Final Report

Feedback library disease & defect platform enhancement and condition review

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Prepared by: Richard Shephard
Herd Health Pty Ltd

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Meat & Livestock Australia Limited
PO Box 1961
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5 Abstract

The *myFeedback* portal provides producers with access to carcase and consignment measurements and relative performance through use of benchmarking and comparison against desired specifications. Whilst measurement is the first step in the process of driving change (reduction in disease levels), the next component requires affected producers to understand what they should do about the diseases and defects reported in their consignments. This requires access to information on the cause, spread, control and prevention of individual diseases and defects. Producers are farmers first and foremost and so the presentation of information to them must be respectful of their time and work pressures; information on diseases and defects must be up-to-date, succinct, clear and unambiguous and the cost-benefit of treatments and controls clearly presented to allow them to make a choice or to seek further information. The Solutions to Feedback library has been developed with this objective in mind. This project updated and expanded the library to include 20 sheep and 16 cattle diseases and defects that are regularly reported from meat inspection. The information is designed to provide a farmer with sufficient direction on dealing with their problem—which could range from doing nothing (endemic disease at low prevalence), to seeking expert advice to help investigate and control disease in their herd or flock. The Solutions to Feedback library has been expanded along these lines. The new diseases and defects were tested through farmer workshops and strong support for the concept was received, especially for the benchmarking of disease against peers. The disease summary information was regarded as a good but basic introduction to the disease and links to other sources of up-to-date information more regarded. This is something to consider; maintenance and update of the resources must be ongoing. In general, farmer-directed information on diseases and defects identified at meat inspection (i.e. is able to be seen with the naked eye) is perfectly suited to visual-led learning. The use of photographs and videos is encouraged and the development of a virtual reality sheep and cattle carcase that is used as the central point for focusing in on individual pathologies and findings identified at meat inspection is presented for consideration. Some producers expressed concerns about how such a system can engage the processors; what is in it for them? The value proposition must extend to the processors for this system to be generate necessary momentum and to become an industry-wide service. Engaging processors with myFeedback is a key to success.

Executive summary

Background

Develop and expand the disease and defect Solutions to Feedback library that is linked to the *myFeedback* portal.

Objectives

The Livestock Data Link resource allows producers and processors to quantify disease within their stock and consignments, and to benchmark relative performance. Producers with an excess of disease need access to clear, concise and consistent information on options they have for controlling the disease. The Solutions to Feeback library provide this to farmers in a digestible form, and the linkages in *myFeedback* automate the presentation of this to users. This has been achieved.

Methodology

The counts of diseases and defects identified at meat inspection for sheep and cattle were examined and the most prevalent and important diseases selected. Solutions to Feedback options for each selected disease were either updated (if one existed) or generated to ensure the information was up to date, relevant and accessible. Hyperlinks to external sources of information were updated and expanded.

Results/key findings

A total of 20 sheep and 16 cattle disease and defects information sheets are now available. These are ready for incorporation into the *myFeedback* system.

Benefits to industry

Producers now have measures of diseases and defects within their livestock and with the expanded Solutions to Feedback sheets, the necessary information to control or investigate disease and defects within a producer's flock or herd is provided to them automatically through *myFeedback*.

Future research and recommendations

Farmers are often visual learners. The engagement of a technology company that can develop and service a virtual reality sheep and cattle carcase that links to diseases and defects and sites of lesions would be a central platform for presenting information to producers. The increased use of visual medium (photographs and video) allows often arcane descriptions of pathology to be more easily conveyed to the user. This comes with the burden of increased maintenance cost and time but is presented for consideration.

Engagement with the processors to demonstrate value for them from recording and reporting disease and defect finding into LDL is now a priority. Without processors seeing value in collecting this data, the pilot study will not expand to a national service. Similarly, the strategic roll-out of information recorded by participating processors must be developed in such a way that they are not at a disadvantage to those non-participating processors (and competitors). This has data governance, access and hierarchical reporting components that require solutions from the management and IT expertise running LDL.

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1. Background

The Australian red meat industry produces and collects a wide range of data at various points along the livestock supply chain. The information is mostly collated within the data platform and information for the supply chain is provided to users through the *myFeedback* program. This focuses on carcase performance information and animal disease and defect information in a user-friendly format that can aid in decision-making throughout the supply chain.

The power of *myFeedback* is its ability to allow users to analyse carcase performance in terms of compliance to market specifications and provides users with analytical and benchmarking tools that allows review against a specific target market or comparison to similar suppliers. Much information on what to do in response to the information provided in *myFeedback* is via links to specific disease or control information within the *Solutions to Feedback* library. The information that each user requires from analysis of consignments mostly differ and must be tailored to the user. This places an information supply burden on *myFeedback* for integration with the internal and external sources of information that a user may need. The *Solutions to Feedback* library, links carcase performance outcomes to a library of solutions on how to address non-compliant issues on farm.

This project focused on expanding the current information for cattle available in the Solutions to Feedback library from 5 to 16 (11 new conditions were added). The initial goal was to increase the number of conditions by 15, however, there were no conditions beyond the 11 additional diseases that were added of sufficient prevalence or impact and able to be detected at routine meat inspection to justify addition to the resource base. The conditions within the *myFeedback* resource base were identified by analysis of existing meat inspection findings, recent reports (such as the Priority List of Endemic Diseases of the Red Meat Industry), and as nominated by ISC employees. The focus was on diseases that can be detected at meat inspection (i.e. have gross pathology that can be detected during routine meat inspection). The project extended to reviewing and updating the information currently available on the nineteen (19) sheep disease and defect conditions.

A key focus will be on enhancing communication of essential information and action options for producers and processors. This project had an end-user focus on the development of material. Improving the functionality and user experience was also a key part of the project. Outputs were tested with three producer groups (two cattle and one sheep focused) in late May and early June 2023. The concept of providing contextual feedback on endemic diseases identifiable at meat inspection to the consignors of livestock was universally well received. Some producers discussed the (independent) feedback provided to them by their processor but commented that what was missing from these independent systems was relative performance. The brief, summary information and links to other resources on individual diseases were regarded well, but most producers were more interested in understanding why they may have more (or less) disease than their peers; many reported a solid understanding of the basics of each disease that are summarised in the links.

Finding the necessary expertise to investigate an excess of disease stimulated much discussion. The power of LDL-based meat-inspection disease recording and reporting (to find local hotspots of disease) was strongly supported. This was seen as a way of directing levy funding to research local solutions (through vehicles such as Producer Demonstration Sites). However, some producers (who had previously held senior roles in state departments of agriculture) questioned the drivers for engagement of the processing sector—what is in it for them? We discussed examples of previous attempts to provide disease feedback to Victorian producers through reporting abattoir findings by

the Victorian department of Agriculture (around the 1990s) in some detail. These hit the (then) insurmountable barrier of failure to enrol abattoirs to the reporting system or to keep those enrolled suitably engaged to build the necessary momentum. The challenge for ISC and *myFeedback* is to develop (and sell) the value proposition to the processing sector to encourage their widescale uptake and ongoing use.

This further highlights the problem of a staged roll-out of *myFeedback* reporting to producers and processors that participate. This must happen without providing any disadvantage for participating over a non-participating processors and competitor. Meeting these challenges will be paramount to ongoing success and a sustainable system.

2. Objectives

The project objectives are:

1. Develop content for (up to) fifteen additional (new) beef disease and defect conditions as nominated by ISC.
2. Review content and provide feedback on the existing five beef conditions listed in the Solutions to feedback library.
3. Review content and provide feedback on the existing nineteen sheep conditions listed in the Solutions to feedback library.
4. Check content of current linked material (i.e. DPI factsheets). Provide links to any additional documentation that would be relevant and beneficial for producers.
5. Test outputs of information available through the Solutions to feedback library with producers and discover if the content and information available promotes a willingness to make actionable changes on-farm.
6. Turn content heavy, scientific speak on animal diseases and defects into digestible, relatable information that producers want to use, can understand, and helps promote increased profitability through the supply chain.
7. Look at other current producer disease & defect information tools (such as Animal Health Australia's Sheep carcass conditions VR tool) and provide feedback on how ISC may link too (for sheep conditions), or scope development of similar models for beef conditions etc.

Milestone 3 requirements are to provide the final report. This report is to include content for the 15 new/additional beef conditions. Refreshed, updated content and links for the current 5 beef conditions and 19 sheep conditions. And to provide feedback from all producer workshops.

3. Methodology

The process has been divided into three stages:

1. Identification of diseases and defects for development of resources
2. Collation of new (disease) resources, update of existing resources
3. Testing resource output (information) with producer groups

3.1 Identification of diseases and defects

A search of LDL found 46 separate conditions reported (Table 1). Many items are variants of the same, suggesting that aggregation could occur.

Table 1: Reported meat inspection conditions (LDL)

Condition	Condition	Condition
Abscess	Fibrosis	Myositis
Abscess Grade 1	Fluke	Neoplasia/Cancer
Abscess Grade 2	Foetus	Nephritis
Adhesions	Granuloma	Neurofibroma
Bile Contamination	Grass Impaction	Other
Blood Inhalation	Grass Seed Abscess	Pleuritis Grade 1-3
Bovine Leucosis	Hepatic Cirrhosis	Pneumonia
Cancer Eye/Squamous Cell Carcinoma	Hepatitis	Polyps
Chronic Valve Lesions	Hydatids	Retained Placenta
Chronis Pericarditis	Ingesta Contamination	Rupture
Contamination	Ingrown Horn	Ruptured Uterus
Cyst	Lymphadenitis	Sinusitis
Degeneration	Melanosis	Telangiectasis
Emaciation	Metritis	Trim
Enteritis	Miliary Necrosis	Xanthosis
Eosinophilic Myositis/Eosinophilic Myocarditis		

An analysis of counts of aggregated conditions was undertaken. This is presented in Table 2. This information was used to select the disease and defects for inclusion within the Solutions to Feedback library.

Table 2: Count and relative percentages of diseases and defects reported for a period within LDL.

Attribute	Count	Percentage
Other	281,725	25.4%
Hydatids	262,183	23.7%
Nephritis	125,138	11.3%
Fluke	116,258	10.5%
Abscess	99,776	9.0%
Pleuritis	72,360	6.5%
Pneumonia	61,304	5.5%
Cyst	18,683	1.7%
Adhesions	18,006	1.6%
Ingesta Contamination	17,158	1.5%
Fracture	16,036	1.4%
Arthritis	4,620	0.4%
Degeneration	4,072	0.4%
Chronic Pericarditis	2,664	0.2%
Grass Seeds	2,391	0.2%
Bruising	2,374	0.2%
Bile Contamination	1,158	0.1%
Neoplasia/Cancer	753	0.1%
Caseous Lymphadenitis	354	0.0%
Jaundice	126	0.0%
Polyps	10	0.0%
Fever	5	0.0%
Gross Contamination	2	0.0%

The selected sheep diseases are presented in Table 3 and cattle diseases in Table 4.

