

Abattoir post-mortem conditions guide



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Introduction

Disease conditions recorded at post-mortem inspection often lead to financial loss of the carcase value. Accurate post-mortem data provides valuable information on the health and welfare status of livestock. This data should be used by producers to inform current and future health and welfare farm strategy to help reduce production losses throughout the supply chain.

Under the EU Food Hygiene Regulation, cattle and sheep sent to approved abattoirs are subject to ante and post-mortem inspection before their meat and/or offal are sold for human consumption. The Food Standards Agency (FSA) carries out these inspections, which aim to identify any abnormalities that may be of concern to the health and welfare of the animals and the public. These inspections can lead to meat and/or offal being declared unfit for human consumption. Findings from these inspections are fed back to producers to help them alter their animal health plan as necessary. This information flow is called collection and communication of inspection results (CCIR).

To improve the accuracy of post-mortem data, the FSA in collaboration with AHDB and the industry, rationalised the list of conditions used at the point of inspection for sheep and cattle. The new lists, launched in May 2016, focus on conditions with identifiable lesions, which are of true importance to public health, animal health and welfare, and for which interventions to address them are available.

The overview provided in this booklet aims to help farmers better understand the conditions inspected post-mortem and to use the data, along with their vets, to identify and address problematic areas, especially those where animals do not show any symptoms. This booklet gives a brief description of the condition, the impact it has on animals and their carcase, together with a description of symptoms, risk factors and – most importantly – intervention methods to address the condition.

When developing a strategy to manage herd or flock health, it is good practice to discuss the post-mortem inspection results with your vet.

Good use of post-mortem data can lead to better returns by improving productivity and minimising the losses of saleable meat and offal.



Ouafa Doxon
Market Access Manager

Abscess (neck, forequarter, hindquarter)

Cause

Abscesses are collections of pus in confined tissue spaces, usually caused by bacterial infection.

One of the common causes of abscesses is poor needle practice. Abscesses can form at injection sites and can be exacerbated by the use of dirty needles.



Example of an abscess in the flank of a cattle carcass

Cost to industry

In 2015, in England over 1.2 per cent of sheep carcasses and around 6.5 per cent of cattle carcasses contained abscesses. Meat yield is reduced because abscesses have to be cut out of the carcass.

Impact in live animals

Symptoms include local pain, tenderness, warmth and swelling (if abscesses are near the skin layer). If abscesses are deep, ill health symptoms may occur, including weight loss, fever and fatigue. This would affect livestock performance.

Impact on carcasses

Abscesses can lead to loss of yield because of trimming and possible downgrading of the primal or carcass. However, when abscesses are deep they may not be visible or detected at inspection point. Meat containing injection sites may enter the food chain, which, if it contains scar tissue or calcified abscesses, can compromise the eating experience because meat surrounding the site lesion may be tough.

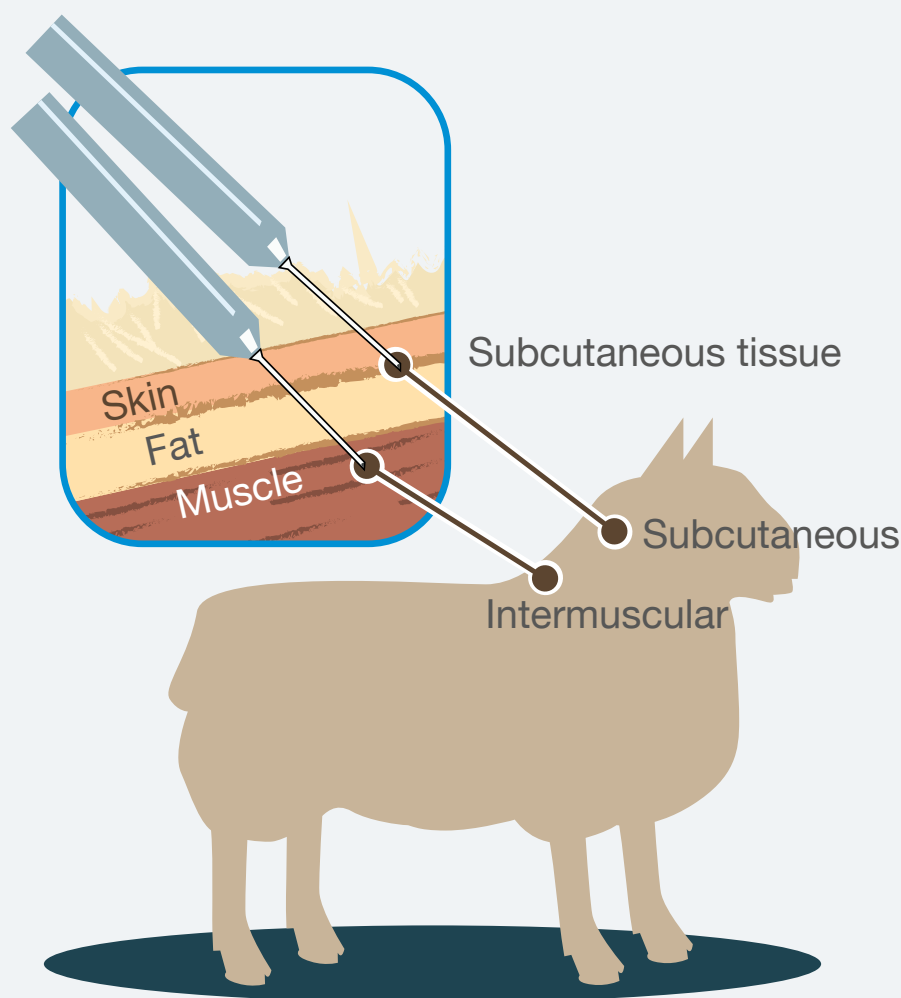
However, if the abscess is not contained and multiplies within the body, pyaemia (blood poisoning) will develop, leading to the carcass and its offal being rejected as unfit for human consumption.

How to use post-mortem data

The location of abscesses provided at post-mortem are predominantly those associated with needle injection sites. The post-mortem report should enable producers to identify poor injection practices.



An example of an abscess on the neck of a sheep carcass



Recommended injection sites

How the disease is spread

An abscess is a response of the body's immune system to invading, pus-forming bacteria. White blood cells meet at the infected site to attack the bacteria by digesting it. As the white blood cells digest the bacteria, surrounding tissue dies, producing a cavity. This then fills with pus containing a mixture of dead tissues, white blood cells and bacteria.

When the body's immune response destroys the bacteria contained in the pus, the abscess remains localised and may, in due course, become calcified. However, if the infection cannot be contained and the bacteria continue to multiply, the abscess will grow until the pus finally escapes. As a result, the bacteria will enter the bloodstream, forming multiple abscesses in the body. This is a condition known as pyaemia.

Risk factors

Poor injection practice, especially the use of dirty needles.

Control

For best results, the following key guidelines should be observed:

- Always use a clean, sterile syringe and needle. Never insert a used needle into a medicine bottle; if injecting multiple animals at once, use a multi-injection gun with a recognised sterilisation system
- Avoid injecting animals through dried-on muck – always choose the cleanest injection site possible and avoid injecting animals that are wet
- Before injecting, check the expiry date, read and follow the directions of the product to be used. Adhere to the stated withdrawal periods to ensure stock are not marketed too soon after the injection has been given
- Use the correct size of needle according to the size of the animal and site of injection
- Ensure the animal is adequately restrained before attempting the injection



Cause

Lung abscesses are often caused by secondary opportunistic bacteria such as *Arcanobacterium pyogenes* and *Staphylococcus aureus* following previous lung damage. Abscesses are collections of pus in confined tissue spaces, usually caused by bacterial infection.

Cost to industry

Chronic respiratory disease can cause economic loss to the industry because it can lead to poorer livestock performance.

Impact in live animals

Some of the symptoms associated with lung abscesses are similar to those observed with pneumonia and include:

- Increased breathing rate and effort
- Weight loss
- Coughing
- Nasal discharge

Impact on carcasses

Some of the impacts observed include:

- Rejection of the affected lung
- Lower carcass weight

How to use post-mortem data

Lung abscesses can be indicative of several respiratory conditions. However, the level and frequency of reporting lung abscesses should trigger further investigations, in particular when other respiratory conditions have also been reported.

How the disease is spread

Following viral infections, lesions may become infected with bacteria, causing abscesses.

Please see section on abscesses.

Risk factors

Lung abscesses in older rams tend to be associated with extensive periods of housing post-birth and during the first winter.

Controls

Some of the controls applied to reduce the risk of pneumonia could be used to manage lung abscess risk factors. These include the environment, where building design and ventilation systems play a crucial part in the health and performance of the animal. Good housing, which should be dry, draught-free, comfortable and well-ventilated, can reduce the risk of respiratory disease.



Example of abscesses on lungs

Cause

Bruising occurs when the tissues are damaged and blood vessels are ruptured, leading to discoloration.



Example of bruising on a beef carcass

It is difficult to establish from the bruise how long before slaughter it occurred. However, the location of bruises on the carcass can give a clue to their cause. For example, hip bruises are commonly caused by cattle pushing through a gate. Typically, bruising happens in yards and handling systems, because of poor facility design or handling techniques. It may also occur:

- During loading and unloading
- During transport, if stock is loaded too tightly, too loosely or if the floor is slippery
- If cattle, especially horned cattle, are mixed with unfamiliar dehorned cattle

Cost to industry

Bruised carcasses can lead to economic loss as they deter buyers, who see the carcass as unappealing. Losses also occur as a result of trimming, which, subject to its severity, not only reduces carcass weight and therefore payment, but may also exclude it from certain high value markets.



Trimming as a result of wool-pull



Lamb carcass showing bruising caused by wool-pull

Impact in live animals

Bruising can be an indicator of poor handling, which needs to be modified to maximise animal welfare and producer returns.

Impact on carcasses

Subject to the depth and localisation of the bruise, trimming may have to be carried out. As a result, the carcass may be downgraded, reducing the economic value of the whole carcass.

Bruising can often be seen alongside a condition known as DFD (Dark, Firm, Dry) meat. This is caused by pre-slaughter stress and, as the term suggests, results in a darker meat with undesirable meat quality characteristics.



Meat showing no DFD



DFD meat

How to use post-mortem data

It is difficult to identify when bruising occurs. The level and extent of bruising reported should alert producers to review their systems.

Risk factors

Risk factors include handling, loading, transit and unloading, as well as appropriate stocking densities.

Control

Appropriate handling of stock to reduce the risk of bruising. This includes ensuring handling systems are free from protruding elements, as well as the appropriate use of handling aids. Careful handling of sheep will minimise wool-pull, particularly on spring lambs, which bruise very easily.

Ensure that staff handling livestock have an awareness and understanding of handling effects on animal welfare. The use of sticks and goads should be avoided.

Ensure transport stocking densities are adhered to and internal partitions used as required to restrict movement. Flooring should be non-slip.

Cysticercus bovis (beef measles)

Cause

Cysticercus bovis also known as beef measles, is caused by the larval stage of the human tapeworm *Taenia saginata*. Cattle become infected by ingesting food and water that is contaminated with eggs passed from humans.

Human infection with the adult tapeworm, known as taeniasis, occurs via the consumption of beef that has been insufficiently cooked or frozen to kill the *Cysticerci*.



