

## In this issue

- Sheep post mortem results
- Cattle post mortem results
- Farmer feedback

## Results in brief

- 1,383 carcasses examined
- 1,225 submissions
- From 906 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

- Extend service to other areas
- Communicate timely health advice via the media
- Encourage inclusion of PMs in farm health plans



## Post mortem project leads to improved stock health on farms

AHDB Beef & Lamb has funded a pilot project to determine whether a post mortem (PM) carried out at a Fallen Stock Collection Centre (FSCC) can provide useful and timely animal health information for producers, vets and government.



The project was led by Ben Strugnell (*pictured left*) of Farm Post Mortem Ltd at John Warren ABP in County Durham. The aim was to see whether meaningful diagnoses could be made by examining fallen stock and if the results were promptly relayed to producers, whether they could take action to prevent further deaths. The study ran from April 2014 until June 2015 across Northumberland, County Durham and North Yorkshire.

"The idea was to investigate ways of dealing with the closure of all but five veterinary investigation surveillance centres in England," explains AHDB Beef & Lamb livestock scientist, Dr Liz Genever.

"The Animal and Plant Health Agency (APHA), formerly known as AHVLA or VLA, continues to have the remit of disease surveillance, identifying new or emerging diseases and are experts in disease diagnostics.

"While some provision was made to retain a service for producers in areas where the local surveillance centre had closed, there was a risk that their access to a PM would be significantly reduced. We thought that trialling PMs at Fallen Stock Collection Centres might help to plug the gap."

### Successful results

"The project has generated some excellent data on disease incidence across the three counties and this was fed back to the producers so they could prevent further illness and losses," says Dr Genever.

"When surveyed at the end of the project, 59% of producers said they had taken action as a direct consequence of the results of the PM and 98% said they would recommend the service to other farmers.

"The pilot was designed to test the approach and successfully demonstrated that producer focused PMs can be done at FSCCs, providing practical advice on common diseases to producers and vets. It also generated data on rare, less well-known diseases, which APHA is particularly interested in.

"This approach could now be rolled out across the country, but we need vets, FSCCs, government agencies, academics and levy boards to form a network to develop a PM service that all producers can access.

"If anyone is interested in helping to develop such a network, please contact by emailing [liz.genever@ahdb.org.uk](mailto:liz.genever@ahdb.org.uk)."

## How the Fallen Stock Project 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.



**Table 1: Charges for PMs for producers taking part in the Fallen Stock Project**

Carcase type	Price (£)
Lamb	20
Adult sheep	25
Calf (< 6 months old)	30
Growing cattle (6-24 months old)	50
Adult cattle	70

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. The results were then sent to the producer and the vet the next day. If additional laboratory testing was needed to confirm a diagnosis, the producer was asked if they were willing to pay for extra tests before they were arranged.

The cost of the PM was kept low to encourage producers to take part and was subsidised by AHDB Beef & Lamb (Table 1). The producer was invoiced for the PM directly or through their vet. The price did not include carcase collection or further laboratory testing.

This approach was different in a few ways to the APHA centre approach, in that the producer could arrange it directly, rather than having to go through their vet. No additional transport or time was needed to move the animals to the centre and the results were communicated back to the producer and their vet.

## Sheep results

During the project, 846 carcasses from lambs and ewes were submitted for PM at the FSCC

**Table 2: The number of sheep carcasses submitted for PM**

Class	Submissions	Carcasses	Holdings
Lamb abortions	46	46*	41
Lambs	364	471	256
Adult ewes	290	329	200
TOTAL	700	846	

\* Classed as one per submission – usually there were multiple samples

A disease diagnosis was reached for 74% of the lamb abortions, 82% of the lamb deaths and 77% of the adult sheep deaths.

When the project's method was compared to APHA's stricter method, 100%, 56% and 74% of the disease diagnoses for lamb abortions, lamb and adult sheep deaths matched. This suggests that the majority of the PMs would be considered of surveillance value for APHA, as well as being useful for producers and their vets.

### Lamb abortions

In the 2014 lambing period, 12 submissions were received to investigate ovine abortion. In 2015, 34 submissions were received. A breakdown of the causes is shown in Figure 1. These are typical of the common causes diagnosed by APHA and SAC Consulting every year.

