



Goat Diseases

The Farmers' Guide

September 2021



Government of South Australia

Department of Primary Industries
and Regions



Goat Diseases

The Farmers' Guide

Developed by:

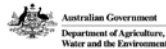
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Exotic and Notifiable Diseases

Reporting serious or unusual animal disease signs

Any unusual behaviour or clinical signs 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 local government veterinarian or biosecurity department

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

Unusual signs and Clinical Signs in animals

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

- Unexplained deaths, especially of kids.
- 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.
- 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.

Where to get help

Emergency Animal Disease Watch Hotline on 1800 675 888 (free call)

SA: PIRSA Biosecurity Animal Health (08) 8207 7900

QLD: Biosecurity Queensland 132 523

NSW: Local Land Services 1300 795 299

VIC: Agriculture Victoria – Animal Health 136 186

WA: Agriculture and Food (08) 9368 3333

ACT: Environment, Planning and Sustainable Development Directorate 132 281

TAS: Biosecurity Tasmania 1300 368 550

NT: Emergency Animal Disease Watch Hotline 1800 675 888

Good Biosecurity: Have a Biosecurity Plan

Having a biosecurity plan can greatly minimise your biosecurity risk and susceptibility to livestock disease outbreaks.

For more information on developing a biosecurity plan, please visit

www.animalhealthaustralia.com.au/what-we-do/endemic-disease/farm-biosecurity-plan

For National Goat Health Declarations and additional practical biosecurity information please visit

www.farmbiosecurity.com.au



VISITORS

**PLEASE RESPECT
FARM BIOSECURITY**

Please phone or visit the office before entering

 _____

Do not enter property without prior approval
Vehicles, people and equipment can carry weed seeds,
pests and diseases

 animalhealth AUSTRALIA

farmbiosecurity 

 Plant Health AUSTRALIA

Farm Biosecurity sign
Animal Health Australia
(AHA) and Plant Health
Australia (PHA)

Good Biosecurity: What to watch out for

Farm Inputs

Anything that can be moved on to your property including feed, water, animals and chemicals can be a biosecurity risk.

- **Feed:** Ensure it is accompanied by a Commodity Vendor Declaration (CVD) and inspect feed prior to purchase. Store feed in a clean, dry storage area and dispose of any old or contaminated feed appropriately.
- **Water:** Regularly inspect water sources and water storage and keep troughs clean. Inspect areas around water sources for new weeds and ensure any recycled water is managed properly according regulation.
- **New animals:** Always request a National Vendor Declaration (NVD) and National Goat Health Declaration (NGHD). Keep good stock records and ensure the National Livestock Identification System (NLIS) database is up to date. Be aware of the cleaning and hygiene of transporters and inspect and quarantine stock on arrival.
- The NGHD can be accessed here: www.farmbiosecurity.com.au/toolkit/declarations-and-statements
- **Chemicals:** Ensure staff using chemicals are appropriately trained and follow label instructions. Ensure Withholding Periods (WHP) and Export Slaughter Intervals (ESI) are met and keep a record of all chemical use.

Farm Outputs

- **Moving animals off the property:** Ensure animals are fit to load (page 72) and keep stock movement records. Supply NVD and NGHD and be aware of the cleaning and hygiene of transporters.
- **Taking animals to shows and sales:** In addition to the above, isolate returning stock for a minimum of 30 days to allow them to show signs of anything they may have picked up.

The image shows a sample National Vendor Declaration (NVD) form for goats and waterbirds. The form is titled "NATIONAL VENDOR DECLARATION (GOATS) AND WATERBIRDS" and includes a QR code and the number 38888888. It contains various sections for providing details of the goats, including property name, NLIS number (ABCD1234), and registration details. There are also sections for declarations regarding biosecurity measures, health status, and withholding periods. A large "SAMPLE" watermark is overlaid on the form.

Goat NVD form
MLA/ISIC

Ferals and Weeds

- **Wild and feral animal access:** Develop a feral animal control program and ideally co-ordinate it with neighbouring properties. Ensure fences are maintained and feed and water sources are protected.
- **Weeds:** Be aware of which weeds are found in your region and which are harmful to livestock. Have a weed management plan for your property and request a commodity declaration form for all purchased feed to reduce the risk of bringing weeds onto the property.

People, Vehicles and Equipment

- **People:** Have limited access points to the property, have a designated parking area for all visitors and provide a visitor register. Boots and equipment should be cleaned on arrival
- **Signage:** Use signs to inform visitors of biosecurity requirements
- **Vehicles:** Have limited access points to the property, have a designated parking area for all visitors and have a vehicle wash down facility
- **Equipment:** Have designated equipment for high biosecurity risk
- Activities / areas and ensure boots and equipment are cleaned before being used for other livestock



Managing a biosecurity incursion

STEP ONE » WHAT SHOULD I DO TO PREPARE?	STEP TWO » WHAT SHOULD I DO IF I NOTICE SOMETHING UNUSUAL?	STEP THREE » WHAT CAN I EXPECT FROM CALLING FOR ADVICE?	STEP FOUR » WHAT SUPPORT CAN I GET TO MANAGE THE PROBLEM?
<p>At a minimum you should have:</p> <ol style="list-style-type: none"> 1. A current farm biosecurity plan 2. A working relationship with a private vet 3. An easily accessible list of key contacts including for your private vet, government biosecurity officer, and the government biosecurity hotline that is easily accessible: The Emergency Animal Disease Hotline 1800 675 888 4. Regular monitoring of your herd to understand what is their normal behaviour and what is abnormal 5. A systematic approach to recording your observations and other key events related to your animals 6. Compliance with National Livestock Identification System (NLIS) requirements 7. Plenty of Personal Protective Equipment (PPE) on hand (check condition as it can perish over time) 	<p>Observe, assess, record: First step is to observe and assess the situation and surrounds, to gain information that will assist when you call a professional. Record these details – take photos and/or notes of condition and/or behaviour of the animal such as:</p> <ul style="list-style-type: none"> • notable signs of illness or infection, unusual posture or gait, changed feeding or watering habits, how many animals/herds affected, how long they appear to have been sick or dead, whether introduced or home-bred? <p>Then seek advice: Phone an animal health professional before proceeding further; call either:</p> <ul style="list-style-type: none"> • your local private vet Ph: _____ • a government vet or inspector Ph: _____ • if you suspect you are dealing with a notifiable or exotic disease, immediately: <ul style="list-style-type: none"> - Call the Emergency Disease Hotline 1800 675 888 - Restrict the movement of animals to avoid spreading disease and use Personal Protective Equipment to protect yourself. 	<p>A phone call to a professional may enable the vet or biosecurity officer to:</p> <ul style="list-style-type: none"> • determine whether the condition is a possible notifiable or exotic disease • exclude some diseases/conditions based on the information you provide • advise on safe handling of sick or dead animals • develop a list of possible differential diagnoses • determine whether a farm visit is necessary • determine whether to proceed with a post mortem and/or collection of samples <p>If the disease is confirmed by diagnosis as an exotic or notifiable disease, you will be contacted by your vet or a biosecurity officer who will instruct you on the appropriate actions you must take.</p> <p>If a non-notifiable disease or other non-notifiable cause (e.g. plant or chemical poisoning) is confirmed, your vet will provide guidance on appropriate treatment and/or necessary actions to protect the rest of your herd.</p>	<p>Your local private or government vet or biosecurity officer can provide advice on what support you may receive if a notifiable or significant disease is suspected and the best management procedures going forward.</p> <p>The Federal and State/Territory governments support farmers and private vets for diagnosing and managing notifiable diseases in a range of ways.</p>

Adapted from the FMD Ready Subproject 2 *Biosecurity and Surveillance Chain of Response Guide*

What Does a Healthy Goat Look Like?

Knowing what a healthy goat looks like, and understanding what normal behaviour is, can greatly help you detect when a goat is unhealthy and/or acting abnormally.

Animals should exhibit a healthy hair coat and skin and have a body condition score appropriate to their production stage. Additional information on body condition scoring can be found on page 74. Both coat and body condition score are good indications of overall health and nutritional status. Signs of an unhealthy animal may include:

- isolation from the rest of the herd
- abnormal eating habits
- depression
- scouring or diarrhoea
- abnormal vocalisation
- teeth grinding, or
- any other abnormal behaviour.

KEY INDICATORS OF GOAT HEALTH	NORMAL VALUES / MEASURES
Temperature	38.5–40°C – Rectal Temperature
Respiratory Rate*	10–30 breaths per minute
Heart Rate*	70–90 beats per minute
Rumen Contraction Rate	1–1.5 per minute

**Kids can be significantly higher*



Healthy Boer Goat MLA

Diseases of Goats

KEYS TO DIAGNOSIS BY CLINICAL SIGN

Abscess

Swellings
Cheesy Gland
Foot Abscess
Injury

Abortions / Stillbirths

Listeriosis
Many other causes

Anaemia

Barbers Pole
Cobalt Deficiency
Copper Deficiency
Johne's Disease
Liver Fluke
Oxalate Poisoning

Blindness

Pinkeye
Polioencephalomalacia
Pregnancy Toxaemia

Bottle Jaw

Barbers Pole
Johne's disease
Liver fluke

Convulsions

Polioencephalomalacia
Pulpy Kidney
Tetanus

Coughing

Pneumonia

Downer Goats

Botulism
CAE
Copper Poisoning
Milk Fever
Oxalate Poisoning
Polioencephalomalacia
Pulpy Kidney
Pregnancy Toxaemia

Ill Thrift

Barbers Pole
Other Worms
Cobalt Deficiency
Coccidiosis
Copper Deficiency
Copper Toxicity
Flystrike
Hardware Disease
Johne's Disease
Lupinosis
Mastitis
Nitrate Poisoning
Oxalate Poisoning
Photosensitisation
Polioencephalomalacia
Selenium Deficiency
Stomach Worms

Jaundice

Copper Poisoning
Lupinosis
Photosensitisation

Lameness

Laminitis post Acidosis
CAE
Foot Abscess
Footrot
Injury
Toe Abscess

Leg Paddling

Listeriosis
Milk Fever
Oxalate Poisoning
Polioencephalomacia
Pulpy Kidney
Tetanus

Lethargy

Barbers Pole and other worms
Copper Poisoning
Hardware Disease
Johne's Disease
Polioencephalomacia
Pregnancy Toxaemia
Salmonellosis
Urolithiasis

Nervous / Neurological Signs

Botulism
CAE
Copper Deficiency
Listeriosis
Lupinosis
Milk Fever
Oxalate Poisoning
Pulpy Kidney
Polioencephalomacia
Tetanus

Salivation / Frothing at the Mouth

Botulism
Listeriosis

Scabs

Cobalt Deficiency
Injury
Lupinosis
Photosensitisation
Scabby Mouth

Scours

Acidosis
Coccidiosis
Copper Poisoning
Johne's Disease
Nitrate Poisoning
Salmonellosis
Worms

Sudden Death

Acidosis
Barbers Pole
Copper Poisoning
Flystrike
Hardware Disease
Listeriosis
Milk Fever
Oxalate Poisoning
Polioencephalomacia
Pulpy Kidney
Salmonellosis
Tetanus

Acidosis

Cause

- Overconsumption of, or unaccustomed access to, high risk grain such as wheat or barley

Clinical Signs

- Signs occur within 24–36 hours of changing to a grain rich diet
- Mildly affected goats may have diarrhoea but continue to eat
- More severely affected goats may stop eating, have cow-pat like faeces or scouring, rumen feels sloppy when push on the abdomen, slow or no rumen movements, may spit out their cud and grind their teeth.
- Some affected goats die over 2–3 days and others slowly recover. Those that recover are often chronically lame due to the laminitis that often develops later after a bout of acidosis.



Grain overloaded rumen
PIRSA (Jeremy Rogers)

Acidosis Continued

Diagnosis

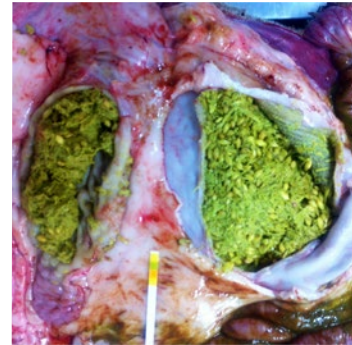
- A history of eating high risk grain without being acclimatised, clinical signs and post-mortem findings
- On post-mortem, damage to the rumen wall may be seen
- Rumen contents have a foul smell, is acidic (often 5 or below) and can appear milky

Treatment

- Remove animals from grain, feed good quality hay, and provide access to water
- Treat with a paste of sodium bicarbonate (bicarb soda) at a dose of 100g/goat
- Acidosis has a high mortality rate so veterinary treatment is best for expensive goats
- Goats that do not die from acidosis may develop laminitis or polioencephalomalacia, so arrange to have some have some Non-Steroidal Anti-Inflammatory Drugs and Vitamin B1/ thiamine on hand

Prevention

- Gradual introduction of high risk grains into the diet
- Make sure goats cannot get sudden access to grain



Acidosis (Colin Trengove)

Barbers Pole

Cause

- Barbers Pole (*Haemonchus contortus*) is a common worm in goats, especially in Queensland and Northern NSW. However the range for barbers pole is expanding.

