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## Results in brief

- 2,472 carcasses examined
- 2,187 submissions (some contained multiple carcasses)
- From 1,053 beef and sheep farms
- Carried out at one FSCC
- Requested by producer or vet
- Diagnostic rates good
- Information fed back to producer
- Producers took action to prevent further losses
- On-farm productivity increased

## Next steps

- Train a new pathologist
- Communicate timely health advice via the media
- Encourage inclusion of PMs in farm health plans



## Using post-mortems to reduce future losses

AHDB Beef & Lamb's funding for post-mortems (PMs) carried out at fallen stock collection centres (FSCCs) stopped last year, but the results of the project have proved so useful, activity has continued.

This special bulletin provides an update on what has been found between April 2015 and March 2016. It will compare these results with the previous year – March 2014 to March 2015.

The activity is still being led by Ben Strugnell of Farm Post Mortems Ltd at John Warren ABP in County Durham. Fallen stock arrives from farms across Northumberland, County Durham and North Yorkshire.

The aim is to see whether meaningful diagnoses can be made by examining fallen stock and if the results are promptly relayed to producers, whether they can take action to prevent further deaths. Mr. Strugnell works closely with many local vet practices to ensure they share the information wider than the clients who supplied the dead animals.

### How it worked

When producers with a dead animal rang the FSCC to arrange collection, they were asked whether they wanted a PM to be carried out. If they did, the collection driver placed an identity tag around the animal's leg and delivered it to the PM room on arrival at John Warren ABP. Alternatively, one of the local vet practices would suggest that a producer book an animal in to be examined.

Before starting, Mr. Strugnell rang each producer for additional information and informed their vet that a PM was being conducted. This was generally done on the day of arrival and the results were sent to the producer and the vet

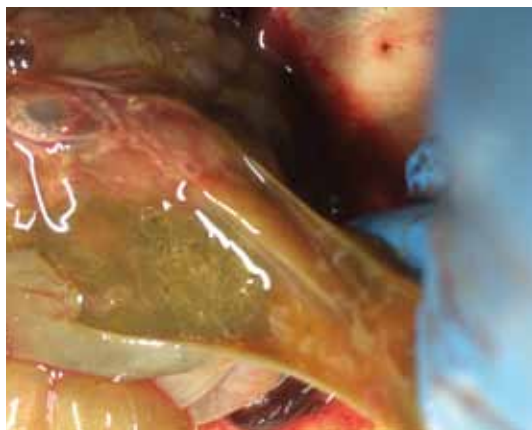


the next day. If additional lab testing was needed to confirm a diagnosis, the producer was asked if they were willing to pay for extra tests before these were arranged.

"The AHDB Beef & Lamb-funded project highlighted how useful it is to identify the cause of death before carcasses are destroyed," says Ben Strugnell. "There were literally hundreds of reasons why animals had died, but identifying the top ten causes for each class of stock has really brought home the most important ones.

"As many as 40% of these could have been prevented, either through the use of veterinary medicines, good colostrum uptake, or improved drug administration techniques. By feeding back the information to the individual farmers and then telling producers in the wider area, we can help prevent further losses."

# Sheep results



**Nematodirus worms in the gut**

## Lamb deaths

There were over 100 diagnoses made on lambs. The ten most common causes of death for both years are shown in Figure 1.

No diagnosis was reached in nearly 44% of carcasses across both years. Some of this was due to the producers not wishing to spend money on additional tests to find out the exact cause of death.

### Worms including nematodirus

Worms, including nematodirus, was the most common condition discovered in the dead lambs. The peak time for this diagnosis was November for both years (see Figure 2).

There is a trend towards increasing numbers of fatal cases of worms (diagnosed at PM examination) in autumn and winter. This trend was not quite so marked in 2015/16 as in 2014/15, but is still present.

It is a reminder that worms remain a major production constraint to store lambs kept outside in the back end of the year. The main three reasons for this are:

- The nutritive value of grass is poorer then. It is known that protein intakes are important in lambs' ability to withstand a worm challenge
- Such pastures may well have had ewes and lambs on them for much of the season, so challenge levels could be high
- Anthelmintic resistance is more common in worm species that are active later in the season

Worm egg count monitoring and prompt intervention is therefore very important to maximise returns on these animals.

Over one in five of the lambs submitted died as a consequence of parasites, if deaths due to worms, coccidiosis and nematodirus are added together.