Infected heart with *Cysticercus bovis*

Cost to industry

The public health implication of this parasite means it causes significant economic loss through condemnation of infected meat and offal and trade restrictions for endemic regions.

Carcases with visible cysts are either downgraded or condemned, depending upon the amount and type of visible cysts.

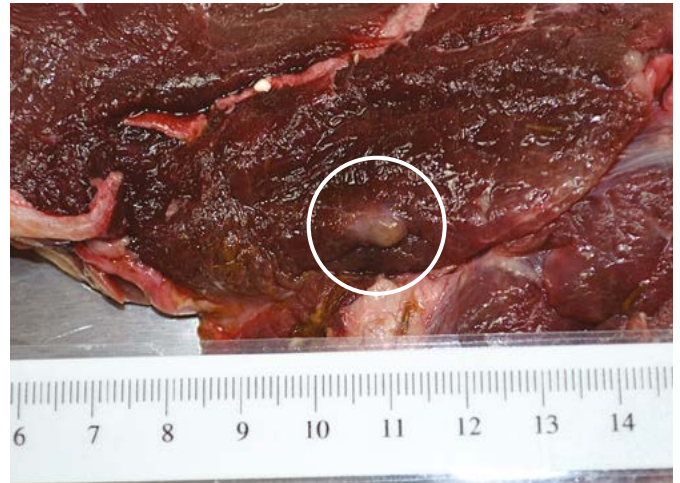
Impact in live animals

Cattle infected with *C. bovis* show no clinical symptoms.

Impact on carcasses

C. bovis causes small cysts in the muscles of cattle, with the most commonly affected parts being the heart, tongue, diaphragm and muscles of the jaw. In cattle, *C. bovis* infection appears as small, whitish cysts filled with fluid that contain an immature worm. They are the size of a pea and infected beef can have dozens of such cysts.

Carcasses and offal of heavily infected animals with viable cysts (generalised infections) are condemned. In the case of lightly infected cattle (localised infections) the affected organ or parts of the carcass are rejected as unfit for human consumption and the rest of the carcass must undergo a freezing treatment that deactivates the cyst. Some processors may opt to debone the carcasses before starting the freezing treatment.



Example of cysts in the heart

How to use post-mortem data

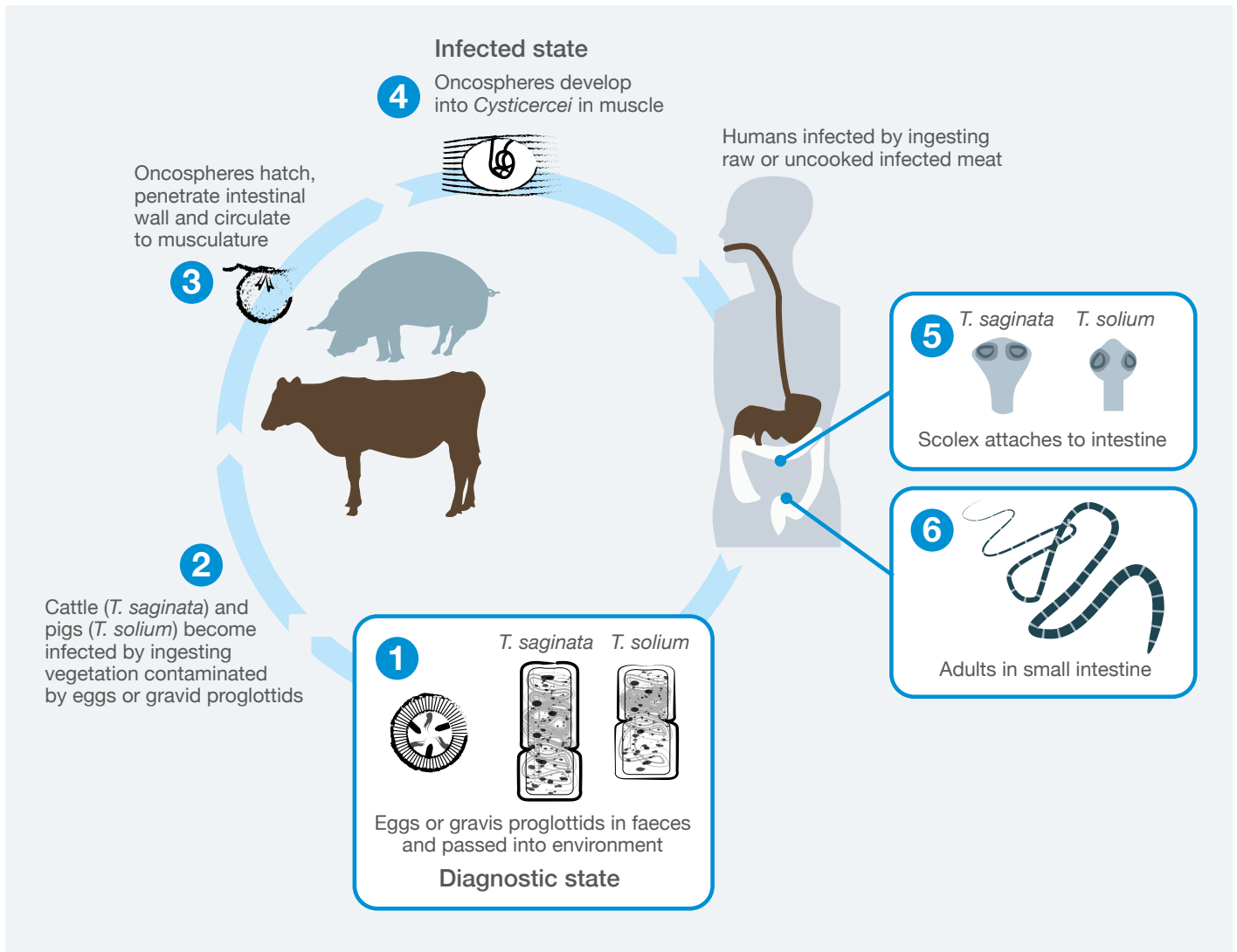
Since cattle do not display signs of infection, post-mortem data is used to demonstrate the exposure of cattle to viable eggs at some point in the production cycle.

How the disease is spread

Cattle become infected by ingesting food or water contaminated with eggs or gravid segments of *Taenia saginata*. Contamination of feed can occur through human defecation on the pastures but also through irrigation that has been contaminated with human sewage. The eggs can remain infective for more than six months.

Once ingested by cattle, the young larvae hatch out of the eggs in the gut, go through the intestinal wall, reach the bloodstream and migrate to a muscle where they encyst. The cysts need 10–12 weeks to complete development. The cysts may remain infective to humans for up to one year.

Humans become infected when eating insufficiently cooked meat that is contaminated with cysts. Once in the human gut, the cysts release the young tapeworm, which attaches to the gut wall and starts producing segments. Within 5–12 weeks the tapeworms mature and start shedding eggs.



How the disease is spread

Risk factors

The risk of exposure to infective eggs from human faeces/sewage includes grazing on land that has:

- Human faecal contamination, especially land adjacent to pathways or public roads
- Overflowing domestic sewage systems
- Irrigation with inadequately treated reclaimed sewage water
- Bird movements to and from a nearby sewage treatment works. Birds can pick up tapeworm eggs from the sewage treatment works and transfer them to the farm

Control

Although beef measles is not harmful for cattle, prevention is important to avoid transmission to humans and carcase condemnation at slaughter.

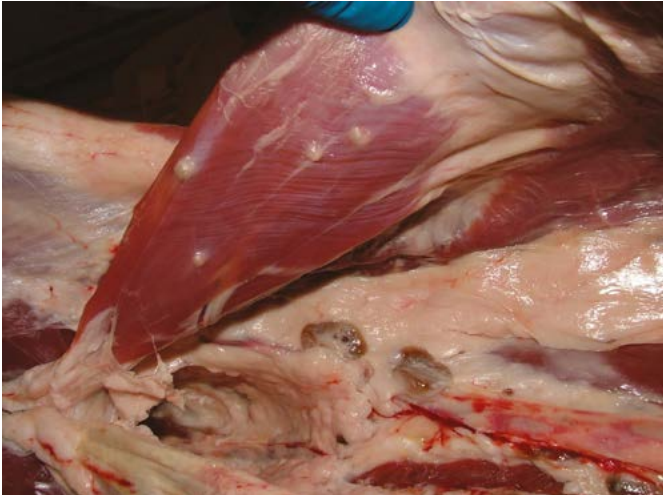
Currently there are no vaccines available that would protect cattle against *C. bovis*.

Prevention is by avoiding the contamination of cattle feed or water with human faeces.

Cysticercus ovis (sheep measles)

Cause

Sheep measles refers to the cystic (larval) stage of a dog or fox tapeworm. The cystic stage in sheep is called *Cysticercus ovis* and the adult tapeworm stage in dogs and foxes is called *Taenia ovis*.



Cysts characteristic of *C. ovis*

Cost to industry

C. ovis leads to significant losses because generally its presence leads to total rejection of the carcass. In 2015, *C. ovis* was estimated to cost the sheep industry over £4.1 million.

Impact in live animals

C. ovis does not usually impact on sheep so no signs of ill health will be seen on farm.

Impact on carcasses

Sheep measles cysts are usually found in the heart. In more severe cases, cysts can be found in muscle tissues such as the diaphragm and masseter muscle. The cyst is oval and a white/cream colour; older cysts become hard (calcified). Only the affected part(s) is rejected if a cyst is localised (found in less than three different sites). The whole carcass and associated offal are rejected as unfit for human consumption if cysts are found in three or more different locations in the whole animal (offal/carcass).

How to use post-mortem data

Since infected animals are asymptomatic, the post-mortem report will provide valuable information on the presence of the tapeworm on farm and the effectiveness of any health plan.