### Lamb deaths

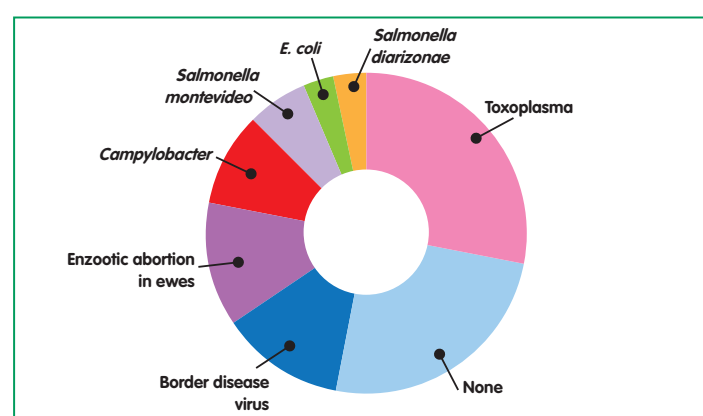
There were 59 diagnoses made on lambs and the most common causes of death (seen in more than three cases) are shown in Figure 2.

No diagnosis was reached in nearly 18% of cases. Some of this was due to the producers not wishing to spend more money on additional tests to find out the exact cause of death.

### Coccidiosis

Coccidiosis was a common cause of death in both the early spring seasons over which the project ran, accounting for 9.3% of submissions. This is an example of a disease where prompt intervention by the producer with a coccidiostat, could reduce mortality and morbidity of the rest of the flock significantly.

**Figure 1: The distribution of the most frequent abortion diagnoses in spring 2015 (n=34)**



## Gut worms

Gut worms, defined as parasitic gastroenteritis, were the most common condition discovered in the dead lambs. The peak time for this diagnosis was November.

This may have been due to a mild winter, which allowed worm eggs to persist on pasture, or producers may have assumed that overwintering lambs had acquired sufficient resistance to worms, so did not feel the need to treat. It could be down to anthelmintic resistance in worms active later in the year, or failure by producers to worm their lambs with an effective wormer at housing.

Anthelmintic resistance was suspected in some cases, especially in relation to white wormers. This demonstrates the need for producers to understand the resistance status of the farm and to use an appropriate product for the situation.

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

## Pulpy kidney

The incidence of pulpy kidney showed marked seasonal variation (Figure 3). 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.

There is a sub-class of lambs in which the disease 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 very well and are cost-effective, which means that most of these losses are preventable.

## 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 and according to the data sheet instructions, are usually very effective.

The seasonal distribution of pasteurellosis can be seen in Figure 4. 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.

Only in 12% of the outbreaks had the lambs been vaccinated according to the data sheet or recently enough to be protected. No other diseases or risk factors were identified to explain the presence of pasteurellosis. This shows that following the correct vaccination protocol, or finding out the status of bought-in lambs is crucial.

## Ruminal acidosis

Ruminal acidosis (also known as barley poisoning) was diagnosed on 17 occasions on 17 different farms, accounting for 4.6% of all diagnoses.

There are well-established principles that farmers 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.