This project highlights how PMs can increase the awareness and uptake of Sustainable Control of Parasites in Sheep (SCOPS) principles. See more at [www.scops.org.uk](http://www.scops.org.uk).

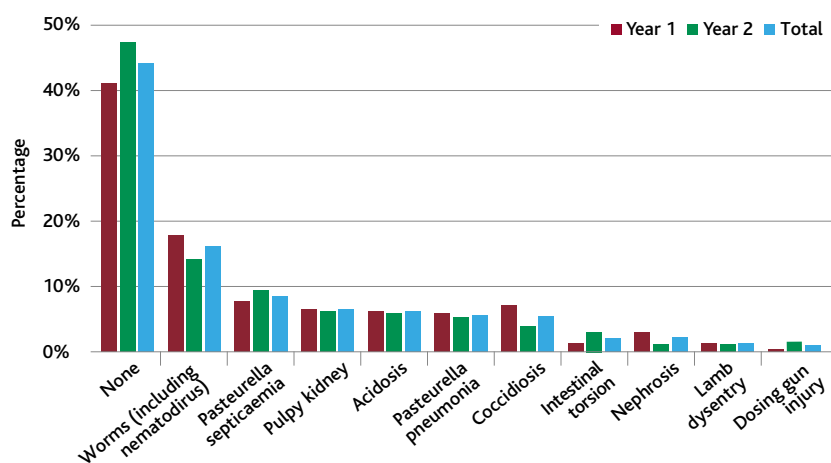
Over the two years, 1,389 carcasses from lambs, adult ewes and tups, were offered for PM at the FSCC (Table 1).

**Table 1: The number of lambs and adult sheep carcasses submitted for PM from March 2014 to March 2016**

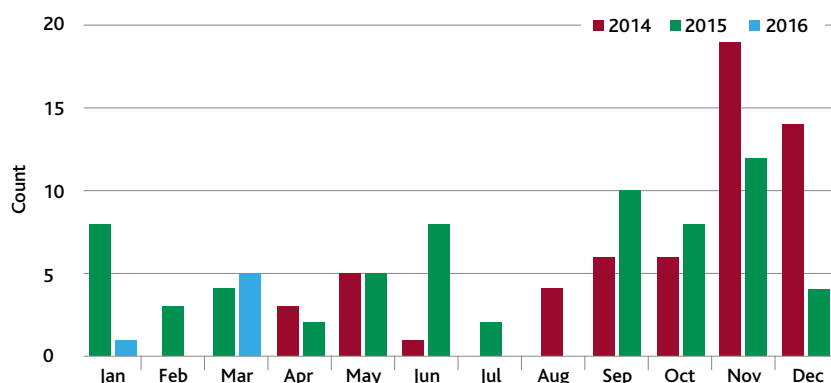
Class	Submissions	Carcases	Holdings
Lambs	662	859	380
Adult sheep	472	530	298
<b>TOTAL</b>	<b>1,134</b>	<b>1,389</b>	

For lambs and adult sheep, 48% and 50% of the carcasses reported in Table 1 were from the second year of the work respectively.

**Figure 1: The ten most common causes of death in lambs (excluding abortions) from March 2014 to March 2016**



**Figure 2: The count of deaths due to worms by month and year**



## Pasteurellosis

Pasteurellosis is an opportunistic disease which requires a trigger to cause disease or death, such as worms, border disease, trace element deficiency, adverse weather or overstocking.

Vaccines are available, which if used on healthy animals according to the data sheet instructions, are usually very effective. Around one in four of the lambs diagnosed died as a consequence of pasteurella.

The seasonal distribution of pasteurellosis can be seen in Figure 3.

The autumn peak of septicaemic pasteurellosis has important implications for its control. If producers are keeping store lambs during this period, they should be vaccinated ahead of any anticipated adverse weather or other stressors such as moving.

Lambs that are vaccinated when they are young (from one month old), may lose their immunity by the autumn if not given a booster around August/September.

## Ruminal acidosis

Ruminal acidosis (also known as barley poisoning) was diagnosed on 26 occasions on 24 different farms over the two years, accounting for 4.8% of all diagnoses.

There are well-established principles that producers can follow when feeding grain to lambs, which would avoid these problems. These include introducing cereals into the diet slowly and feeding whole grains at no more than 0.5kg/head per feed.