How the disease is spread

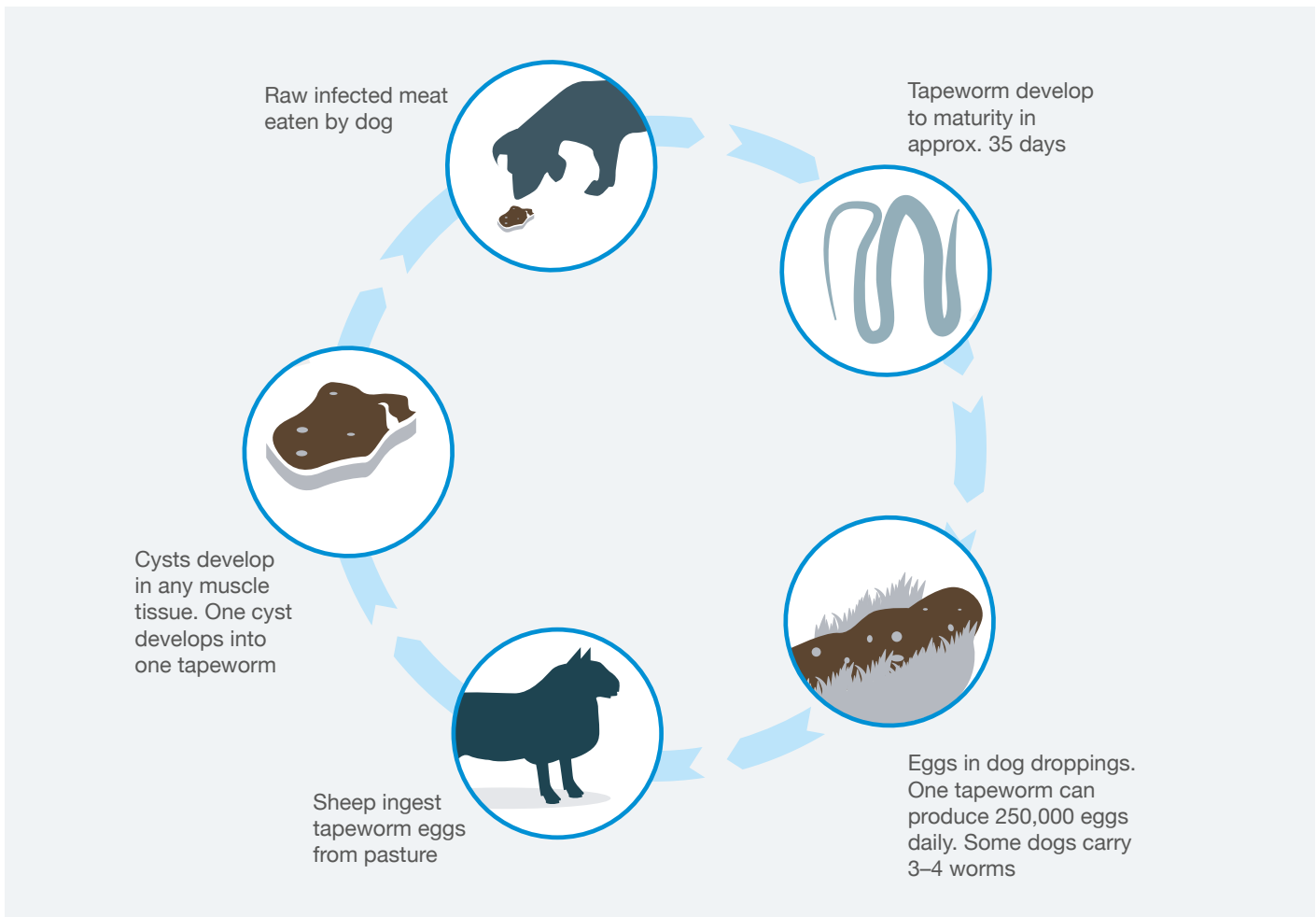
The most widespread cycle that exists is between dogs (including foxes) and sheep. When dogs are fed fresh offal or scavenge infected sheep carcasses containing cysts, they become infected without ill effect. Dogs contaminate the pasture with their faeces, and the eggs are then scattered by wind and water. Sheep are re-infected as they graze.

Risk factors

Risk factors that can expose animals to infective eggs include grazing on land that has been contaminated with infected dogs' faeces. Dogs are a key risk as they carry the tapeworm without showing any sign of infection.



Cysts characteristic of *C. ovis*



C. ovis life cycle

Control

There is no treatment for sheep. To prevent or eliminate the risk of being exposed to infective eggs, the tapeworm's life cycle must be broken.

This can be achieved by:

- Regularly worming all working and visiting dogs for tapeworm
- Fencing off public footpaths
- Not feeding dogs with raw offal or allowing them to scavenge on carcasses
- Rapidly and effectively disposing of dead sheep to stop scavenging
- Encouraging dog owners to pick up their dogs' faeces

The only suitable tapewormer for dogs is praziquantel, which is found in many dog wormers. Great care must be taken when treating infected dogs and in disposing of their faeces for three days post-treatment.

To reduce the risk of unsuccessful treatments, wormer should be used appropriately and monitored to identify early signs of anthelmintic resistance.

Good hand-washing hygiene reduces the risk of infection, especially after handling dogs.

Cysticercus tenuicollis (sheep bladder worm)

Cause

Cysticercus tenuicollis is the larval stage of the dog or fox tapeworm *Taenia hydatigena*. Sheep become infected by ingesting food or water that is contaminated with eggs passed in carrier faeces.

Cost to industry

This parasite causes economic loss to the industry because it leads to poorer livestock performance. Loss of appetite results in longer finishing periods, increased feed costs and loss in value for not reaching target specification. In 2015, it was estimated to cost the sheep industry in England nearly £400,000.

Impact in live animals

Some of the symptoms observed include loss of appetite, leading sheep to become weaker and more vulnerable to other infections, poor body condition and weight loss.

Impact on carcasses

C. tenuicollis forms pockets full of fluid containing one tapeworm head. Infested animals may have a dozen or more pockets. Several months after infection, the cysts die and scar. The cysts are mainly found in the liver and on the surface of abdominal organs.

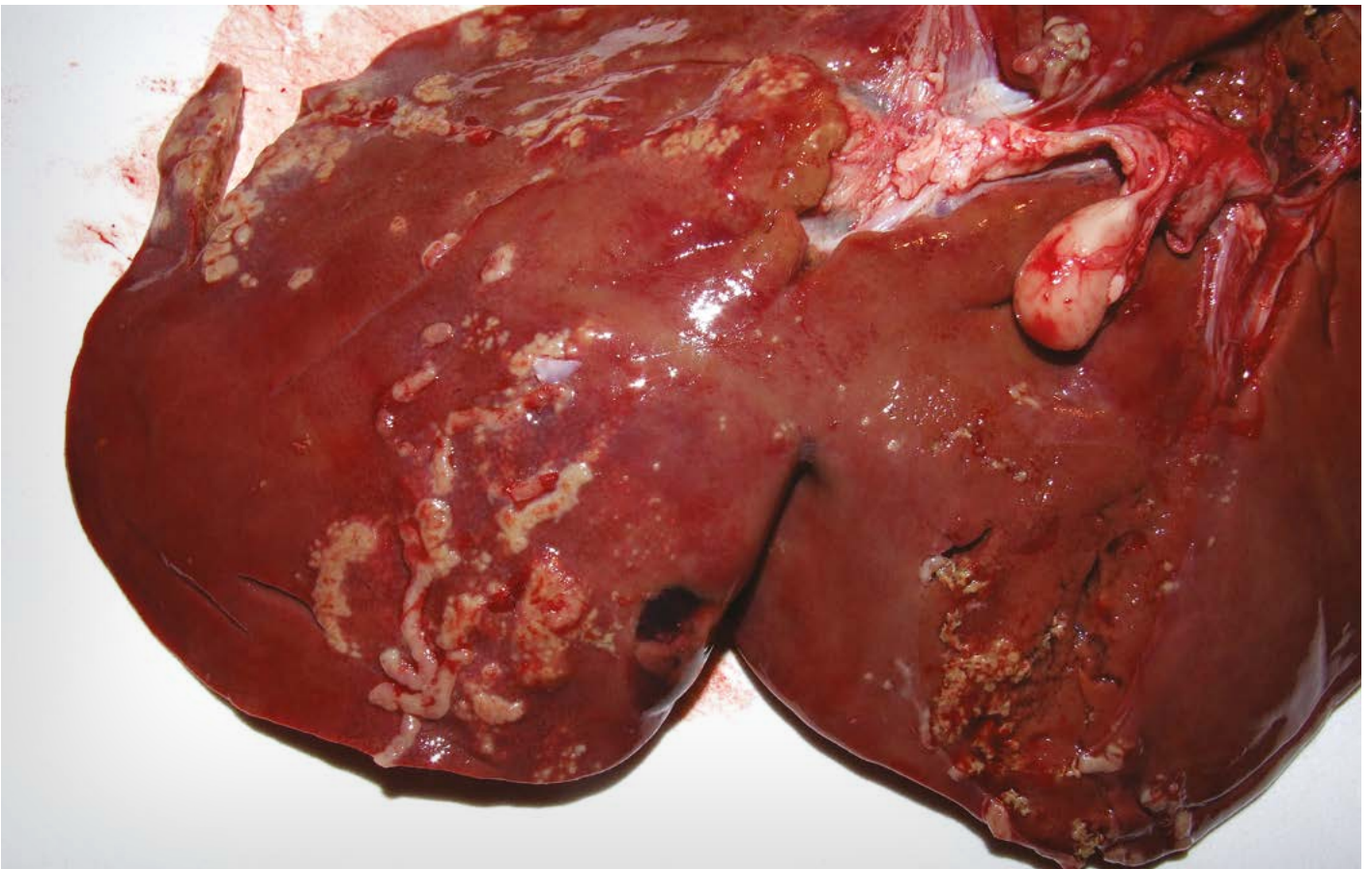
Presence of *C. tenuicollis* usually leads to the infected organ/part being rejected. As a result of lower appetite, lower carcass weights are also observed.



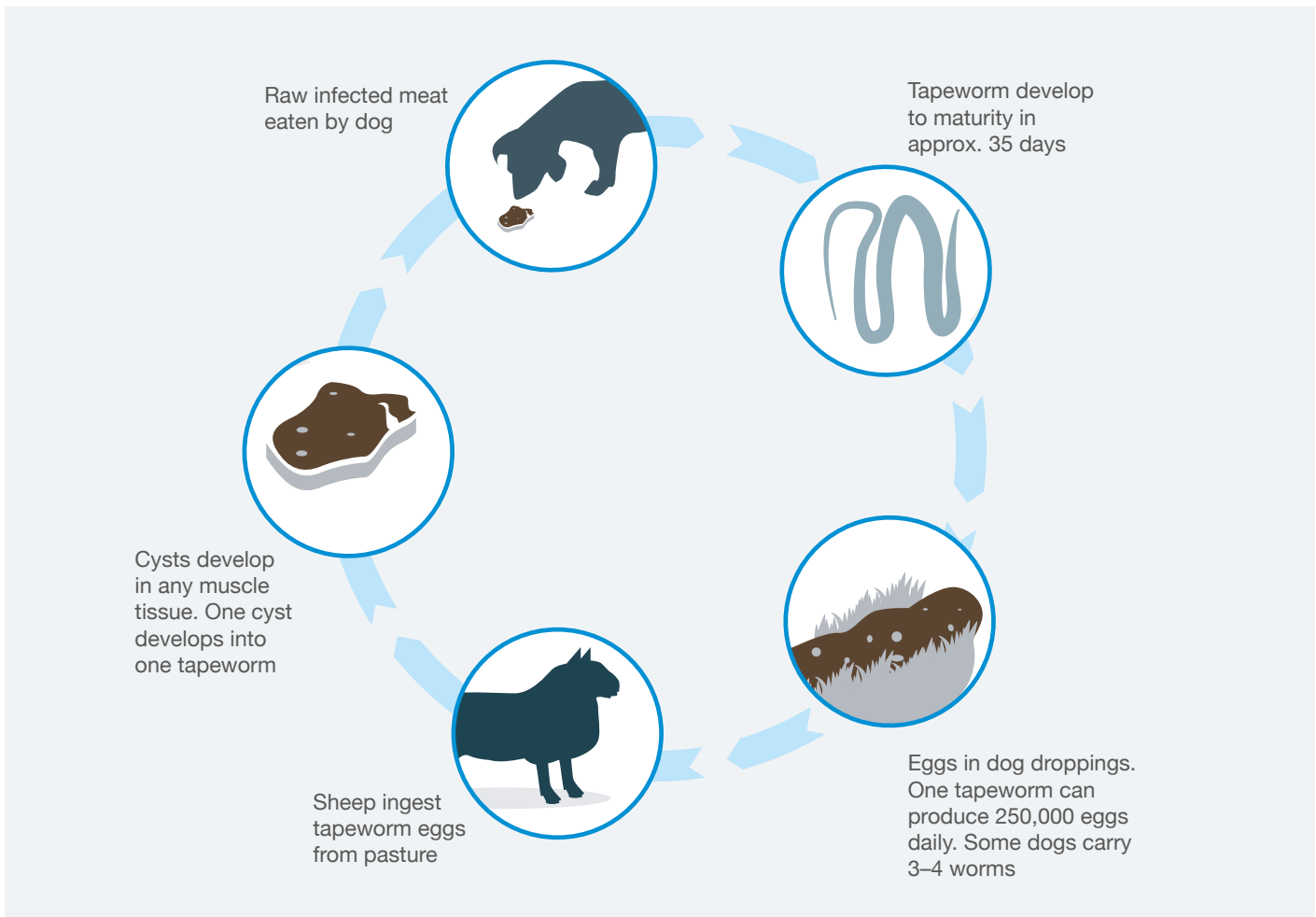
Liver with *C. tenuicollis* or bladder worm cyst

How to use post-mortem data

Based on the symptoms displayed on farm by sheep, it is difficult to establish with certainty the presence of the tapeworm *Taenia hydatigena*. The post-mortem report should be used to confirm the presence of the tapeworm on farm and inform future dog-worming plans.



