AHDB Beef & Lamb
R&D Review

AHDB
AGRICULTURE & HORTICULTURE
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BEEF & LAMB

Contents

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Introduction

Welcome to the third edition of the AHDB Beef & Lamb R&D Review.

This review is a summary of some of the research the organisation is carrying out on behalf of levy payers and includes key findings from completed projects and updates on ongoing research.

In April 2017, AHDB launched its 2017–2020 'Inspiring Success' strategy, which seeks to achieve the vision of a world-class food and farming industry that is inspired by and competing with the best.

Accelerating innovation and productivity growth through coordinated research and development (R&D) and knowledge exchange (KE) is a key priority within the strategy. Improved productivity underpins the agriculture industry's ability to function profitably in a highly competitive global market. It also enables the industry to cope better with volatility.

Against this priority, AHDB Beef & Lamb's target is a 5% increase of farm profitability, per hectare, over a four-year period by comparing performance of approved Farmbench users benchmarking for any two consecutive years, indexed to remove market volatility.

To achieve this, AHDB Beef & Lamb will focus activity in the following areas:

- Driving greater on-farm uptake of genetic potential by increasing the use and understanding of estimated breeding values (EBVs)

- Improving the efficiency of meat production through improved nutrition and management

- Improving animal health and welfare, while reducing costs and driving uptake of best practice of on-farm medicine use

AHDB Beef & Lamb funds around 25 research projects a year, with the aim of generating practical outcomes that the industry can adopt. The organisation also funds a number of PhD studentships, which are incredibly important in terms of both the high-quality research they produce and the value they provide by training new people for the industry.

I hope you enjoy reading about some of our R&D work over the past year. However, there is not enough room to include everything. For more information on all the activity we are involved in and for resources that have been developed based on our R&D work, take a look at our website, **beefandlamb.ahdb.org.uk**

Assessing parasite burdens in beef carcases

The aim of this study was to assess the level of parasite infection in commercial beef cattle by inspecting carcases from one abattoir at different times of the year and to identify any associated production impacts.

A total of 974 beef carcases, from 156 herds in England and Wales, were examined at an abattoir in the South West over four days in March, June, October and January. For each carcase, the liver, rumen and abomasum were examined and the organs scored for the severity of liver fluke infection, presence of liver fluke, proportion of the rumen wall that was colonised by rumen fluke and the estimated numbers of rumen fluke present, as well as abomasal lesions which would indicate gut worm (*Ostertagia*) infection.

The distribution of the cattle population assessed was 53% steers, 20% cows, 16% heifers, 11% young bulls and less than 1% mature bulls (Table 1).

Table 1. Summary of cattle recorded in the trial

Variables	Cows	Heifers	Steers	Young bulls
Average age (months)	79	29	29	14
Average cold carcase weight (kg)	323	314	344	294
Average conformation class	P+	R	O+	O+
Average fat class	3	4L	3	2
Liver condemnation	31.6%	12.9%	14.1%	9.4%

Table 2. Parasite burdens found in beef carcases

Infection	Prevalence by cattle	Prevalence by farm
Ostertagiosis (gutworms)	89%	97%
Liver fluke	29%	64%
Rumen fluke	25%	48%
Carcases with co-infections of two or more parasites	39%	

Key findings

- Cattle older than 30 months were more likely to show presence of rumen fluke and gut worm lesions than cattle under 24 months of age
- Carcases weighing more than 300kg were less likely to show gut worm lesions than carcases weighing less than 300kg
- Compared to carcases with no parasite infections, carcases only showing signs of gut worm lesions or adult rumen fluke had significantly lower cold carcase weight and fat coverage
- Carcases with only liver fluke lesions had significantly lower conformation classification
- Presence of more than one parasite was highest in October and lowest in June
- Presence of co-infections was negatively associated with carcase weight

Rumen fluke

Generally, mature rumen fluke do not cause disease. However, there have been reports of health problems in youngstock when large numbers of immature rumen fluke have been present in the intestine. Page 15 outlines a new project aiming to increase our understanding of rumen fluke.