Clinical Signs

- Anaemia, lethargy, failure to gain weight and bottle jaw
- Weakness and fall behind if mustered
- In severe cases, death will occur, often before any body condition is lost

Diagnosis

- Performing regular worm egg counts
- Clinical Signs
- On post-mortem, worms can be seen in the fourth stomach (rumen) or at least the pinpoint red lesions where they were attached.

Treatment

- Drenching with an appropriate and effective drench (see page 62)

Prevention

- Using a good and effective drenching program
- Grazing management for worm control



Anaemia caused by Barbers Pole LLS (Kylie Greentree)



Bottle Jaw from Barbers Pole LLS (Kylie Greentree)



Barbers Pole infestation of the abomasum PIRSA (Jeremy Rogers)

Bladder Worm

Problem

- There are no clinical signs in live goats. At slaughter however, infected organs, usually the liver, are trimmed or condemned. This is a cost to industry

Cause

- Bladder worm is the cystic stage of the dog tapeworm *Taenia hydatigena* seen in goats
- Bladder worm, also known as false hydatids, are not hydatids. They are not a risk to human health

Clinical Signs

- No clinical signs

Diagnosis

- Bladder worm cannot be detected in live goat but are readily seen at slaughter when meat inspectors detect:
 - Tracts in the liver from migrating larvae
 - Thin walled fluid filled cysts ('bladders') on the liver or in the abdomen
 - White scars on the liver surface (remnants of old cysts)

Treatment

- There is no effective treatment for bladder worm

Prevention

- Worm all dogs monthly with a tapeworm tablet (must contain praziquantel)
- Don't feed raw meat / offal to dogs. Instead, cook thoroughly or freeze at -10° C for 10 days
- Burn or bury carcasses to prevent scavenging



Bladder Worm MINTRAC

Botulism

Cause

- Occurs when potent toxins are produced by the bacterium *Clostridium botulinum*
- Most cases occur in pastoral areas in association with phosphorus deficiency, as goats chew old bones to get phosphorus. Can also occur if goats eat spoilt feed.

Clinical Signs

- Early signs are incoordination, loss of appetite, excessive salivation, mild excitability, nervous twitching, tongue protrusion and jaw champing
- As the disease progresses, goat become dull, respiration becomes laboured and flaccid paralysis of limbs sets in
- Affected goats will go down and die quietly, generally within 2–3 days of initial signs

Diagnosis

- Diagnosis is based on history and clinical signs and the stopping of animals becoming affected after vaccination

Treatment

- Treatment is often unsuccessful if animals have become recumbent
- Supportive nursing care should be provided to affected animals

Prevention

- Two doses of botulism vaccine 12 months apart will provide life-long immunity however, it is only recommended in areas where phosphorus deficiency and botulism are problematic.

CAE (Caprine Arthritis Encephalitis)

Cause

- A viral disease of goats, most commonly found in dairy goats
- The disease is generally spread from mother to kid through the colostrum or milk but all body fluids contain the virus. Prolonged close contact with carriers can spread CAE.

Clinical Signs

- There are several different clinical presentations of CAE
- Arthritis
 - Swelling of one or more knees ‘big knees’
 - Goats will generally be lame in more than one joint.
- Wasting despite access to feed
- Pneumonia with mouth breathing and unable to exercise
- “Hard udder” where udder feels like two smooth rocks
- Encephalitis
 - Generally, occurs in kids 2–4 months of age
 - Incoordination and hind limb paralysis
 - Short stepping gate leading to inability to stand and death



‘Big Knees’ caused by CAE
Sandra Baxendell

CAE (Caprine Arthritis Encephalitis) Continued

Diagnosis

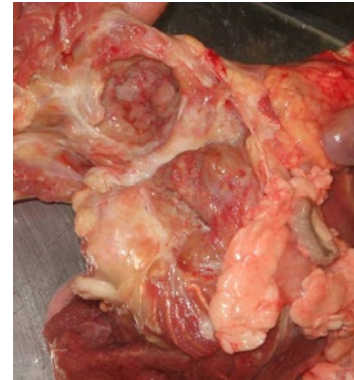
- Clinical signs and serological testing

Treatment

- There is no treatment other than palliative care. Animal remains infected for life

Prevention

- Use serological testing to detect CAE in infected goats with no sign of disease
- Avoid feeding pooled milk to kids, mixing goats from different farms and introducing new goats into the mob
- Avoid sharing unsterilised equipment between goats



Arthritic knee joint caused by CAE MINTRAC

Cheesy Gland (CLA)

Problem

- Affects carcass quality leading to condemnations and trimmings
- Internal abscesses can lead to ill-thrift

Cause

- A bacterial infection that causes abscesses in the lymph nodes and lungs
- Abscess of the lymph nodes may occur in the head, neck, shoulder, flank or udder

Clinical Signs

- Most goats will show no clinical signs and the disease will be detected at slaughter
- Fever and loss of appetite may occur

Diagnosis

- Detected at slaughter

Treatment

- There is no effective treatment for CLA

Prevention

- Vaccination is the best prevention. Kids must get two vaccinations 4–6 weeks apart.



Cheesy gland of the udder
LLS (Kylie Greentree)



Cheesy gland of the lymph node

Cobalt Deficiency

Cause

- Generally, occurs on sandy coastal soils
- Cobalt is utilised by goat in the formation of vitamin B12

Clinical Signs

- Goats are ill-thrifty and anaemic
- Goats often have weepy eyes, scaly ears, pale skin and mucous membranes, reduced weight gain and decreased milk production

Diagnosis

- Blood testing for B12 and or cobalt
- Liver cobalt and Vitamin B12 levels

Treatment

- Vitamin B12 injections. Can use vaccines containing B12
- Drench with cobalt. Some worm drenches contain added cobalt

Prevention

- In recognised cobalt deficient area, B12 injections or cobalt bullets should be administered



Anaemia from cobalt deficiency

LLS (Kylie Greentree)

Coccidiosis

Cause

- Caused by a protozoan parasite which invades the cells of the intestinal walls

Clinical Signs

- Ill-thrift and severe diarrhoea containing blood. Kids often strain when scouring.
- Generally a disease of kids from three weeks to post weaning.
- Can occur in stressed adult goats in close confinement
- Can result in death
- Recovered animals may have permanent intestinal damage resulting in reduced weight gain and milk production

Diagnosis

- Clinical signs and post-mortem examination of the intestines at the laboratory
- Faecal worm test results can indicate the presence of coccidial oocysts but it is a poor guide to the severity of damage to the wall of the intestinal tract

Treatment

- Affected goats generally respond to treatment with a 'sulpha' drug by injection or drench
- Veterinary advice should be sought before administering the treatment as these drugs are not registered for goats
- Electrolyte therapy will help to replace lost fluid due to the scouring

Prevention

- Prevent goats from grazing areas with large numbers of oocysts
- There are coccidiostats registered for meat goats that can be added to feed pellets
- Reduce stresses in the environment



Scour from coccidiosis
LLS (Kylie Greentree)

Copper Deficiency

Cause

- Mineral deficiency from grazing pastures deficient in copper or high in minerals that block copper e.g. molybdenum

Clinical Signs

- Ill-thrift scouring, rough dull coat, anaemia and reduced reproduction rate
- In kids, a hind limb incoordination or swaying gate can occur ‘swayback’

Diagnosis

- History and clinical signs
- Testing copper levels in blood or liver

Treatment

- Treatment with copper should only be administered after copper deficiency is confirmed.
- There are two types of copper treatment available – copper oxide capsules are registered for goats but injections are not. Worm drenches containing copper can be used under veterinary supervision.
- Treatment of kids with “swayback” is unlikely to be successful as the nerves have not formed properly in utero

Prevention

- Where the pasture concentration of copper is low, top dress with copper
- Capsules can be used in areas of known copper deficiency as a prevention. Highly recommended for pregnant does if the property has had cases of “swayback”.



Severely anaemic carcass of a copper deficient goat
MINTRAC

Copper Poisoning

Cause

- Copper poisoning occurs when copper accumulates to toxic levels in the liver, as a result of an imbalance between uptake and excretion

Clinical Signs

- Sudden death
- Jaundice, red urine, depression and collapse

Diagnosis

- History and clinical signs
- Testing copper levels in blood or tissue.
- Copper may have left the liver for the kidneys which are a dark blue/black colour

Treatment

- There is no economic treatment for copper toxicity.

Prevention

- Avoid feedstuffs and mineral supplements with extra copper and treatments for copper deficiency, unless copper deficiency is confirmed



Jaundiced carcass as a result of copper poisoning

MINTRAC

Flystrike

Cause

- Although flystrike in goats is significantly less common than in goat, it does occur, particularly in fibre goats.
- *Lucilia cuprina* initiates more than 90% of flystrike in Australia

Clinical Signs

- Flystruck animals will generally appear sick and restless and will often separate from the mob
- Flystruck areas will be damp and foul smelling with maggots visible on closer examination

Diagnosis

- Clinical signs



Flystruck wound in a goat

Cathy Zwick

Flystrike Continued

Treatments

- Flystruck goats should be treated as soon as they are detected to minimise suffering and reduce the risk of death
 1. Shear the hair from the affected area close to the skin, plus 5 cm barrier around the strike to remove maggots
 2. Collect the maggot-infested hair into a plastic bag and leave the bag in the sun for a couple of days to kill all maggots
 3. Apply a registered flystrike dressing to the area to prevent re-strike
 4. Remove struck goats from the herd as leaving them will attract more blowflies. Moving struck animals to a 'hospital' paddock allows closer monitoring and recovery and reduces the risk to the rest of the herd

Management

If flystrike is a problem in your enterprise, the following can be used to manage the risk:

- Shearing and crutching.
- Chemical application.
- Dag and scouring management.
- Breeding and selection.
- For more information, please visit www.flyboss.com.au/sheep-goats

Foot Abscess

Cause

- Generally, occurs when paddocks are wet and muddy and is caused by a bacteria entering the foot

Clinical Signs

- Foot abscess is an infection of the distal interphalangeal joint which extends down from infection of the interdigital skin. The affected area is hot and swollen, with or without pus bursting out
- A foot abscess will contain bloody then light brown or green pus
- Goats with a foot abscess are very lame and lose condition until the abscess bursts and the pus drains out. Excess granulomatous tissue can form at the exit and can interfere with pus drainage and should be scraped away

Diagnosis

- Examination of the feet of lame goats
- Unlike footrot, only a few goats will be affected in any mob.