Figure 2: The most common causes of death in lambs in the project

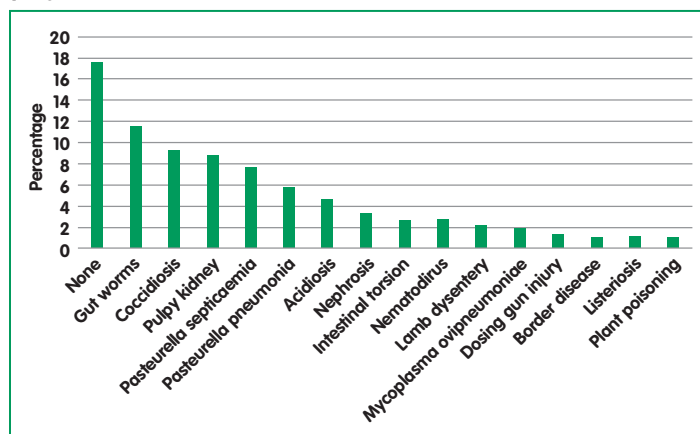


Figure 3: The seasonal incidence of pulpy kidney

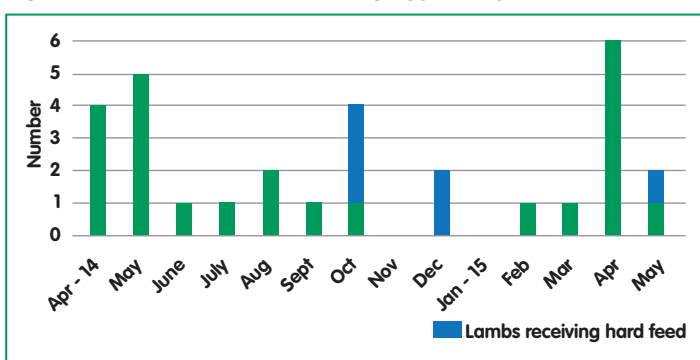
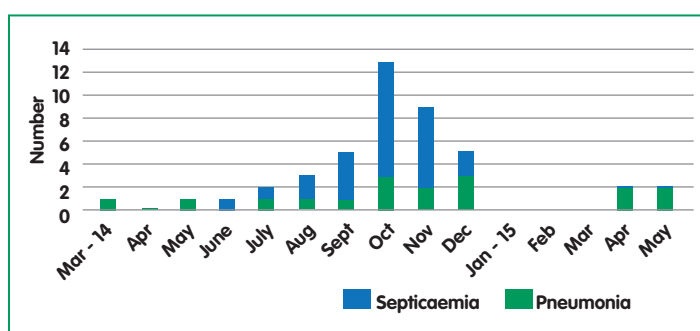


Figure 4: Seasonal incidence of pasteurellosis in lambs



Appearance of the rumen in cases of barley poisoning in lambs (ruminal acidosis)

# Sheep results

## Adult sheep

In all, 329 adult sheep carcasses were examined during the project – 282 ewes and 47 tups. There were 48 different diagnoses for cause of death and the most common (more than four cases) are shown in Figure 5.

### Ovine Pulmonary Adenocarcinoma (OPA)

OPA was diagnosed in 7% (n=20) of carcasses, which is consistent with previous estimates of incidence from examining fallen stock.

There appeared to be a clustering of cases on certain farms and multiple submissions from four farms.

### Johne's disease

Johne's disease was found on 6.5% (n=19) of submissions to the FSCC, including four tups and 15 ewes from a total of 15 farms. It 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.

There were five cases of ewes with poor teeth which had led to chronic wasting. This aspect of health is often overlooked by farmers and vets and may be the cause of death, particularly in older sheep. It is important to distinguish this type of wasting from that caused by Johne's disease.

### Listeriosis

Listeriosis was diagnosed in 14 adult sheep from ten holdings. The neurological form was most common and there was one case of septicaemic listeriosis. Most of the sheep had picked it up from eating silage, although a few of the animals had just been grazing. The diagnosis usually needs to be confirmed by sending the brain away for further testing.

### Endocarditis/chronic suppurative pneumonia

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.

### Liver fluke

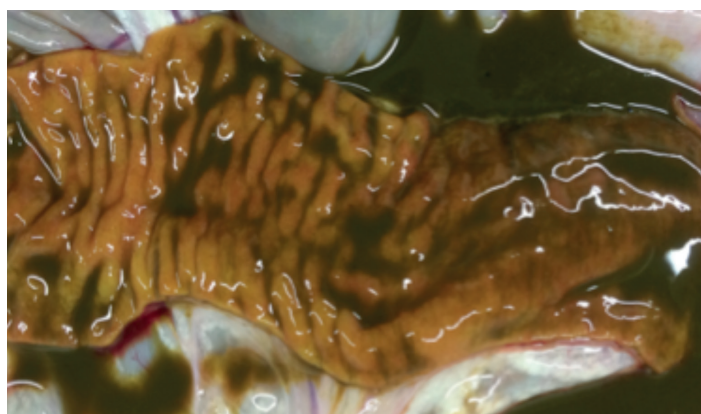
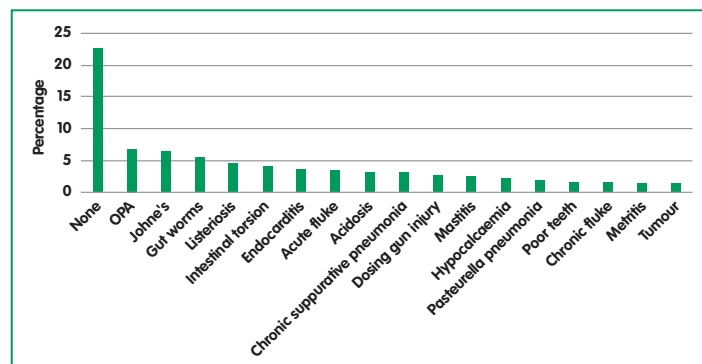
Fifteen ewes were diagnosed with liver fluke, from 14 farms, comprising nine cases of acute fluke and six cases of the chronic form. In almost every case the diagnosis triggered prompt treatment on the farm, preventing further losses.