Abomasal lesions from gut worm

Gut worms (*Ostertagia*) can cause loss of appetite as well as loss of body weight and condition. Infection is spread by ingestion of larvae from pastures. In youngstock, gutworms can reduce growth rate by around 30% and remain a constant threat to performance and health of grazing cattle.

A secondary problem can occur when larvae ingested in the autumn become dormant (or arrested) in the gastric glands and suddenly resume development several months later, causing considerable damage to the stomach lining (known as Ostertagiosis Type II).

Liver fluke

Cattle infected with liver fluke typically develop chronic disease and show loss of weight, condition and become anaemic.

Severity of disease depends on the number of parasites that infect the animal. Livestock become infected by ingesting metacercaria, which contaminate grass and other vegetation. These hatch in the small intestine and migrate into the liver. Once the fluke reach the bile ducts, they mature into adult egg-laying parasites.

Looking for diseases in cull ewes
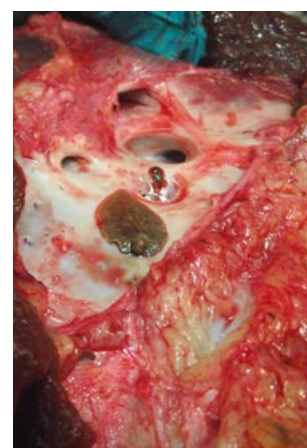
Cull ewes could be a source of useful information relating to the health status of the breeding flock and could provide insight into the causes of poor condition and premature culling. At present this information is generally unavailable to producers because:

a) Cull ewes have low value and are often considered not worthy of veterinary investigation

b) They are often sold live and are difficult to trace to slaughter

AHDB Beef & Lamb funded a pilot scheme whereby producers could receive more disease information on cull ewes. A total of 111 ewes, from 16 flocks from the North East of England, were submitted into the scheme. Once slaughtered, blood samples, along with tissue from the lungs and intestines, were collected. These samples were examined by Ben Strugnell of Farm Post Mortems Ltd, with samples sent for further testing where necessary.

It was found 73%, 13%, 6% and 19% of the flocks tested positive for Johne's, Maedi Visna, Ovine pulmonary adenocarcinoma (OPA) and lung abscessation, respectively. A positive status was assigned if at least one animal from the batch tested positive to any disease by any test.

Johne's disease was by far the most common disease identified during the project. Further work is required to establish the significance of the infection on these farms.

Key findings

The project found that, with some effort, ewes can be followed to slaughter and samples obtained from individuals to determine flock status for important, production-limiting diseases. The value of the ewes obtained at slaughter can offset the cost of testing.

Next steps

AHDB Beef & Lamb, alongside MSD Animal Health, is funding a pathology fellowship which has been awarded to Katie Waine, a senior clinical training scholar in Farm Animal Pathology at the University of Nottingham. See Page 14 for further details.

Figure 1. Yellowing of the gut seen in some Johne's cases. Photo courtesy and copyright of Ben Strugnell

Closer to a new test for screening ewes for OPA

OPA is an infectious lung tumour of sheep caused by Jaagsiekte sheep retrovirus (JSRV). The disease appears to be increasingly common throughout the UK and it is recognised that a way to check flock status is needed within the industry.

Moredun Research Institute (MRI), along with Biobest and the Animal and Plant Health Agency (APHA), with funding from AHDB Beef & Lamb and Hybu Cig Cymru – Meat Promotion Wales (HCC), investigated whether a nasal swab collected from thin ewes could be used as a reliable test for the presence of the disease in a flock.

At the start of the project, the results from the nasal swabs were compared against a blood test for known positive and negative sheep from a range of flocks. The nasal swab was more reliable and better suited to testing in a commercial laboratory setting so further trial work focused on this. Ultrasound screening of lungs and some post-mortems were used to establish whether sheep were affected.

The next step was to see if the test could be used for flock screening. Twenty thin sheep were tested from a flock with an unknown OPA status to see if it was good enough to identify a positive animal. The nasal swab does not identify every OPA-positive individual, however, it performed well enough as a flock test applied to thin ewes to have potential as the basis of a flock assurance scheme.