Serpentine tracks indicative of *C. tenuicollis*



C. tenuicollis life cycle

How the disease is spread

The most widespread cycle that exists is between dogs (including foxes) and sheep. When dogs are fed fresh offal or scavenge on infected sheep carcasses containing cysts, they become infected without ill effect. Dogs contaminate the pasture with their faeces, and the eggs are scattered by wind and water. Sheep are re-infected as they graze. The cycle is completed when final hosts (dogs) consume tissues with infected cysts.

When the eggs are swallowed, the embryos invade the liver by burrowing through the intestinal wall. This causes distinctive *C. tenuicollis* tracks in the liver. Occasionally, small caseous/calcified, degenerated cysts may be found in the liver.

Risk factors

Risk factors that can expose animals to infective eggs include grazing on land that has been contaminated with infected dogs' faeces. Dogs are a key risk because they carry the tapeworm without showing any sign of infection.

Control

There is no treatment for sheep. To prevent or eliminate the risk of exposure to infective eggs the cyst life cycle must be broken. This can be achieved by:

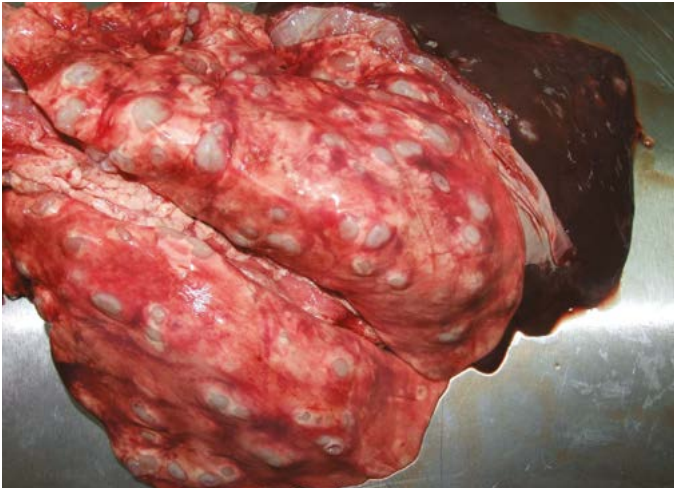
- Regularly worming all working and visiting dogs for tapeworm
- Fencing off public footpaths
- Not feeding dogs with raw offal or allowing them to scavenge on carcasses
- Rapidly and effectively disposing of dead sheep to stop scavenging
- Feeding dogs with dry dog food
- Encouraging dog owners to pick up their dogs' faeces

The only suitable tapewormer for dogs is praziquantel, which is found in many dog wormers. Great care must be taken when treating infected dogs and disposing of their faeces for three days post-treatment. To reduce the risk of unsuccessful treatments, wormer should be used following recommended instructions. Good hand-washing hygiene reduces the risk of infection, especially after handling dogs.

Hydatid cyst

Cause

Hydatid disease in cattle and sheep is caused by the tapeworm *Echinococcus granulosus* which lives in the intestines of dogs and other carnivores, including foxes.



Cyst in the lung

Cost to industry

Hydatid cyst generates economic loss because it usually leads to production losses.

Impact in live animals

Hydatid cysts can interfere with the function of the organ in which they encyst, leading to poor growth and reduced milk production. Often no symptoms are seen because the cysts grow slowly and infected animals are slaughtered before the cysts cause disease problems.



Example of a hydatid cyst in liver

Impact on carcasses

When present, fluid-filled cysts of the larvae tapeworm are usually found in the liver, lungs and other internal organs.

Hydatid cysts affect the value of the carcass in the following ways:

- Condemnation of the affected organs
- Poor carcass weight
- Poor meat yield
- Rejection of the whole carcass in cases where hydatid cyst is found together with emaciation

Public health risk

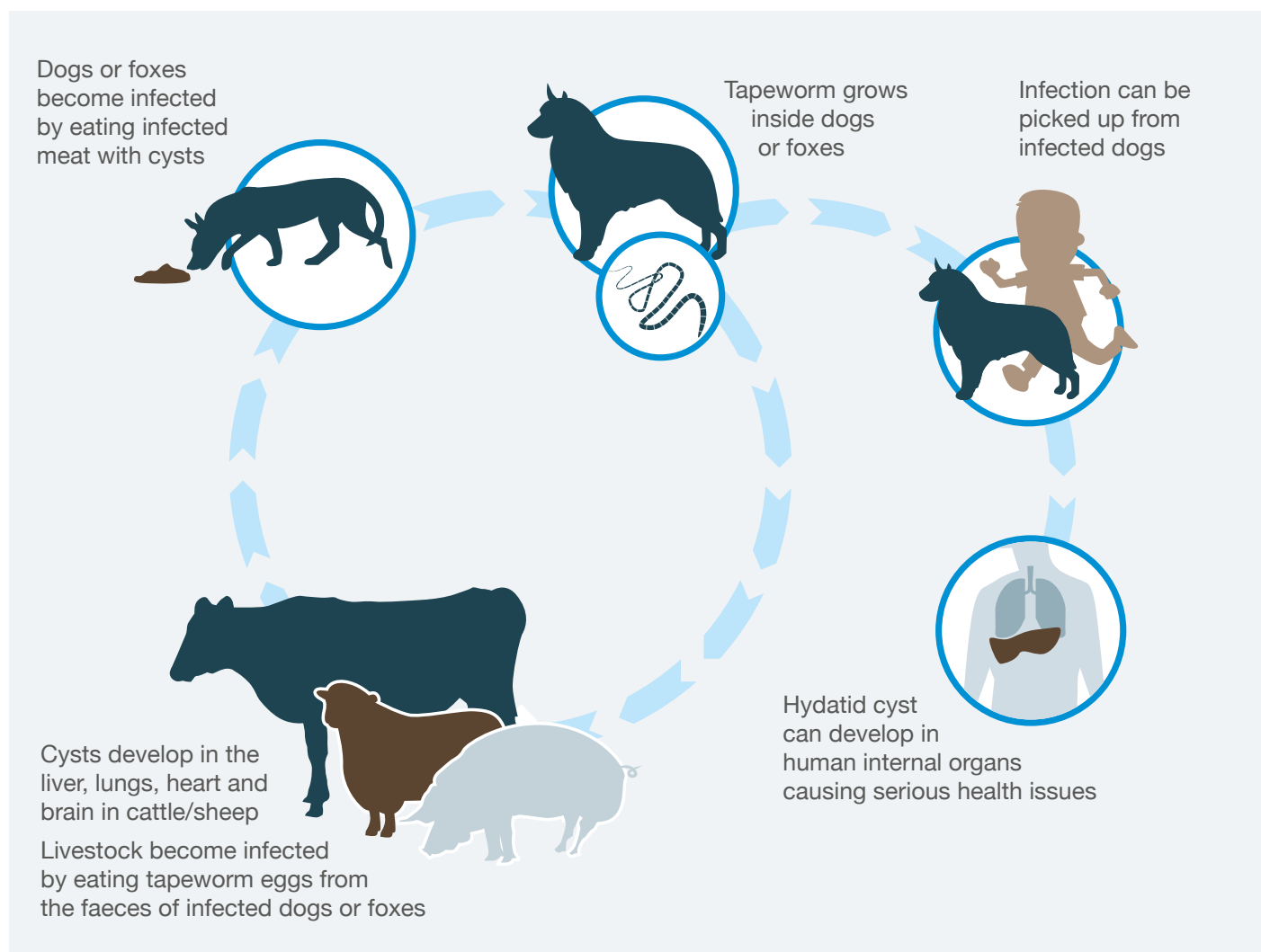
Hydatid disease (*Echinococcosis*) is an important zoonose that can be fatal if untreated. In humans it usually develops in the liver or lungs, leading to liver or lung deficiency. Rarely, cysts form in bones, causing spontaneous fractures, or in the brain, causing neurological signs. Cysts in the body occasionally rupture and cause severe allergic reactions in humans.

How to use post-mortem data

Infected animals often do not display symptoms. A post-mortem report will confirm the presence of the tapeworm *E. granulosus* on farm and inform dog-worming strategy.



Example of hydatid cysts in liver



Hydatid life cycle

How the disease is spread

The most widespread cycle that exists for *E. granulosus* is between dogs and sheep. When dogs are fed fresh offal or scavenge on infected sheep carcasses containing cysts, they become infected without ill effect. Dogs contaminate the pasture with their faeces, where the eggs are then scattered by wind and water. Cattle and sheep are re-infected as they graze. The cycle is completed when final hosts (dogs) consume tissues with hydatid cysts or that are contaminated with cyst fluid.

Risk factors

The key risk is dogs or foxes because they carry the tapeworm without showing any sign of infection.

Control of the disease in animals

To prevent or eliminate hydatid tapeworm infections in dogs, the tapeworm's life cycle must be broken. This can be achieved by:

- Regularly worming all working and visiting dogs for tapeworm
- Fencing off public footpaths
- Not feeding dogs with raw offal or allowing them to scavenge on carcasses
- Only feed dogs with pet food
- Encouraging dog owners to pick up their dogs' faeces

The only suitable wormer for dogs is praziquantel, which is found in many dog wormers. Great care must be taken when treating infected dogs and disposing of their faeces for three days post-treatment. To reduce the risk of unsuccessful treatments, wormer should be used as advised. Good hand-washing hygiene reduces the risk of infection, especially after handling dogs.

Joint lesions

Cause

Arthritis means inflammation in one or more joints. In sheep, it is usually the result of bacterial infection. When a joint is inflamed because of bacteria, the condition is referred to as septic arthritis.

There are two important ways in which bacteria can invade joints: following a traumatic injury, especially a penetrating wound to the joint; and via the bloodstream.

Arthritis usually causes lameness and visible swelling of at least two joints in the legs. Young lambs are most susceptible to arthritis infection.



Swollen cattle feet

Cost to industry

Arthritis causes production losses in cattle and sheep. Treatment costs also occur and, subject to the stage of the disease, may result in the premature sale of affected animals.

Impact in live animals

Arthritis causes lameness and painful dysfunction of the joints. If the process is active or acute, the surrounding tissues of the joints become swollen and warm. In chronic arthritis, the joint becomes hard and stiff, thus reducing mobility.