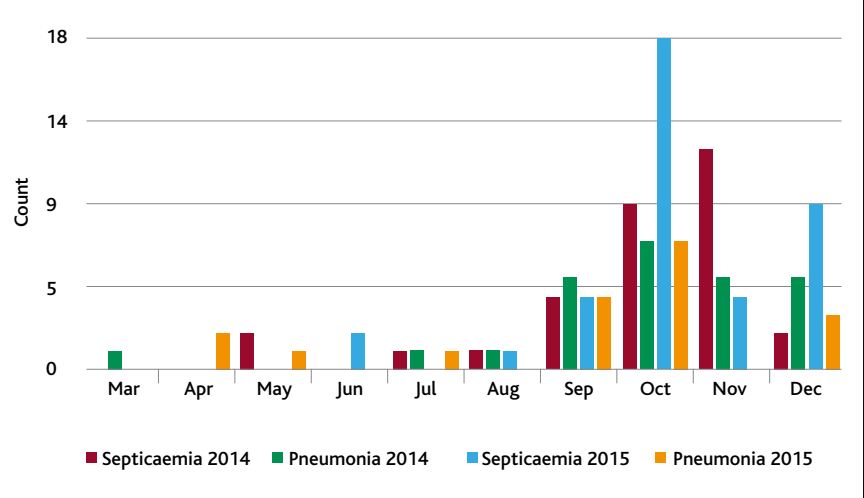
**Ruminal acidosis was diagnosed 26 times on 24 farms**

## Pulpy kidney

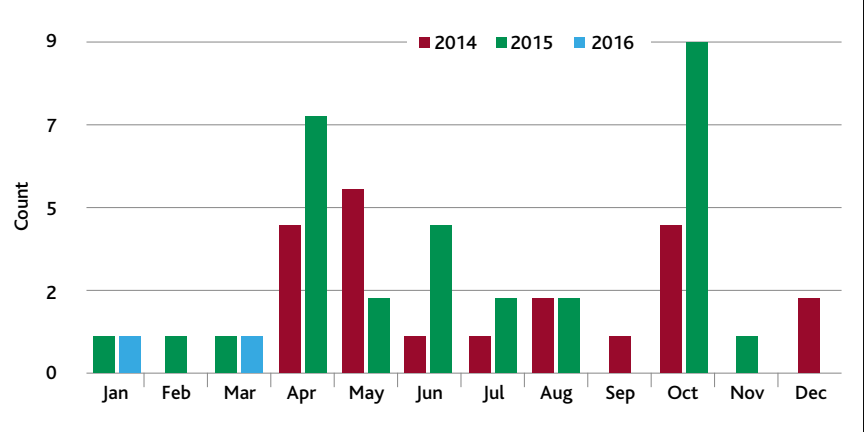
The incidence of pulpy kidney (clostridial disease) showed marked seasonal variation (see Figure 4).

In year one, there was a large peak in early spring, where lambs aged two to eight weeks of age were affected. In almost all cases in young lambs, neither the dams nor the lambs had been protected by vaccination.

**Figure 3: Seasonal incidence of pasteurellosis in lambs by month and year**



**Figure 4: The seasonal incidence of pulpy kidney by month and year**



There was a second peak in the autumn, which was very noticeable in year two. It may be triggered by changes in gut flora, notably the proliferation of clostridia, occurring as a result of dietary change.

In the case of the fed lambs, most had not received a booster prior to the change in diet and any immunity they may have had from drinking colostrum at birth, may have waned.

In general, clostridial vaccines in sheep work well and are cost-effective, which means that most of these losses are preventable.

## Coccidiosis

Coccidiosis was the second most common cause of death during the early spring of 2014, accounting for 7.2% of carcasses. However, the levels were lower in the second year with only 4.0%. This demonstrates the impact of the season on disease occurrence.

This is an example of a disease where prompt intervention by the producer with a coccidiostat, can reduce mortality and morbidity of the rest of the flock significantly.



# Sheep results

## Adult sheep deaths

In all, 530 adult sheep carcasses were examined during the project – 455 ewes and 75 tups. In year two, 50% of the carcasses were submitted.

There were 91 different diagnoses for cause of death in ewes. The ten most common are shown in Figure 5.

No diagnosis was reached in 15% of cases across both years. Some of this was due to the producers not wishing to spend money on additional tests to find out the exact cause of death.

### Ovine pulmonary adenocarcinoma

Ovine pulmonary adenocarcinoma (OPA) was diagnosed in 8.4% (38 carcasses), which is consistent with previous estimates of incidence from examining fallen stock.