Treatment

- Once the abscess bursts, healing should occur without further treatment
- Some foot abscesses may result in damaged foot joints and chronic lameness

Prevention

- Keep susceptible goats out of muddy paddocks where possible



Foot abscess

LLS (Kylie Greentree)

Footrot NOTIFIABLE DISEASE

Cause

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

Clinical Signs

- Lameness, generally in more than one foot of a large proportion of the herd
- On examination of the feet, signs will range from mild redness, hair loss and moisture between the toes to lesions underrunning the entire hoof separating the hoof from the toe
- Footrot has a characteristic putrid smell but there will be no swelling and no pus



Footrot in goats
LLS (Kylie Greentree)

Footrot Continued

Diagnosis

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

Treatment

- Seek veterinary help to confirm the virulence of the strain/s on your farm and the best treatment options. These options include foot baths (with paring of under-run hooves), antibiotic injections and vaccinations
- 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 goats during the non-spread period
 3. Surveillance phase – involves surveillance of the whole flock to ensure the disease has been eradicated and preventing reinfection



Footrot (Colin Trengove)

Hardware Disease (Traumatic Reticuloperitonitis)

Cause

- Swallowing hard metallic objects such as wire, needles or nails. The object perforates the reticulum or rumen and causes leakage of gut content into the abdominal cavity
- Rare in goats, unlike cattle, due to their feeding behaviour

Clinical Signs

- Reduced appetite, ill-thrift, fever and arched stance
- Animal will appear pained and depressed
- Respirations may be slow and rapid

Diagnosis

- A definitive diagnosis can only be made by post-mortem

Treatment

- Oral administration of a magnet may assist in immobilising the object
- Antibiotics may help prevent infection
- If clinical signs persist, a veterinary consultation is required to determine the next course of treatment
- If the animal does not improve and veterinary assistance is unavailable, the animal may require euthanasia on welfare grounds



Some items that may cause hardware disease
MLA

Hydatids

Problem

- There are no clinical signs in live goats, however, at slaughter affected organs are condemned
- Hydatids can cause serious, sometimes fatal, disease in people

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 goat

Clinical Signs

- No clinical signs

Diagnosis

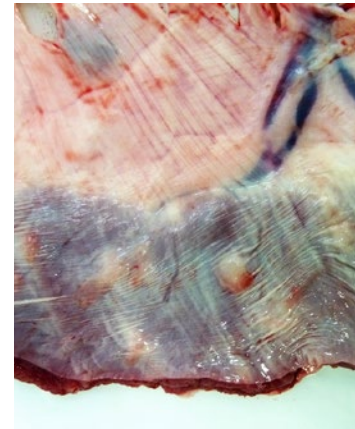
- Cannot be detected on live animals but affected carcasses are condemned at slaughter

Treatment

- There is no effective treatment for Hydatids

Prevention

- Worm all dogs monthly with a tapeworm tablet (must contain praziquantel)
- Don't feed raw meat / offal to dogs. Instead cook through entirely or freeze at -10°C or 10 days.
- Burn or bury carcasses to prevent scavenging



Hydatid cysts
MINTRAC

Injuries

Cause

- Injuries are generally accidents involving one animal injuring another, or when an animal falls or strikes surrounding infrastructure (flooring, fence, gate)
- Poorly designed or maintained facilities such as yards, laneways, fences, gates and flooring, may increase the risk of injury to animals while being housed or handled
- Poor stockmanship, including rough handling and applying excessive pressure, may also contribute to the risk of injury

Clinical Signs

- Clinical signs may include fractures, dislocations, wounds, subcutaneous bruising, haematoma, and cellulitis or other forms of infection

Treatment

- Animals with severe injuries (such as fractures) that interfere with walking, eating and drinking, should be euthanised
- Animals with wounds should be isolated to a clean area and the wounds cleaned
- Lamé animals should be moved to a hospital pen with uninhibited trough access
- Dislocated joints require early intervention and expertise for successful reduction

Prevention

- Ensure all handling facilities are in good working condition and are regularly maintained
- Ensure all staff are adequately trained in stock handling



Broken leg DAF (Kylie Hopkins)



Tear in skin from wire



Dog bite wound Cathy Zwick

Johne's Disease

NOTIFIABLE DISEASE

Cause

- Johne's disease (JD), also called paratuberculosis, is an incurable wasting disease of livestock
- Goats can become infected with JD 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
- Some goats infected with JD 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 goats do not begin to show any signs of illness until after two years of age

Clinical Signs

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



Thickening of intestines caused by Johne's Disease
PIRSA (Jeremy Rogers)

Johne's Disease Continued

Diagnosis

- Taking a pooled faecal sample from a selection of animals over two years old on the property
- Individual animals can be tested by faecal samples or blood tests. No test picks up the early incubation stage
- On post-mortem, thickening of the intestines and enlarged lymph nodes may be seen in affected animals

Treatment

- There is no treatment for JD

Prevention

- Purchase low risk stock only
- Consider vaccination of your mob with Gudair®
- Ensure all purchased goats are accompanied by a NGHD and meet the entry requirements for JD in your state



Wasting cause by
Johne's Disease

Listeriosis

Cause

- Listeriosis is a 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

Clinical Signs

- Initial signs are depression, anorexia (not eating), disorientation, head tilt, and circling
- As the disease progresses, facial paralysis may develop, causing the ear and eyelid to droop, the muzzle to be pulled to one side, and a lack of muscle tone of the lip of the affected side
- Profuse salivation may also be observed
- Abortion, stillbirths, and neonatal death may occur in the herd but not generally at the same time as the nervous form
- There is usually a high death rate

Diagnosis

- Clinical signs and post-mortem samples sent to a veterinary laboratory
- On post-mortem there will be no significant findings but if the brain and a portion of the spinal cord are collected, laboratory testing can detect the disease

Treatment

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

Prevention

- Care should be taken to avoid feeding livestock spoiled silage or ingesting soil
- 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 veterinarian

Lupinosis

Cause

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

Clinical Signs

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

Diagnosis

- A history of grazing lupin stubble or eating lupin grain; clinical signs shown by affected goats and post-mortem findings
- On post-mortem, the animal will be jaundiced with yellowing of the fat, skin and most importantly, the liver



Jaundiced liver caused by lupinosis
PIRSA (Jeremy Rogers)

Lupinosis Continued

Treatment

- There is no treatment for lupinosis, however steps can be taken to minimise the number of goats 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 animals should be fed a low protein diet of hay and grains with a low protein content
- Affected animals should have access to a ready supply of good quality water and plenty of shelter

Prevention

- Check goats daily when grazing lupin stubble, drive the mob around the paddock for at least 500 metres looking for any animals lagging behind
- If rain occurs or there is a heavy dew, remove the goats 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 goats that have a history of liver damage that may be more susceptible to lupinosis
- Feed only good quality lupin grain to goats. It is a good idea to have lupins tested before feeding – this can be done through Agrifood Technology in Werribee, Victoria



Goat standing away from the mob, not eating

Mastitis

Cause

- Inflammation of the mammary glands
- Can be caused by bacteria, fungi or mycoplasma.
- Physical injury or stress may predispose to mastitis.
- Most common in dairy goats but is occasionally seen in other breeds

Clinical Signs

- Drop in milk yield and abnormal milk texture, colour, smell or taste
- Swollen, red or misshapen udder
- Ill-thrift or weight loss

Diagnosis

- Clinical signs

Treatment

- Affected does should be isolated and milked last if in a dairy situation
- Depending on the severity of the mastitis, antibiotics may be needed
- Veterinary advice should be sought
- Meat goats should have their udders examined at weaning or marking
- Any does with hard udders or scar tissue should be culled before the next mating season



Swollen, red udder from mastitis



Dissection of an udder with mastitis MLA

Milk Fever

Cause

- Occurs when the calcium levels in the blood fall below normal
- Often seen in conjunction with low blood magnesium (hypomagnesaemia or grass tetany)
- Most common in the last few weeks of pregnancy or the first few weeks after kidding

Clinical Signs

- Initial signs include a staggery gait and muscle tremors and the goat moves or struggles when approached
- Affected goats then go down often in a sitting position with their head turned around to their flank
- Sub-clinical cases can present as dystocia due to weak uterine muscles
- Death will occur within 24–36 hours of initial signs

Diagnosis

- Herd history; clinical signs shown by affected goats and the rapid response to treatment

Treatment

- Animals will respond rapidly to calcium injections with treated goats possibly getting up and walking away within minutes. Ideally, a veterinarian would give 50–80 ml of 20% calcium borogluconate solution IV while monitoring the heart, then another 100 ml under the skin
- 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 goats in the last month of pregnancy, or with young kids at foot
- Avoid grazing late pregnancy or lactating does on lush pasture or cereal crops
- Keep calcium and magnesium solution on hand while handling pregnant or lactating does
- Supply a mix of two parts stock salt to one part stock lime next to the drinking water source for the herd during the last two weeks of pregnancy and early lactation

Nitrate Poisoning

Cause

- A common disease when goats 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

Clinical Signs

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

Diagnosis

- A history of grazing plants with a high nitrate level; and post-mortem specimens being submitted to a laboratory

Treatment

- The scouring should stop when the animals are removed from the high nitrate feed
- Valuable goats with discolouration of the mucous membranes can be treated with 1–2% methylene blue solution intravenously by a veterinarian
- However this is a carcinogen and the meat withholding period is very long

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)



Scouring goat caused by nitrate poisoning
LLS (Kylie Greentree)

Oxalate Poisoning

Cause

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

Clinical Signs

- Acute oxalate poisoning:
 - The first signs occur within 1–3 hours of goats eating the high oxalate plants
 - Affected goats have muscle tremors and a staggery gait. They will go down but will be alert and struggle when handled. Leg paddling may occur
 - Within hours the goat will become exhausted, the struggling will stop, they will sink into a coma with death occurring soon after. Goats will often be found dead without signs of struggling
- Chronic oxalate poisoning:
 - Goats with chronic oxalate poisoning are generally poor doers and are anaemic with pale membranes
 - Sporadic death occurs within an affected herd



Pale kidneys from chronic oxalate poisoning, look closely for very fine crystals/streaks in the kidney
PIRSA (Jeremy Rogers)

Oxalate Poisoning Continued

Diagnosis

- A history of goats grazing high oxalate plants and clinical signs
- Examining the goat's kidneys under a microscope

Treatment

- Goat with acute poisoning should be treated with calcium solution as for milk fever (page 36)
- There is no effective treatment for chronic poisoning

Prevention

- Ensure hungry goats do not have access to a paddock with large amounts of high oxalate plants



Leg paddling of a goat with acute oxalate poisoning

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

Clinical Signs

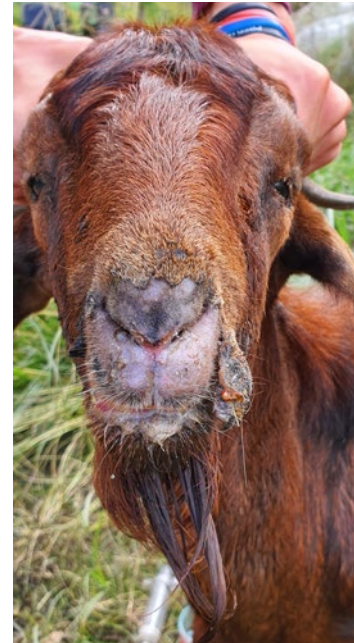
- Affected animals are initially restless, they seek shade, shake their heads and may rub their ears and eyes
- Later signs may range from mild to severe sunburn, loss of appetite, jaundice and death
- Areas of skin not covered by hair are the most affected such as face, ears and vulva
- Fluid may build 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

- Examination of affected goat

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 (consult your veterinarian)



Photosensitisation from lantana consumption
Kylie Leahy, Mt Roy Stud

Pinkeye

Cause

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

Clinical Signs

- The first sign of pinkeye is the inflammation of the eye membranes and the production of clear watery tears that run down the cheek
- As the pinkeye progresses, the cornea (the clear eye surface) develops a blue haze that becomes more cloudy and turns white over 3–4 days
- Shallow ulcers may develop on the cornea
- A goat with pinkeye cannot see out of that eye so goats 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

- Examination of the eye of affected goats

Treatment

- Most cases recover without treatment in 2–3 weeks
- Yarding goats can make the situation worse as dust and flies can make the infection spread through the mob
- Antibiotic ointment and antibiotic injections can also be used with positive results, but must be used under veterinary advice



Pinkeye in a kid with ulceration MLA



Pinkeye in a goat with blue haze and cloudiness

Pneumonia

Cause

- Inflammation or infections of the lungs
- Pneumonia may be viral, bacterial, fungal or from aspiration.