Table 3: Solutions to Feedback - sheep diseases

Sheep Diseases	New/Updated
Arthritis	Updated
Bladder Worm	Updated
Bruising	Updated
Cancer	Updated
Caseous Lymphadenitis	Updated
Dog Bites	Updated
Grass Seeds	Updated
Hydatids	Updated
Jaundice	Updated
Knotty Gut	Updated
Liver Fluke	Updated
Lung Worm	Updated
Melanosis	Updated
Nephritis	Updated
Pneumonia/Pleurisy	Updated
Rib Fractures	Updated
Sarcocystis	Updated
Sheep Measles	Updated
Vaccination Lesions	Updated
Fever/Septicaemia	New

Table 4: Solutions to Feedback - cattle diseases

Cattle Diseases	New / updated
Adhesions	New
Beef Measles	New
Brusing	New
Cancer Eye	New
Eosinophilic Myositis	New
Fractures	New
Granuloma	New
Hydatids	Updated
Jaundice	New
Nephritis	Updated
Liver Abscess	Updated
Liver Fluke	Updated
Pericarditis	New
Pneumonia	Updated
Vaccination Lesions	New
Fever/Septicaemia	New

3.2 Collation of information

For each disease listed in Table 3 and Table 4, a review of existing knowledge was undertaken, with focus on information available to red meat producers through MLA and ISC web sites. The disease (and its pseudonyms) were subject to a google search, firstly using the domain limiter *site:.mla.com.au* or *site:.integritysystems.com.au* after the search term[1]. This was supplemented by a generalised search for Australian disease information (using the domain limiter, *site:.au)*, and finally by a generalised internet search. This was often supplemented by a search of the peer-reviewed literature (using Google Scholar) to ensure material was consistent with current thinking[2].

Of concern was that for a few diseases, these searches did not find the relevant resources. The keywords and links will need to be examined by the parent organisations to allow them to be found by a simple search using relevant terms.

Hyperlinks of existing disease and defect reports were checked and updated where necessary. Approximately half of all hyperlinks no longer worked, but most of the documents and sites that they referenced were still in existence (but had been moved to a new location). This is worthy of noting as there is a requirement for regular updating of information as sites change and upgrade their websites, making old links less likely to point to the correct location of the article.

The text for each disease was updated and for new diseases was concisely described using the existing format and approach of the Solutions to Feedback library. Finally, the text of each disease was reviewed by a communications expert who has no direct veterinary or animal farming background to ensure the messaging was clear and user friendly.

3.3 Workshops

Three workshops have been undertaken and are reported here.

4. Results

The diseases are presented in alphabetical order for sheep and cattle below.

[1] This effectively limits the search to the domain listed after the colon.

[2] No Google Scholar links were used within the Solutions to Feedback material as this primarily yielded research papers, which are not useful for communication of key messages to producers and processors.

4.1 Sheep diseases and defects

4.1.1 Arthritis

General description

- Arthritis is inflammation of the joints, usually in the legs, and leads to permanent changes within the joints.
- It is more common in lambs but can affect older sheep.
- When multiple joints are affected, the condition is referred to as polyarthritis.
- Arthritis is estimated to cost the sheep industry $97 million a year due to poor growth rates and deaths on farm (up to 50% of affected lambs may die from impaired mobility and systemic infection), plus losses at abattoirs due to trimming and condemnations and combined treatment and prevention costs. This makes arthritis the 8th most costly endemic disease of the Australian sheep industry.
- It is estimated that industry could reduce losses by approximately $50 million if optimal prevention was undertaken by all.
- Arthritis typically affects between 0.6–3.1% of sheep in affected flocks, with 2.0% the most reported prevalence.

Cause

- Inflamed joints can be damaged by infection, often from skin wounds.
- Numerous different types of bacteria can cause arthritis in sheep; Erysipelas bacteria are the most frequent cause of arthritis. The bacteria gain access to the body, circulate in the blood stream, settle out and multiply in the joints.
- Bacterial arthritis occurs when lambs have a break in their skin, which becomes infected. They then get septicaemia, or blood poisoning, and blood-borne bacteria lodge in a joint.
- Often seen in lambs prior to weaning (lamb marking wound infections), but also in older sheep (shearing wound infections).
- Short tail docking has been linked to bacterial arthritis in lambs.

Clinical signs

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

Diagnosis

- Examining the joints for swelling and heat.
- There is often visible bone damage in the joints, the joint fluid becomes thicker and fibrous, the tissues around the joint thicken and there can be pus within the joint.
- Arthritis is often not seen in live animals and only discovered in meat processing plants leading to losses due to downgrading, trimming, or condemnation. The average loss per carcase from arthritis is 3kg; more for older affected sheep.
- There can be up to a 5% reduction in fleece cut in affected sheep.

Treatment

- Early antibiotic treatment can reduce the extent of joint damage, however mob-level treatment is often not practicable. Prevention is the key.

Prevention

- A vaccination called Eryvac is available for the prevention of arthritis (but only arthritis due to *Erysipelas ssp.*). Vaccine is best administered to ewes 4 weeks prior to lambing.
- Keep stress at lamb marking to a minimum by choosing a warm sunny day, keeping droving to a minimum before and after marking and allowing the lambs to mother up as soon as possible.
- Maintain good hygiene at marking, dipping and any mob intervention or treatment.
- Tails should never be docked higher than the third palpable joint.
- Do not move sheep immediately after shearing, until wounds are healed. Minimise shearing of terminal lambs

Learn more

Priority list of endemic diseases for the red-meat industry (2022)

Fact Sheet - Arthritis

WA Ag - Arthritis in sheep

Sheep Connect Tasmania - Arthritis factsheet

Solutions to Feedback - arthritis & polyarthritis

How to prevent arthritis in sheep

Tail docking best practice

A producer's guide to sheep husbandry practices

Animal Health Australia - National sheep health monitoring project

Animal Health Australia - Virtual Reality tool (visualise the condition)

4.1.2 Bladder Worm

General description

- Bladder worms are large cysts (look like bladders) containing the parasite *Cysticersus tenuicollis*
- Cysts are typically found in the liver and in the abdominal cavity of sheep.
- The cysts contain intermediate stages of the dog tapeworm *Taenia hydatigena* (the 'false' hydatid tapeworm of dogs).
- Note that bladder worm does not infect or cause hydatids in humans.

Cause

- Sheep are infected by ingesting tapeworm eggs (passed by dogs) from contaminated pastures.

Clinical signs

- Sheep will show no clinical signs.

Diagnosis

- Cysts cannot be detected in live animals but are visible at abattoir meat inspection.
- Bladder worm cysts have a thin wall, are 1-6 cm in diameter and are filled with clear fluid. Each cyst contains an immature tapeworm.
- They occur on the liver, diaphragm and abdominal organs and tissues.
- Before cysts are formed, the migrating stages cause bloody tracts in the liver tissue.

Treatment

- There is no effective treatment for sheep with bladder worm cysts.
- Treatment is not necessary as the cysts cause no economic or production loss and are not a human health risk.
- However, affected organs (and carcases) may be condemned at processing.

Prevention

- Breaking the life cycle (between farm dogs and sheep) is the key to control.
- Monthly worming of farm dogs, restrict access to offal and uncooked sheep meat.
- Control wild dogs.

Learn more

Fact Sheet - Bladder Worm

Sheep Connect Tasmania - Bladder worm factsheet

Video of bladder worm in sheep liver

Wormboss - bladder worm

NSW DPI - Sheep measles (bladder worm) fact sheet

4.1.3 Bruising

General description

- Bruising of the carcase is caused by injury. External blunt trauma results in bleeding and muscle discolouration.
- Depending on the severity of bruising, entire areas could be trimmed, reducing carcase weight.
- Bruising is a condition of animal welfare importance.
- Bruising is estimated to cost industry millions of dollars in losses.

Cause

- Bruising may be caused by many agents, including dog bites, lifting sheep by their wool, trauma during shearing or crutching, poor handling and yard designs, and injury during transport.
- The location of bruises can give indication as to their cause.
- Poor handling and/or poor facilities are the most common factors behind excessive bruising.

Clinical signs

- Muscle bleeding and discolouration.

Diagnosis

- At processing the visual appearance of the lesion, without a visible open wound.

Treatment

- Although bruises heal and disappear over time, they are not seen in the live animal, so there is no treatment for bruising.

Prevention

- Proper yard design, handling stock calmly, minimising the use of dogs, appropriate transport loading, and consigning at least 2 weeks after shearing or other husbandry procedures.
- Gentle handling of sheep, using the principles of low-stress stock handling, reduces risk of bruising by preventing excessive sheep responses to threats entering into their 'flight zone' region.

Learn More

Bruising

Solutions to Feedback - bruising

A producer's guide to sheep husbandry practices

Animal Health Australia - National sheep health monitoring project

4.1.4 Cancer

General description

- There are many different types of cancer (malignant tumour) that can affect livestock; however most are rare.
- The most common sheep cancers in Australia affect the skin and eyes and are caused by the sun's ultraviolet radiation irritating exposed areas of the skin. But cancer can have other causes and affect other organs too.
- If malignant tumours are found in animals slaughtered at abattoirs, all or part of the carcase may be rejected.

Cause

- Sheep that have been badly mulesed, or had their tails docked too short are predisposed to cancers.
- Sun damage to bare areas of unpigmented skin plays a large role.

Clinical signs

- Skin cancers begin as red, sun-damaged patches.
- As the tumour grows it may cause severe irritation and distress to the animal.

Diagnosis

- Diagnosis is confirmed after microscopic identification of the tumour tissue.

Treatment

- A veterinarian can successfully treat early stages of some cancers by surgically removing the affected area and/or treating it with cryosurgery (freezing) or radiation.
- Sheep with cancer may have adverse welfare. Badly affected sheep should be euthanised.

Prevention

- Leaving skin on top of the tail during the mulesing operation and permitting tail length to extend to the tip of the vulva will offer some protection.
- Some lines of sheep may be more prone to cancer. Consider culling affected animals from the flock if you experience excessive rates of cancer.

Learn more

Solutions to Feedback - cancer

Flock and herd - flock eye cancer problem case report

4.1.5 Caseous Lymphadenitis (CLA)

General description

- Cheesy Gland (also known as CLA) is a contagious bacterial disease that produces lymph node abscesses in sheep and goats. It can have significant economic impact at slaughter through trimming of carcases and carcase contamination.
- Where multiple abscesses are present, carcases will be condemned.
- On farm impacts can include reduced wool production and weight loss or reduced growth rates. Most flocks have at least one animal affected with cheesy gland.
- The prevalence of cheesy gland can be as high as 30% in unvaccinated flocks, but as low as 3% in vaccinating flocks. Up to 8% of carcases are identified with cheesy gland at meat inspection.
- The estimated annual cost to industry is $23 million.

Cause

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

Clinical signs

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

Diagnosis

- Detected in the carcase after slaughter.

Treatment

- There is no effective treatment; prevention is the key to control.

Prevention

- Vaccination is the most effective strategy. Consider boosters if flock under high challenge.
- Hygiene at shearing and dipping are also key controls.
- Shear young sheep first, minimise handling (and treatment) of sheep with wounds (e.g. off shears) and use hygienic methods to handle and treat sheep.
- Don’t plunge or shower dip sheep without good reason and ensure good dipping hygiene, including time for shearing wounds to heal.
- Keep time in the yards for recently shorn sheep to a minimum.
- If an abscess is ruptured at shearing or crutching ensure the handpiece, floor or anything else that is contaminated is disinfected.
- Maintain good hygiene at marking.