The submissions were from 22 farms, with eight of them submitting multiple cases.

### Johne's disease

Johne's disease was found in 6.8% (31 cases) submitted to the FSCC over the two years, from a total of 25 farms, with five submitting multiple cases.

This disease can be challenging for PM technicians to diagnose, as it presents with multiple forms. One of the easiest signs to detect is a yellowing of the gut.

### Listeriosis

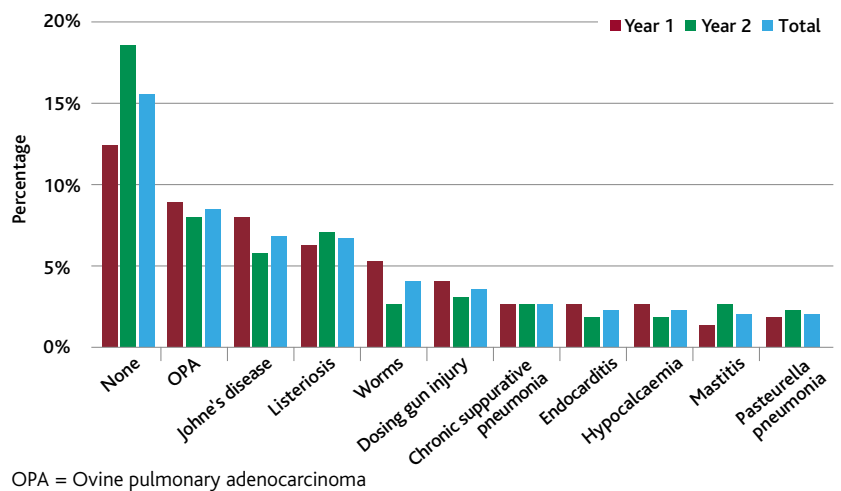
Listeriosis was diagnosed in 14 and 16 adult ewes in year one and two respectively, in sheep from 20 holdings.

In 2015/16, cases were clustered around the autumn and winter, which was very wet and muddy. Soil contact of any kind, be it muddy feed troughs, molehills, bare poached patches on pasture etc, poses a risk. Efforts should be made to reduce the risk by minimising soil contamination of feed troughs and ruthless mole control.



Dry rumen caused by listeriosis

Figure 5: The ten most frequent diagnoses made in adult ewes from March 2014 to March 2016



Good dosing gun technique is essential to prevent avoidable injury

### Dosing gun injury

This completely preventable cause of death was diagnosed on 16 occasions over the two years. It is likely that more sheep were affected than the ones actually submitted. Some of the dead animals had boluses pushed through their oesophagus, which caused severe infection and death. The incidence of this was too high.

### Worms

Worms were surprisingly common in ewes, with 4% of carcasses diagnosed with them. Seventeen of the 21 cases were during February, March and April, suggesting a relaxation of immunity to parasites around lambing if animals are not properly fed.

### Chronic suppurative pneumonia/endocarditis

These diseases probably resulted from an infected blood clot released into the circulation from a focus of infection somewhere in the body, possibly a bad foot, a skin wound, or from the use of a dirty needle.

While a certain level of this kind of problem is unavoidable, further investigations would be warranted if several similar cases were occurring in one flock.

# Cattle results

## Calf deaths

There were 416 calf carcasses submitted over the two years, with 48% of them being in the second year of the work. Over 100 different diagnoses were made. Figure 6 lists the ten most common and shows the differences between the years.

### Pneumonia

Pneumonia was the single biggest cause of death in calves, accounting for over 30% of the diagnoses made. The cases occurred mainly during the housed period (Figure 7) with a summer peak in 2015.

Further investigations were undertaken to understand the causes.

Bacterial pneumonia was the most common reason with 25 cases. Housed calves are pre-disposed to this disease for many reasons including:

- Airspace sharing with older cattle, which are emitting potentially pathogenic bacteria in large numbers
- Sub-optimal ventilation at calf level
- Trace element deficiency leading to immunity suppression

Vaccines for the most likely causes are available. However, two doses are required and it may be difficult to administer before the threat of bacterial pneumonia begins.

There is also a challenge, if the calving period is spread out, to get a large enough batch of calves of the right age to vaccinate appropriately.

Primary bacterial pneumonia is a sporadic disease and it was rare for suckler herds to lose more than one calf to it. However, the degree of sub-clinical disease amongst the other calves, which may be constraining growth rates, is difficult to assess. It may be that each death represents the tip of an iceberg and producers should be encouraged to follow best practice for housing and husbandry.