Clinical Signs

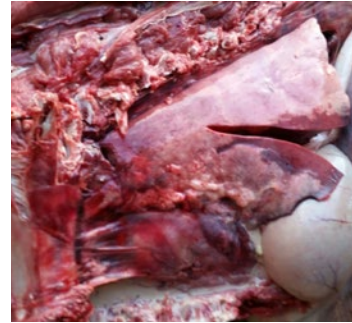
- Difficulty breathing, coughing, fever, rapid respiratory rate and nasal discharge
- The laboured breathing will often cause lethargy and slow movement

Diagnosis

- Clinical signs and post-mortem examination of the chest cavity and lungs

Treatment

- Treatment is dependent on the cause of the pneumonia
- Veterinary prescribed antibiotics are generally required
- Provide easy access to feed and water
- Severely affected animals may require euthanasia



Pneumonic changes in the lungs with consolidated portions and pus
PIRSA (Jeremy Rogers)

Polioencephalomalacia (PEM)

Cause

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

Clinical Signs

- The first signs are listlessness and a loss of appetite, affected goats will separate from the rest of the mob, appear blind and either wander aimlessly or stand still
- Goats 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 goats will go down and if startled may start galloping leg movements and have convulsions
- A goat that is down will generally have its head and neck arched back stiffly
- If not treated, goats will get weaker, sink into a coma and die within 2–3 days

Diagnosis

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

Treatment

- Goats respond to thiamine or B1 injections which are available from most rural stores. Repeat doses will be needed every 6 hours until normal
- Mildly affected goats will improve within 6–8 hours of treatment
- Goats that are down will have irreversible damage to the brain and should be destroyed on welfare grounds



Head and neck arched back stiffly from PEM

Kylie Leahy Mt Roy Stud

Pregnancy Toxaemia

Cause

- Common disease of ewes in the last six weeks of pregnancy and immediately after kidding
- During late pregnancy, the doe has a very high energy requirement to provide for her own needs and the growth of the kid or kids she is carrying
- If the energy requirement is not met by feed intake, the doe will break down her own body tissues
- If the rate at which the doe breaks down her tissues is too rapid, toxic wastes from the breakdown process accumulate and pregnancy toxaemia occurs
- Seen in either very thin or very fat does and does carry triplets or quads
- Rangeland does often abort, rather than develop pregnancy toxaemia, if nutrition is poor

Clinical Signs

- The initial signs are dullness, swelling of the lower limbs, loss of appetite and affected goats lagging behind the herd when driven
- Later the doe will stand alone, appear dopey and will not move when approached
- If driven the doe will appear blind, stumble and go down
- The doe will eventually sink into a coma and die within 5–7 days



Heavily pregnant doe with multiples at risk of pregnancy toxaemia
MLA

Pregnancy Toxaemia Continued

Diagnosis

- Based on flock history, presence of ketones in the urine and clinical signs shown by affected does 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 inside the abdomen (which physically limited feed intake)

Sometimes the liver is so badly affected a piece of it will float in water due to the infiltrated fat

Treatment

- Treatment is usually unrewarding as most goats die despite treatment
- If treatment is to be given, the strategy is to give the doe a source of energy
- Treatment must be given as soon as possible after initial signs to be of any benefit
- Oral propylene glycol solutions are readily available from most rural stores. Glycerine can also be used – 60 ml in warm water twice a day

Prevention

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

Pulpy Kidney Enterotoxaemia

Cause

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

Clinical Signs

- Most goats with pulpy kidney are found dead as the disease develops very quickly and death will occur within hours of initial signs
- Initial signs of pulpy kidney are dullness followed by goats going down with convulsions and frothing at the mouth
- Death will generally occur within 24 hours

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, brain and urine
- On post-mortem the pericardial fluid may clot on exposure to air. There may be glucose in the urine and tiny haemorrhages scattered in some muscles

Treatment

- There is no economic treatment available. Veterinarian can treat with intravenous antibiotics and fluids

Prevention

- Vaccination is the key to prevention of pulpy kidney. Note goats require more frequent vaccination than sheep

Salmonellosis

Cause

- An infectious disease of livestock caused by *Salmonella* bacteria

Clinical Signs

- Affected animals appear dull, have a fever and have profuse scouring
- The scours are often watery with strands of mucous
- Death generally occurs within 12–24 hours of onset of clinical signs
- Surviving animals may suffer serious setbacks and become poor performers

Diagnosis

- Diagnosis is based on clinical signs, mob history, culture of faecal samples and post-mortem examination
- On post-mortem examination, enlarged lymph nodes and inflamed intestines will be evident

Treatment

- Affected goats may be treated with antibiotics and electrolyte therapy if caught early, however, treatment is generally unsuccessful. This is a zoonotic disease so care must be taken when handling sick goats
- The spread of the disease can be slowed by minimising stress on affected mobs, decreasing stocking density by opening gates and ensuring animals have access to good quality feed and water



Scour from salmonellosis
LLS (Kylie Greentree)

Scabby Mouth (Orf)

Cause

- A viral disease that affects goat and humans. The virus can survive on the ground for many years

Clinical Signs

- Multiple animals may be affected, with the most common site of infection being the lips / mouth
- Scabby mouth scabs can also be found on the teats of does, on the skin around the coronet and the bulbs of the heels
- Infection begins with a clear sticky discharge which then hardens into a thick brown scab firmly attached to the skin beneath it

Diagnosis

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



Scabby mouth of the lips and mouth

PIRSA (Jeremy Rogers)

Scabby Mouth (Orf) Continued

Treatment

- Provided the scab is not knocked or pulled off, most cases recover with no treatment within three weeks and precautions against flystrike should be taken during this time
- Goats 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. Do not vaccinate unless you have confirmed scabby mouth on your property. Avoid vaccination of does with kids at foot



Scabby mouth of the foot
PIRSA (Jeremy Rogers)

Selenium Deficiency

Cause

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

Clinical Signs

- Generally seen in spring born kids at 3–4 weeks of age
- Affected kids walk with a stiff gait and appear weak
- Severe cases die of starvation, exposure or predation
- Some kids die of heart 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 goats by injection or as a drench
- There is a very small safety margin in regard 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. There are slow release pellets registered for sheep, but not goats
- Care must be taken to not overdose by supplementation with repeat vaccination/drenching

Tetanus

Cause

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

Clinical Signs

- 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 kids 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 goats

Treatment

- There is no economic treatment for tetanus. Veterinary treatment is often disappointing unless started early

Prevention

- Vaccination is the key to prevention of tetanus
- See the 'vaccination program' section for a detailed description of best practice for vaccinations (page 54)
- Good hygiene at kid marking is important in preventing tetanus

Toe Abscess (White line abscess)

Cause

- Various agents enter through the hoof via cracks especially in the white line (between hoof wall and sole) area

Clinical Signs

- Only one hoof is affected on the severely lame leg
- Most cases are only in the toe but if untreated the abscess will discharge eventually at the coronet (where hair meets the hoof)
- Only a small percentage of the herd are infected

Diagnosis

- Based on clinical signs shown by affected goats

Treatment

- After finding the most painful area, hoof paring to establish drainage and release the pus

Prevention

- There is no prevention strategies as the different bacteria that invade the toe are found anywhere in the environment

Urolithiasis

Urinary Calculi or Bladder Stones

Cause

- A common ailment of male goats
- The calculi form when minerals in the bladder precipitate to form crystals
- The crystals grow in size as more minerals are deposited

Clinical Signs

- Affected animals are initially restless and regularly strain to try to pass urine
- If the urinary calculi can pass, the animal will release a large volume of urine
- If the urinary calculi can't pass, the urine will become backed up and will start to be absorbed into the blood stream and the bladder may rupture. If this happens, the animals will initially improve but quickly become dull, fall into a coma and die

Diagnosis

- Diagnosis is by examination of the animal and observing clinical signs
- On post-mortem, urinary calculi will be visible in the bladder and evidence of leaked urine or a ruptured bladder or urethra may be evident

Treatment

- If the urinary calculi are lodged in the tip of the penis, it can sometimes be milked out or the worm like structure removed from the end of the penis with scissors
- The stones should be kept for mineral analysis as there are a few different types
- If the animal can't pass the calculi on its own, the only treatment available is surgical removal however this is rarely economical



Urinary calculi being milked out of the tip of the penis
PIRSA (Jeremy Rogers)

Vaccination

Vaccines that are registered for use in goats are shown in the table below:

NAME	ACTIVES
Coopers® Tasvax 5in1 Vaccine for Sheep, Cattle and Goats Plus Selenium for Lambs	Selenium as Sodium Selenate <i>Clostridium chauvoei</i> – Toxoid <i>Clostridium novyi</i> Type B – Toxoid <i>Clostridium perfringens</i> Type D Toxoid <i>Clostridium septicum</i> – Toxoid <i>Clostridium tetani</i> – Toxoid
Gudair® Vaccine	<i>Mycobacterium paratuberculosis</i>
Glanvac® 3 Vaccine	<i>Clostridium perfringens</i> Type D Toxoid <i>Clostridium tetani</i> – Toxoid <i>Corynebacterium pseudotuberculosis</i> (ovis) – Toxoid
Glanvac® 6 Vaccine	<i>Clostridium chauvoei</i> – Formol Culture <i>Clostridium novyi</i> Type B – Toxoid <i>Clostridium perfringens</i> Type D Toxoid <i>Clostridium septicum</i> – Toxoid <i>Clostridium tetani</i> – Toxoid <i>Corynebacterium pseudotuberculosis</i> (ovis) – Toxoid
Equivac® T Vaccine	<i>Clostridium tetani</i> UF Toxoid
Leptoshield® Vaccine	<i>Leptospira interrogans</i> serovar <i>pomona</i> – Formol culture <i>Leptospira borgpetersenii</i> serovar <i>hardjo</i> Type <i>hardjobovi</i>
Glanvac® 6 B12 Vaccine	Vitamin B12 (Hydroxocobalamin acetate) <i>Clostridium chauvoei</i> – Formol Culture Enterotoxaemia = Pulpy Kidney = <i>Cl. perfringens</i> <i>Clostridium novyi</i> Type B Malignant oedema = <i>Clostridium septicum</i> CLA = <i>Corynebacterium pseudotuberculosis</i> (ovis) Tetanus = <i>Clostridium tetani</i>
Coopers® Tasvax 5in1 Vaccine for Sheep, Cattle and Goats	<i>Clostridium chauvoei</i> – Killed <i>Clostridium novyi</i> Type B – Killed <i>Clostridium chauvoei</i> – Toxoid <i>Clostridium novyi</i> Type B – Toxoid <i>Clostridium perfringens</i> Type D Toxoid <i>Clostridium septicum</i> – Toxoid <i>Clostridium tetani</i> – Toxoid

Vaccination Continued

Clostridial diseases

- Available Vaccines – 2-in-1 (tetanus and pulpy kidney), 3-in-1 (tetanus, pulpy kidney and cheesy gland) or 5-in-1 vaccine (tetanus, black disease, black leg, malignant oedema and enterotoxaemia)
- Note research has shown that goats react badly to multiple vaccines so the smallest number of active ingredients should be chosen based on diagnosed problems on your property. The fewer ingredients also means the lumps at the site of vaccination will be smaller

Caseous Lymphadenitis (CLA)

- Available Vaccines – Glanvac® 3 (tetanus, pulpy kidney and cheesy gland), Glanvac® 6 (tetanus, pulpy kidney, black leg, malignant oedema, black disease and cheesy gland) or Glanvac® 6 B12
- Note the manufacturers of Glanvac® recommend that as goats do not commonly suffer from clostridial diseases other than tetanus and enterotoxaemia; that farmers use Glanvac® 3 unless these diseases are known to occur in goats on the property

Leptospirosis

- Clinical cases of leptospirosis is rare in goats, unlike in cattle

Gudair®

- Registered as an aid in the control of Johne's disease in goats. Only one injection is needed i.e. no booster is required
- Kids should be vaccinated between one and four months of age

Vaccination Continued

Clostridial disease and cheesy gland vaccination

For maximum protection of newborn kids:

- Vaccinate does four weeks before kidding

For protection of kids from unvaccinated does:

- Vaccinate at six weeks with a booster 4–6 weeks later

For protection of kids from vaccinated does:

- Vaccinate kids at 6–8 weeks, with a second 4–6 weeks later.

Older stock:

- Annual booster timed before known high-risk periods. More frequently in high-risk situations, such as grain feeding in drought

New stock:

- If goats come from a herd with a known history of vaccination, simply slot the animals into the existing herd program
- If vaccination history unknown, give a sensitising dose as per label directions, then a booster 4–6 weeks later. Follow with annual boosters as per the rest of the herd
- All new stock should be quarantined and carefully monitored for signs of illness/disease for at least seven days, prior to introduction to other animals on the property

Vaccination Continued

Key points when injecting:

- Give low volume (less than 5 ml) subcutaneous injections high on the goat's neck, behind the ear, and high volume ones under the skin of the chest, over the ribs
- Give intramuscular injections in the muscles of the neck, in front of the goat's shoulder, at a maximum of 10 ml per injection site
- Read all product labels and veterinarian's instructions before use, and take note of the withholding period, export slaughter interval, dose rate and site of injection. Record the batch number, expiry date and date of treatment
- Use sterilised injecting guns, syringes and sharp needles. Replace needles frequently and change needles that are blunt, bent or dirty
- Train all operators in injection technique, and how to avoid accidental self-injection and exposure to injected medicines
- Take special care when injecting oil-based vaccines and Gudair® so use guarded needle vaccinating guns
- Carefully dispose of needles and other sharps according to local government requirements



Correct vaccination technique for intramuscular injection

Agriculture Victoria (Berwyn Squire)

Worms

SIGNS OF WORMS

Bottle Jaw (sub-mandibular oedema)

- Swelling under the jaw results from severe barber's pole worm or liverfluke. Johnne's disease can also cause bottle jaw

Coughing and pneumonia

- The large lungworm infects the airways of goats and causes the production of a frothy mucus that will cause the animal to cough; there may also be a nasal discharge. In heavy infections pneumonia (inflammation and infection in the lung tissue) may be evident, accompanied by rapid breathing. Infection with the small lung worm rarely produces clinical evidence of disease in affected animals

Anaemia

- Barber's pole worm is the only roundworm to cause anaemia (blood loss) as it sucks blood from the lining of the fourth stomach (abomasum). Severe acute or ongoing (chronic) blood loss from barber's pole worm leads to obvious signs of anaemia. These are pale gums and conjunctiva (inside the eyelids); lack of stamina causing lagging or collapse when mustered; and ultimately death from lack of red blood cells needed to carry oxygen around the body
- Liver fluke can also cause anaemia