A warning was sent out in early February after a run of chronic cases presented at the FSCC. However, after the warning, no major fluke problem developed and the level of disease was lower than expected. This was probably due to a combination of weather conditions and informed producers taking appropriate action to limit their flock's exposure to fluke.

### Dosing gun injury

This completely preventable cause of death was diagnosed on eight occasions. It is likely that more sheep were affected in each outbreak than the ones 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.

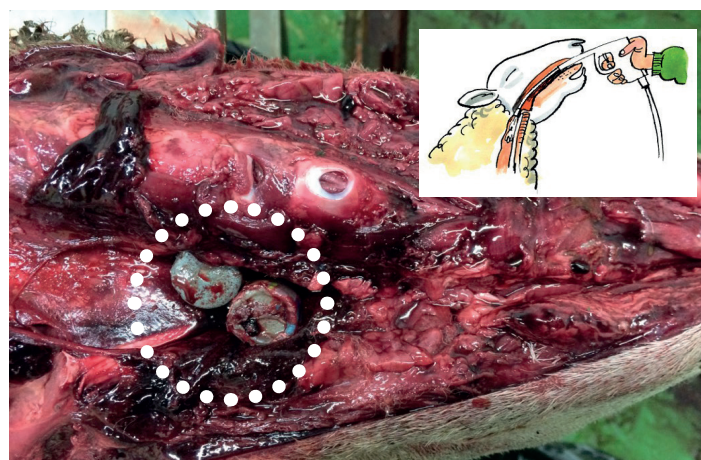
Figure 5: The most frequent diagnoses made in adult sheep



Yellowing of the gut seen in some Johne's cases



Poor teeth



Bolus pushed through oesophagus

# Cattle results

During the project 532 cattle carcasses were submitted for PM (Table 3).

A diagnosis was reached for 11% of the cases for bovine abortions, 78% for young calves, 80% for growing cattle and 85% for adult cattle.

When the project's method was compared to APHA's stricter method, 50%, 79%, 70% and 85% of the disease diagnoses for bovine abortions, calves, growing and adult cattle matched. This also suggests that the majority of the PMs would be considered of surveillance value for APHA, as well as being useful for producers and their vets.

**Table 3: The number of cattle carcasses submitted for PM during the project**

Class	Submissions	Carcasses	Holdings
Bovine abortion/stillbirth	36	36	29
Calves (<6 months)	243	250	144
Growing Cattle (6-24 months)	129	133	106
Adult cattle	112	113	105
TOTAL	520	532	

## Rearing calves

Only 34 dead animals were submitted in this category – mostly dairy-origin calves sold onto specialist calf rearing holdings.

Pneumonia was the most common cause of death, accounting for 17 out of the 34 that were examined.

There was a general unwillingness amongst the producers to investigate the pneumonia cases further. This was surprising given the significant contribution pneumonia was probably making to the losses and the fact that effective vaccines and other management options are available to control it.

## Suckler calves

Suckler calves comprised 71% (n=173) of all the calf submissions and 38 different diagnoses were made. Figure 6 lists the most common, where there were three or more cases.

### Pneumonia

Pneumonia was the single biggest cause of death in suckler calves, accounting for 44 out of 173 submissions (25%). The cases occurred mainly during the housed period (Figure 7).

Bacterial pneumonia was the most common reason (n=13). Housed suckled calves are pre-disposed to this disease for many reasons including:

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

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

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 farmers should be encouraged to follow best practice for housing and husbandry.