Cattle and sheep may be reluctant to walk and increase time spent lying down. Sheep will often walk with a short-stepping, shuffling gait. Reduced appetite leading to weight loss may also be observed because of the pain.

Cattle and sheep usually recover. However, those that remain chronically lame and in poor condition should be humanely destroyed.

Impact on carcasses

Based on the severity of arthritis, the affected joint is rejected, but if there is evidence of systemic infection the whole carcass may be rejected.



Arthritis in sheep

How to use post-mortem data

Post-mortem data should be used to confirm the presence of joint lesions on farm.

How the disease is spread

Once bacteria invade the joint, they attach to the lining of the joint where they multiply, causing inflammation. In response, the lining of the joint thickens and roughens, creating an ideal environment for the bacteria to grow.

As a defence, the synovial tissue of the joint releases chemicals into the joint fluid, breaking down the cartilage at the ends of the bones. Once the cartilage barrier is broken, the infection is then free to spread under the bone, causing extreme pain, especially with movement.

Risk factors

- Unhygienic conditions at lambing or calving time leads to infection through the navel
- Poorly designed buildings with sharp corners leads to traumatic arthritis
- Water-logged gateways with old bricks and stone provide an ideal environment for bacteria, leading damaged animals' feet to become infected

Control

- Colostrum helps calves and lambs to acquire the maternal antibodies to fight infection against the risk of septic arthritis
- Good hygiene practices to reduce the risk of navel infection
- When treating, follow product guidelines and vet instructions to ensure products are used appropriately

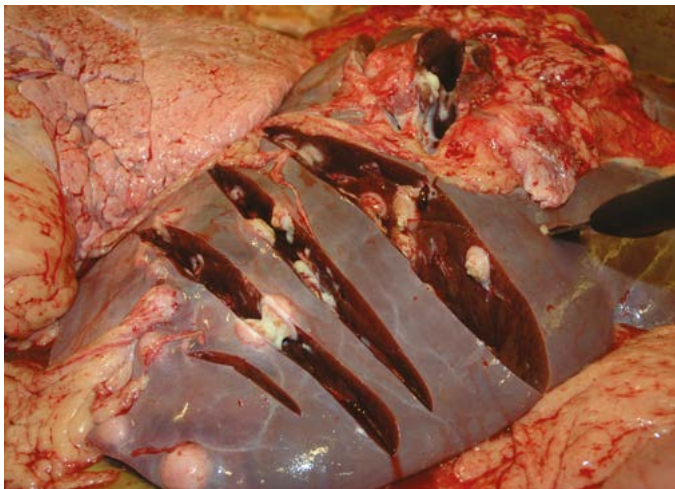


Arthritis in sheep

Liver abscess

Cause

Liver abscesses are often associated with acidosis in finishing cattle. Acidosis occurs when the acid load in the rumen increases because of too high levels of rapidly fermentable starch and sugar in the ration.



Liver showing severe abscesses likely to be caused by acidosis

Cost to industry

Liver abscesses have an economic consequence as they usually lead to poorer livestock performance with reduced meat yield.

Impact in live animals

Some of the following symptoms may be seen when the condition is at an advanced stage:

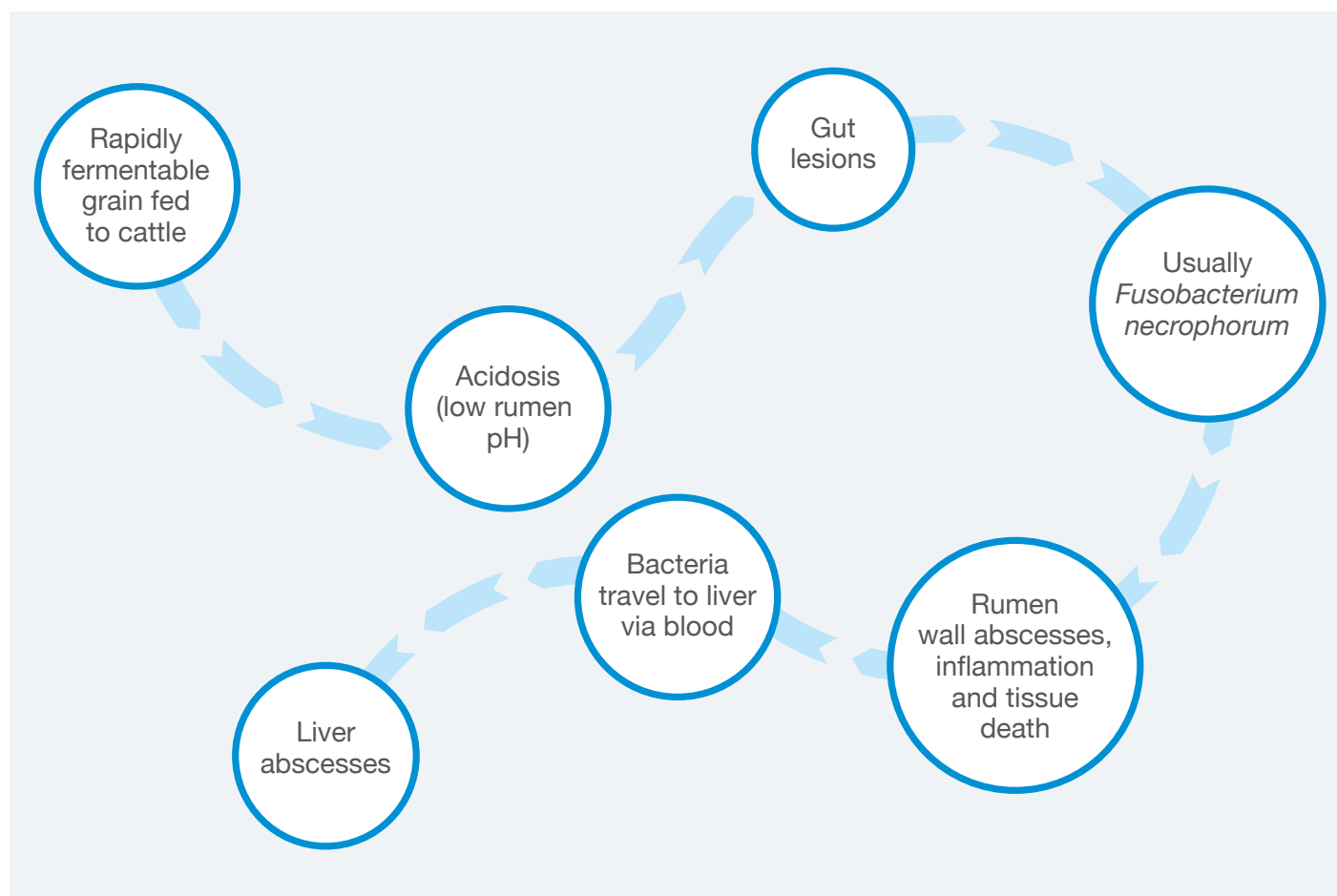
- Reduced feed intake
- Poor body condition and weight loss
- Unexplained diarrhoea
- Raised temperature
- Pulse rate and respiratory rate may rise
- Lethargy
- Pneumonia
- Bleeding from the nose
- Death in extreme cases

Impact on carcasses

- Liver is rejected
- Lower carcass weight
- High level of carcass trimming, due to abscess adhesion to the diaphragm and surrounding organs
- In some instances, condemnation of the entire viscera



Steer showing reduced weight gain



How the disease is spread

How to use post-mortem data

The many symptoms of liver abscesses means it is difficult to establish for certain when cattle suffered from rumen acidosis. Post-mortem data will help to inform producers whether acidosis is occurring on the farm and if so, a review of feeding management should be made.

How the disease is spread

Direct transfer from a roughage regime to a finishing regime with poor feed trough management increases the risk of acidosis. It usually happens when the pH of the rumen falls below 5.5.

This has two effects:

1. The rumen stops turning over, leading to loss of appetite and weight loss.
2. Acidity level increases, creating the right environment for acid-producing bacteria to take over. Bacteria travel to the liver, via the blood, where they create abscesses.

Risk factors

Key factors causing acidosis are high levels of carbohydrate in feed and its texture and method of feeding, as well as poor trough management.

Control

A balanced ration containing sources of fibre and readily fermentable carbohydrates.

A source of long fibre such as straw can be particularly helpful. This, combined with feed trough management, should reduce the risk of acidosis.

Tips to avoid acidosis:

- Do not grind cereals into fine particles – crack the grain
- Offer moist cereals like crimped or treated grains
- Always have a source of long fibre, eg straw available in racks to provide structural fibre – intakes are likely to be 0.5–1.5kg/day
- Never let ad lib feed hoppers run out so animals gorge on high energy feeds when they are filled up
- If not feeding cereals ad lib, feed in small meals throughout the day. Avoid individual meal sizes greater than 2.5kg/head/feed for dry cereals

Liver fluke

Cause

Liver fluke (*Fasciola hepatica*) is a flat, leaf-like parasite found in the tissues and bile ducts of the liver. Adults are only around 3cm long but cause severe damage to the animal they infect, lowering production and costing farmers millions of pounds each year.

The disease, called fasciolosis, can result from the migration of large numbers of immature flukes through the liver, or from the presence of mature (adult) flukes in the bile ducts, or both.

Once the mature fluke pass their eggs, liver function starts to recover, but with an extensive level of fibrous, historic scarring of the tissue as a result of the parasitic infestation.



Flatworm *Fasciola hepatica* (liver fluke)

Cost to industry

Liver fluke is estimated to cost English producers around £25.5 million per year. On farm cost per cattle is estimated at £87 and £5.56 for each sheep case.

Impact in live animals

Animals infected with liver fluke typically have poor performance, lose weight and become anaemic.



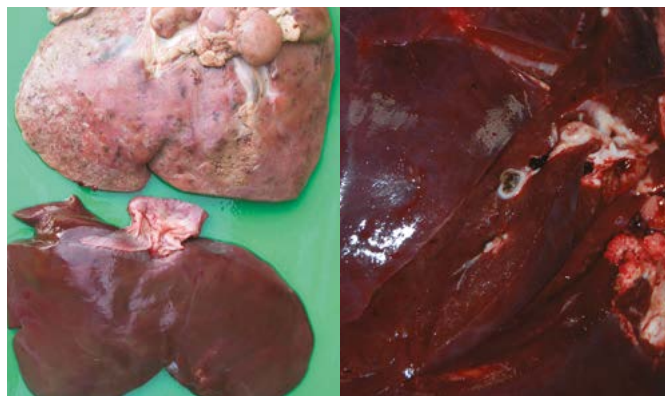
Beast showing poor body condition

Other key signs of fasciolosis include:

- Reduced milk yield
- Occasional deaths caused by acute or untreated chronic infections, increasing susceptibility to other infections

Impact on carcasses

- Infected livers are rejected
- Poorer carcass classification
- Lower carcass weight



Livers showing infestation with fluke

How to use post-mortem data

Diagnosis of liver fluke is not simple because it can be mistaken for other conditions. The level of liver fluke recorded provides evidence that fluke is present, even when clinical signs are absent.

When reporting fluke, it is important to note whether they are mature or immature because this is valuable for deciding on the most appropriate flukicide to use. Liver fluke take approximately 12 weeks to mature and not all flukicides are effective against all immature stages. Therefore, speak to the vet to obtain the right flukicide that reflects the developmental stage of the fluke being targeted.