Learn more

MLA - cheesy gland

Fact Sheet - Cheesy Gland

Sheep Connect Tasmania - Cheesy gland factsheet

NSW DPI - cheesy gland fact sheet

AWI Making more from sheep - preventing cheesy gland

4.1.6 Dog Bites

General description / cause

- Dog bites are detected on abattoir inspection when wounds to the skin, resembling bite marks, are found.
- Damage and bruising to underlying tissue may be present and wounds may be infected.
- Bite wounds are most found on the back legs.

Clinical signs

- Reluctance to walk due to pain.

Diagnosis

- There is no certain way to distinguish between domestic and wild dog attacks.
- The size of the puncture marks; their location and nature help distinguish between foxes, dogs and the talons of birds of prey.

Prevention

- Muzzle biting dogs.
- Improve dog training and management.
- Control dingoes and wild dogs.

Learn more

Fact Sheet - Dog Bites

Making more from sheep - Sheep Husbandry Practices Guide

Pestsmart Guide for wild dog management

Pestsmart Guardian dogs manual

Sheep animal welfare standards and guidelines

4.1.7 Grass Seeds

General description

- Grass seeds reported at the abattoir refer to seeds found in the carcass (in the muscle).
- At slaughter, seed contaminated carcases require trimming, which can result in significant reductions in carcase weight.
- Carcases may be downgraded and export markets put at risk. Some markets refuse to accept grass-seed-affected carcases.

Cause

- As lambs/sheep graze on or walk through seedy pastures/areas, seeds are collected in the wool and then enter the body within days.
- The greatest risk period for picking up seeds is October to January in most regions.
- Several plant species cause grass seeds problems including:
    - Barley grass
    - Brome grass
    - Chilean needle grass
    - Erodium
    - Silver grass
    - Spear grass
    - Wire grass

Different species are present in different areas. Find out which species may be in your area.

Clinical signs

- Reluctance to move, particularly young sheep and lambs.
- Eye, ear, face and mouth injuries which may result in blindness, lameness or loss of appetite. Mortalities up to 1% of lambs can occur following these injuries.
- Flystrike secondary to grass seeds penetrating the skin.
- Rough, discoloured or cotted wool (from biting or rubbing).

Diagnosis

- Seeds are readily visible when the fleece is opened along the neck, jowl, and belly.
- At slaughter and after skinning you will evidence of seed penetration on the underside of the animal.

Treatment

- There is no treatment for removing wide-scale grass seed infestations.
- Seed-infested sheep can be relocated to seed-safe pastures but can remain contaminated for over two years, although the level of seed contamination will reduce rapidly in the first six months after relocation.

Prevention

Seed management strategies:

- Grazing management (stocking density, feedlotting, grazing rotation)
- Livestock management (time of lambing, shearing)
- Agronomic management (pasture manipulation, sown fodder crops, fodder conservation, spray topping)
- Target market and time of turn-off

Learn more

MLA - Managing grass seeds

MLA - options for managing grass seeds

Seed contamination of carcases and management strategies

QLD - Avoiding impacts on sheep from grass seeds

DAFWA - Managing grass seeds in sheep

Grass seeds seasonality

Animal Health Australia - National sheep health monitoring project

Animal Health Australia - Virtual Reality tool (visualise the condition)

4.1.8 Hydatids

General description

- 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.
- Hydatids do not affect sheep health or production on farm.
- **Hydatid cysts can be fatal in humans.** Tapeworm cysts can be found in the liver or lungs (the two most common sites), the brain, kidneys, spleen, heart or other parts of the body. A heavily infested organ may fail, or a cyst may rupture and cause a life-threatening allergic reaction.

Cause

- The larval cyst forms in intermediate host animals such as sheep. Affected sheep organs are condemned at slaughter.
- Kangaroos, wallabies, foxes and feral dogs, deer or pigs can either carry hydatid cysts or harbour the dog tapeworm and therefore maintain an infection cycle on land.

Clinical signs

- Clinical signs in live sheep are rare, unless the cyst is in the brain, when the animal's movement may be affected. At slaughter infected carcasses may be trimmed or condemned.

Diagnosis

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

Treatment

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

Prevention

- Monthly worming of farm dogs (with a product that contains the active ingredient praziquantel), restricting them from access to offal will help prevent hydatids.
- Consider not feeding raw meat to dogs. Raw meat should be cooked or frozen to minus 20℃ for 2 days or longer before feeding. Dogs receiving raw meat should be wormed more frequently.

Learn more

Image - Hydatid cysts in a sheep liver

Fact Sheet - Hydatids

Sheep Connect Tasmania - hydatids factsheet

NSW DPI - Hydatids the basics factsheet

Wormboss - Hydatid tapeworm

Hydatids - A Disease of Dogs that Affects People

Hydatids they are still out there

4.1.9 Jaundice

General description

- Jaundice is the yellowing of body tissues like gums and conjunctiva due to liver malfunction or excessive breakdown of red blood cells, leading to an accumulation of the yellow pigment (bilirubin) in the body.
- Jaundice typically results from serious liver damage, where the liver cannot process the excess bilirubin and allow its removal from the body.
- Liver malfunction can be caused by a variety of toxic plants.
- Cirrhosis occurs when liver cells are so damaged, they die and are replaced by scar tissue. Cirrhosis is a sign of chronic liver disease.
- Liver damage, producing jaundice and cirrhosis, also results in reduced growth rate/weight loss, death, and extra costs due to management/treatment.
- Jaundiced animals can be prone to sunburn. This is because the liver also processes the light-sensitive chemical chlorophyll that plants use to capture sunlight; a damaged liver may not remove all active chlorophyll from the circulation thereby leaving the skin hypersensitive to sunlight.
- At the abattoir severely affected (yellow) carcases or livers may be condemned.

Cause

- Various toxins cause liver damage resulting in **jaundice** and/or **cirrhosis.**
- Mycotoxins produced by fungus and commonly found in lupins (Lupinosis) and spoiled or mouldy feed (Aflatoxicosis).
- A variety of toxic plants (e.g. Lantana, St John's Wort) can cause liver damage, jaundice and light sensitivity.
- *Mycoplama ovis* (formerly *Eperythrozoon ovis*), an infectious bacterium affecting the red blood cells that can cause carrier animals to relapse under stress.
- *Leptospirosis* can also produce jaundice due to haemolytic anaemia.
- Copper toxicity can occur due to stresses like poor nutrition, yarding, transport and bad weather.

Clinical signs

- Heliotrope toxicity causes death (weeks to years after toxin ingestion), depression and jaundice for 1-2 days before death.
- Lupinosis causes reduced appetite, condition loss, disorientation, depression, lethargy, stiff gait/hunched back, jaundice and death within 3 days.
- Copper toxicity causes pale gums, jaundice, lethargy and death in 3-5 days.
- *Mycoplasma ovis* causes ill thrift, pale gums, jaundice and death (especially after a stressful event).
- Photosensitive animals develop crusty lesions on less well-covered parts of the body, like to the ear, face and nose.

Diagnosis

- Veterinarians assist in diagnosis and management.
- The first step is to identify the cause of jaundice; is it due to rupture of red blood cells (haemolysis) or liver damage?

Treatment

- Immediately remove animals from the source of toxicity.
- Provide animals with access to shade if showing signs of photosensitisation.
- Feed oats and cereal hay and prevent access to green pick for 6 weeks to prevent photosensitisation.
- Minimise stress and avoid yarding.

Prevention

- Reduce bacterial infections by using sharp marking equipment, disinfected regularly by a chlorhexidine-based disinfectant e.g. Hibitane.
- Prevent weed introduction, use seeds and grain from known uninfested sources, maintain pastures, use weed deterrents and provide hay in weedy paddocks.
- Lupinosis can be prevented by limiting and managing lupin stubbles and avoiding grazing heavily pregnant ewes or weaners on lupin stubble.

Learn more

Jaundice and Cirrhosis Factsheet

Prime Fact 449 Photosensitisation in Stock

Prime Fact 449 Eperythrozoonosis in Sheep

AgWA - Eperythrozoonosis in sheep

Prime Fact 1308 Reducing the risk of lupinosis and the incidence of phomopsis

4.1.10 Knotty Gut / Pimply Gut

General description

- *Oesophagostomum columbianum* (nodule worm) is a large (20 mm) white stout worm.
- The parasite occurs in the summer rainfall areas.
- Nodule worms live in the large intestine of the sheep.
- The larval stages cause damage to the lining of the gut (which can no longer be used for sausage casings and suture material).
- The adult worms can damage the colon in severe infestations leading to ulcers and bloody scours.

Cause

- *O. columbianum* prefers warm, wet conditions (summer rainfall). Cold and dry conditions are not conducive to egg and larvae survival on pasture.
- Sheep grazing close to the soil surface ingest the infective larvae.

Clinical signs

- Nodule worm, if present in numbers, causes severe disease. Sheep, particularly weaners, show ill-thrift, often standing with a characteristic humped back, they lose condition, become weak and scour intermittently.

Diagnosis

- Eggs in faeces are like those of other nematodes.
- Worms identified at slaughter.

Treatment

- Many of the sheep drenches are registered for the treatment of nodule worms.
- However, existing nodules persist as scars that can lead to condemnation of runners.

Prevention

- Ensure an adequate drenching program is carried out regularly.
- Avoid use of contaminated pastures.

Learn more

Fact Sheet - Knotty Gut

NSW DPI - Nodule worm of sheep fact sheet

PIRSA - Knotty gut fact sheet

4.1.11 Liver Fluke

General description

- Liver fluke (*Fasciola hepatica*) are large, flat, leaf shaped parasites found in the liver.
- Adults are approximately 2cm long and 1cm wide while immature fluke are millimetres long.
- Liver fluke require specific freshwater snail species to complete their life cycle; hence the problem occurs where there is open water, which allows the survival of snails, and the presence of the intermediary snail species.
- Liver fluke can infect other hosts (such as macropods and wildlife) and so persist readily in favourable environments.
- Disease can be acute (following rapid uptake of large numbers of larvae) or chronic (where a significant adult burden exists in the liver) or secondary to infections in damaged livers (e.g. black disease due to *Clostridium novyi*).
- Liver fluke is estimated to cost the Australian sheep industry approximately $40 million per annum.

Cause

- Intermediate stages released from snails form cysts on pasture which are then ingested by grazing livestock.
- The ingested immature stage fluke migrate from the small intestines through internal organs to finally settle into the liver and reach maturity in the bile ducts.

Clinical signs

- Liver fluke disease (fasciolosis) is classed as acute or chronic.
- Acute fasciolosis often does not show obvious clinical signs, affected sheep simply dying suddenly without any sign of struggle.
- Affected animals may go down and die within minutes if driven at pace. On close examination anaemia and abdominal pain may be detected.
- Chronic fasciolosis is more common and reflects the long-term loss of liver function. Sheep generally display ill thrift, anaemia and bottle jaw.
- Where liver fluke is present, deaths from **Black disease** may occur if sheep have not been vaccinated.