### Perinatal management

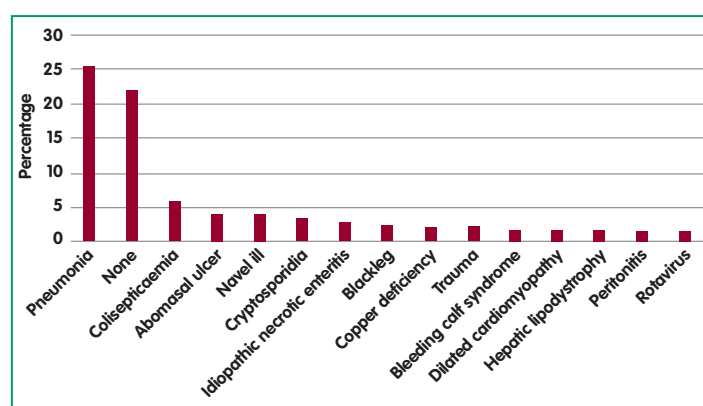
Thirty-six of the diagnoses made in suckler calves (20%) were diseases which could have been prevented by following optimal perinatal calf management, including navel or joint ill, peritonitis, *E.coli* scour and cryptosporidiosis.

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.

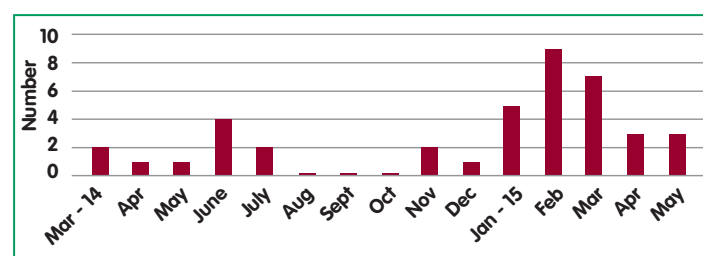
There were many examples of often well-grown suckler calves dying while out at grass, showing non-specific clinical signs of illness. However, the PM revealed a chronic disease, which had originated in the perinatal period.

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 is expensive, but all have unquestionable cost-benefits for producers by reducing preventable deaths.

**Figure 6: The most common diagnoses in suckler calves**



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



# Cattle results

## Growing cattle

In total 132 growing cattle between six and 24 months of age, were submitted for PM examination from 93 different farms. Pneumonia and clostridial disease accounted for 42% of all the diagnoses made. Some of the common diseases discovered are shown in Figure 8.

### Bovine respiratory disease

Respiratory diseases, including pneumonia and Infectious Bovine Rhinotracheitis (IBR), were the most common diagnosis made in this group of cattle, accounting for 25% (n=33) of submissions.

Eight different causes of respiratory disease were identified (see Table 4).

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

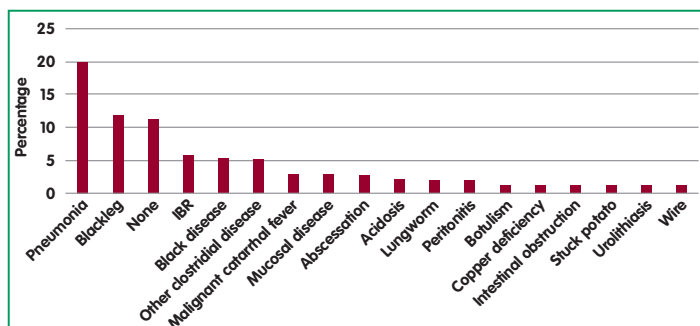
### Blackleg

Blackleg, a type of clostridial disease, was the second most common cause of death in cattle of this age, with 13% (n=17) of submissions. Swabbing lesions found during the PM was useful in identifying the organism responsible. Cheap and effective vaccines are available which will protect against all significant clostridial diseases.

### Mucosal disease

This was diagnosed on four farms. This led to a search for other animals persistently infected with BVD within either the home herd, or the herd the stock was purchased from. Action was then taken to avert further losses.

**Figure 8: Common reasons for death in growing cattle aged six to 24 months of age**



**Table 4: Causes of respiratory disease in the growing cattle that were examined after they had died**

Causes	Number of cases	Details
Bacterial	9	Opportunistic infection, perhaps caused by mixing groups, poor ventilation or temperature fluctuations
Infectious Bovine Rhinotracheitis (IBR)	8	Bovine Viral Diarrhoea (BVD) virus was also detected in two cases. In four cases, no routine vaccination was in place
Previous viral insult	6	Predisposal to bacterial infection
Mycoplasma bovis	3	Predisposal to bacterial infection
Shipping fever	3	
Acute Respiratory Syncytial Virus (RSV)	2	History of recent movement
Chronic end stage	1	
RSV/interstitial	1	

## Adult cattle

In the project, 112 adult cattle were inspected in 111 submissions, including 12 stock bulls and 100 suckler cows. Thirty-seven different causes of death were recorded. Figure 9 shows the most common diagnoses, where there was more than one case, for the suckler cows.

