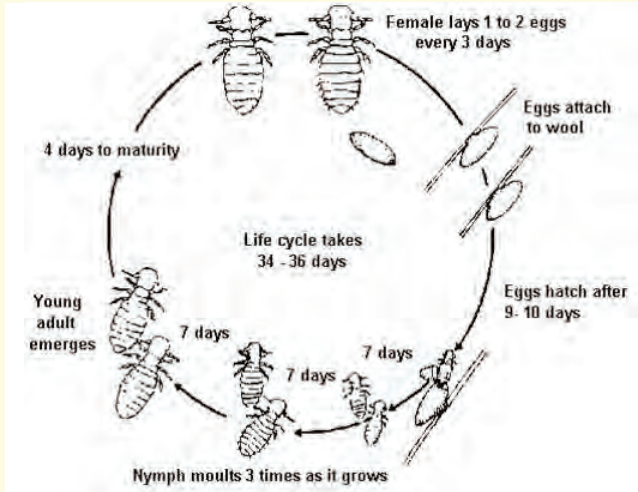
When sheep rub against each other, lice move to the tip of the fleece and quickly transfer between sheep. This usually occurs during yarding, in sheep camps, or at any time when sheep are in close contact. Transfer takes place most quickly when sheep have short wool.

Lice freely transfer between ewes and lambs and can spread from rams to ewes during mating.

Sheep Lice

How do lice breed?

The average period for completion of the cycle is 34 days. Female lice lay one or two eggs every three days, and live for about 30 days.



Sheep Lice

How quickly do lice build up?

It is difficult to find lice on infested sheep any earlier than three months after shearing or contact with a lousy sheep, even if sheep have not been treated. If shorn sheep are not wetted thoroughly at dipping, or backline treatments are not correctly applied, it could be more than six months before lice can be easily found.

Lice spread slowly among sheep in the early stages of an infestation, but once signs of lice are seen in the mob the infestation can develop rapidly.

What factors influence lice build-up?

Temperature and humidity - All stages of sheep lice, including the eggs, are sensitive to extremes of temperature and humidity. This is why most lice die quickly once removed from sheep.

Wool length - Shearing removes up to 60 per cent of lice and exposes the remaining lice to unfavourable weather conditions. Thus, control measures are most effective when applied soon after shearing.

Rainfall - Large numbers of nymphs, adults and hatching eggs can be killed when the fleece becomes saturated by heavy rainfall.

Season - Lice tend to breed most quickly in autumn and winter, and remain in low numbers during summer. However, louse numbers can continue to increase through summer on sheep that have not recently been shorn.

How many lice does a sheep have?

If an average of one louse per 10 cm fleece parting is found, then the sheep is carrying about 3,000 to 4,000 lice. A very heavily infested sheep can have more than 100,000 lice on them.

In the early stages of an infestation even an extremely close examination may fail to find lice.

Sheep Lice

Where are lice found?

Most lice are found near the sheep's skin where they feed on scurf (scaly or shredded skin) and wool yolk. After shearing, lice will be found in poorly shorn patches where the longer wool provides protection - this is most commonly under the neck and on the flanks. In longer woolled sheep, lice are most common along the flanks and on the shoulders.

How far do lice move?

Lice move up and down the wool fibres but do not move far across the sheep's body. Therefore, when treating sheep for lice it is important to use the correct application technique so that all wool covered sites on the sheep get a lethal dose of chemical.

What damage do lice cause?

Reduced fleece weight - A light infestation (less than an average of one louse per 10 cm fleece parting) can reduce clean fleece weight by 0.2 kg/head. A heavy infestation (more than an average of five lice per parting) can reduce fleece weight by 1 kg clean.

Reduced fleece quality - Lice cause cotted, yellow wool, which will suffer a price discount when sold because of its poor performance during processing.

Damage to fences, troughs and other structures - Sheep rub to relieve irritation.

See “LICEBOSS” website for further information on sheep lice control.
www.wool.com/liceboss



Sheep Worms

Sheep worm facts

There are four main types of worms responsible for the worm problems occurring in Australian sheep flocks:

Ostertagia - Small brown stomach worm

Trichostrongylus - Black scour worm

Haemonchus - Barber's pole worm

Nematodirus - Thin necked intestinal worm



Sheep Worm

Assessing Worm Burdens

Scouring and ill-thrift are generally associated with worm infestations, however this is not always the case and can be poor indicators of the worm burden in the sheep.