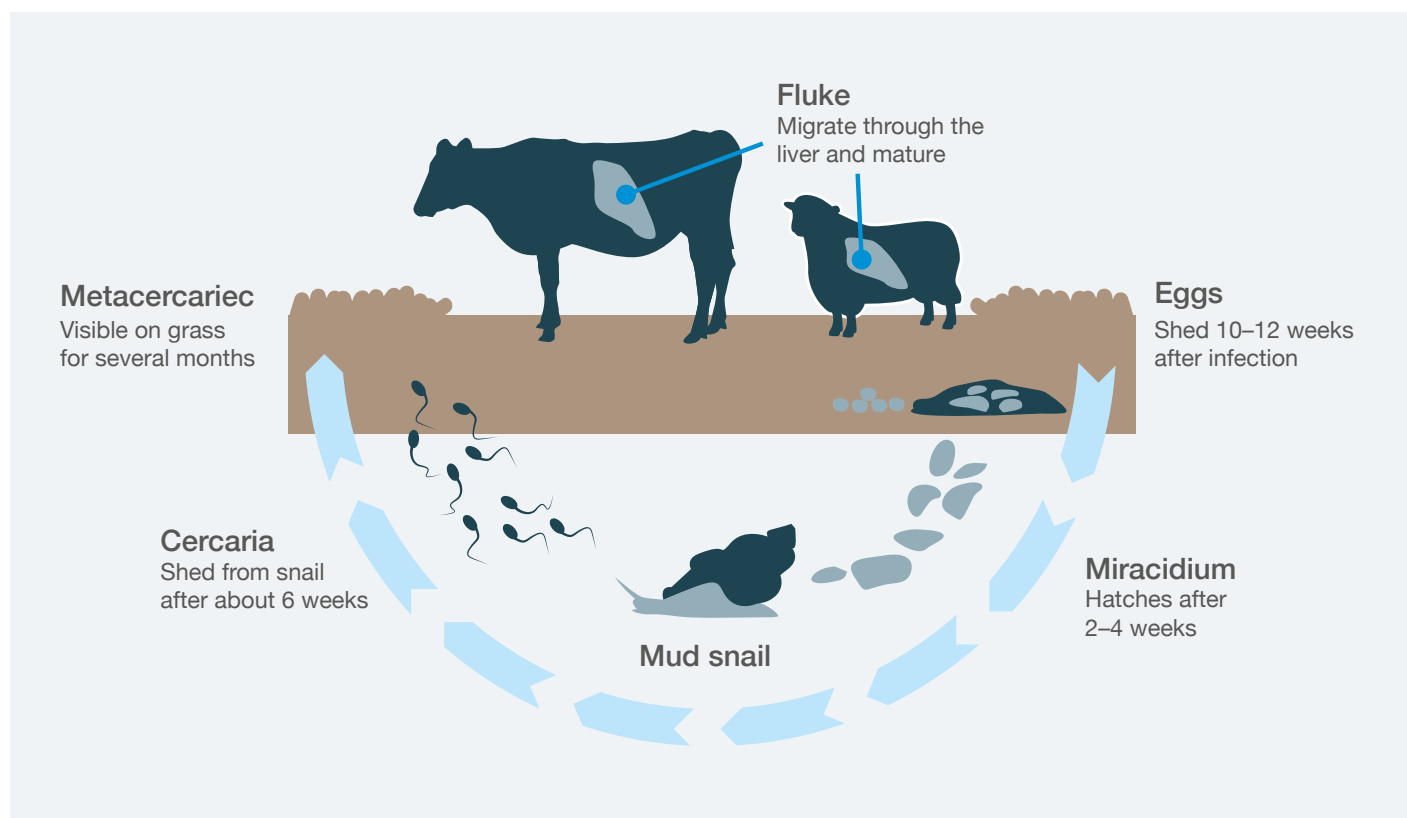
How the disease is spread

The whole liver fluke life cycle takes about 20 weeks. Part of the life cycle involves an intermediate host, which is a small mud snail.

Within two weeks of being excreted, the eggs hatch into microscopic-like tadpoles. They find the mud snail, the host. The fluke develop and multiply within the snail over a period of six weeks or more, after which they leave the snail to attach to the surrounding vegetation.

Once ingested by grazing cattle/sheep, the immature fluke travel to the liver over an estimated period of eight weeks. They then migrate into the bile ducts, where they spend their adult lives.

After 12 weeks inside the animal, the cycle is completed when the mature fluke produce eggs. Liver fluke can live in cattle for up to two years unless they are destroyed by a flukicide.



Liver fluke life cycle

Risk factors

Wet muddy areas

Mud snails are found around the edges of ponds, streams, rivers or tractor ruts in muddy fields.

Warm and wet summer weather

Warm, wet summers facilitate the reproduction of mud snails and the development of fluke.

Epidemiology

Liver fluke is a seasonal disease, with late summer/autumn presenting a high risk to pasture being infected with active cysts, resulting in disease in cattle/sheep over the winter period.

Control

Control of liver fluke should be tailored to an individual farm, based on the history of all stock, regardless of age and species. A treatment plan for the whole year should be developed in collaboration with the farm vet. A good programme should include both the use of flukicides and grazing strategies to avoid heavily contaminated pasture.

Before implementing a control programme it must be established if fluke infection is present and fluke-free pastures should be identified.

Stock that are bought in from potential fluke or roundworm areas should be quarantined to reduce the risk of introducing fluke or roundworms to the farm.

Triclabendazole is widely used to control fluke in sheep. Reportedly, there is some resistance to triclabendazole in the UK; however, it is the only product effective against fluke of two days and older in sheep.

While resistance to triclabendazole has only been reported in the fluke population in sheep, it should be noted that the same parasite also affects cattle.

Lungworm (parasitic bronchitis, dictyocaulosis, 'husk', 'hoose')

Cause

Parasitic bronchitis (husk), is a parasite infection of the respiratory tract caused by the thread-like *Dictyocaulus* worms. Infection usually occurs in mid-to-late summer, with typical infection sites being the trachea and bronchi of the lungs.

Dictyocaulus viviparus is commonly found in cattle, and *Dictyocaulus filaria* in sheep. Other sheep lungworm such as *Muellerius capillaris* and *Prostrongylus rufescens* are also found during inspection.



Infected cattle lung

Cost to industry

Species of *Dictyocaulus* in sheep and cattle lead to important economic loss. It has been reported that severe lungworm outbreaks in growing cattle cost on average £50–100 per head.

Impact in live animals

First-year grazing cattle develop symptoms in late summer and autumn, whereas older animals may show symptoms earlier in the year.

The most characteristic clinical sign of lungworm infection is widespread coughing within a herd. It causes reduced weight gain and milk yield.

Other symptoms include:

- Loss of condition
- Increase in respiratory rate
- Difficulty breathing
- Death in heavy infections

Similar impacts are observed in sheep. However, in extreme cases, lung oedema and emphysema can also be present.



Laboured breathing

Impact on carcasses

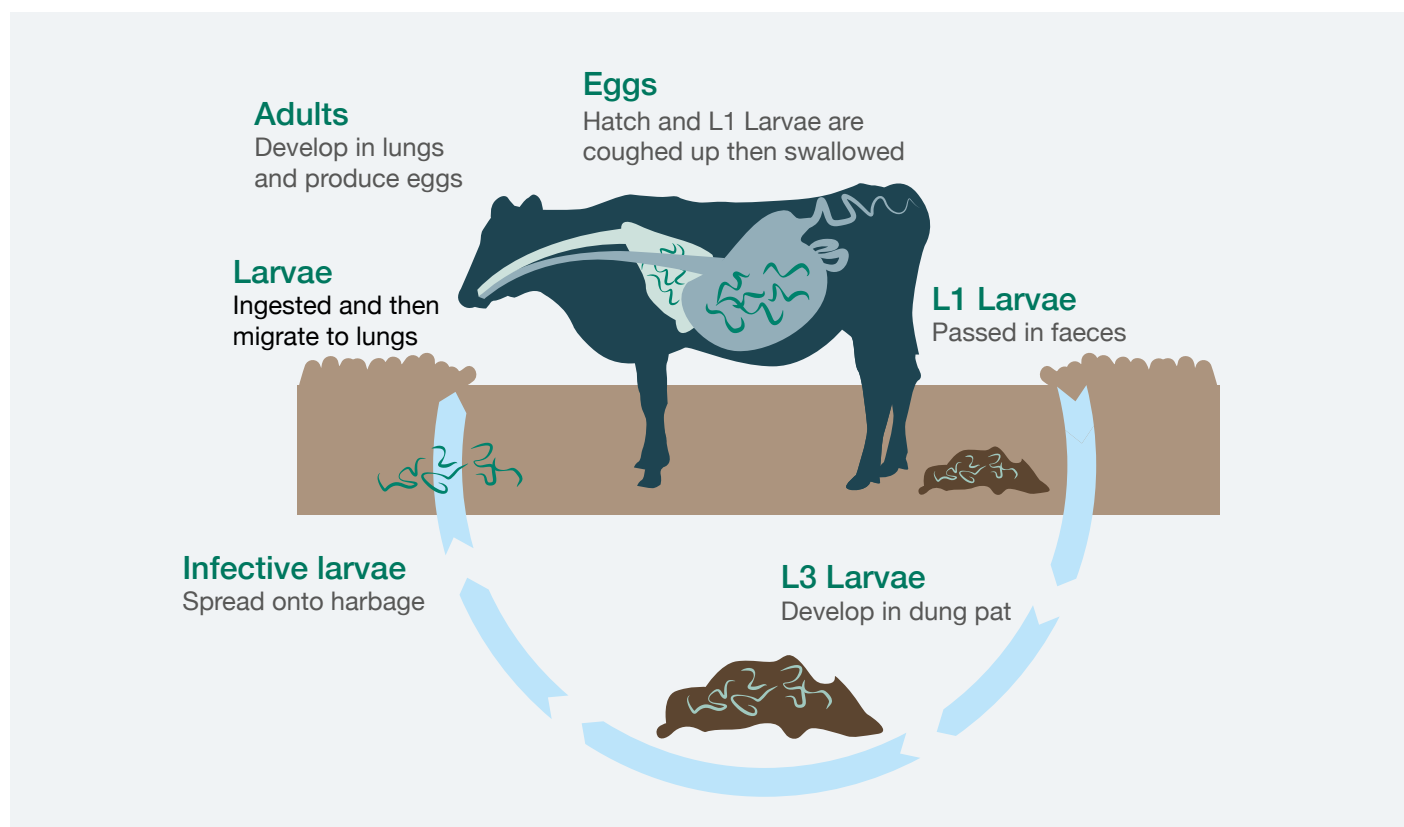
- The affected lung is rejected
- Poor carcase condition
- Lower weight of carcasses
- Lungworm infection can lead to a secondary infection such as pleuritis

How to use post-mortem data

Infected animals do not always show obvious symptoms, so the post-mortem examination should be used to identify early risk of lungworm on farm and develop a suitable strategy for its management.

How the disease is spread

Animals become infected by ingesting infective larvae from pasture. The larvae develop in the faeces and after a week or less, move onto the grass, either through their own activity, helped by rainfall, or by attaching to the spores of fungi that also grow on faeces. Once eaten by the animal, the larvae penetrate the animal's gut and travel to the lungs, where they mature into adults over a period of about three weeks. Adult female worms then start laying eggs and the cycle is complete. The life cycle of lungworms takes a minimum of about four weeks.