Where evidence of a prior viral insult was detected, vaccines had almost never been administered, so vaccine use was recommended to the producer. *Mycoplasma bovis* was suspected in eight cases.

### Perinatal management

Seventy-seven of the diagnoses made in calves (20%) were diseases which could have been prevented by following optimal perinatal calf management, including navel or joint ill, peritonitis, scour, abscesses and cryptosporidiosis. Some of the losses occurred in the perinatal period, but quite often the calf was left with a lesion that would kill it later in life.

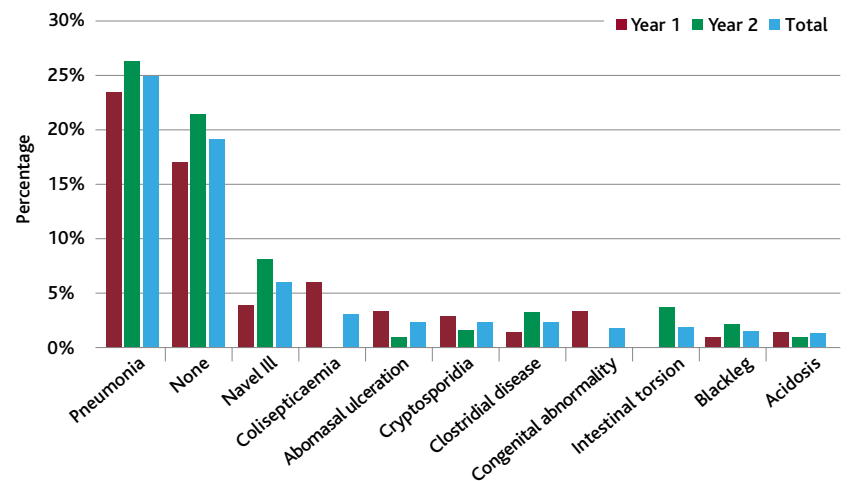
There were many examples of often well-grown suckler calves dying while out at grass, showing

During the project, 1,083 cattle carcasses, excluding abortions, were offered for PM (Table 2).

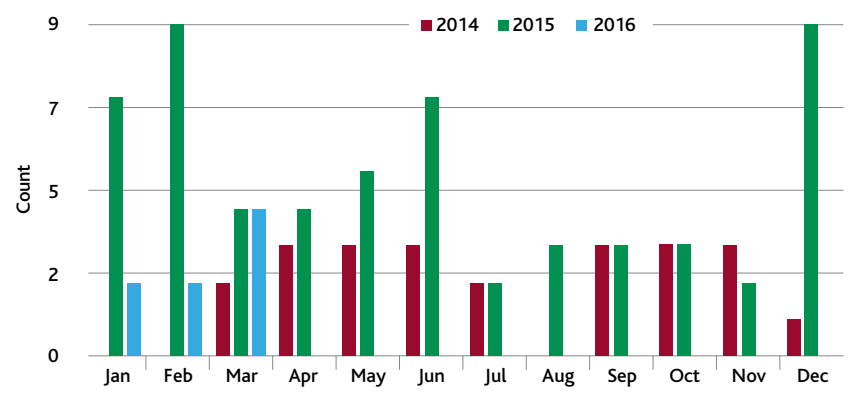
**Table 2: The number of cattle carcasses submitted for PMs from March 2014 to March 2016**

Class	Submissions	Carcasses	Holdings
Calves (<6 months)	402	416	270
Growing cattle (6-24 months)	248	259	186
Adult cattle (including suckler cows and bulls)	210	214	171
Adult dairy cows	193	194	88
<b>TOTAL</b>	<b>1,053</b>	<b>1,083</b>	

**Figure 6: The ten most frequent diagnoses made in calves, excluding abortions, from March 2014 to March 2016**



**Figure 7: Seasonal distribution of pneumonia in calves**



non-specific clinical signs of illness. However, the PM revealed a chronic disease, which had originated from the perinatal period.

Producers must ensure cows produce adequate amounts of high quality colostrum and that calves receive enough of this within the first six hours of life. Cows must calve down in clean conditions and the navels of the newborns dipped. None of these interventions are expensive, but all have unquestionable cost-benefits for producers by reducing preventable deaths.

# Cattle results

## Growing cattle

In total 259 growing cattle, between six and 24 months of age, were submitted for PM examination from 186 different farms.