Lethargy and Collapse

- Lethargy or weakness can result from a severe infection of many worms

Weight Loss

- An infection with scour worms results in a marked decrease in appetite and reduced digestive efficiency. As a result, affected animals lose weight and with severe infections can become emaciated

Scouring

- The presence of scour worms initiates a strong immune response from the host animal that damages the lining of the gut resulting in diarrhoea (scouring). Coccidiosis can also cause scouring

Worms

TYPES OF WORMS

Barber's Pole Worm

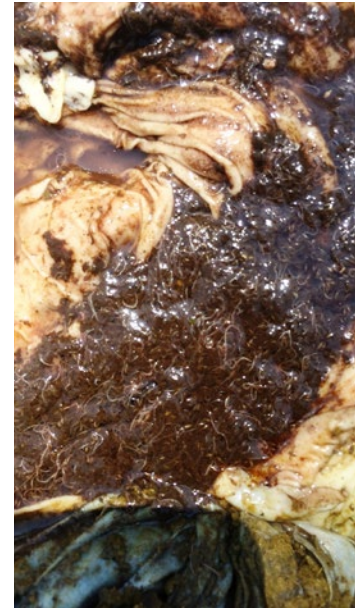
- Barber's pole worm is most commonly found in Queensland and the northern half of NSW where summer rainfall is common or dominant. However its range is increasing
- The adult female worms are quite long (20 to 30 mm) and clearly visible. They have the characteristic 'barber's pole' appearance due to the pink (blood-filled) intestinal tract of the worm twisted around the paler reproductive tract; whereas the males are smaller (around 15 mm) and pale pink
- Generally located in the abomasum
- Signs include anaemia, lethargy, collapse, failure to gain weight, bottle-jaw and death

Black Scour Worms

- Black scour worms occur in all goat and goat production districts of Australia
- All scour worms are small, hair-like worms tapered at one end. Males are 4–6 mm long and the females are 5–7 mm long, and not easily seen at post-mortem
- Generally located in the small intestine
- Signs include lethargy, collapse, weight loss, scouring and death

Brown Stomach Worm

- Brown stomach worm occurs in most goat and goat areas of Australia and is a major parasite in winter rainfall districts. It is relatively rare in Queensland
- It is a small red-brown worm, 10 mm in length that is just visible on the lining of the fourth stomach (abomasum)
- Generally located in the abomasum
- Signs include lethargy, collapse, weight loss, scouring and death



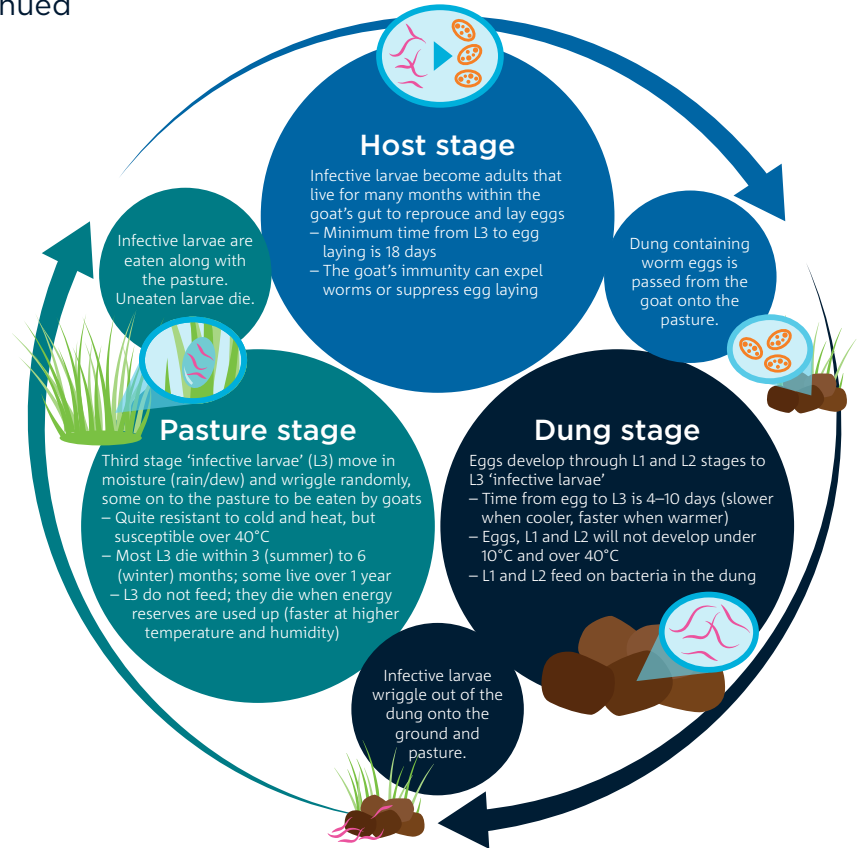
Barbers pole in abomasum
LLS (Kylie Greentree)

Worms

TYPES OF WORMS Continued

Thin-necked intestinal worm

- Thin-necked intestinal worm occurs in most of the major goat and goat production areas of Australia but is mostly an issue in the winter rainfall districts
- They are relatively long worms with a slender anterior end that is frequently coiled
- Generally located in the small intestines
- Signs include lethargy, collapse, weight loss, scouring and death



Worms TREATMENT AND PREVENTION

Treatment

A faecal egg count is best practice in determining when to treat for worms. There are limited drenches registered for treatment of worms in goats. Drench resistance is a growing problem so drenches should only be used when a worm burden is causing ill health or production losses.

When selecting a drench to control worms, consider the following four R's:

1. The use of **REGISTERED** drenches with a vet's prescription for a higher dose rate than on the label
2. Chemical **RESIDUES** following treatment
3. Worm **RESISTANCE** to drenches
4. The number of parasites in the **REFUGIA** (animals, paddocks, mobs not exposed to drench)

Additional information can be found at www.wormboss.com.au and by talking to your local veterinarian.

Drenching

Key points when drenching:

- Use an effective product for the job and always check that the drench gun is compatible with the product. If in doubt, ask your veterinarian or animal health adviser.
- Carefully read the label before drenching and follow the instructions. Adhere to the recommended dose rate, withholding period, export slaughter interval and any precautions or contraindications.
- Calibrate the drench gun using a measuring cylinder or large disposable syringe before the start of drenching, and recheck after every 200 goats. Weigh some goats to set the appropriate dose for the heaviest goat in the mob.
- Excess speed can cause goats to be missed, spit out the drench or to be injured.
- Keep the goat's head level (horizontal) with one hand while slipping the gun into the side of its mouth. Place the tip of the barrel over the goat's tongue and gently depress the trigger.
- When dispensing large volume treatments, such as for metabolic diseases, stop briefly after each 10 ml to check that the goat is swallowing.
- Shake the drench before use to ensure the active ingredient is evenly distributed through the product.
- Hold goats off feed for up to 24 hours before drenching and six hours after drenching if possible, as it may improve drench efficacy.
- Only use a drench off label under the advice of a veterinarian.



**Correct drenching technique
in goats**

Agriculture Victoria (Berwyn Squire)

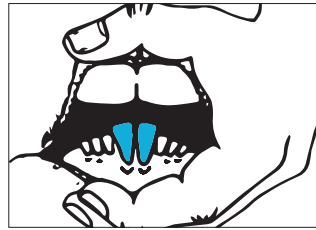
Mouthing for Age

Goats mouths are inspected to:

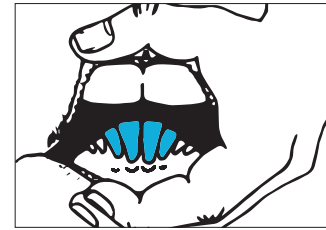
- Determine their age
- Determine the condition of their teeth and mouth
- Determine if the animal meets market specifications



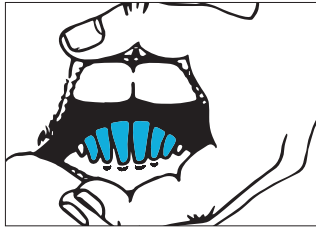
Milk Teeth
kid less than 18 months old



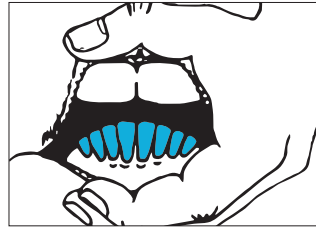
Two Tooth
13–15 months old



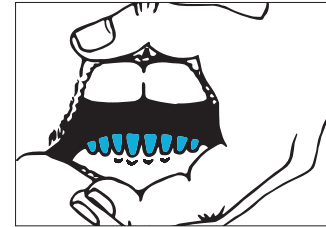
Four Tooth
18–21 months old



Six Tooth
22–24 months old



Eight Tooth
27–32 months old



Worn and Broken Teeth
four years and older

Foot Paring

Key points when foot paring:

- Foot health is essential to the wellbeing of goats.
- Goat productivity can be severely affected by lameness.
- Knowing the normal shape of the goat's foot and how to pare feet will help detect problems earlier.
- Promptly inspect the feet of any goats that are lame and take appropriate action.
- Prior to purchasing goats always inspect the feet of as many of the goats as possible and request a fully completed National Goat Health Declaration.
- Inspect bucks' feet prior to purchase, and at least eight weeks before joining. Pare to the normal shape if required.
- Over trimming feet causes bleeding and pain and can lead to the formation of toe granulomas.
- After paring, observe goats for lameness and bleeding. Keep any lame goats or goats with bleeding feet in a holding paddock with feed, water and shelter until they have recovered.



Overgrown toe needing paring LLS (Kylie Greentree)



Correct paring technique to bring toe back to a normal shape Agriculture Victoria (Berwyn Squire)

Disbudding

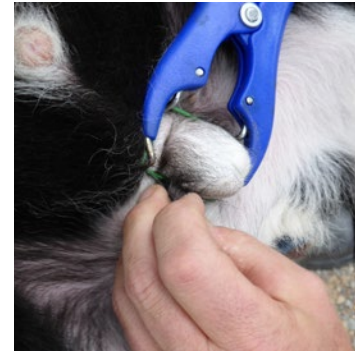
Key points when disbudding (removal of horn buds in kids):

- Always disbud animals as soon as there is enough horn bud can be felt to properly centre the horn bud to minimise pain and stress to the animals and limit production losses. This can be as early as 3–4 days in bucks and 5–7 days in does and up to two weeks in miniature kids. Disbudding should not be conducted after three weeks of age.
- Ensure good restraint facilities.
- Ensure adequate protection against tetanus.
- Ensure instruments are well-maintained, clean and sharp.
- Do not use caustic dehorning chemicals.
- Do not use tools such as axes, hammers and chain saws.
- Ideally use a pain killer as prescribed by your veterinarian
- Use a hot disbudding iron to burn the horn bud and area around it. The hot iron also cauterises the blood vessels.
- Inspect kids frequently (daily) after disbudding for approximately 10 days to detect complications. If these occur, treatment should be quickly administered.

Castration

Key points when castrating:

- Kids should be castrated before they reach 12 weeks of age. Castrating kids older than 12 weeks is not considered best practice. In some states kids over two months can only be castrated by a veterinarian.
- The most common method of castrating kids is with elastrator rings. Elastrator rings:
 - Have less overall welfare impact on the kids compared to using a marking knife or scalpel
 - Reduce the risk of bleeding
 - Reduce the risk of transferring blood between animals and reduces the risk of spreading disease
 - Removes the workplace health and safety risk of exposure to blood and working with knives or scalpels
- The use of a marking knife or scalpel is a less common option.
- The operator should be competent in the castration technique.
- Pain relief must be given. Cost effective pain relief products are available through your veterinarian.