Diagnosis

- Where mature fluke is present, testing for eggs in the faeces is a reliable method of confirmation; however, egg numbers often do not correlate to the liver damage being caused, nor to the size of the fluke burden.
- Based on flock history, environment and post mortem findings.

Treatment

- Triclabendazole is the only drench which can be used to kill all stages of the Liver fluke within the sheep. Others will kill the mature parasite (in the bile ducts) but will have varying degrees of effectiveness on migrating stages.
- There is increasing resistance to Triclabendazole and other parasiticides. This can make the control of liver fluke on affected properties challenging.

Prevention

- Good biosecurity practices should be used when introducing new stock on farm.
- Effective, strategically timed oral drenching of sheep is very important. This controls liver fluke egg production and subsequent pasture contamination by limiting infected animals shedding of eggs in their faeces.
- Drenching stock when they exit a paddock with marshy ground, which supports a snail population, will both reduce the parasite burden on the sheep as well as preventing them from shedding eggs in subsequent paddocks.
- Avoid exposing animals to marshy areas infested with snails, especially in dry periods when water levels in the marshy areas are lower and animals have easier access to contaminated herbage (around the water source). Graze such paddocks with adult sheep and cattle as they have a greater tolerance to the parasite and preferably when water levels are high.
- Clean water troughs regularly to prevent the establishment of snail colonies. Where possible, fence off marshy areas and stream banks which offer a suitable habitat for snail survival.
- Monitoring fluke burden and fluke resistance to chemicals, combined with strategic drenching and livestock management is essential for control within endemic regions.

Learn more

Wormboss - Flukes of sheep and goats

Fact Sheet - Liver Fluke

NSW DPI - A review of liver fluke and their control programs

Sheep Connect Tasmania - Liver fluke factsheet

Grazing management

Choosing and selecting drenches for sheep

4.1.12 Lung Worm

General description

- There are two different types of worms that infest the lungs of a sheep, large lungworms and small lungworms. Large lungworms cause most of the disease seen in sheep – they live in the airways. Small lungworms live in the lung tissue.

Cause

- Lungworms are most prevalent in the cooler, wetter areas of southern Australia, generally in autumn or winter.
- Lambs 4-6 months of age are most severely affected however it can be seen in sheep of any age.

Clinical signs

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

Diagnosis

- Lungworms can be identified in a faecal egg count and culture, although this is not as straightforward as for other sheep worms.
- On post mortem, lungworms can be seen in the airways and lungs.

Treatment

- Many of the sheep drenches are registered for the treatment of lungworms.
- No resistance to chemicals has been reported in lungworm in Australia.

Prevention

- Ensure an adequate drenching program is carried out regularly.

Learn more

NSW DPI primefacts - Lungworms in cattle, sheep and goats

Wormboss - lungworm

Worms - lungworm

Animal Health Australia - National sheep health monitoring project

4.1.13 Melanosis

General description

- Melanosis is an abnormal accumulation of melanin, dark pigment, in various organs including the kidneys, heart, lungs and liver.
- Discolouration of the liver tends to occur in certain regions, and this may be associated with the local grazing diet of the sheep.
- Affected livers are not compromised functionally; the sheep are normal.
- Organs affected are trimmed for aesthetic reasons at slaughter.
- Not a preventable disease.

Learn more

MLA - review summary of melanosis (black livers) in sheep

4.1.14 Nephritis

General description

- Nephritis is a term used to describe damaged kidneys seen at the abattoir.
- Kidney damage may be active or old and localised or generalised; nephritis is a general term for kidney inflammation.
- Prolonged damage causes kidneys to be shrunken, irregular and scarred. Recent damage causes swollen, discoloured or spotty kidneys (also referred to as 'white spotted kidney').
- Long-term, nephritis reduces growth rate/weight loss, and this can lead to sudden death or chronic ill-health and subsequent death (weeks to months).
- Kidneys are condemned at the abattoir depending on the extent and spread of damage.

Cause

- Kidney damage may follow infections or toxin exposure. Toxins may come from poisonous plants or chemical exposures.
- Infections can come from wounds or rumenitis or direct infections of the kidney (e.g. leptospirosis)
- Toxins typically derive from poisonous plant exposure e.g. soursobs; or from chemical exposure (e.g. some antibiotics, fertilisers, heavy metals etc.).

Clinical signs

- Some animals may be mildly affected and show no signs of illness.
- Animals with chronic kidney damage may suffer from ill-thrift, pale gums, increased urination and sporadic deaths.
- Sheep can appear normal with 25% (or more) kidney function; disease is only seen when kidneys become severely degraded.
- Significant damage leads to decreased production, growth and/or death. Affected animals are often unresponsive to treatment.

Diagnosis

- Finding the cause of the nephritis is the first step. This may require investigation by a veterinarian.

Treatment

- Will vary depending on the cause and if it is sudden or chronic.
- Stock should immediately but slowly, be moved from known toxic areas.

Prevention

- Consider vaccination against leptospirosis.
- Use sharp and clean marking equipment disinfected regularly, with a chlorhexidine-based disinfectant e.g. Hibitane.
- Avoid wet conditions, overcrowding, prolonged holding and unnecessary separation of lambs and ewes.
- Choose a balanced ration introduced over 2 or more weeks.

- Prevent weeds by quarantining new sheep for 7 days and using weed deterrents and provide adequate hay in weedy paddocks.
- Measure drench and antibiotic dosage rates accurately and use faecal egg counts to determine if drenching is required.

Learn more

AHA - Sheep nephritis factsheet

Nephritis Factsheet

4.1.15 Pneumonia-Pleurisy

General description

- Pneumonia is infection and inflammation of the lungs. Pleurisy is an infection of the layer around the lungs and lining the chest cavity. Pleurisy often occurs together with pneumonia (pleuropneumonia)
- Pneumonia is a sporadic disease of adults and lambs, caused by several agents including bacteria, viruses, and parasites. Disease is seen more commonly in lambs.
- Pneumonia/pleurisy was identified in 1.2% of carcases at meat inspection and is estimated to cost the Australian sheep industry approximately $25 million per year.

Cause

- Combination of multiple factors including infectious agents, weather or environmental conditions and poor sheep immune system.
- Most outbreaks of pneumonia are in young animals during late summer and autumn.

Clinical signs

- Affected sheep will develop a cough and may have a nasal discharge.
- A large proportion of the mob may be affected with pneumonia without apparent clinical signs and with few deaths occurring.
- Signs of pneumonia will subside after 4-6 weeks, however there may be lasting adhesions between the lungs and chest wall which could mean that sheep tire more readily if exerted in later life and that carcases are trimmed or downgraded at slaughter.

Diagnosis

- Based on history, clinical signs and reports from meat works.

Treatment

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

Prevention

- Management of risk factors for pneumonia (stress, crowding, heat-stress, cold-stress, diet, movement etc) are key controls.

Learn more

Fact Sheet - Pneumonia/Pleurisy

AgVic - short-cut videos: sheep pneumonia and pleurisy

NSW LLS - preventing pneumonia

Flock and Herd - Summer pneumonia case studies

4.1.16 Rib Fractures

General description

- Rib fractures can be caused by increased bone fragility from nutritional deficiencies.
- Some broken ribs are caused by birth difficulties, excessive force during handling and/or incorrect equipment.
- On farm production losses due to rib fractures include slow maturation, ill thrift, infertility and weight loss.
- Fractured ribs generally heal by themselves, causing thickening or deformation at the site of the break.
- The fractured sections of rib cage are trimmed at processing, reducing carcase/dressed weights. Trimming of healed fractures, if with large calluses, can occur.

Cause

- Deficiencies e.g. in vitamin D, calcium or phosphorus, causing weak bones to break.
- Commonly in fast growing lambs on lush pastures.
- Deficiencies can be primary (dietary deficiencies) e.g. cereal and grass hays are deficient in calcium, or secondary, e.g. lush green feed contains anti-vitamin D substances or high grain diets. It should be noted that a recent South Australian study found no association between copper deficiency and the incidence of rib fractures in lambs.
- Ribs can also be broken by rough handling, e.g. lambs at birth or marking.

Clinical signs

- Many animals show no obvious signs however some may have difficulty breathing, ill thrift, anorexia, infertility and lameness.

Diagnosis

- The appearance of broken or deformed ribs at slaughter.
- A veterinarian can diagnose rib fractures based on examination and blood analysis (for mineral imbalances).

Treatment

- Provide trace mineral mix or other oral or injectable supplement for the specific deficiency.
- Adding hay to the diet if animals are grazing rapidly growing lush winter pasture or cereal crops.
- Providing a source of calcium (e.g. stock lime, dolomite) when heavily supplementing ewes with grain in late pregnancy can ensure bones remain strong.
- Care must be taken to prevent supplement toxicity by overdosing.

Prevention

- Feed livestock a complete and balanced ration.
- Undertake soil and pasture tests at laboratories to determine the need for adjustments in management or for supplements.
- Careful stock handling, e.g. ensure pneumatic settings are appropriate for stock and draft lambs into correct group size if needing to adjust the setting.

Learn more

Rib Fractures Factsheet

PIRSA - rib fractures

Animal Health Australia - National sheep health monitoring project

Animal Health Australia - Virtual Reality tool (visualise the condition)

4.1.17 Sarcocystis

General description

- Sarco is caused by a group of protozoan organisms (*Sarcocystis spp.*).
- Sheep are the intermediate hosts and cats are the final hosts.

Cause

- Sheep are infected by eating sporocysts in cat faeces. The sporocysts hatch in the sheep gut and the parasite migrates through the gut wall and into tissues and muscles where it forms a living cyst, awaiting consumption by a carnivore.
- Meat infected with sarcocystis is condemned as unfit for human consumption. Losses of $0.6 million per year due to sarcocystis condemnations have been estimated.
- The parasite is common in cooler climates.

Clinical signs

- Sheep will show no clinical signs.

Diagnosis

- Cysts cannot be detected in live animals but are readily seen by examining the animal at the abattoir.
- Sarcocystis cysts are white and resemble grains of rice.
- They can occur in the oesophagus, tongue, diaphragm and skeletal muscle.

Treatment

- There is no treatment for the cysts in sheep.

Prevention

- Revolves around cat control on sheep pastures.
- Keep livestock feed secure from access by cats.
- Restrict domestic cats (and dogs) from access to offal and uncooked sheep meat.
- Dispose of carcasses quickly and effectively to prevent access by predators, including cats.
- Control feral cat populations.

Learn more

Fact Sheet - Sarcocystis

AWI Sheep Connect Tas - Sarcocystis factsheet

Wormboss - sarcocystis

Sarcocystis-infected meat

4.1.18 Sheep Measles

General description

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

Cause

- Sheep measles occurs when sheep ingest tapeworm eggs from contaminated pastures.

Clinical signs

- There are no clinical signs in live sheep.
- The cysts can calcify and have a 'gritty' feel.
- At slaughter infected carcasses may be trimmed or condemned.

Diagnosis

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

Treatment

- There is no effective treatment for sheep measles.