Pneumonia and clostridial disease accounted for 21% and 18% of all the diagnoses made respectively. The ten most common diseases discovered are shown in Figure 8.

### Bovine respiratory disease (BRD)

Respiratory diseases, including pneumonia, infectious bovine rhinotracheitis (IBR), fog fever and shipping fever, were the most common diagnoses made in this group of cattle, accounting for one in four of the diagnoses.

Shipping fever is a bacterial pneumonia, usually caused by an overgrowth of bacteria in the lungs which are often present in the nose and throat of cattle.

This is usually triggered by stress, in much the same way as pasteurellosis is in sheep. Store cattle, often from suckler herds, are bought via marts and mixed with others before being transported to beef finishing units. Here they experience dietary and husbandry changes, including mixing with other cattle and are susceptible to this stress-induced disease.

Shipping fever accounted for a significant proportion of the mortality in these cattle, usually within ten days of arrival. Attention to the following factors may help prevent these losses:

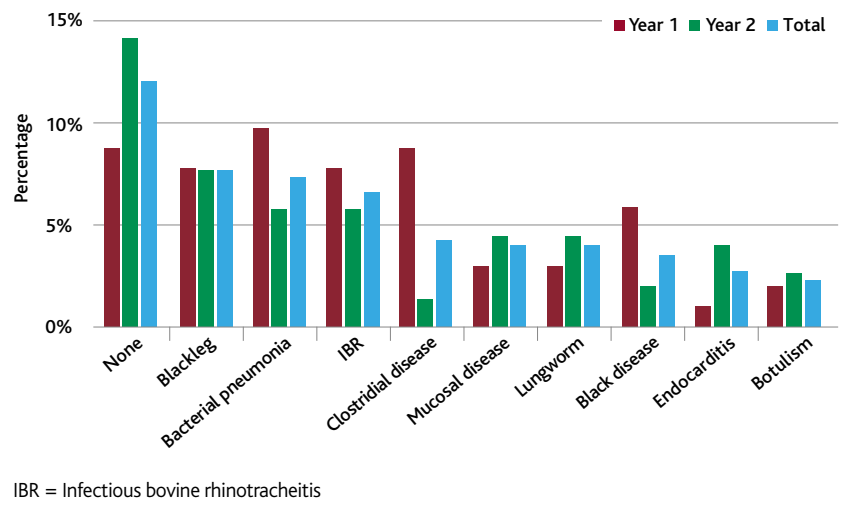
- Quarantine incoming cattle and screen them for BVD persistently infected (PI) status, using a tag-and-test method. This is now very affordable
- Endeavour to find out as much as possible about the herd of origin and ensure that cattle are not suffering from trace element deficiency
- Vaccinate all incoming cattle for IBR as a matter of routine
- Keep stress to a minimum and ensure optimal ventilation for newly-arrived cattle

Vaccines for the causal organisms of shipping fever (*Mannheimia haemolytica*, *Histophilus somni*) have recently become available and they are a welcome addition to the toolkit when dealing with BRD.

As these are killed vaccines, cattle need to have had two doses prior to the risk event. This will probably be difficult to achieve in practice but not impossible in all cases. The Sure Calf Scheme is an excellent example showing how this can work – [www.surecalf.co.uk](http://www.surecalf.co.uk).

Post-mortem investigation can provide useful information when trying to characterise bovine respiratory disease.

Figure 8: The ten most common reasons for death in growing cattle aged six to 24 months from March 2014 to March 2016



Blackleg lesions

### Blackleg

Blackleg, a type of clostridial disease, was a common cause of death in cattle of this age, affecting 7.7% (20 carcasses). Swabbing lesions found during the PM was useful in identifying the organism responsible, as vaccines are available to protect against some of these.

### Lungworm

Lungworm accounted for 3.9% (ten carcasses) and occurred between July and October. Outbreaks are unpredictable and younger cattle are at risk until they acquire immunity through exposure to lungworm larvae. Vaccination is encouraged on farms with a history of lungworm issues.

### Black disease

Black disease, a type of clostridial disease, accounted for 3.4% (eight carcasses). It can be caused by immature liver flukes migrating during late summer/early autumn, which allows the bacteria to infect the liver. Six of the nine animals died between July and November. A fluke control plan and clostridial vaccination can be used to prevent the risk.

See COWS guidance at [www.cattleparasites.org.uk](http://www.cattleparasites.org.uk).