Next steps

The aim now, subject to funding, is for MRI and Biobest to further develop the test to ensure that it works well in a commercial laboratory setting prior to undertaking more extensive field studies and engaging with producers to establish the demand and format of a flock assurance scheme.

Updating Feeding the Ewe

The last **Feeding the Ewe** was published in 1988. Since then, not only has there been a significant amount of research carried out but there have also been some significant on-farm management changes including heavier ewes and improved lamb growth rates.

The updated manual was authored by Gill Povey, Lesley Stubbings and Kate Phillips. They conducted an extensive literature review and formed expert focus groups to ensure all new information was included. The full literature review is available on the AHDB Beef & Lamb website.

The manual is intended for use by consultants, vets and progressive sheep producers. Workshops and events have been held to ensure the updates are communicated widely. The focus was to ensure that the potential contribution of grazed and conserved forage is maximised to ensure both minimal cost and optimal rumen function. This leads to cost-effective feeding systems that support optimum output and profitable breeding flocks.

Results from the AHDB-funded sheep key performance indicator (KPI) project underlined the huge importance of body condition scoring (BCS) when considering the nutrition and performance of ewes. Preliminary data suggests that the impact of, and changes in, BCS are highly significant and longer term than previously thought.

Next steps
Feeding the Ewe will be used as the basis for a selection of topical articles. The aim is to update the document as more data becomes available from work such as the Agrifood and Bioscience Institute's (AFBI) Feed into Lamb project and the final sheep KPI project results.

Dry cow nutrition

Traditionally, spring-calving suckler cows are fed a flat-rate ration during the dry period, which restricts their energy and protein intake prior to calving. This may fall short of meeting their protein requirements, especially when taking into account the production of colostrum.

A recent review conducted by Scotland's Rural College (SRUC) analysed the information available on pre-calving nutrition of beef cows to better understand the effect of protein supply on the cow and the survival and performance of the calf.

The review found that if the basal forage is poor, lacking sufficient energy and protein to make the required microbial protein, then supplementing with a high-protein source may be advisable.

Cows may also benefit from additional protein supplementation if they are in poor body condition (BCS <2) as they will have less body reserves to buffer short-term, inadequate nutrition, however, this does depend on the forage available to them. Heifers, especially those calving at two years, may benefit from additional protein as they have requirements for growth as well as pregnancy.

Cows that are in good condition (BCS >3) have reserves to use and need to have feed restricted to avoid them becoming too fat. However, adequate rumen degradable protein should always be fed as severely undersupplying protein by feeding straw alone will reduce rumen function and, in the last few weeks pre-calving, reduce colostrum quality, thus inhibiting passive transfer of immunity to the calf.

Next steps
This work has been incorporated into the revised **Feeding Suckler Cows and Calves for Better Returns manual**, available on the AHDB Beef & Lamb website.

Grass silage performs well for pregnant and lactating ewes

More producers are feeding ewes high-quality forages during late pregnancy and early lactation, but there are few studies that compare ewe and lamb performance on these different forages.

During this study at Harper Adams University, ewes were fed one of four treatments – grass silage (GS), lucerne silage (LS), red clover silage (RC) or urea-treated whole crop wheat (UWCW) (mixed with GS) – from six weeks before lambing to four weeks post-lambing. Diets were formulated to meet energy and protein requirements based on chemical analysis of the forages, with actual dry matter intake and ewe body condition measured.

Dry matter intake of forages varied throughout the trial but intake of RC was significantly higher (P<0.001) than all other forages until week two of lactation, when intakes of all other silages increased. Intake of GS was consistently lower than all other silages during late pregnancy (Figure 2).

RC-fed ewes tended to maintain body condition better than ewes on the other forages and were in significantly better condition at lambing (P<0.01) than GS or UWCW fed ewes (Figure 3).

There were no significant differences in terms of lamb performance on the four diets.

Using intake data gained from the trial and assumed growing costs, feed costs were calculated for the four diets offered. GS was shown to be the cheapest at £17.87 per ewe and LS was the most expensive at £22.41 per ewe for the 10-week trial period (Table 3).