Lungworm life cycle

Risk factors

Wet summers

Wet summers provide favourable conditions for the larvae to thrive.

Heavy stocking densities

All infected animals are a source of contamination of pasture. However, not all infected animals will display symptoms. It is therefore important to manage the density of the herd to minimise the risk of cross-contamination.

Lack of immunity due to low exposure to infective larvae

Calves that had little exposure to the infective larvae have not acquired immunity and therefore are likely to become infected as adults if introduced to contaminated pasture.

Newly purchased stock

Bought-in stock may introduce lungworm onto a farm.

Control

Lungworm infections in herds or flocks are mostly controlled by vaccination or anthelmintics.

Farms with a previous history of lungworm should consider vaccinating calves as part of herd health planning with a vet.

It is important to keep detailed records of grazing patterns and anthelmintic treatments in order to tailor the best lungworm control programme for a given situation.

Bought-in stock should have been previously vaccinated to prevent introducing lungworm to husk-free herds.

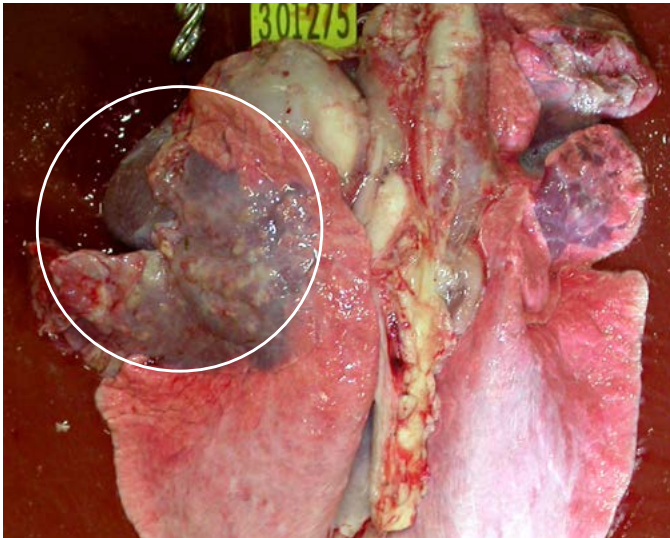
Worming treatment can also be considered because most wormers kill lungworms.

Consult the vet for the best control of lungworm specific to your farm.

Cause

Pneumonia, or bovine respiratory disease complex (BRD), causes inflammation of the lung tissue and airways. It is commonly caused by a variety of viruses and bacteria.

Pleurisy is inflammation of the pleura, which is a membrane that covers the lungs, heart and walls of the chest cavity. Pleurisy can be caused by the same pathogens as pneumonia.



Lungs with evidence of pneumonia infection (circled)

Cost to industry

Pneumonia is the most common cause of death and poor performance in young cattle from weaning to 10 months of age.

Pneumonia can lead to reduced feed conversion efficiency and lifetime performance. Cattle may also fail to achieve growth targets.

It is estimated that pneumonia costs the UK cattle industry £50 million a year. The estimated cost per affected animal is between £30 and £80; however, this could increase to £500 or more if the animal dies.

Impact in live animals

Pneumonia symptoms are similar to those observed for pleurisy. These can include:

- Reduced feed intake
- Raised temperature (above 39.5°C or 103°F)
- Increased breathing rate and effort
- Head down, looking depressed
- Coughing
- Nasal discharge
- Increased susceptibility to other diseases
- Death



Example of cattle with nasal discharge

Impact on carcasses

- Affected lung is rejected
- Reduced carcass weight
- Pneumonia can spread to the pleura, causing pleurisy
- Pneumonia can lead to a development of a secondary generalised infection. If this occurs the whole carcass and its offal are rejected as unfit for human consumption

How to use post-mortem data

Reported levels of pneumonia and pleurisy should be used with the vet to review the herd health plan, checking the effectiveness of current control strategies and ensuring all veterinary and management factors have been considered to reduce the incidence of future respiratory disease.

How the disease is spread

Pneumonia can be caused by several different airborne viruses and bacteria that are easily spread from infected animals to susceptible calves. It occurs when the animal's immune system is weakened by a variety of stressors such as poor nutrition, weaning, mixing with other cattle, transport, veterinary procedures and concurrent disease.

The main viruses involved are:

- Respiratory syncytial virus (RSV)
- Parainfluenza type 3 virus (PI3)
- Infectious bovine rhinotracheitis virus (IBR)
- Bovine viral diarrhoea virus (BVD)



How the disease is spread

The main bacteria involved are:

- *Mannheimia haemolytica* (known as *Pasteurella haemolytica*)
- *Pasteurella multocida*
- *Mycoplasma* spp.
- *Histophilus somnus*

Risk factors

Animal factors

Fast growing cattle can have relatively smaller lungs in comparison to the size of their body, which may affect their resistance to respiratory infection.

Environmental factors

Environmental factors and management are important in the control of pneumonia. Cattle housing is a key focus area, as it can influence both the animals and the pathogens responsible for the disease. Inadequate ventilation increases the risks of respiratory disease.

Pathogens

Pneumonia is not only caused by external infection but often the pathogen can lie dormant in the animals awaiting a trigger to activate it, often this will be a form of stress.

Control

Disease can be reduced by avoiding overcrowding and the mixing of cattle of different origins and different ages. To prevent or control pneumonia the three identified risk factors above must be tackled together:

Animals

- Colostrum is essential in building the calf's resistance to the disease
- Ensure the correct nutrition requirements of the calves are met at every developmental stage
- The accumulation of stress in a calf's life lowers its development. It is essential to plan ahead to the weaning phase to reduce stress
- Bought-in animals are a potential source of infection. They should be quarantined and monitored for signs of disease for a minimum of 21 days

Environment

Building design and ventilation systems play a crucial part in the good health and performance of the animal. Good housing, which should be dry, draught free, comfortable and well ventilated, can reduce the risk of respiratory disease.

Pathogens

A number of vaccines are available that fight the main causative agents of respiratory disease. However, not all are covered by vaccines so it is important to inform the vet of post-mortem data to decide the best form of action moving forward.

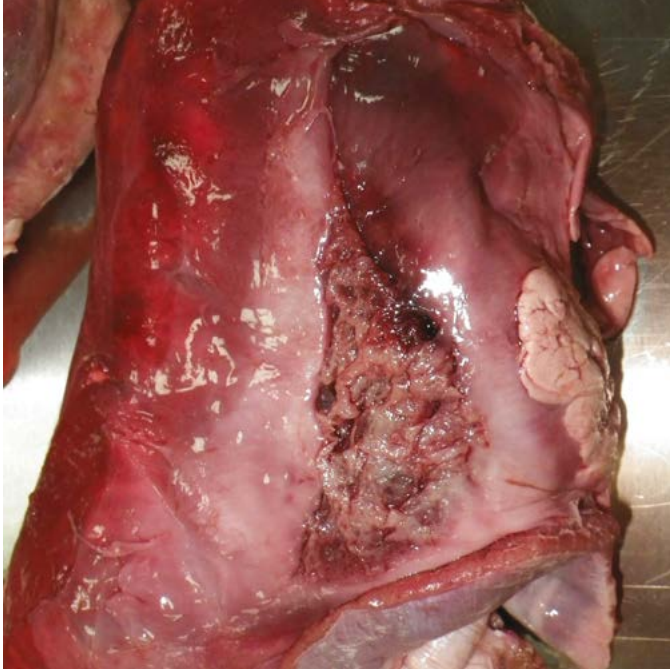


An example of good ventilation

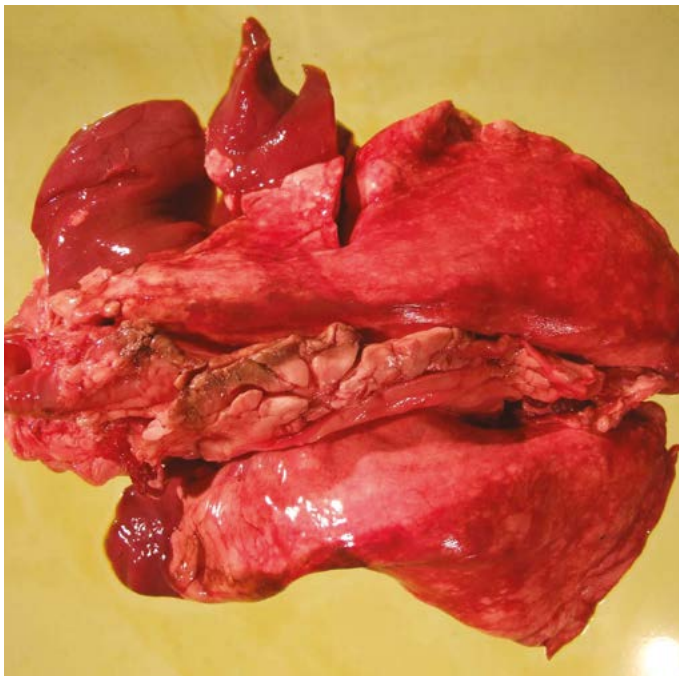
Pneumonia/Mycoplasma-like and Pasteurella-like

Cause

Pneumonia can be described as inflammation of the lung tissues and airways. It can be caused by a variety of infectious agents including bacteria, parasites and viruses. *Pasteurella*-like and *Mycoplasma*-like pneumonia result from bacterial infections.



Pasteurella-like pneumonia



Mycoplasma-like pneumonia

Cost to industry

Pneumonia, in particular *Pasteurella*-like pneumonia, is associated with a high mortality rate, causing significant loss to industry.

Impact in live animals

Pneumonia, in particular *Pasteurella*-like pneumonia is the most common cause of death and poor performance in sheep. *Mycoplasma*-like pneumonia and *Pasteurella*-like pneumonia have similar symptoms, including:

- Reduced appetite
- Increased breathing rate and effort
- Looking depressed
- Loss of condition
- Coughing
- Nasal discharge
- Death

Impact on carcasses

- Affected lung is rejected
- Lower carcass weight
- Pneumonia can spread to the pleura causing pleurisy
- Pneumonia can lead to the development of secondary, generalised infections. If this occurs the carcass and its offal are rejected as unfit for human consumption



Lung rejected because of pneumonia



How to use post-mortem data

The type of pneumonia recorded at post-mortem should enable producers to identify the appropriate treatment to use to fight infection on farm. For instance, *Pasteurella* requires *Pasteurella* pneumonia-specific treatment.

How the disease is spread

Pneumonia can be caused by infection with bacteria such as *Pasteurella* or *Mycoplasma*. The infective agents are airborne and easily spread from infected animals to susceptible animals through contaminated air, feed, water and equipment. Infection tends to occur when the animal's immune defence is weakened by other pathogens.

Risk factors

Animal

The lungs and immune system are not fully developed until the animal is 12 months old.

Environment

The conditions in which animals are housed can influence the animals' health and the pathogens responsible for the disease.

Pathogens

Pneumonia is not only caused by external infection but often the pathogen lies dormant in the animals, awaiting an activation trigger such as stress.

Control

To prevent or control pneumonia, the three identified risk factors must be tackled together.