## Suckler cows

Over the two years, 206 suckler cows were inspected in 202 submissions, as well as eight stock bulls. For the suckler cows, over 80 different causes of death were recorded. Figure 9 shows the ten most common diagnoses for the suckler cows, with problems post-calving being the largest issue.

### Johne's disease

Johne's disease was the biggest single cause of death in this class of animal. The disease will often go undetected in many herds, with animals only showing clinical signs towards the end of life but often shedding the disease through their faeces. Blood and faeces tests in the live animal, which is showing clinical signs of Johne's disease, are quite reliable. If caught early in the course of the illness, these animals can be sent as culls rather than dying or needing to be euthanased.

Calves are the most susceptible to the disease, becoming infected from the faeces and colostrum of an infected animal, either whilst suckling or from the environment. The offspring of infected animals are highly likely to contract the disease around birth and the early stages of life and this should be considered when choosing animals to keep as replacements.

The disease is widespread within the dairy herd and precautions must be taken when buying in replacement animals or bulls. The potential cost of a Johne's infection is significant and herd screening using either serology or Johne's PCR test could be cost-effective.

### Wire

Eleven suckler cows died as a result of eating metallic objects, which pierced the rumen and caused infections. The animals came from ten different farms.

The aim is to prevent metal objects being available for consumption. Magnets that sit in the rumen can be used to reduce the risk of internal damage.

### General lung conditions

Pneumonia, fog fever, lungworm, lung abscesses plus other lung conditions combined, were the cause of death in 29 animals (14.0%) over the two years.

### Clostridial diseases

When combined, general clostridial diseases, black disease and blackleg were the cause of death in 24 animals (11.6%) over the two years.

## Dairy cows

Over the two years, 194 dairy cows were inspected from 88 holdings. Figure 10 shows the ten most common diagnoses for dairy cows.

Figure 9: The ten most common causes of death of suckler cows from March 2014 to March 2016

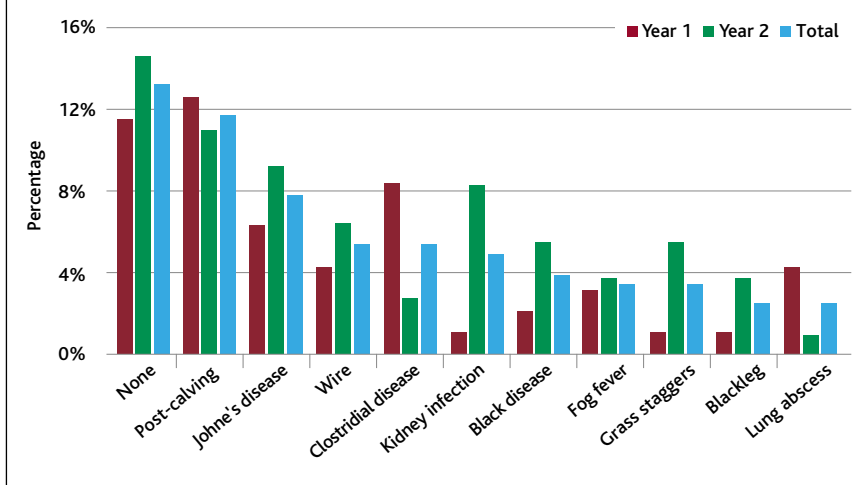
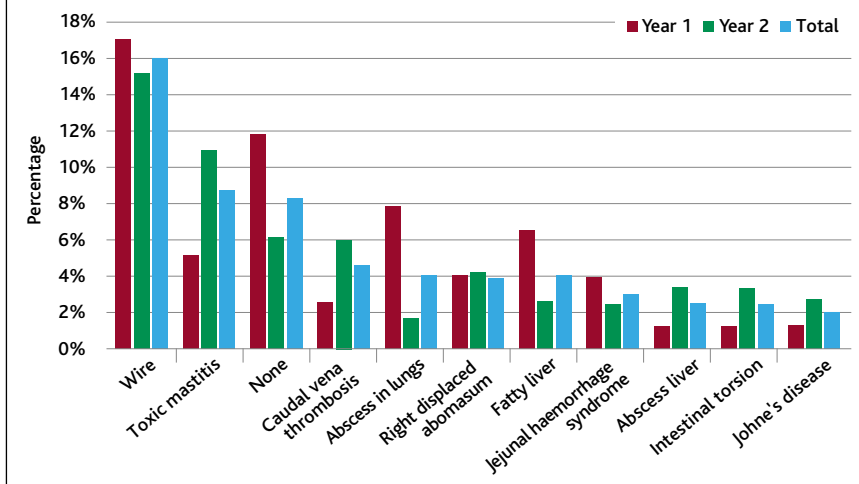


Figure 10: The ten most common causes of death of dairy cows for the two years



# Summary

The key messages remain similar, with around 40% of the losses being preventable through the use of vaccinations and common medicines, ensuring good colostrum intake and improved techniques, such as with dosing guns and injections.