Prevention

- Sheep measles can be prevented through monthly dog worming with a wormer that controls tapeworm and by restricting dog access to raw sheep meat and offal.
- Frozen raw meat can be fed if held at or below -20℃ for two or more days beforehand.

Learn more

Fact Sheet - Sheep Measles

Wormboss - Sheep measles

Sheep Connect Tasmania - Sheep measles fact sheet

AgWA Farmnote - Sheep measles

Animal Health Australia - Virtual Reality tool (visualise the condition)

4.1.19 Vaccination Lesions

General description

- Vaccination lesions are reactions, such as an abscess or scar tissue, at vaccination sites.
- Sheep vaccinated with the Gudair® OJD vaccine often develop a large vaccination reaction at the injection site.

Cause

- Incorrect vaccination technique, e.g. not placing the injection correctly.
- Vaccinating wet sheep.
- Unhygienic vaccination equipment/processes.

Clinical signs

- Firm swelling usually develops at the site of injection, followed by a nodule 7–15 days later.
- In a small proportion of animals, the lump may be more than 5cm in diameter or develop into an abscess and burst, which may predispose to flystrike.

Prevention

- Correct vaccination technique.
- The vaccine should be administered subcutaneously high on the neck behind the ear.
- Producers should avoid vaccinating sheep which will be slaughtered as lambs.

Learn more

Fact Sheet - Vaccination Lesions

NSW DPI - Sheep vaccines and when to use them

Best Practice Vaccination for Lambs

MLA e-learning - Summary of vaccination for sheep flocks

Animal Health Australia - Virtual Reality tool (visualise the condition)

4.1.20 Fever / Septicaemia

General description

- Fever is a generalised sign of disease that can produce changes to body tissues.
- Septicaemia (sepsis, or 'blood poisoning') is a life-threatening condition due to spreading by bacterial infection (via the blood stream), and an acute, generalised inflammatory response.
- Septicaemia and fever often occur together. Both conditions can produce changes to the carcase that require condemnation.
- Affected carcases are prone to putrefaction, often have cloudy fluid collection in tissue, darkened tissues, enlarged lymph node glands and evidence of bleeding within organs and muscles.
- The signs are general and simply reflect the presence of severe infection.

Cause

- Localised infections can result in bacteria gaining entry to the blood stream.
- Many bacteria and many sites of infection can lead to septicaemia. Septicaemia may develop from severe pneumonia, gut infections or from contaminated wounds (e.g. at lamb marking etc.)
- The infection produces toxins, which damage tissues.
- Bacteria (and toxins) in the blood stream will stimulate acute inflammatory response by the body, and these further promote change in tissues such as reddening and swelling).
- An outbreak of septicaemia indicates animals are exposed as a group to infection. Immediate veterinary investigation is warranted.

Clinical signs

- Affected sheep are often depressed and won't eat.
- In the early stages of disease, they may have an elevated temperature and respiratory rate. This may progress to a decrease in temperature as disease progresses.
- Death may follow shortly after the onset of signs.
- The gums and membranes can show signs of small haemorrhages (mini bleeds) and lymph nodes may be enlarged and/or painful.

Diagnosis

- A veterinarian can assist in diagnosis and management.
- Samples may need be collected and sent to the laboratory for culture to determine the bacteria involved.
- Post mortem examination can identify the primary site of infection.

Treatment

- Affected sheep may require antibiotics to eliminate the bacteria from the blood stream and anti-inflammatory medications to counteract the effect of toxins, and the body's response to the toxins.
- Affected sheep should be withheld from slaughter.

Prevention

- Requires identification of the source of the bacteria and the site of first infection. Control of these routes into the body underpin prevention.
- This may include use of sterile marking equipment, clean yards and changed practices if an outbreak is due to poor sterility practices.

Learn more

Animal Health Australia - National sheep health monitoring project

4.2 Cattle diseases and defects

4.2.1 Adhesions

General description

- Adhesions are bands of scar tissue that connect affected organs or sites preventing natural separation.
- Adhesions follow injury or chronic inflammation.
- Affected organs and sites must be trimmed at meat inspection. Severely affected carcases are condemned.

Cause

- Any long-term injury or inflammation can result in adhesions between the affected site and nearby tissues and organs.
- Common sites for adhesions include between the lungs and the chest wall (e.g. following chronic pleurisy), the gut and other abdominal organs and abdominal wall (e.g. following chronic trauma like penetrating bodies).

Clinical signs

- Cattle may show signs relating to the affected organs or due to restrictions in movements arising from the mechanical effects of the adhesions.
- Some cattle with mild adhesions and/or resolved inflammation may show no outward signs.

Diagnosis

- Most cases are detected at meat inspection.

Treatment

- The underlying cause of the adhesions must be addressed. For example, adhesions between the lungs and chest wall may indicate a pleurisy problem in the herd. The causes of pleurisy will need to be addressed.

Prevention

- Prevention depends upon accurate diagnosis of the cause of the adhesions.

Learn more

[Animal Health Australia - Cattle health and biosecurity (general information)]

4.2.2 Beef Measles

General description

- Small cysts in the muscle of cattle that have eaten pastures contaminated with the infective stage of the human tapeworm (*Tania saginata*).
- This can lead to the development of Cysticerius Bovis or Beef Measles.
- The adult tapeworm typically has little impact in human hosts, occasionally cystic intermediate stages can lodge in the brain producing neurological signs.
- Muscles most affected in cattle are diaphragm, heart, tongue and jaw muscles.
- Cysts are detected at meat inspection and require trimming to ensure the meat is not consumed by humans.

Cause

- Infected humans pass eggs in their faeces, which if they find their way onto pasture may be consumed by grazing cattle.
- This can be sewerage/septic overflow or runoff, or by inadequate treatment of run-off water or by migratory birds who have had access to sewerage sites.
- After consuming infected pastures, the eggs hatch in the animal's gut and migrate through the body to form cysts in target muscles.
- Humans who eat live cysts (in infected and rare-cooked beef) go on to develop adult tapeworms in their small intestine.

Clinical signs

- Infected cattle show no outward signs of infection and there is no production loss.

Diagnosis

- Cysts are diagnosed at meat inspection.
- Infected cattle are traced to their property of origin and the property is subject to follow-up to determine how the cattle became infected.
- Other cattle from the property are subject to more detailed meat inspection until the problem resolves.
- This is because routine meat inspection may not detect all infected carcases.

Treatment

- There is no treatment for cattle infected with Beef Measles.
- Infected humans (or households) take a treatment course for tapeworm.

Prevention

- Preventing tapeworm eggs entering grazing pasture is the key to lowering the risk of Cysticerius Bovis or Beef Measles.
- This can include fencing and management of septic and sewerage system drainage, suitable treatment of effluent and exclusion of cattle from contaminated pasture.
- Cooking beef beyond rare (at least to 57°C) and/or freezing beef (10 days at -10°C) will kill the cysts and prevent human infection.

Learn more

NSW DPI - Cysticercus bovis in cattle

AHA - Cysticercus bovis (beef measles)

Vic Dept Health - Tapeworm in humans

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.3 Bruising

General description

- A bruise is a localized bleed (and subsequent swelling and inflammation) into tissues, typically the skin and underlying muscle.
- Bruises mostly following injury.
- Bruised tissue must be trimmed at meat inspection. Severely affected carcases are condemned.

Cause

- Most bruising is due to injury.
- Injury can occur in yarding, handling and transport or by other cattle (especially horned cattle).
- Poorly designed or maintained yards (especially with protruding objects), rough handling and slippery surfaces contribute to bruising.
- Cattle with bad temperament are more prone to panic and subsequent trauma.
- Poor mixing, loading and stock density (too few or too many) can contribute to bruising during transport.

Clinical signs

- Bruised cattle may not show outward signs, but severe bruises may produce obvious swelling, pain, lameness and/or external wounds.

Diagnosis

- Bruised sites are diagnosed as red/black swellings at meat inspection.
- Affected sites are trimmed or the carcase condemned if severe.

Treatment

- Treatment depends upon diagnosis of the cause of bruising.

Prevention

- As above.

Learn more

MLA - Cattle bruising

AUS-MEAT - Beef and Veal Language (see page 3)

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.4 Cancer Eye

General description

- Eye cancers can occur in older cattle following prolonged exposure to sunlight.
- Cattle with unpigmented eyelids and eyeballs are at most risk.
- Elevated risk for developing eye cancers can be inherited.
- Selection of resistant cattle (cattle with more eyelid pigment) is effective.
- You should not breed from affected cattle.
- Cancer eye is a painful condition.
- Cattle with a poor prognosis should be sent for immediate slaughter if fit to travel.
- Severely affected cattle that are unfit for travel should be immediately euthanised.
- Affected carcases with evidence of spread of the cancer at meat inspection (enlarged lymph nodes that drain the head) are condemned.

Cause

- Ultraviolet light exposure increases the risk of cancerous cell formation in the skin of the eyelid, third eyelid and sclera (junction between the whites of the eye and cornea).
- Factors such as viruses, nutrition and pregnancy may also be risk factors for eye cancer.

Clinical signs

- Cancer can develop after the emergence of protruding lesions around the eyelid, third-eyelid or sclera, but not all lesions will go on to become cancer.
- If the lesion becomes cancerous, a spreading ulcer (erosion of tissue) will form. This can become infected, producing pain and result in weeping.
- Eye cancers grow at different rates, but large cancers grow rapidly and often spread to internal organs. They can outgrow their blood supply resulting in a foul smell from the rotting core of the cancer.
- They can take years to reach these final stages.
- Affected cattle can become thin and weak, reflecting pain, difficulty seeing (if both eyes affected and/or internal spread of the cancer.

Diagnosis

- The presence of characteristic plaques or ulcers on the eyelid, third eyelid or sclera.

Treatment

- Small lesions can be surgically removed by a veterinarian. Suitable sedation and local anaesthesia may be necessary.
- Lesions often recur, so treated cattle should be followed up and sent for salvage slaughter if evidence of recurrence is present.
- Extensive and severe cancers can be removed by surgical removal of the eye by a veterinarian, but this is only warranted if there is no evidence of spread from the eye.
- Severely affected cases should be immediately destroyed if they are in pain or are deemed not fit to travel for slaughter.

Prevention

- Breeding to select resistant cattle is the most suitable option for producers.
- Susceptible stock should be examined regularly for early eye cancers, especially in the warmer months.

Learn more

NSW DPI - Cancer eye in cattle

MLA - fit to load guidelines

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.5 Eosinophilic Myositis

General description

- Sarcosporidiosis is a parasitic disease of cattle and other mammals and birds.
- Eosinophilic myositis is a collective term describing an inflammatory condition of some muscles in cattle characterised by major, green lesions, often produced by sarcocystis spores.
- They are most likely to be seen in skeletal muscle, heart and the oesophagus.
- Cattle become infected with intermediate stages of *Sarcocystis spp* by grazing infected pasture contaminated by the faeces of an infected host animal (e.g. fox, cat, dog).
- The infected primary hosts pass spores in their faeces and cattle become secondary hosts when they ingest these spores which spread through the body to form infective cysts in muscle.