**Correct castration technique
with elastrator rings**

Agriculture Victoria (Berwyn Squire)

Kidding

NORMAL BIRTH PROCESS

Signs the doe is ready to kid

- Udder will be firm and enlarged
- Swollen vulva and thick mucous discharge will appear
- Doe may separate from the herd and find a quiet area

The Kidding Process

- The doe will paw the ground and get up and down frequently
- The water bag will appear and generally burst
- For a normal presentation, the nose and front hooves will then be visible
- The doe will then lie on the ground and push until the kid is born
- The birth membranes will be expelled soon after the kid is born
- The doe will lick her kid dry and attempt to feed within the first hour of birth



Thick mucous discharge and appearance of the water bag Kylie Hopkins (DAF Queensland)



Normal kidding presentation of nose and front hooves Kylie Hopkins (DAF Queensland)

Kidding DIFFICULTIES

Abnormal Presentations

- Forward presentation – head first with front legs back
 - Will often require assistance
- Forward presentation – front legs first with head back
 - Will often require assistance
- Backward presentation – hind legs first
 - Generally, won't require assistance
 - Normal presentation for the second kid
- Breech presentation – rump first with all legs facing forward
 - Will require assistance

Other Potential Difficulties

- Overgrown kids
- Twins and triplets
- Deformed kids
- Dead kids
- Twisted Uterus
- Retained birth membranes
- Prolapsed Uterus

Kidding DIFFICULTIES Continued

Kidding Assistance

- Hygiene and lubrication
 - Clean soapy water to wash the doe's rear end and your hand and arm prior to examining the animal. It is essential that no dirt or faecal material is introduced into the vagina to prevent infection. Apply antiseptic to gloved arm.
 - Lubricant – More damage can be done to the doe if a suitable lubricant is not used. The water bag lubricates the process during a normal birth however if the doe has been labouring for a long time, this lubrication will have dried up. The lubricant should ideally be placed behind any stuck kid by use of some tubing on a large syringe.
- Assessing the problem
 - Is the cervix open – if the cervix is not fully open and you can only fit a couple of fingers through, do not try and assist further. The doe needs to be left quietly to continue labour and to allow the cervix to open naturally.
 - How many kids – you need to determine how many kids are in the birth canal as two kids cannot fit through the pelvis at the same time.
- Applying traction
 - Gentle traction should be applied when necessary. Excessive force through the use of vehicles, bikes etc should not be used.
 - A soft rope should be attached to the visible hoof or hooves or around the head taking care that it is fastened behind both ears and tightens through the mouth.
 - Ensure adequate lubricant is applied to reduce the risk of injury to the doe and kid.

Rearing Orphan Kids

Fostering

- This is the easiest option if a suitable doe is available and willing to accept the orphan kid.
- Confining the doe and orphan kid in a small area will often help with the bonding process and this should be continued for several days until the bond is well established

Colostrum

- The first milk (colostrum) is full of antibodies and is high in energy and vitamin A. Without it the kid is more susceptible to cold stress, diseases and death.
- Newborn kids should receive colostrum as its first feed and this must be in the first 4–6 hours of life, as the kid's gut loses the ability to absorb antibodies very rapidly after this time. If a suitable freshly kidded doe is available, consider restraining the doe and allowing the orphan kid to suckle the colostrum. Alternatively, milk out one side of the doe and bottle feed the colostrum to the orphan kid.
- Sheep or cow's colostrum can be used if no goat colostrum is available, alternatively there are commercial powdered colostrum replacer and recipes for artificial colostrum but it is not as effective as the real thing. Raw egg must not be fed to young kids in any colostrum recipe as it is restricted animal matter and can't be fed to ruminant animals in some states.

For detailed information on colostrum management and feeding, refer to the AHA publication *Snatch Rearing and Pre-Weaning Kid Management in Goat Enterprises*.



Doe naturally raising twin kids
MLA

Rearing Orphan Kids Continued

Feeding milk

- There are several options for milk for feeding orphan kids
 - Goat milk from other lactating does
 - Full cream cow's milk
 - Goat or calf milk replacer
- Milk requirements are based on kids' weight and should be around 15% of the kid's weight over a 24 hour period.
- The following table shows an average small breed kid age and milk requirements

AGE	MILK REQUIRED
1–3 days	150 ml four times per day
4–9 days	300 ml four times per day
10–14 days	500 ml three times per day
15–21 days	Gradually increasing to 1 L twice per day
3–6 weeks	1 L twice per day, gradually decreasing milk over 7–10 days to wean

Kids need access to water grain and hay from the first week. Weaning should only occur if the kid is eating sufficient hay and grain.



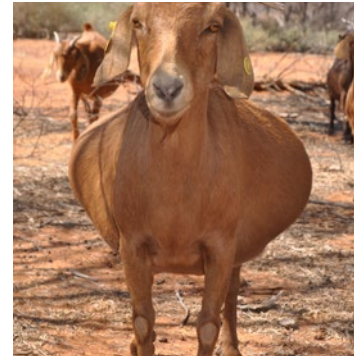
Bottle feeding an orphan kid
MLA

Fit to Load

- Remember, it is your responsibility to ensure animals are fit to load and fit for the intended journey before they are loaded.
- Before livestock are loaded, ensure you complete this checklist.
The animal:
 - can walk on its own by bearing weight on all four legs
 - is free from visible signs of severe injury or distress or conditions likely to further compromise its welfare during transport
 - is strong enough to make the journey (i.e. not dehydrated or emaciated)
 - can see well enough to walk, load and travel without impairment or distress (e.g. it is not blind in both eyes)
 - is not in late pregnancy or too young to travel (refer to the Standards to determine limits for late pregnancy)
 - has had adequate access to water prior to loading to meet the maximum time off water standards



Not fit to load as it is unable to bear weight on all four legs Kylie Hopkins (DAF)



Not fit to load as the doe is too late in pregnancy MLA

National Livestock Identification System (NLIS)

The National Livestock Identification System (NLIS) is Australia's system for the identification and traceability of cattle, sheep and goats. NLIS reflects Australia's commitment to biosecurity and food safety and provides a competitive advantage in a global market.

As goats are bought, sold and moved along the supply chain, they must be tagged with an NLIS-accredited tag or device, unless they are eligible to be moved tag free in your state or territory.

The NLIS is underpinned by state and territory legislation, which forms the regulatory framework for the system. Producers need to comply with relevant legislation in the jurisdiction in which they operate.

The basic requirements of the NLIS for goat producers are:

- All goat properties must have a Property Identification Code (PIC) or equivalent
- All goat movements must be accompanied by a Livestock Production Assurance (LPA) National Vendor Declaration (NVD) or alternate documentation
- All goats must be tagged with an accredited NLIS tag or device before being moved off a property, unless a tagging exemption applies (rangeland goats harvested from the wild and dairy goats are exempt from tagging in some states and territories)
- When moving goats that are non-vendor bred animals and which have not been previously tagged, post breeder devices must be applied (unless there is a tagging exemption for the movement)
- Check with your state/territory NLIS authority to find out what exemptions apply in your jurisdiction

More information on the NLIS system can be found here: **NLIS**

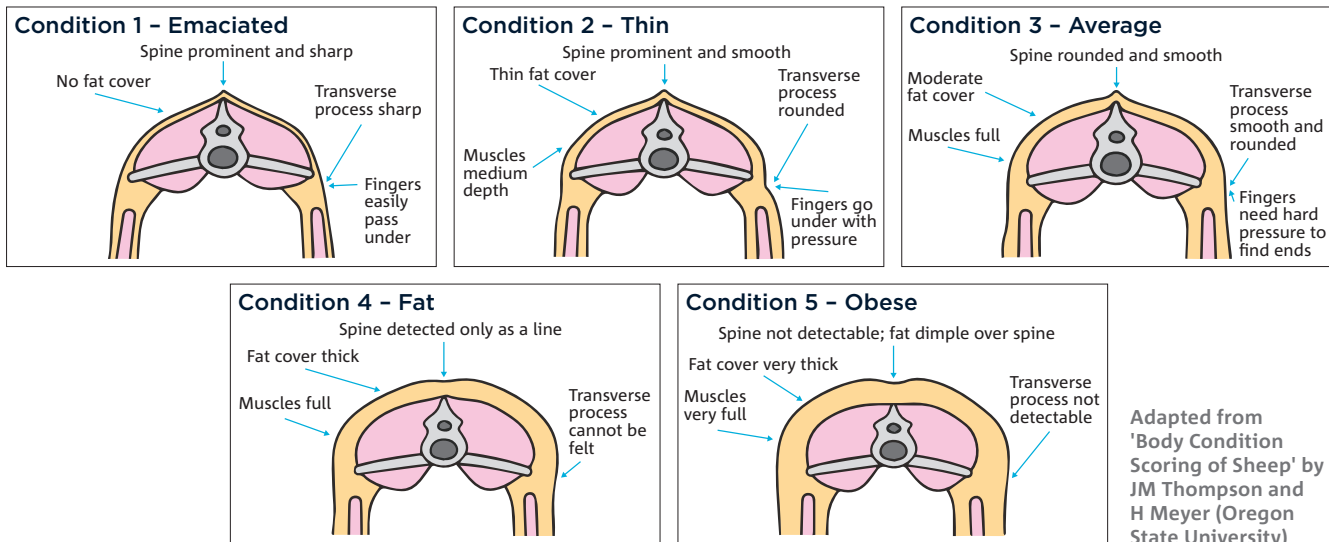
www.integritysystems.com.au/identification--traceability/national-livestock-identification-system

Body Condition Scoring

Condition scoring is important in all aspects of goat management, but especially so in the breeding of does.

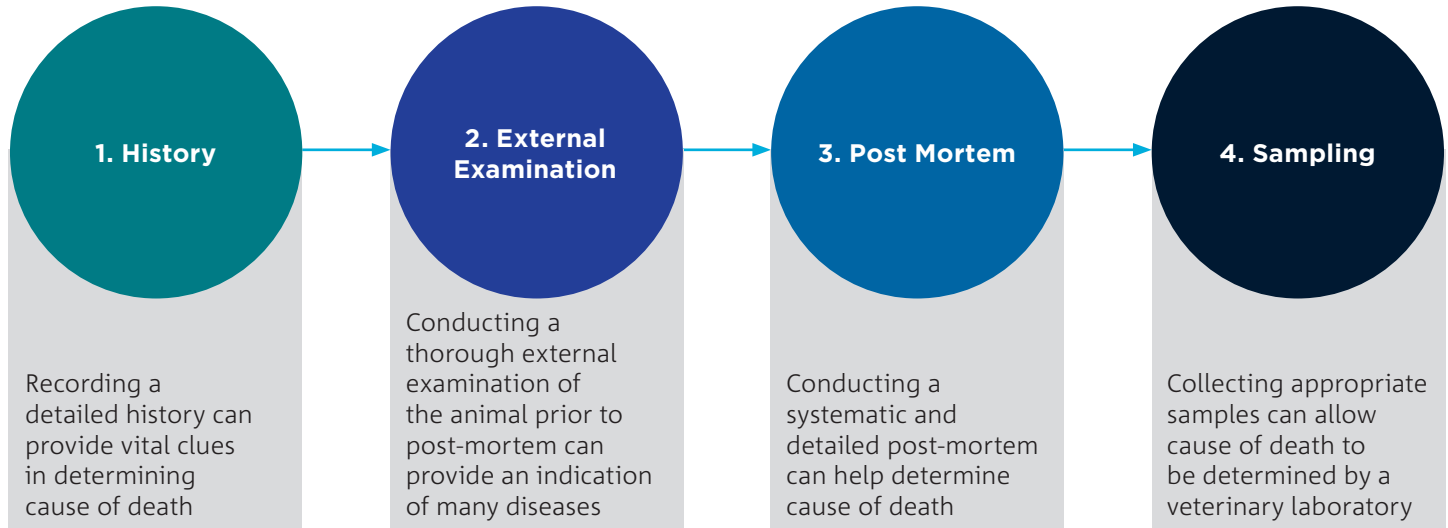
Does with condition scores of between 3 and 4 are more likely to get into kid, conceive earlier and conceive twins. Condition scores of between 3 and 4, when giving birth, allow the doe to kid more quickly, produce a healthy, active kid and produce more milk for the kid.

To determine the condition score, you feel the grid reference (GR) site of the goat. This point is located 110 millimetres from the backline along the second-last long rib. The condition score relates to the tissue depth (in millimetres) at the GR site.



Adapted from 'Body Condition Scoring of Sheep' by JM Thompson and H Meyer (Oregon State University)

Ruminant Disease Investigation



Ideally, a **disease investigation should be conducted by a qualified veterinarian**. When embarking on a disease investigation, exotic or notifiable diseases should always be at the forefront and if it is suspected that the animal had one of these diseases, stop the investigation immediately and call your local veterinarian, biosecurity contact or the Emergency Animal Disease Hotline.

This disease investigation methodology should be used as a guide only and it is not recommended that you undertake a disease investigation unless you are trained to do so.

Personal Protective Equipment and Standard Post-Mortem Equipment

If you attempt to carry out a disease investigation on your property, it is essential that appropriate personal protective equipment be worn.

Some animal diseases can be passed onto humans with debilitating or even fatal results (e.g. anthrax)

At a minimum, latex or nitrile gloves and rubber boots should be worn prior to touching the animal.

- If you have not been vaccinated for Q-Fever or do not know your Q-Fever status, a face mask should be worn.
- Overalls are also recommended. Disposable overalls are available from most rural stores and hardware stores.