There are two reliable ways of assessing worm burdens in sheep; faecal egg counts and total worm counts.

Faecal Egg Count

- Faecal egg counts are the best method for monitoring worm burdens in a mob of sheep.
- The number of worm eggs in a sheep's faeces is used to estimate the number of worms the animal is carrying.
- Generally 1-2 pellets from 10-15 sheep are collected by holding a mob of sheep against a fence or in a yard for a period of time.
- The advantages are:
 - Relatively simple and inexpensive.
 - If sampled correctly it gives a good assessment of worm burden.
 - Gives rate of pasture contamination by worm eggs.
 - It is not necessary to sacrifice any sheep.

Total Worm Count

- The total number of worms in a sheep can be counted and identified at post mortem.
- It provides an accurate count of the number of worms in an animal but it does involve sacrificing that sheep.



Sheep Worm

Worm Control Programs

When to Drench - A faecal egg count is the best practical guide currently available to decide on the need for treatment.

Choosing a Drench - When choosing a drench you need to know the specific properties and potential uses of all of the different drench groups and the current drench resistance status of your property.

Paddock Management – Where possible, put newly drenched sheep into a clean paddock that has not been recently grazed, as it will greatly assist in breaking the life cycle of the worms.

Drench Resistance

Drench resistance occurs once a population of a species of worm can survive a dose of a drench that would have previously killed it. Worms killed by a drench are said to be susceptible to the treatment.

The rate of development of drench resistance can be influenced by many factors such as:

- The chemical group and persistence of the product involved.
- The frequency of treatments.
- The worm species involved.
- Environmental factors such as climate.

See “**WORMBOSS**” website for further information on worm control.
www.wormboss.com.au

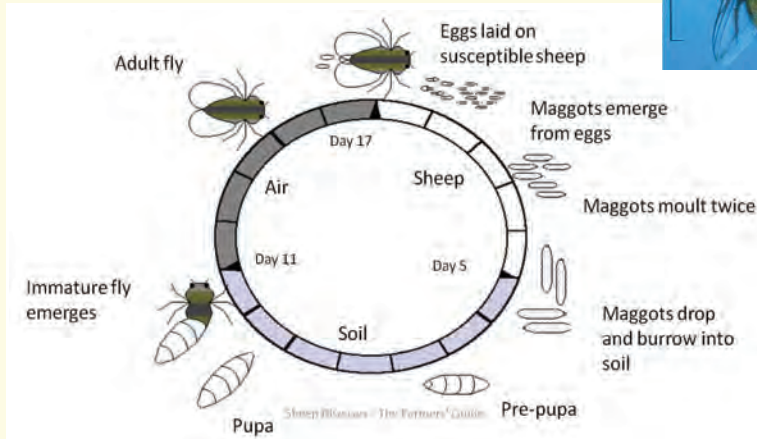
Fly Strike

Fly facts

Lucilia cuprina initiates more than 90% of flystrike in sheep.



The life cycle of the fly



Fly Strike

Blowfly Emergence

- Emergence controlled by soil temperature ($>15^{\circ}\text{C}$).
- Maggots survive in the ground over winter as larvae or pre-pupae.
- As soil temperature increases, larvae pupate.
- Males sexually mature when they emerge from the ground.
- Females must consume protein meal to mate and develop eggs.

Blowfly Strike

- Once mated, females search for susceptible sheep.
- May lay up to 300 eggs every 4-8 days.
- Depending on temperature, eggs hatch in 8-24 hours.
- Maggots feed for 3-5 days.
- Maggots moult twice during this time.
- Fully-fed maggots drop off, then burrow into loose soil.



Environmental Influences

- Sufficient rain to maintain fleece moisture long enough to cause fleece rot.
- Air temperature around 17°C or higher.
- Moderate wind speed around susceptible sheep ($< 30 \text{ km/hr}$).
- Other types of strike may occur in absence of rainfall if temperature and wind speed are right.