Cause

- *Sarcocystis spp.* are the primary cause of eosinophilic myositis, which is mostly identified at meat inspection.
- Some regions have a very high prevalence of infected cattle, reflecting the high number of infected primary hosts having access to cattle pastures.
- Prevalence is highest in the northern and more extensive grazing cattle industries.

Clinical signs

- Most infected cattle are clinically normal.

Diagnosis

- The sarcocystis cysts in muscle are mostly microscopic and not detected at meat inspection.
- Carcases with eosinophilic myositis are trimmed or condemned, if severely affected.

Treatment

- There is no effective treatment for affected cattle.

Prevention

- Revolves around primary host management. Limiting access by dogs, cats, foxes and other carnivores to cattle pastures is the key control.
- The spores can live on pasture for several years under favourable conditions.

Learn more

AHA - Sarcosporidiosis and eosinophilic myositis

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.6 Fractures

General description

- Bone fractures are partial or complete breaks in one or more bones.
- Fractures include fresh breaks or partially resolved fractures characterised by a healing swelling (called a callus) around the fracture site.
- Long bone fractures occur mostly following trauma. Cattle are generally unfit to travel so rarely seen at meat inspection.

Cause

- Sporadic fractures can arise from misadventure.
- A line of cattle with fractures (and bruising), especially in exposed body sites such as the point of the hip, suggests poor handling and/or substandard facilities and yards.
- Multiple fractures within the animals, such as ribs, and especially if the fractures are of varying age, suggest a bone mineral deficiency (such as phosphorous, copper or selenium).

Clinical signs

- Cattle with long-bone fractures are severely lame and should be treated (or destroyed) locally.
- Cattle with mineral deficiencies may have other signs associated with the deficiency such as rough and faded coats (copper deficiency), stiff-legged gait (selenium deficiency), ill-thrift (cobalt deficiency) or red water (phosphorous deficiency) as examples.

Diagnosis

- Fractures are diagnosed at meat inspection. Affected sites are trimmed or the carcase condemned if severely affected.

Treatment

- Treatment depends upon diagnosis of the cause of the fractures.

Prevention

- As above.

Learn more

MLA - mineral deficiencies

MLA - upgrading yards

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.7 Granuloma

General description

- A granuloma is a firm, often fleshy, lump found growing on cattle.
- They are mostly found on the mouth, jaw, tongue or lymph nodes, occasionally affecting internal organs.
- They can be fibrous, even bony, and can contain pus or other material.
- Affected lesions and tissues are condemned at meat inspection.

Cause

- There are multiple causes, mostly due to slow-growing infection of the site. Baceteria involved can include tuberculosis-causing mycobacteria (Australia is recognised to be free of cattle tuberculosis, but surveillance remains active) along with actinobacillosis (bacteria producing 'woody tongue') and actinomycosis (fungi producing 'lumpy jaw').

Clinical signs

- Cattle with benign granulomas may be physically impacted by the presence of the mass. If this affects the mouth, they may show signs of difficulty eating such as emaciation. Cattle with underlying infections may also show signs related to the infection such as fever and depression.
- Woody tongue results in a swollen, firm, painful and immobile tongue. Affected cattle often stand open-mouthed, drool saliva, have trouble eating and show signs of pain.
- Lumpy jaw results in bony swelling of either the lower or upper jaw with occasional pus-draining sinuses producing a thick discharge and foul smell. Affected cattle may have trouble eating and chewing.
- Cattle with tuberculosis may be normal but may experience wasting and emaciation. Tuberculosis granulomas may be apparent on internal inspection.
- Affected organs are condemned, affected carcases may be condemned if there are signs of spread.
- Cattle under suspicion of tuberculosis are condemned and pathology samples are sent for further testing.

Diagnosis

- Lesions suspicious of tuberculosis are sent for confirmatory testing at a veterinary laboratory.
- Lumpy jaw and woody tongue are diagnosed by their characteristic clinical signs.
- A mouth examination can eliminate a foreign body (like a stick or bone) lodged in the mouth.

Treatment

- There are no effective treatments for most granulomas; especially if long-established.
- Early-onset woody tongue and lumpy jaw may be treated with antibiotics and iodine formulations.
- If the tongue or jaw is damaged to the point it has permanently lost function, the animal should be sent for salvage slaughter if it is fit to travel or destroyed if unable to be shipped or in pain.

Prevention

- Remove affected animals from the mob as they can become a source of infection for herd mates.

Learn more

NT DPI - Granuloma in cattle

NSW DPI - Lumpy jaw and wooden tongue in cattle

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.8 Hydatids

General description

- 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.
- Hydatids do not clinically affect cattle health but may be associated with production loss. A recent study found feedlot cattle with hydatids had carcases that were 7.2kg lighter than unaffected cattle. The other major loss from hydatids is at processing where meat products are downgraded due to the hydatid cysts.
- **Hydatid cysts can be fatal in humans.** Tapeworm cysts can be found in the liver or lungs (the two most common sites), the brain, kidneys, spleen, heart or other parts of the body. A heavily infested organ may fail, or a cyst may rupture and cause a life-threatening allergic reaction.
- Affected humans may be subject to complicated and prolonged surgery to remove cysts.

Cause

- The larval cyst forms in intermediate host animals such as cattle. Affected cattle organs are condemned at slaughter.

Clinical signs

- Clinical signs in live cattle are rare, unless the cyst is in the brain, when the animal's movement may be affected. At slaughter, affected organs are condemned and infected carcases may be trimmed or condemned.

Diagnosis

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

Treatment

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

Prevention

- Monthly worming of working and pet dogs (with a product that contains the active ingredient praziquantel), as well as restricting them access to offal, will also help prevent hydatids.
- A cattle vaccine exists but is not registered in Australia. Vaccinated cattle tend to have fewer cysts than unvaccinated cattle but are still able to be infected. The effectiveness of the vaccine in reducing production loss is unknown.

Learn more

Hydatids Factsheet

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.9 Jaundice

General description

- Jaundice is the yellowing of body tissues like gums and conjunctiva due to liver malfunction or excessive breakdown of red blood cells, leading to an accumulation of the yellow pigment (bilirubin) in the body.
- Jaundice typically results from serious liver damage, where the liver cannot process the excess bilirubin and allow its removal from the body.
- Liver malfunction can be caused by a variety of toxic plants.
- Cirrhosis occurs when liver cells are so damaged, they die and are replaced by scar tissue. Cirrhosis is a sign of chronic liver disease.
- Liver damage, producing jaundice and cirrhosis, also results in reduced growth rate/weight loss, death, and extra costs due to management/treatment.
- Jaundiced animals can be prone to sunburn. This is because the liver also processes the light-sensitive chemical chlorophyll that plants use to capture sunlight; a damaged liver may not remove all active chlorophyll from the circulation thereby leaving the skin hypersensitive to sunlight.
- At the abattoir severely affected (yellow) carcases or livers may be condemned.

Cause

- Various toxins cause liver damage resulting in **jaundice** and/or **cirrhosis.**
- Mycotoxins produced by fungus and commonly found in lupins (Lupinosis) and spoiled or mouldy feed (Aflatoxicosis).
- A variety of toxic plants (e.g. Lantana, St John's Wort) can cause liver damage, jaundice and light sensitivity.
- Theileriosis and tick fever are infections of cattle by (different) protozoan parasites spread by infected ticks. The parasites can rupture red blood cells (haemolytic anaemia) and produce jaundice.
- Leptospirosis is a bacterial infection, often spread by rats, that can also result in jaundice from haemolytic anaemia. Leptospirosis is a zoonotic disease; you and your workers may be at risk if cattle are infected.

Clinical signs

- Anaemic animals often have pale gums, jaundice (yellowing of eyes and mucous membranes), lethargy, may abort, collapse and can die.
- Chronically affected animals have ill thrift, pale gums, jaundice and death (especially after a stressful event).
- Photosensitive animals develop crusty lesions on less well-covered parts of the body, like the ears, face and nose.

Diagnosis

- Veterinarians assist in diagnosis and management.
- The first step is to identify the cause of jaundice; is it due to rupture of red blood cells (haemolysis) or liver damage?
- Is there an infectious component?

Treatment

- Immediately remove animals from the source of toxicity.
- Provide animals with access to shade if showing signs of photosensitisation.
- Feed oats and cereal hay and prevent access to green pick for 6 weeks to prevent photosensitisation.
- Minimise stress and avoid yarding, especially if anaemic.

Prevention

- Vaccinate against leptospirosis and consider vaccination against tick fever if in an infected tick region.
- Manage movement of cattle to minimise contact with bush ticks (for Theileria)
- Limit grazing of paddocks with toxic plants—especially naïve cattle on lantana.

Learn more

MLA - Leptospirosis

MLA - Cattle tick fever

QDPI - Cattle tick fever

NSW DPI - Tick fever

NSW DPI - Lantana

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.10 Nephritis

General description

- An inflammatory, degenerative disease of the kidney that is often referred to as 'white spotted kidney'.
- Nephritis is characterized by scattered, greyish-white foci in cattle kidneys measuring between 1-5 mm.
- Nephritis is predominately found in beef cattle under extensive management, i.e. on pasture.

Cause

- Leptospirosis, a bacterial disease, is thought to be the most predominant cause of the nephritis in beef cattle.
- Between 3–10% of processed cattle can be identified as affected with nephritis in problem herds.
- Leptospirosis can be transmitted to humans via contact with contaminated cattle urine. Vaccinating against leptospirosis may be required on occupational health and safety grounds.
- The causal bacteria can be spread through contaminated urine entering cuts, abrasions or mucus membranes of cattle from contaminated water, soil or mud.
- Exposure to flood water can spread the bacteria quickly and over a vast area. Bacteria can enter through abrasions in the mouth when eating or drinking water contaminated with them.
- Animals that recover can develop a carrier condition where the bacteria continue to develop in renal tubules for periods of days to years.
- Ascending bladder infection and toxin exposure from poisonous plants (e.g., sorrel, soursob, buffel grass, lantana, acorns, etc.) or farm chemicals (e.g. some drenches, antibiotics, superphosphate etc.) may cause a proportion of nephritis

Clinical signs

- No obvious signs on farm. However, it is likely to have an effect on cattle health.
- Nephritis could potentially lead to production losses (ie, trouble passing urine, excessive urination, loss of appetite) leading to deterioration of weight.

Diagnosis

- The cause of the nephritis first needs to be determined; this will require testing by a veterinarian.

Treatment

- If an infectious cause is found, antibiotics may be prescribed.
- Treatment involves the removal of infected cattle from the rest of the herd, often moving them to an area where bacteria do not thrive, including dry soils or increased soil acidity.
- Protective clothing and gloves should be worn if leptospirosis is suspected as it is a zoonotic infection.

Prevention

- Provide clean water and feed sources to cattle.
- Undertaking biosecurity measures such as changing clothing, cleaning shoes and not cross-contaminating equipment can prevent the spread of disease.
- If leptospirosis is diagnosed, then introducing an effective vaccination program offers the best protection against it. Consult with your veterinarian before commencing a vaccination program.