- For ewes, iceberg or production limiting diseases, such as OPA and Johne's disease, need to be addressed by the industry
- For lambs, worms, pasteurellosis and clostridial disease accounted for a significant number of lamb losses

- For calves, respiratory disease and colostrum intake are the big opportunities for reduced mortality
- For growing cattle, respiratory disease and clostridial disease need to be the focus
- For suckler cows, Johne's disease needs earlier intervention through herd screening. Attention needs to be given to lung health
- For dairy and suckler cows, dealing with wires needs to be a priority to ensure they are not eaten and cause internal damage

## Invaluable information



The work that Mr Strugnell has carried on with after the initial funding by AHDB Beef & Lamb, continues to show the value of PMs for identifying what is and what is not causing animal deaths on farm.

The information is crucial for the producers and vets directly involved, but is also becoming an important source of industry data. For example, the information from the project in year one has been used within the Sheep Health and Welfare Report for Great Britain, produced by the Sheep Health and Welfare Group 2015/16, available at [www.shawg.org.uk](http://www.shawg.org.uk).

## Next steps

The original fallen stock project has proved to the industry and government agencies that there is value in performing PMs at FSCCs. More options are being made available for producers in other regions to have PMs done at FSCCs:

- Veterinary Investigations Services Ltd offers a similar service to Mr Strugnell in Gloucestershire. Producers can contact Guda van der Burgt directly on **07900 904193** or [vetinvestigation@outlook.com](mailto:vetinvestigation@outlook.com)
- University of Surrey and Westpoint Vets coordinate the provision of subsidised PM services from the Animal and Plant Health Agency (APHA) at five sites in Derbyshire, Leicestershire, West Sussex, Essex and Cornwall. Vets can contact them on **01483 689823** with the submission information
- Some vet practices are keen to perform PMs for clients. Ask the local vet to see if they are willing to carry out PMs



## More knowledge



AHDB Beef & Lamb, along with MSD Animal Health and Farm Post Mortems Ltd, are funding a pathology fellowship at the University of Nottingham.

The fellowship has been awarded to Katie Waine who will be spending time at the university, APHA sites and various FSCCs over three years. The aim of the project is to ensure the industry has trained people so more services can be offered in future.

AHDB Beef & Lamb is also funding Farm Post Mortems Ltd to carry out two pilot projects. One is on whether samples taken from cull ewes at the abattoir can be used for surveillance of iceberg – hidden yet production-limiting diseases, so individual farms can understand their status.

The second project is on reducing deaths on farms where hill lambs are being brought onto in-bye land in autumn. More information on these projects will be available in 2017.

AHDB Beef & Lamb is also funding a PhD student at Warwick University, who is investigating options for surveillance for beef and sheep producers, which could include the use of apps to record disease on their farms.

## Unusual diagnoses

The ability of any surveillance system to detect rare and unusual conditions is a measure of its sensitivity. A system with high sensitivity is more likely to detect new and emerging diseases of possible national significance, early in their course, which is important for future control.

Table 3: Some of the unusual diagnoses made by Farm Post Mortem Limited

Disease	Species	Details
Bovine Papilloma Virus Type 4	Cattle	Nodules form on the gullet caused by a virus. Association with exposure to bracken.
Hypoplastic Left Heart Syndrome	Cattle	This is an unusual congenital heart defect only rarely reported in cattle <a href="http://www.cdc.gov/ncbddd/heartdefects/hlhs.html">http://www.cdc.gov/ncbddd/heartdefects/hlhs.html</a> Diagnosed with assistance from SRUC Edinburgh.
Oxalate Nephropathy in Zwartbles Sheep	Sheep	This is a rare condition first identified by the APHA. More cases enable further characterisation of this likely genetic problem.
Polyarteritis Nodosa	Sheep	Further cases have been seen, which has enabled further research into possible causes of this unexplained condition.

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