### Johne's disease

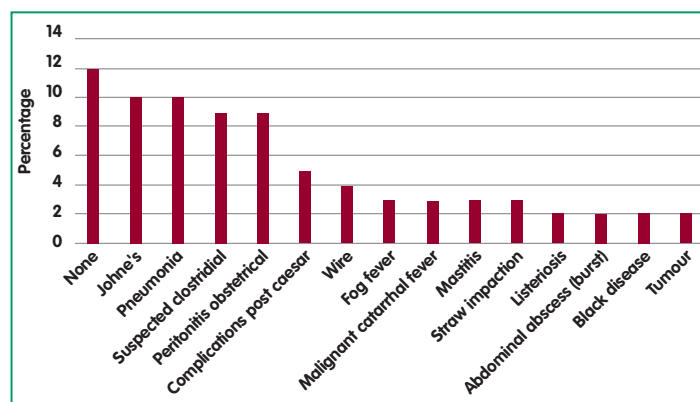
Johne's disease was the biggest cause of death in this class of animals. It is surprising that so many cases were diagnosed at post mortem as the diagnostic tests in live clinically affected animals are pretty good; positive animals could have been culled before they lost too much condition.

Many suckler herd owners buy replacements, often of dairy herd origin, which lays them open to bringing in animals that are incubating the disease. The costs to a suckler producer can be significant and herd screening using either serology or a Johne's PCR test could be cost effective.

### Pneumonia

Pneumonia, along with more general lung problems, was the second most common disease diagnosis in breeding cows. This included bacterial pneumonia, lung abscesses, lungworm and shipping fever.

**Figure 9: The most common causes of death of suckler cows**



# Project findings

## Lessons learned

This project has successfully established that:

- Carcasses can be successfully identified on collection and transported to a PM room at a FSCC in a state fit for examination and further diagnostic investigation, if necessary
- Producers can be contacted before the post mortem to obtain a clinical history of the animal and to make them aware of the costs and procedures involved
- Producers were willing to pay the prices charged in this project and not deterred by the fact this did not include any further diagnostic tests
- Vets whose clients' animals were subjected to a PM were, in general, happy with the system. In many cases they felt it led to more on-farm involvement than they would otherwise have had
- The throughput of carcasses achievable under the circumstances of this project exceeded that of a typical regional laboratory. Although the figures are not directly comparable due to differences in recording scheme, the number of adult cows examined in the project are comparable to the numbers examined by the entire network of APHA regional laboratories in England and Wales
- Very useful information on endemic disease was collected throughout the year, which can be used to plan the timings of technical events and press articles



## Identifying rare conditions

The main aim of the project was to pilot a carcass-based diagnostic service that could be used to diagnose promptly endemic diseases of economic significance to beef and sheep producers, so that they could implement effective control strategies.

However, this project also detected a large number of rare diseases that are present on farms. Table 5 outlines some of these.

**Table 5: Details of some of the rare diseases identified**

Name	Species	Details
Segmental myelodysplasia	Sheep	Developmental disorder, with a similar presentation to Schmollenberg virus (SBV)
Polyarteritis nodosa	Sheep	Causes failure of arteries in major organs
Swaledale encephalopathy	Sheep	Heritable condition that causes progressive neurological signs, found in hill breeds
Porencephaly and optic nerve abiotrophy	Sheep	Severe neurological disease in newborn lambs, not identified prior to this project. In this case it was seen in Suffolk X lambs; further investigation is ongoing
Galloway lipodystrophy	Cattle	Heritable condition that causes fat to build up in the livers
Unexplained haemorrhagic diathesis	Cattle	Similar to 'bleeding calf syndrome', but not the same disease. Farm Post Mortem Ltd is working with APHA on this new disease
Bleeding calf syndrome (Bovine Neonatal Pancytopenia (BNP)) variant	Cattle	No history of Pregsure use in the calf identified; this adds to a small number of cases where this disease has been identified but not linked to that vaccine
Non-suppurative encephalitis	Cattle	A potentially new and emerging disease caused by a recently identified virus (Astrovirus). Farm Post Mortem Ltd is working with APHA on this
Suspect closantel toxicity in a suckler cow	Cattle	Possible closantel overdose. Reported to the Veterinary Medicines Directorate

This outcome means a PM service like this could also provide sensitive national flock disease surveillance for new and (re-) emerging diseases, fulfilling a government role as well as one that meets industry aims.