More Information

Health4Wealth – nephritis

Leptospirosis

Making more from Beef: Module 6: Herd health and welfare

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.11 Liver Abscess

General Description

- Liver abscess is a disease marked by inflammation and necrosis of the liver.
- Lesions that occur on the liver are pale yellow, often spherical with necrosis of the liver cells and the surrounding area which leads to inflammation of the liver.
- Abscesses are found in all ages and breeds of cattle and under all types of management, but most cases are found in beef cattle from feedlots due to a high grain content diet.
- Feedlot cattle with abscessed livers have reduced feed conversion efficiency, and those with severely abscessed livers gain 5–15% less per day than cattle without abscesses, reducing production rate and resulting carcases weight.
- A recent study found 4.4% of feedlot cattle were identified with liver abscess at processing.
- Livers with more than 20% of the organ affected are classified as severely affected. These animals have markedly poorer performance including lower carcase weight, dressing percentate, rib fat and carcase value. Affected livers are condemned.

Cause

- *Fusobacterium necrophorum* is an anaerobic bacterium; it is the primary agent of the disease.
- The disease is initiated by damage to the rumen outer layer, allowing bacteria that is normally contained in rumen fluid to enter the blood steam.
- Acidosis is often the first step in creating an entrance point for bacteria in the rumen. It does this by damaging the lining of the rumen.

Clinical Signs

- No obvious clinical signs on farm or in feedlot. However, maybe suspected due to reduced production efficiency.
- Disease is found at slaughter when the whole liver is condemned due to abscess in the liver.

Diagnosis

- Difficult to diagnose liver abscess in live cattle.
- Diagnosis is predominately made at meat inspection.

Treatment

- Preventative measures are often undertaken rather than treatment.
- Treatment usually involves antibiotics but should only be used in consultation with your veterinarian.

Prevention

- Change of diet is key to preventing the acidosis that leads to liver abscesses occurring. An increase in fibre and a decrease in the amount of carbohydrate-rich grain provided should minimise of the incidence of liver abscesses in cattle.
- Consult with your cattle nutritionist and veterinarian about nutritional management and other preventative measures.

More information

Liver Abscess Factsheet

Grain poisoning of cattle and sheep

UQ - Feedlot liver study

Acidosis

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.12 Liver Fluke

General description

- Liver fluke (*Fasciola hepatica*) are large, flat leaf-shaped parasites found in the liver.
- Adults are approximately 2cm long and 1cm wide, whilst immature fluke are millimetres long.
- Liver fluke requires a freshwater snail to complete their lifecycle; hence the problem occurs where there is open water which allows the survival of snails.
- Liver fluke reduces animal productivity on farm. It is also an economic cost to the meat industry due to condemnations of livers.
- A recent study found 3.4% of feedlot cattle carcases had liver fluke.

Cause

- Intermediate stages released from snails form cysts on pasture which are then ingested by grazing livestock.
- The ingested immature-stage fluke migrates from the small intestines through the liver tissue to mature in the bile ducts.

Clinical signs

- Liver fluke disease (fasciolosis) is classed as either acute or chronic.
- Acute fasciolosis often does not show obvious clinical signs; affected animal simply die suddenly without any sign of struggle. Affected animals may go down and die within minutes if driven at pace. On close examination anaemia and abdominal pain may be detected.
- Chronic disease is more common in cattle and occurs at any time but is most common from autumn to spring. Cattle generally display ill thrift, anaemia (pale gums and membranes around eyes), scouring and bottle jaw may develop.
- Where liver fluke is present, deaths from Black disease may occur if cattle have not been vaccinated.

Diagnosis

- Based on flock history, environment and post mortem findings.
- Where mature fluke is present, testing for eggs in the faeces is a reliable method of confirmation; however egg numbers do not correlate to the liver damage being caused, nor to the fluke burden.

Treatment

- Triclabendazole is the only drench which can be used to kill all stages of the liver fluke within the cattle. Others will kill the mature parasite (in the bile ducts) but will have varying degrees of effectiveness on migrating stages.
- There is increasing resistance to triclabendazole (and other drenches) reported in Australia.

Prevention

- Good biosecurity measures when introducing new stock on farm.
- It should be noted that liver fluke can infect sheep, kangaroos and other animals.

- Effective, strategically timed oral drenching of cattle is very important for the control of liver fluke to reduce pasture contamination as infected animals shed eggs in their faeces.
- Drenching stock when they exit a paddock with marshy ground which supports a snail population will both reduce the parasite burden on the cattle as well as prevent them from shedding eggs in subsequent paddocks.
- Monitoring drench performance (to identify emerging resistance), rotation of drench groups and strategic drenching is essential to minimise risk of drench resistance of fluke affecting your cattle.
- Avoid exposing animals to marshy areas infested with snails, especially in dry periods when water levels in the marshy areas are lower and animals have easier access to contaminated herbage. Graze such paddocks with adult sheep and cattle as they have a greater tolerance to the parasite and preferably when water levels are high.
- Clean water troughs regularly to prevent the establishment of snail colonies. Where possible, fence off marshy areas and stream banks which offer a suitable habitat for snail survival.
- Monitoring the fluke status of livestock using either faecal samples to check for fluke eggs, a blood test, or reports on liver condemnations of animals sent for slaughter.

Learn more

Liver Fluke Factsheet

Liver Fluke – the basics

Liver Fluke disease in sheep and cattle

Department of Primary Industries Victoria publication Control of Liver Fluke

Cattle disease guide – Liver Fluke

The cattle parasite atlas – A regional guide to cattle parasite control in Australia

More information

Making more from Beef: Module 6: Herd health and welfare

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.13 Pericarditis

General description

- Congestive heart failure can be due to bacterial infections of the heart and surrounds arising from blood infection or from penetrating foreign bodies (e.g. a wire) or, occasionally, from poisoning (e.g. monensin)
- The heart is less able to pump blood and so fluid builds up in dependent tissues, such as the head, neck and brisket and the legs of cattle. The swelling of tissues with excess fluid is called oedema.
- Affected cattle have reduced exercise tolerance and may also show signs of infection (fever, depression, inappetence).
- Cattle with oedema are condemned at processing.

Cause

- Bacteria entering the heart from the bloodstream often follow unhygienic procedures (such as marking) or from generalised infection (such as pneumonia). The bacteria damage the heart valves, which leak, resulting in fluid build-up in the tissues.
- Bacteria can enter the heart sac (pericardium) by a penetrating wound, typically a wire or nail eaten by the animal. The wire can behave like a grass seed and penetrate the reticulum (second stomach), the diaphragm and pericardium, establishing infection. This is called traumatic pericarditis. Pus inside the pericardium prevents the heart from filling leading to fluid retention.
- Toxic doses of Ionophore feed additives produce heart muscle failure. The weakened muscle cannot pump blood, and this results in fluid retention.

Clinical signs

- Exercise intolerance,
- Swelling under the jaw (bottle jaw), the brisket and legs.
- Occasionally fluid retention is so severe the abdomen will expand.

Diagnosis

- Clinical signs are often diagnostic. Always check the mouths of cattle with bottle jaw signs to ensure they do not have a foreign body stuck in the mouth.
- Veterinary examination can confirm if the heart is involved in swelling.
- Meat inspection will identify if there is excessive fluid build-up in the tissues and muscle. Affected carcases are condemned.

Treatment

- Mild cases of infective congestive heart failure may be treated with antibiotics. Cattle with traumatic pericarditis or mild forms of ionophore poisoning should be sent for salvage slaughter if fit to travel and generalised swelling (oedema) is not present.
- Cattle with severe congestive heart failure should be immediately destroyed.

Prevention

- Consider vaccination against serious respiratory disease, especially for feedlot-bound cattle.

- Minimise contamination of grazing areas or feeding areas with metallic rubbish (to prevent risk of traumatic pericarditis).
- Avoid Ionophore toxicosis by ensuring correct doses are delivered using an appropriate supplement feeding system.

Learn more

LiveCorp - congestive heart failure (veterinary handbook)

Wikivet - Pericarditis

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.14 Pneumonia

General description

- Pneumonia is an inflammation of the lungs caused by infectious agent, either a virus or bacteria.
- Pneumonia in cattle is a complicated disease with multiple factors that can impact its onset.
- Pneumonia often occurs following the interaction of stress (i.e. handling, transport) and an infectious agent (bacteria, virus).
- Pneumonia is commonly linked to Bovine Respiratory Diseases especially in Feedlot cattle.

Cause

- A combination of factors can cause pneumonia in cattle such as an infectious agent (bacteria, virus, or a combination of both); weather or environmental conditions; animal management; type of cattle; and poor cattle immune system.
- Viruses that initiate pneumonia in cattle are infectious bovine rhinotracheitis IBR, bovine respiratory syncytial (BRSV), parainfluenza 3 (P13), bovine virus diarrhoea (BVD), and certain rhino viruses.
- Bacteria that are involved in pneumonia in cattle are *Mannheimia hemolytica, Pasteurella multocida*, *Histophilus somni*, Salmonella spp., and Mycoplasma spp.

Clinical signs

- Affected animals may display the following signs: nasal/ocular/oral discharge, depression, lethargy, emaciated body condition, laboured or rapid shallow breathing, coughing, extended head and neck, and droopy ears.
- In addition, animals may have decline in weight or growth rate and will have reduced feed intake.

Diagnosis

- Based on history, clinical signs and reports from feedlot and meat works.

Treatment

- Isolate affected animals in a well-ventilated area protected from excessive cold or heat; maintain hydration, andprovide easy access to water and feed.
- It is important to keep physical stress of an animal affected by pneumonia to a minimum.
- Antibiotic and anti-inflammatory treatment may aid recovery.

Prevention

- Preventive strategies should be aimed at minimising adverse effects of potential stressors that may increase susceptibility to clinical infection, as well as reducing pathogen exposure and transmission.
- To prevent pneumonia in cattle the following should be taken into consideration:
    - Avoid moving stock in extreme conditions: heat, cold, very dusty.
    - Avoid overcrowding in all situations: grazing, stockyards, transportation.
    - Avoid immediate and sudden diet changes.
    - Minimise the mixing of herds.

    - Provide appropriate shelter from extreme conditions.
    - Ensure continual access to clean water.
    - Separating affected animals from non-infected.
- Alternatively, there are number of measures that can be implemented on farm to prepare cattle for feedlots to help prevent pneumonia including:
    - Yard weaning.
    - introduction to trough feeding and watering.
    - Drenching.
    - Dehorning.
    - Castration.
    - Vaccination against a range of diseases such as Bovine Respiratory Disease (BRD) pathogens (both bacterial and viral).

Learn more

MLA- Bovine respiratory disease

Pneumonia Factsheet

Antimicrobial stewardship guidelines for the Australian cattle feedlot industry

Tip & Tool - Summary of Bovine Respiratory Disease preventative practices

More information

Lot feeding and intensive feeding - backgrounding

Evaluation of practices used to reduce the incidence of bovine respiratory disease in Australia feedlots

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.15 Vaccination Lesions

General description

- Vaccination can result in local reactions at the site of injection.
- These can include swelling, infections, pain and scarring.
- Vaccination lesions must be trimmed at abattoir processing.
- Affected animals may also be lighter and of lower carcase value than animals with no adverse response to vaccination.
- Good vaccination practice can reduce risk of lesions developing.