Fly Strike

Triggers

- Urine or faeces-stained wool.
- Moist fleece, e.g. wrinkle, fleece rot or mycotic dermatitis.
- Wounds from fighting.
- Sweat around base of horns.
- Any wound e.g. marking, mulesing or other injuries.

Recognition of Fly Struck Sheep

- Struck sheep:
 - appear generally sick and restless.
 - become separated from the flock.
 - move about with their heads close to the ground.
- The wool over the strike becomes dark, moist and foul smelling due to wetting with inflammatory exudates caused by the activities of the maggots.

Flystrike Control Strategies

- Shearing and crutching.
- Breech modification.
- Chemical application.
- Dag and scouring management.
- Breeding and selection.

Fly Strike

Shearing and Crutching

- Changing shearing and/or crutching dates may reduce the risk of fly strike.
- Altering shearing dates is a non-chemical way of controlling fly strike and reduces the dependence on chemicals.
- As flocks become plainer, they are easier to shear and crutch.
- Crutching reduces the risk of breech and pizzle strike significantly.
- Crutching is driven by shearing date - within 3 months of shearing.

Breech Modification

- Tail docking:
 - Dock immediately below third palpable joint (or to tip of vulva in ewes).
 - Allows sheep to lift tail well away from urine or faeces.
 - Reduces incidence of cancers.
- Mulesing:
 - Use pain relief when mulesing.
 - Current codes of practice for sheep state: Mulesing must not be done on sheep that are older than 12 months of age and anaesthetic must be used when mulesing sheep older than six months of age.

Fly Strike

Chemical Application

- Use chemicals strategically to prevent flystrike.
- Manage to prevent the development of resistance.
- Think about the insecticide 'class' (not products).
- Be aware of withholding periods & safety.
- Chemical resistance is caused by:
 - Exposing insects to concentrations of insecticide that do not kill them.
 - Resistant individuals surviving and breeding.
- Resistance risk factors:
 - If resistance is present in one insecticide in a chemical group, it will also be present in the other insecticides in that group.
 - Treatments applied to control sheep lice have contributed to resistance.
 - Over reliance on a single chemical class.
 - Re-treatment after failed initial treatment.
 - Use of a combination of dipping chemicals outside label recommendations.
 - Plunge or shower dipping with more than 6 weeks wool.
 - Poor application (uneven coverage).
 - Chemicals being applied twice in a growing season.

Fly Strike

Treatment of a Fly Struck Sheep

Flystruck sheep should be treated as soon as they are detected to:

- Minimise suffering.
 - Minimise the severity of the break in the fleece.
 - Minimise the risk of death.
 - Keep the fly population to a minimum by destroying the maggots before they drop off and pupate.
1. Shear struck wool and a 5 cm barrier of clean wool around the strike, close to the skin to remove maggots.
Unless wool is shorn off it is likely that maggot trails will be missed and sheep will remain struck.
 2. Collect the maggot-infested wool into a plastic bag and leave the bag in the sun for a couple of days to kill all maggots.
 - This breaks the life cycle.
 - Don't rely on registered flystrike dressings to kill maggots .
 - Many maggots escape treatment by dropping from the sheep and burrowing into the soil before the insecticide can be applied.
 3. Apply a registered flystrike dressing to the shorn area to prevent re-strike.
 4. Remove struck sheep from the mob.
 - Leaving struck sheep in the mob attracts blowflies.
 - Moving struck sheep to a 'hospital' paddock allows closer monitoring and recovery and reduces the risk to the rest of the mob.
 5. Adult ewes that sustain repeated flystrike should be culled from breeding programs.

See “FLYBOSS” website for further information on fly control.

www.flyboss.org.au

EXOTIC DISEASE WATCH HOTLINE 1800 675 888

24 Hour Service



Local PIRSA Animal Health Offices

Glenside	08 8207 7900	Murray Bridge	08 8539 2110
Clare	08 8842 6222	Nuriootpa	08 8568 6400
Mt Gambier	08 8735 1300	Lenswood	08 8389 8800
Kadina	08 8821 1555	Pt Lincoln	08 8688 3400
Kingscote	08 8553 4949	Struan	08 8762 9100
Pt Augusta	08 8648 5160		

Visit the Biosecurity SA website: www.pir.sa.gov.au/biosecuritysa