# Advice for beef and sheep producers

The results of the Fallen Stock Project highlight how farm productivity can be improved if producers have access to an affordable, easy-to-access carcass-based diagnostic service.

For each class of stock there are clear messages for producers on which diseases to look out for and how to minimise their effects on farm.

## Lambs

- Parasitic gastroenteritis, pasteurellosis and clostridial disease accounted for a significant number of lamb losses. There is much scope for improved management of these preventable diseases, eg by following SCOPS principles, use of coccidiostats and/or vaccination following manufacturers' recommendations closely
- In many cases, prompt diagnosis of seasonal diseases enabled prompt treatment of the group back on the farm to prevent further losses eg in cases of coccidiosis and nematodirus
- Take care when feeding grain to lambs to avoid acidosis

## Adult sheep

- Iceberg diseases (OPA, Johne's disease) are common. However, control of many diseases of adult sheep requires longer-term flock health planning, rather than immediate action
- Management-induced diseases such as dosing gun injuries, endocarditis and lung abscesses were diagnosed and are preventable. Producers need to learn new techniques or refine their management to stop such losses

## Calves

- Respiratory disease is a major source of economic loss and there is scope for better application of best practice by producers including, ventilation, vaccination, cattle flow, control of potential immunosuppressive factors. It is always worth producers investigating the causes of pneumonia
- Many causes of death are a direct result of insufficient colostrum intake, suboptimal environmental hygiene at calving or poor perinatal management eg treatment of navels. These interventions are cheap and have unquestionable health benefits and will reduce deaths

## Growing cattle

- Respiratory disease in the housed period and clostridial disease outside, accounted for a large part of the diagnoses
- A diagnosis of mucosal disease can alert the producer to look for other animals persistently affected with BVD in the home herd and to take action to avoid further losses

## Adult cattle

- Johne's disease was commonly diagnosed in the suckler herd suggesting that earlier intervention was lacking. Herd screening is available and cost effective and producers should be encouraged to do this
- There is some scope for better prevention of pneumonia and clostridial disease
- Fog fever and lungworm are important seasonal diseases in adult cattle which would lend themselves to seasonal threat warnings, triggered by the first diagnosis each year

## Excellent producer feedback

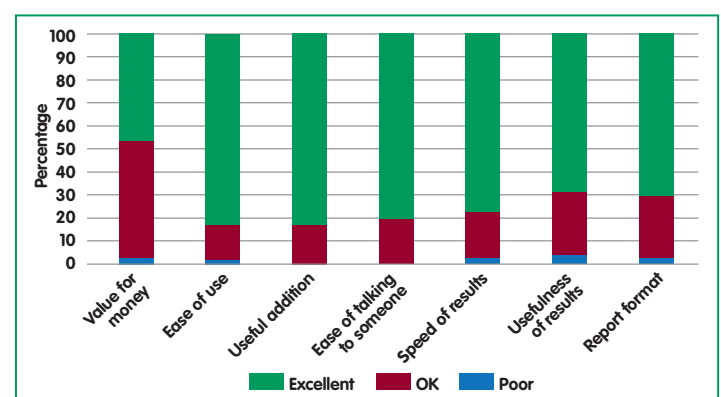
Near the end of the Fallen Stock Project, producers were surveyed to gather their thoughts on the service. John Warren ABP sent out a questionnaire to a sample of their producers (around 2,000) in April 2015 and the response rate was a high 16.6%. The respondents were farming 194,623 animals and had requested 453 PMs.

Producers who had used the service were asked to rate it for various aspects such as ease of use and speed of results (Figure 10).

Most of them thought the service was excellent or at least OK. The only option that had a higher proportion of OK compared to Excellent was 'Value for money'.

When the respondents were asked what they did with the results, 59.9% had spoken to their vet, 28.6% had treated the group that the dead animal came from, 21.1% had added a treatment to their health plan and 16.8% had thought the problem had solved itself.

Figure 10: Producer feedback on the PM service



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