Equipment required for a post-mortem:

- boning and skinning knives
- scissors
- scalpel and blades
- forceps
- large pruning secateurs
- small axe
- hammer
- pH strips
- urine test strips
- if you are collecting samples, you will also need sterile specimen jars, needles and syringes, swabs and formalin
- a camera and ideally a second person to take the photos is also very useful



Personal protective equipment should be worn when conducting a disease investigation MLA



Standard post-mortem equipment MLA

Investigation

1. Collect History and Record Findings

CONTACT DETAILS	<ul style="list-style-type: none"> Name, Phone, Address, Email 	
ANIMAL IDENTIFICATION AND HISTORY OF THE ANIMAL	<ul style="list-style-type: none"> Species, Breed, Sex, Age Number in Herd and Number Affected Date of Death and Onset of Symptoms Joining/Reproductive Supplementary Feeding and Water Drenching, Vaccinations and Other Treatments Stock Movements and Introductions 	
EXTERNAL EXAMINATION	<ul style="list-style-type: none"> Body Condition Score Observation of Dead Animal Ears, Eyes, Nose and Mouth Anus, Genitalia and Mammary Glands Skin and Coat Limbs and Feet 	
POST-MORTEM	<ul style="list-style-type: none"> Subcutaneous and Muscle Tissues Blood Joints Chest Cavity incl. Heart and Lungs Trachea and Oesophagus Liver, Spleen, Kidneys 	<ul style="list-style-type: none"> Lymph Nodes Bladder and Urine Reproductive Tract Faeces Large Intestine, Colon, Cecum and Small Intestines Abomasum, Omasum, Reticulum and Rumen



Collecting history on feed and water can provide insight into why and animal has died MLA

Investigation

2. External Examination

Ear tag or tattoo or other identification

- Body Condition Score: 1–5 (see page 74)
- Observation of Dead Animal: Signs of paddling, head position, discharges. Was it under a tree or near a metal gate?
- Check the umbilicus area in kids for any hernias, abscesses or infections
- Ears, Eyes, Nose and Mouth: Mucous membrane colour in mouth and around the eyes, any discharges, ulcerations, scabs, lesions, excess salivation, worn or sharp teeth, mouth abscess or obstructions. NOTE if you are in a known anthrax area and blood discharges are present do not continue with the post-mortem and contact your local veterinarian or government vet or inspector. Anthrax is a notifiable disease in most states.
- Rectum, Genitalia and Mammary Glands: Colour, swelling, discharge, lesions, diarrhoea, prolapse or injury.
- Skin and Coat: Colour, rough or sleek coat, lesions, swellings, patches of missing hair, peeling skin, scorch marks, abnormal growths, presence of lice or other external parasites.
- Wounds
- Limbs and Feet: Lesions, swellings, discharge, wounds, overgrown toes, deformities.
- When did the animal die. If the animal died more than six hours ago, generally it is unsuitable for post-mortem.



External examination of the nose and mouth MLA

Investigation

3. Post-Mortem

3.1 Open the Carcass

Place the goat on its left side.

- Reflect the top side limbs
- Skin the top side of the goat
- Does the underside of the skin feel “tacky”?
If yes, this is a sign of dehydration

Fat

- What colour is the subcutaneous fat?
- How much subcutaneous fat?

Muscle Tissue

- What colour is the muscle tissue?
- Are there any cysts or abnormalities?

Joints

- What colour is the fluid in the joint?
- Are there any erosions or signs of wear and tear in the joint?



Display stage of a post-mortem

MLA

3.2 Open the Abdominal Cavity

- Carefully cut through the abdominal muscles from sternum to anus. Take care not to rupture any of the abdominal organs
- How much internal fat is present? (goats have more internal fat than sheep)

Observe the contents in place

- Is there any fluid in the cavity?
- Is there any discolouration or noticeable findings?
- Are any organs displaced or twisted?



Opening the abdominal cavity

MLA

3.3 Open the Chest Cavity

- Cut the diaphragm along the inside of the ribs
- Use the base of the knife to cut through the sternum
- Use the rib cutters to remove the top rib cage
- Are the lungs an even colour all over?
- Is there any fluid in the chest cavity? What colour is it?
- Are there any adhesions between the lungs and the rib cage?



Opening the chest cavity
MLA

3.4 Open and Examine the Neck and Mouth

- Cut the neck from the chest to the chin
- Expose the trachea (windpipe) and esophagus and cut through the middle of the lower jaw to open the oral cavity
- Check for loose teeth, abscesses, injuries, erosions, foreign objects and lesions



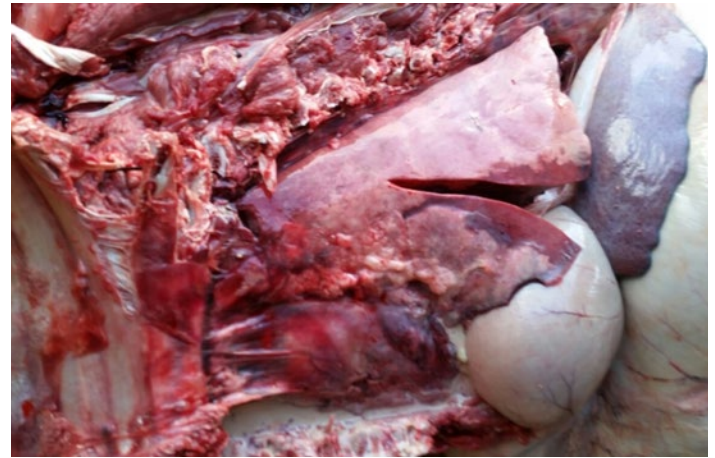
Opening the oral cavity MLA

3.5 Examine the Lungs

- What colour are the lungs? Are there any signs of pus? Are there any congested areas?
All of these can be signs of pneumonia
- Normal lungs should be fluffy and pink



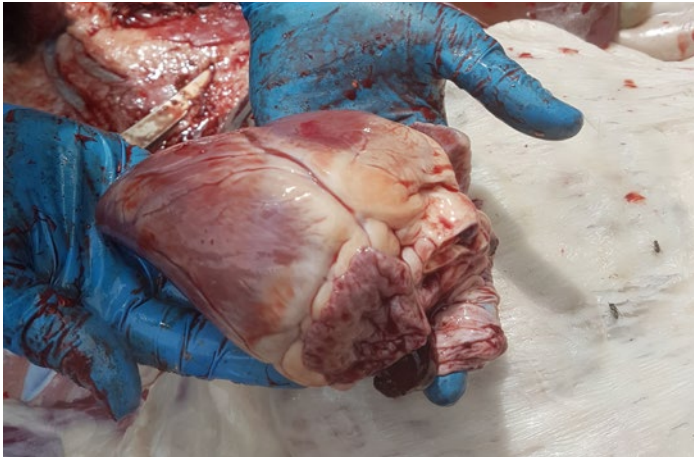
Healthy lungs
MLA



Pneumonia lungs with consolidation and pus
MLA

3.6 Examine the Heart

- Open the heart sac and examine the surface of the heart.
- Is there any fluid in the heart sac? Does the fluid clot on exposure to air? Are there any lesions, white areas or haemorrhages on the surface of the heart? Dissect the heart. Are the valves intact? Are there any abscesses or cauliflower type growths?



Examination of the surface of the heart

MLA



Examination of the heart valves

MLA

3.7 Examine the Liver

- The liver should be red / brown in colour with sharp edges and no discolouration. It should be firm, not friable.
- The gall bladder should be proportionate to the liver and content should be watery. Open the gall bladder and bile ducts to examine for liver fluke.
- Consider sampling and saving it fresh or freezing, if concerned about trace mineral levels.



Healthy liver, red/brown in colour with sharp edges
MLA



Yellow jaundiced liver
PIRSA (Jeremy Rogers)

3.8 Examine the Spleen

- The spleen should be dark bluish red in colour with white specks.
- An enlarged spleen or protruding white areas indicate abnormalities.



Healthy spleen in situ, dark bluish red in colour with white specks
MLA



Healthy spleen, dissected
MLA

3.9 Examine the Kidneys

- Examine the fat around the kidney. A lack of fat or gelatinised fat can indicate starvation / wasting
- Open the capsule and examine the kidneys. They should be firm and red/brown in colour.



Examination of the fat around the kidney
MLA



Healthy kidney, firm and red/brown in colour
MLA



Streaks in kidney from oxalate poisoning
PIRSA (Jeremy Rogers)

3.10 Examine the Mesenteric Lymph Nodes

- Are the lymph nodes enlarged? What colour are they?
- Enlarged lymph nodes can indicate worms, coccidia, Johne's disease or chronic intestinal issues



Normal lymph nodes in situ
MLA



Normal lymph nodes dissected
MLA

3.11 Examine the Bladder

- Is the bladder enlarged?
- Take a urine sample with a needle and syringe. What colour is it? What is the pH? Test for glucose (may indicate enterotoxaemia) and for ketones (may indicate pregnancy toxaemia)
- Open the bladder. Are there any signs of urinary calculi?



Normal empty bladder

MLA



No signs of urinary calculi in dissected bladder

MLA

3.12 Examine the Reproductive Tract

- Is the Doe pregnant? If so, how many kids are there and how advanced is the pregnancy?
- Any signs of infection, retained placenta or mummified fetuses?
- Do not open the uterus if you are not vaccinated for Q fever. Instead just feel through the uterine wall.



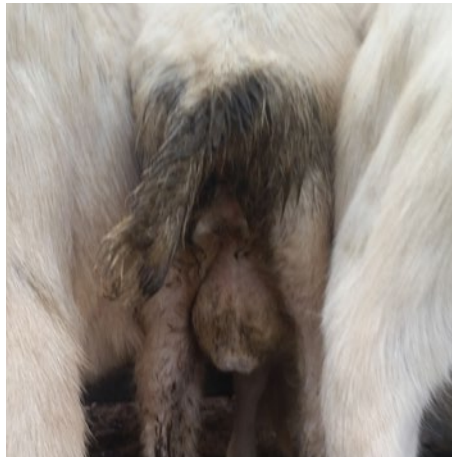
Reproductive tract of an empty doe
MLA

3.13 Examine the Faeces

- What is the colour and consistency of the faeces?
- Consider collecting a sample for faecal egg counts
- Faecal egg counts can done by a laboratory or vet or can be done yourself if you have access to a microscope. Instruction can be found here:
www.dpi.nsw.gov.au/_data/assets/pdf_file/0006/749292/DIY-worm-egg-counts-livestock-incl-poultry.pdf



Healthy goat faeces
Kylie Hopkins (DAF)



Evidence of scouring



Scour
LLS (Kylie Greentree)

3.14 Examine the Digestive System



Abomasum 'True Stomach'

Produces digestive enzymes
Check for barbers pole worms or the pinpoint haemorrhages from where they were. Large burdens of Ostertagia or brown stomach worms can be seen as a twisting mass although the individual worms are very tiny.