Animals

- Colostrum is essential for building lambs' resistance to the disease
- Ensure the correct nutrition requirements are met at every developmental stage
- The accumulation of stress may affect an animal's immunity to pneumonia. It is essential to plan ahead key changes to farming practices to reduce stress
- Bought-in animals are a potential source of infection. Their introduction to the farm should be closely monitored

Environment

Building design and ventilation systems are crucial to the health and performance of the animal. Good housing, which should be dry, draught-free, comfortable and well ventilated, can reduce the risk of respiratory disease.

Pathogens

Prevention of *Pasteurella*-like pneumonia can be achieved by the use of specific *Pasteurella* vaccines before known risk periods.



Newborn lamb suckling for colostrum



Cause

This heart condition is caused by ingestion of wire or other pieces of metal or solid plastic into the rumen of the beast. Ruminal movements can cause the wire to penetrate the stomach, in turn penetrating the pericardium and/or liver, causing pericarditis.

Cattle commonly ingest foreign objects because they do not discriminate between metal materials in feed and do not completely masticate feed before swallowing.



Bovine traumatic pericarditis



Example of traumatic pericarditis

How the condition arises

Swallowed metallic objects, such as nails or pieces of wire, fall directly into the reticulum or pass into the rumen. Subsequently, they are carried over the rumino-reticular fold into the front upper part of the reticulum by ruminal contractions. Contractions of the reticulum promote penetration of the wall by the foreign object. Perforation of the reticulum wall allows leakage of the stomach contents and bacteria, causing peritonitis. The object can penetrate the diaphragm and enter the thoracic cavity (causing pleurisy and sometimes pulmonary abscessation) and the pericardial sac (causing pericarditis, sometimes followed by myocarditis). Occasionally, the liver or spleen may be pierced and become infected, resulting in abscessation, or septicaemia can develop.

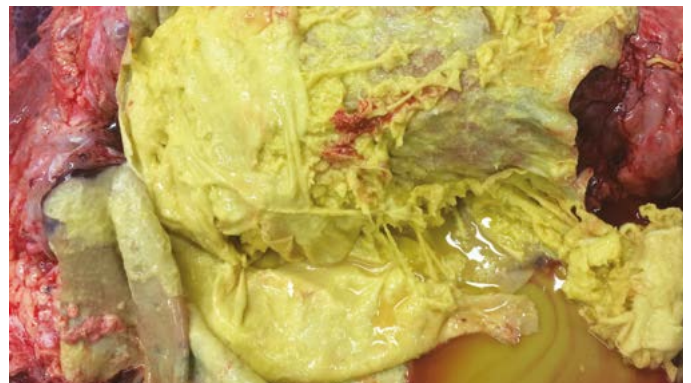
Risk factors

Incorporation of wire into silage clamps from tyres. Pastures near sites where buildings have recently been constructed, burned, or torn down increase the risk of exposure to tyres, nails and metallic objects.

Control

Care should be taken to remove worn tyres with exposed wire when sheeting down the silage clamps. Care should also be taken when building work is carried out on or near pasture, to avoid the ingestion of common metal objects such as nails.

As a preventive measure, magnets can be given to cattle; once ingested they lodge in the reticulum and collect metal debris.



Perforation of the rumen by a piece of wire

Cost to industry

The costs associated with this condition are surgery and veterinary medicine to remove the foreign body. Replacement costs of an animal can also occur in the event of culling or sudden death.

Impact in live animals

Some of the impacts observed in live animals include:

- Loss of appetite
- Reduced milk production
- The animal stands with an arched back and moves reluctantly
- Appears dull and depressed and may stand away from the herd
- Signs of abdominal discomfort and swelling
- In extreme cases, death

Impact on carcasses

- Infected organ is rejected
- Lower carcass weight caused by loss appetite
- Often, traumatic pericarditis can lead to systemic infection, causing the entire carcass and associated offal to be rejected as unfit for human consumption



The table below refers to conditions leading to total condemnation of a carcase and its offal. Localised conditions are restricted by the animal's defence mechanisms to a certain area or organ, as opposed to generalised conditions, in which the disease spreads to the whole body. Most of the conditions leading to total condemnation are the outcome of conditions described in this booklet.

Condition	Details
Abnormal odour-suspect uraemia	Abnormal odour is often the result of feed, medication or a metabolic disorder. Specific feed can cause odour in meat, particularly in cattle. For example, cattle with access to onions and garlic will produce meat with these strong odours. Veterinary medication with aromatic compounds can taint the meat if administered just before slaughter. The odour may also trigger additional sampling to ensure that the withdrawal period of the medication has been met. Ketosis is a disease caused when fat is rapidly broken down to produce energy, most often seen in early lactation. The ketones produced during this process can result in an odour similar to that of nail varnish. Ketosis reflects problems with nutritional management. Inspection result should trigger a review of diet formulation for the class of stock affected.
<i>Cysticercus bovis</i> (generalised)	Please see section on <i>Cysticercus bovis</i> (page 8).
<i>Cysticercus ovis</i> (generalised)	Please see section on <i>Cysticercus ovis</i> (page 10).
Emaciation/generalised oedema	Emaciation is a wasting condition usually caused by disease. The muscle and fat tissues become depleted, while any remaining fat becomes jelly-like. The animal experiences severe weight loss. Emaciation is usually associated with chronic conditions and parasitic infections such as liver fluke, but also poor teeth and nutrition can be causes. Oedema and emaciation often occur together. Oedema is the excessive accumulation of fluid in tissues, triggered by a disease that encourages excess fluid to leak from the blood vessels. The post-mortem inspection report for that batch of livestock should be reviewed to find potential clues to the primary cause of emaciation. For instance, has liver fluke also been reported?
Hydatidosis	Please see section on hydatid cyst (page 14).
Immature cattle	The slaughter of calves younger than two weeks of age for human consumption is prohibited.
Jaundice	Jaundice occurs when the yellow pigments of the bile gain access to the bloodstream and spread throughout the body, giving the carcase a yellowish colour. Some of the clinical signs reported include yellow pigmentation of the gums and inner eye. Jaundice can be the result of cirrhosis of the liver caused by a blockage of the bile duct by fluke infestation or stones. Plant poisoning and chronic copper poisoning can also trigger jaundice. These and other risk factors should be explored following the identification of jaundice on inspection results. Two of the factors associated with jaundice are liver fluke infection and high intake of copper. These and other risk factors should be explored following the identification of jaundice on inspection results.



Condition	Details
Navel ill/joint ill for young animals	Navel ill or joint ill is usually the result of an infection of the navel (umbilical cord). Navel ill tends to be confined to the navel area. Joint ill occurs when the infection from the umbilical cord spreads to other parts of the body and organs via the bloodstream and settle in joints making them stiff and painful. The risk of infection can be reduced if calving areas are kept clean and freshly bedded and the navel is dry before moving the calf to another pen or pasture. Disinfecting the navel, eg with iodine, can lower the risk of infection. Bulls' navels carry a higher risk of infection than those of heifers because they tend to dry more slowly. Therefore, bulls' navels benefit from two or three applications of disinfectant to reduce the risk. Colostrum intake will also help calves resist navel ill. Please see section on joint lesions (page 16).
Polyarthritis	Polyarthritis occurs when multiple joints are affected by a blood-borne infection. Please see section on joint lesions (page 16).
Multiple abscesses/pyaemia	Pyaemia is when pus-forming bacteria enter the bloodstream and form multiple abscesses throughout the body. Access is usually gained through a lesion such as footrot, an injection site or trauma. The regular reporting of pyaemia and abscesses should trigger an investigation on farm to identify possible causes. Often, abscesses are linked with poor injection practices. Please see section on abscesses (page 4).
Septicaemia/fever	Septicaemia is a bacterial infection of the bloodstream, also known as blood poisoning. Bacteria may enter the body through various routes; for instance, via the navel in a newborn calf, the digestive tract or the lungs as a result of pneumonia. Often, septicaemia develops when there is another infection somewhere in the body.
Tuberculosis (generalised suspect)	Tuberculosis is a chronic disease of cattle, but also affects sheep and goats. Bovine tuberculosis is caused by <i>Mycobacterium bovis</i>, which is a zoonotic disease. If the lesions, which usually appear in the lymph nodes, are localised, then only the infected part is rejected. However, if it is generalised, the entire carcass and associated offal are rejected. The common route of infection in cattle is through the respiratory tract because the bacteria are airborne. Lesions then develop in the lungs and associated lymph nodes. Transmission can also occur via ingestion, causing lesions in the digestive tract and/or associated lymph nodes. Young calves can be infected by drinking contaminated milk. Some of the clinical signs in cattle include coughing and progressive emaciation.



Sheep

Abscess – forequarter
Abscess – hindquarter
Abscess – neck
Abscess – lung
Bruising – traumatic
Bruising – wool-pull
Cysticercus ovis
Cysticercus tenuicollis
Fluke – immature
Fluke – mature
Historic scarring
Hydatid cyst(s)
Joint lesions
Lungworm
Mycoplasma-like pneumonia
Pasteurella-like pneumonia

Total rejection/condemnation:

Cysticercus ovis (generalised)
Emaciation/generalised oedema
Hydatidosis
Jaundice
Multiple abscesses/pyaemia
Polyarthritis
Septicaemia/fever

Cattle

Abscess – forequarter
Abscess – hindquarter
Abscess – liver
Abscess – neck
Bruising
Cysticercus bovis
Fluke – immature
Fluke – mature
Hepatic scarring
Hydatid cyst(s)
Joint lesions (including arthritis)
Lungworm
Pleurisy
Pneumonia
Traumatic pericarditis

Total rejection/condemnation:

Abnormal odour-suspect uraemia
Cysticercus bovis (generalised)
Hydatidosis
Immature cattle
Jaundice
Multiple abscesses/pyaemia
Navel ill/joint ill for young animals
Oedema/emaciation
Septicaemia/fever
Tuberculosis (generalised suspect)
Tuberculosis (generalised suspect)

Further reading

BRP Publications

Beef Manual 3 – **Improving cattle handling for Better Returns**

Beef Manual 6 – **Improved beef housing for Better Returns**

Sheep Manual 8 – **Worm control in sheep for Better Returns**

Beef Manual 9 – **Controlling worms and liver fluke in cattle for Better Returns**

Beef and Sheep Manual 9 – **Minimising carcass losses for Better Returns**

Beef and Sheep Manual 10 – **Controlling external parasites for Better Returns**

Understanding cattle and carcasses for Better Returns

Understanding lambs and carcasses for Better Returns

Cattle and sheep parasite control product guide

Beef diseases directory

Sheep diseases directory

Reducing liver fluke

BRP+ **Better management of bovine respiratory disease (BRD/Pneumonia)**

Andy Grist

Grist, A., 2011. **Ovine meat inspection: anatomy, physiology and disease conditions**. Nottingham University Press

Grist, A., 2008. **Bovine meat inspection: anatomy, physiology and disease conditions**. Nottingham University Press

Control of Worms Sustainably (COWS)

Control of liver and rumen fluke in cattle

Control of lungworm in cattle

Sustainable Control of Parasites in Sheep (SCOPS)

scops.org.uk/vets-manual

NADIS

Traumatic Reticulitis and Heart Conditions in Cattle

OIE World Organisation for Animal Health

OIE Terrestrial Manual 2008, CYSTICERCOSIS

web.oie.int/eng/normes/MANUAL/2008/pdf/2.09.05_CYSTICERCOSIS.pdf

OIE What is Echinococcosis or Hydatidosis?

oie.int/doc/ged/D13941.PDF Cattle and sheep parasite control product guide

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