Cause

- Some vaccines produce local reactions as part of the body's immune response. These mostly pass with time.
- Poor hygiene and/or technique can result in infection at the site of injection. These can producer unsightly swelling, pain and ill-health in the animal.

Clinical signs

- Swelling and pain at the site of injection. Swelling may result in discharge of pus and can lead to scarring and permanent lumps.
- Animals with infection may show signs of systemic disease, such as reduced appetite, weight loss and altered behaviour.

Diagnosis

- Swelling at the site of vaccination injection that persists beyond a few days is often an indicator.
- Lumps/abscesses/scars at common sites of vaccination (e.g. neck) identified at meat inspection, especially in more than one animal from the same consignment are strongly suggestive of vaccination lesions.

Treatment

- Infections at the site of vaccination resulting in abscess formation may need to be drained by surgical incision.
- Your veterinarian may prescribe a course of antibiotics for any systemically unwell animal with a vaccination site lesion.

Prevention

- Good, hygienic vaccination principles should always be used to minimise risk of vaccination site lesions developing.
- Store vaccines appropriately, use according to directions.
- Use sterile needles (change regularly), clean equipment.
- Operators should regularly wash their hands. Avoid vaccinating muddy or dirty cattle.

Learn more

MLA - Vaccinating

MLA - Vaccinating southern cattle

MLA - Vaccinating northern cattle

Animal Health Australia - Cattle health and biosecurity (general information)

4.2.16 Fever / Septicaemia

General description

- Fever is a generalised sign of disease that can produce changes to body tissues.
- Septicaemia (sepsis, or 'blood poisoning') is a life-threatening condition due to spreading by bacterial infection (via the blood stream), and an acute, generalised inflammatory response.
- Septicaemia and fever often occur together. Both conditions can produce changes to the carcase that require condemnation.
- Affected carcases are prone to putrefaction, often have cloudy fluid collection in tissue, darkened tissues, enlarged lymph node glands and evidence of bleeding within organs and muscles.
- The signs are general and simply reflect the presence of severe infection.

Cause

- Localised infections can result in bacteria gaining entry to the blood stream.
- Many bacteria and many sites of infection can lead to septicaemia. Septicaemia may develop from severe pneumonia, gut infections or from contaminated wounds (e.g. at marking etc.)
- The infection produces toxins, which damage tissues.
- Bacteria (and toxins) in the blood stream will stimulate acute inflammatory response by the body, and these further promote change in tissues such as reddening and swelling).
- An outbreak of septicaemia indicates animals are exposed as a group to infection. Immediate veterinary investigation is warranted.

Clinical signs

- Affected cattle are often depressed and won't eat.
- In the early stages of disease, they may have an elevated temperature and respiratory rate. This may progress to a decrease in temperature as disease progresses.
- Death may follow shortly after the onset of signs.
- The gums and membranes can show signs of small haemorrhages (mini bleeds) and lymph nodes may be enlarged and/or painful.

Diagnosis

- A veterinarian can assist in diagnosis and management.
- Samples may need be collected and sent to the laboratory for culture to determine the bacteria involved.
- Post mortem examination can identify the primary site of infection.

Treatment

- Affected animals may require antibiotics to eliminate the bacteria from the blood stream and anti-inflammatory medications to counteract the effect of toxins, and the body's response to the toxins.
- Affected cattle should be withheld from slaughter.

Prevention

- Requires identification of the source of the bacteria and the site of first infection. Control of these routes into the body underpin prevention.
- This may include use of sterile marking equipment, clean yards and changed practices if an outbreak is due to poor sterility practices.

Learn more

National Sheep Health Monitoring Project (general information)

Animal Health Australia - Cattle health and biosecurity (general information)

4.3 Workshops

Three workshops were attended (as a guest presenter, secondary to the main purpose of the workshop). The workshops were held in Canberra on 30th (primarily sheep producers) and 31st May (primarily beef producers) and in Seymour on 2nd June (beef producers). The attendees represented approximately 50 farming enterprises across the three workshops. Most enterprises had more than one attendee.

Whilst the primary focus of this project was on enhancing and enabling communication of essential information and action options for producers and processors, this must operate within a system that is used by the supply chain. The end-user focus of this project is on the development of material, improving functionality and enhancing the user experience. But for the system to work these are only a part of the story—the final system must encourage processors to record and centralise their meat inspection findings—and so the system must be of benefit to them as well. Without this, the resources will only be accessed by the small number of producers who use myFeedback and have access to a processor who records and submits defect data to myFeedback.

Improving the functionality and user experience was a key part of the project so the outputs were tested with three producer groups (two cattle and one sheep focused) with the information and material developed by late May 2023. These presentations and discussions confirmed the value in providing contextual feedback on endemic diseases identifiable at meat inspection to the consignors of livestock as it was universally well received. Some producers discussed the (independent) feedback provided to them by their processor but commented that what was missing from these independent systems was relative performance—do they have more disease than their peers? The summary information on diseases and defects and the links to other resources were well regarded, but producers were more interested in understanding why they may have more (or less) disease than their peers; many reported a solid understanding of the basics of each disease that are summarised in the links.

Finding the necessary expertise to investigate an excess of disease stimulated much discussion. The power of myFeedback-based meat-inspection disease recording and reporting (to find local hotspots of disease) was strongly supported. This was seen as a way of directing levy funding to research local disease and defect management and control solutions (through vehicles such as Producer Demonstration Sites) and so was strongly supported. However, some producers (who had previously held senior roles in the state department of agriculture) questioned the drivers for engagement of the processing sector—what is in it for them? They could not see the value for the processor in recording and reporting their findings from meat inspection. We had ‘off-line’ discussion and examined a previous attempt to provide disease feedback to Victorian producers through reporting abattoir findings initiated by the Victorian department of Agriculture (around the 1990s). This system did not continue as it lost momentum when it hit the (then) insurmountable barrier of failure to enrol sufficient abattoirs into the reporting system or to keep those who enrolled initially engaged. As a result, momentum faltered, and the system folded. The challenge for ISC and *myFeedback* is to develop (and sell) the value proposition to the processing sector to encourage their widescale uptake and ongoing use.

This further highlights the problem of a staged roll-out of *myFeedback* reporting to producers and processors that participate. This must happen without providing any disadvantage for participating over a non-participating processors and competitor. Meeting these challenges will be paramount to ongoing success and a sustainable system.

5. Conclusion

Information that is pertinent to a farmer's current situation is time-consuming to find and interpret. The Solutions to Feedback library linked to *myFeedback* provides an effective way to communicate essential information to busy producers. These extra disease and defect pages will expand the capability of *myFeedback*.

This information requires resourcing to maintain an update. Whilst diseases rarely change in importance, prevalence or impact on returns, occasionally this does occur—for example, the University of Queensland has recently refined estimates of the impact of hydatids on cattle carcase performance; it is less than was initially suspected from preliminary studies. This combined with the regular upgrading of web sites that threaten to break hyperlinks to external information requires regular monitoring and servicing. It is essential that resourcing and commitment to revisit and check each disease and defect information suite is enabled.

Similarly, the presentation of information would be improved by the addition of more visual material. Most information is textual; often based upon disease fact sheets from organisations such as Meat & Livestock Australia, Animal Health Australia and the various departments of agriculture. Many farmers are visual learners and who better understand and respond to visual information. For diseases and defects identifiable at meat inspection images and video of typical presentations would be invaluable additions to these resources. Whilst this would require making carcase and pathology imagery obtained from abattoirs publicly available, this could be done in a way that does not challenge the sensibilities of lay observers but aids the understanding of farmers.

There is increasing use of virtual reality (VR) in agriculture. The development of computer-generated VR model of a carcase that highlights the regions affected by a given pathology may help to convey the extent of impact. A VR carcase could then include hyperlinks to actual photographs or video of lesions identified at meat inspection. The language of pathology can be arcane, and this makes it difficult to convey messages to lay observers. Similarly, the common-language description of conditions often is confused—multiple words may be used to describe the same disease (e.g. 'Knotty gut' and 'Pimply gut' to describe nodule worm (*Oesophagostomum columbianum* parasitism and gut damage) and a disease description may not be confined to a single disease (e.g. 'Cyst'). The development of VR models is expensive and time consuming, but a whole-animal model (that may include live versions) may have multiple uses and be a vehicle for conveying a wide range of specific messages within MLA and ISC. This is presented for consideration.

The 16 cattle and 20 sheep disease and defect information sheets are up to date, farmer-focused and suitable for use within *myFeedback* as they currently stand.

Addressing the processor component is essential for ongoing success and uptake. The value proposition for processor involvement must be developed and articulated to that sector for this to become a sustainable and industry-wide reporting resource. Whilst this is outside the scope of the current project, this component will be paramount for *myFeedback* information flows and sustainability.

5.1 Key findings

The challenge is to ensure that the information for producers is a tight but complete summary of all relevant research, MLA reports and economic assessments that pertain to the condition in questions without requiring the reader to specifically source the original documents.

The tool would be greatly enhanced by increased use of images and videos; even extending to a dedicated virtual reality portal that contextualises the information in a form that producers are comfortable with.

Concurrent with these specifics, the value proportion for processor participation must be developed and the processing sector specifically engaged to encourage widespread uptake and adoption.

Finally, whilst the specific disease information summaries are useful for producers, most experienced producers understand sufficient about the diseases that these fact sheets are not the primary benefit they seek from the system. This is the relative performance of their disease control programs, links to the latest knowledge, access to expertise who can help them improve their disease control and follow-up monitoring of the impact of any change to their management on disease expression. This implies the disease fact sheets are but one part of a suite of information that farmers desire on disease.

5.2 Benefits to industry

Measurement (of a condition) is the essential first step for a producer to take control of a problem within their herd or flock. The next step is to access essential information on the condition, it's impact and controls. The data platform provides the mechanism to record diseases and defects detected at meat inspection and this is available to producers through *myFeedback* with benchmarking that contextualises relative performance. This provides producers with some motivation to take corrective action (or to confirm that their controls are working). Providing the essential information on the disease and its controls through *myFeedback* provides producers with the knowhow to control the disease. The expansion of *myFeedback* with these new diseases brings farmers one step closer to optimising their disease control and to improve their profitability.

6 Future research and recommendations

There should be regular examination of the data platform to understand the prevalence, distribution, impact and characteristics of individual diseases and defects. This will help managers understand regions and producer types who are most in need of education and information on control. The regular refinement, updating and visual appeal of disease and defect information will help to drive change. Regular testing of the suite of information with producers through workshops and field days is encouraged.

The development of virtual reality technology that shows the sites and impacts of disease and defects on carcases may be warranted. This could the central point for disease exploration and may have spin-offs into other aspects of productivity (such as liveweight gain). The development of an integrated VR sheep and cattle carcase tool is presented for consideration.

The value to the processing sector for the impost of collecting and centralising disease and defect data must also be developed. The processors need a reason to participate that returns value directly to them for this to expand beyond the current pilot reporting that is currently occurring. Their engagement is an industry priority.