Omasum 'Bible'

Key function is water and nutrient absorption



Reticulum 'Honeycomb'

Collects small digesta particles and moves them into the omasum.
Can collect heavy objects such as nails or wire, causing 'hardware disease'

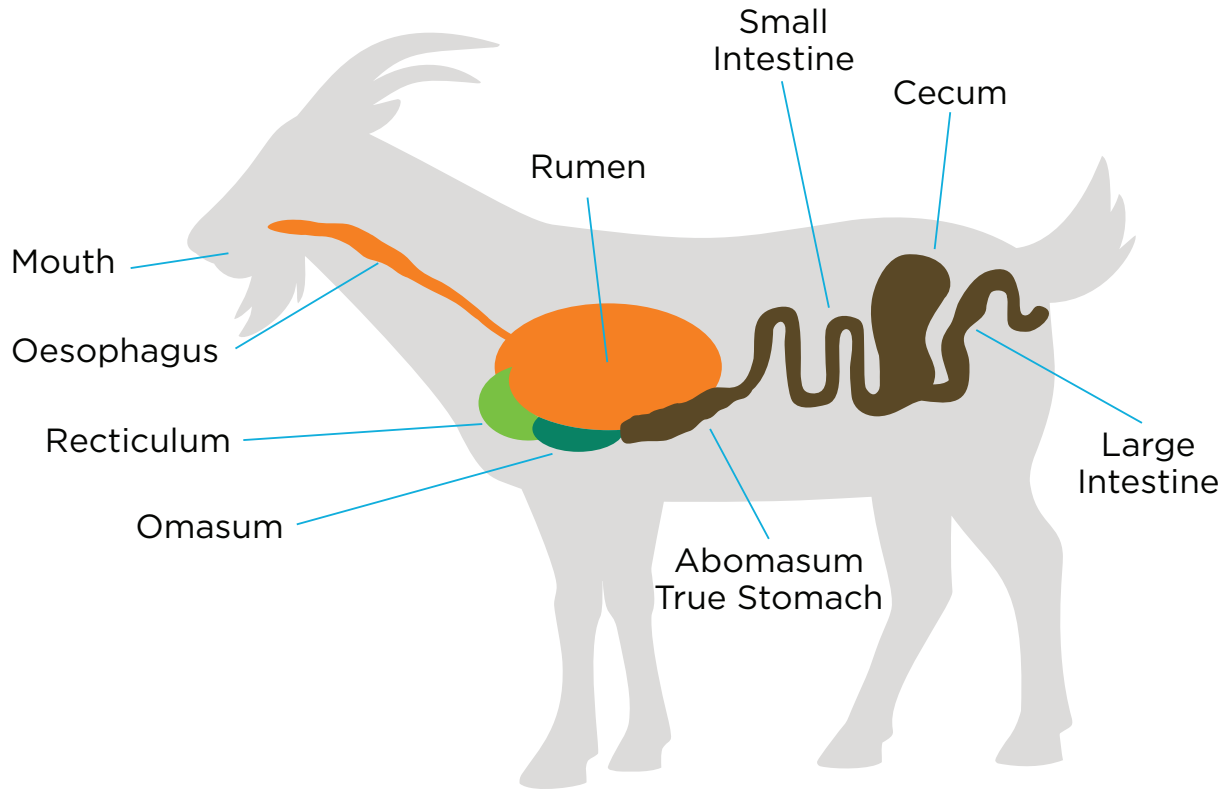


Rumen 'Paunch'

Acts as a fermentation vat by hosting microbial fermentation
Check pH and for colour and sloughing of papillae

Goat digestive system

MLA



3.15 Examine the Large Intestine, Colon, Cecum and Ileocecal Junction

- The walls should be thin and white in colour. The content should have the consistency of pancake mix
- Look for discoloration, corrugations, nodules and signs of ulcerations.
- There is a valve at the junction between the caecum and the ilium (small intestine). This should be examined for discoloration and signs of ulcerations. This site is commonly affected in salmonellosis, parasitism and Johne's disease.



Ileocecal junction
MLA



Examination of the Cecum walls and content
MLA

3.16 Examine the Small Intestine

- The small intestines are made up of three regions, the ileum, jejunum and duodenum
- Open the small intestines at several locations and examine the internal walls and content
- Look at the colour, thickness, any corrugations, nodules and signs of parasites



Healthy small intestine MLA



Thickened intestines from Johne's Disease
PIRSA (Jeremy Rogers)

3.17 Examine the Brain

- Opening the skull and examining the brain requires training and practice to ensure that the brain tissue is not damaged.
- It is recommended that if the animal showed neurological signs, that the brain removal is done by a vet or other trained professional.
- If you are collecting samples to send for testing, the head can be taken to the vet involved for brain removal.



Brain of a goat. Haemorrhage from euthanasia by firearm
MLA



Delicately removing the brain to prevent damage
MLA

Investigation

4. Collecting Samples

- All samples must be submitted through your private veterinarian or local government vet.
- Delivery of samples needs to occur within 24 hours of collection and proper sample handling and storage is vital to getting accurate results.
- All samples should be placed in individual sterile containers or bags and kept in a refrigerator until submitted for testing. **DO NOT FREEZE.**

Sampling Process

- Lung – cut a small piece including a transition zone of affected and non-affected areas
- Heart – cut a thin slice of heart going through both chambers
- Liver – cut a small piece including a transition zone of affected and non-affected areas
- Spleen – cut a thin slice
- Kidney – cut a thin slice that includes all layers
- Intestines – cut a small section including contents from the large and small intestines. Ends can be tied with cable ties or string
- Stomach – cut a small section of all four chambers of the stomach
- All sections and slices for histology must be fixed in 10 times the volume of 10% buffered formalin.
- Faeces – collect a small amount of faeces if possible. Place in a plastic bag and remove the air then chill.
- Urine – If there is urine in the bladder, this can be drawn out with a needle and syringe then put in a sterile container
- Fluid behind the eye can be drawn out with a needle and syringe then put in a sterile container

Euthanasia of Goats

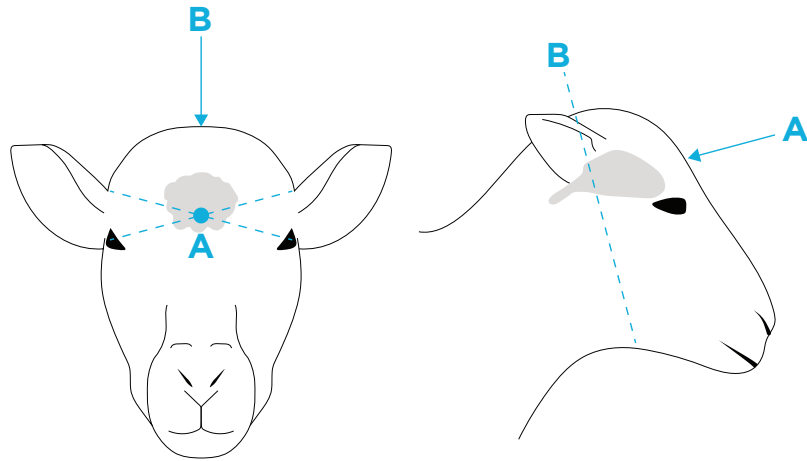
Criteria for Euthanasia

1. The animal has no possibility of satisfactory recovery and is experiencing undue pain and/or suffering and prognosis for recovery is poor.
2. The cost or availability of effective treatment for the animal is prohibitive and/or the specific treatment(s) and the resources needed to apply the treatment are not available.
3. The animal is not fit for loading and/or for transport to a human consumption slaughter facility, rendering facility or a pet food slaughter facility.
4. The animal is not fit for slaughter either for human consumption or for processing into pet food.
5. There is specific need for a post-mortem for disease investigation.

Methods Available

1. Firearm
 - firearm laws must be obeyed
2. Captive Bolt
 - the animal should be immediately bled out following the administration of a captive bolt
3. Lethal Injections
 - lethal injections should only be administered by a vet

Where to aim for firearms and captive bolt euthanasia



Five Fingers Head Check

It is essential that death is confirmed after euthanasia

1. No Blink
2. Pupils are fixed and dilated
3. No jaw tone
4. No tongue tone
5. No breathing

Carcass Disposal

Methods of carcass disposal include:

- Cremation (burning)
- Composting
- Licenced landfills
- Burial (preferred option)

There is a lot to take into consideration when determining the best method of disposal and the requirement for that method.

The best source of information for this is the AUSVETPLAN Operation Manual for Disposal available here www.animalhealthaustralia.com.au/wp-content/uploads/2015/09/DISP-08-FINAL24Aug15.pdf

Acknowledgements and Further Reading

The information in this publication has been collected from:

Abbott, K 2018, *The Practice of Sheep Veterinary Medicine*, University of Adelaide Press: Adelaide.

Allan, S 2010, *Foot Abscess in Sheep*, NSW DPI Primefact 7, NSW.

Animal Biosecurity Unit 2008, *Ovine Johne's Disease*, NSW DPI Primefact 661, NSW.

Animal Health Australia 2020, *Farm Biosecurity Plan*, viewed 9 July 2021, <https://www.animalhealthaustralia.com.au/what-we-do/endemic-disease/farm-biosecurity-plan/>.

Animal Health Australia 2016, *Australian Industry Welfare Standards and Guidelines for Goats*, viewed 9 July 2021, <http://www.animalwelfarestandards.net.au/files/2016/07/Goat-Industry-SnG-Final-July-2016-.pdf>.

Animal Health Australia and Plant Health Australia, *Farm Biosecurity*, viewed 4 June 2020, <https://www.farmbiosecurity.com.au/>.

Animal Health Australia 2012, *Australian Animal Welfare Standards and Guidelines – Land Transport of Livestock*, Animal Health Australia (AHA), Canberra.

Brightling, A 2006, *Livestock Diseases in Australia*, C H Jerram and Associates Science Publishers: Mt. Waverley, VIC, Australia.

CSIRO 2020, *Biosecurity and surveillance chain of response – Goats*, FMD Ready Subproject 2, Canberra, ACT.

Erickson, A 2010, *Hydatid Disease*, Department of Agriculture and Food Farmnote 448, WA.

Harwood, D and K Mueller 2018, *Goat Medicine and Surgery*, CRC Press: Boca Raton, Florida, USA.

Hungerford, TG 1990, *Hungerford's Diseases of Livestock*, 9th Edition, McGraw-Hill Book Company: Sydney, NSW.

Gardner, J 2006, *Pregnancy Toxaemia and Hypocalcaemia of Ewes*, Department of Agriculture and Food Farmnote 105, WA.

Green, DS, et al. 1987, *Injection site reactions and antibody responses in sheep and goats after the use of multivalent clostridial vaccines*. *Vet Rec* 120(18): 435-439.

Jordan, D 2003, *Livestock Health Pregnancy Toxaemia and Hypocalcaemia*, DPI&F QLD Primenote SW0107, QLD.

Litzow, E 2015, *Sheep Diseases – The Farmers' Guide*, 2nd Edition, PIRSA, SA, viewed 9 July 2021, https://www.pir.sa.gov.au/__data/assets/pdf_file/0005/289265/Sheep_Diseases_-_The_Farmers_Guide_-_2nd_Edition_-_July_2015.pdf

Lloyd, J and Playford, M 2013, *A producer's guide to sheep husbandry practices*, MLA, Australia.

Love, S 2008, *Hydatids – The Basics*, NSW DPI Primefact 812, NSW.

Love, S & Hutchinson, G 2007, *Wormtest for Livestock and Guide to Egg Counts*, NSW DPI Primefact 480, NSW.

Matthews, J 2016, *Diseases of the Goat*. Wiley-Blackwell: Oxford, UK.

Maxwell, D 2001, *Livestock Health – Cheesy Gland in Sheep and Goats*, DPI & QLD Primenote SW0047, QLD.

Meat and Livestock Australia 2020, *Farm Biosecurity*, viewed 9 July 2021, <https://www.mla.com.au/research-and-development/biosecurity/farm-biosecurity/>.

Meat and Livestock Australia 2006, *The Going into Goats Guide*, viewed 9 July 2021, <https://www.mla.com.au/extension-training-and-tools/going-into-goats/the-going-into-goats-guide/>.

Meat and Livestock Australia & Livecorp 2020, *Veterinary Handbook for Cattle, Sheep and Goats*, viewed 9 July 2021 <http://www.veterinaryhandbook.com.au/>.

Mitchell, T 1982, *How to tell the age of goats*, Reviewed November 2003, NSW Agriculture Agfact A7.2.2.

Newman, R 2007, *Livestock Health – Tetanus in Sheep and Goats*, DPI&F QLD Primenote SW0088, QLD.

Norris, R 2005, *Scabby Mouth*, Department of Agriculture and Food Farmnote 17, WA.

Parish, J, Rivera, J & Boland, H 2017, *Understanding the Ruminant Animal Digestive System*, Mississippi State University Publication 2503, Mississippi.

Paton, M 2005, *Cheesy Gland in Sheep and Goats*, Department of Agriculture and Food Farmnote 46, WA.

Plant, JW 2004, *Sheep Health – Scabby Mouth*, NSW Agriculture Agfact A3.9.41, NSW.

Plant, J, Seaman, J & Evers, M 2017, *Footrot in Sheep and Goats*, NSW DPI Primefact 1533, NSW.

Pezzanite, L, Neary, M, Hutchens, T & Scharko, P 2009, *Common Diseases and Health Problems in Sheep and Goats*, Purdue University Extension AS-595-W, US.

Pugh, DG, et al. 2021, *Sheep, Goat, and Cervid Medicine*. Elsevier: Edinburgh, UK.

Robson, S 2007, *Photosensitisation in Stock*, NSW DPI Primefact 449, NSW.

Thompson, JM and Meyer H 1994, *Body Condition Scoring of Sheep*, EC1433, Oregon State University.

University of New England 2014, *ParaBoss*, viewed 4 June 2020, <https://www.paraboss.com.au/>.

Walker, B 1996, *Cheesy Gland Caseous Lymphadenitis in Sheep*, NSW DPI Agfact A3.9.21, NSW.

Walker, B 2000, *How Vaccination Works*, NSW Agriculture AgnoteDAL/190, NSW.

Walker, B 2006, *Grain Poisoning of Cattle and Sheep*, NSW DPI Primefact 330, NSW.

Wilson, K, Armstrong, B & Knights, G 2005, *Livestock Health – Management of Body Lice*, DPI & F QLD Primenote SW0102, QLD.