Figure 2. Forage dry matter intake (kg/ewe per day) for the four diet treatments
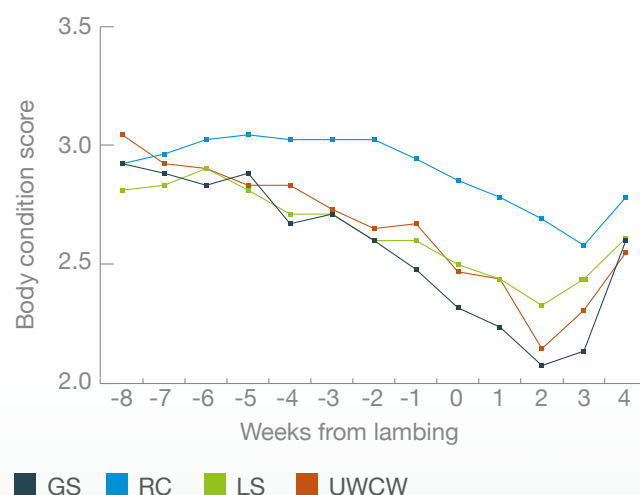
Figure 3. Average body condition for the four diet treatments

Table 3. Total feed costs pre and post-lambing

	GS	LS	RC	UWCW
Growing costs (t/DM)	105	140	105	108
Feed costs (£/ewe)	17.87	22.41	21.03	18.65

Key findings

High-protein forages can be fed without additional protein supplementation which will save on purchased feed costs, however, feed costs would be higher than if good-quality grass silage were used.

Protein requirement of ewes

A series of projects over the last three years at Harper Adams University and SRUC have shown that ewes only respond to additional metabolisable protein (MP) in late pregnancy and early lactation if their body condition score (BCS) is below target or they have a worm burden.

It was initially thought that MP requirements for terminal sire-mated, prolific ewes was likely to be 20–30% greater than industry estimates, largely due to increased lamb birth weight and milk production.

When ewes were managed to reduce BCS by 0.5 units during mid-pregnancy, the benefits of digestible undegraded protein (DUP) supplementation on ewe performance was observed. For thin ewes, additional DUP supply increased lamb birth weight, colostrum component yields and subsequent lamb performance to a larger extent than for fit ewes.

It was observed that ewe DUP supplementation did improve litter weaning weight when ewes were exposed to worm challenge at turn-out, following a housing period with no worm challenge. Unexpectedly, this was not the case for ewes who were under continued challenge during the housing period.

One of the projects investigated the use of protein protection technologies, such as browning with xylose and formaldehyde treatment, to increase DUP of home-grown protein sources like rapeseed meal and beans. The products were used successfully within the various diets and showed no statistical differences in animal performance when compared with soya-bean meal (SBM).

Building on earlier trial work demonstrating that daily volume of SBM can be reduced by 50% when using protected SBM, farm trials showed that feeding daily protected SBM can be replaced with feeding every other day without impact on ewe productivity. Both outcomes provide producers opportunities to reduce costs and to save labour and trough space.

Next steps

These results have been included in the updated **Feeding the Ewe** manual which is available online.

New EBV for ewe longevity

AHDB Beef & Lamb funded a team at SRUC to develop a new estimated breeding value (EBV) for ewe longevity, expressing the expected age of a ewe at her last lambing. This will enable producers to select for ewes less likely to be culled after their first couple of seasons. Long-lived, productive ewes mean reduced female replacement costs and higher flock prolificacy.

When breeding goals focus solely on production traits, eg growth rate and loin muscularity, other commercially important traits such as longevity, fertility and health may suffer. These traits are hard to measure but building them into breeding evaluations mean flocks could be healthier, with greater productivity and therefore profitability.

A study by SRUC on the lifetime data from over 13,600 Lleyn ewes found longevity to have a heritability of 6%.

Although small, this means genetic progress can be made, as considerable variation existed between breeding lines. When the new longevity EBV was tested for all Lleyn animals (over 330,000), a good, positive correlation existed between an individual sire's EBV and the actual productive lifespan of his female progeny, indicating that the EBV works and will be a useful tool for influencing ewe survival.

Next steps
Signet Breeding Services will build longevity EBVs into routine breeding evaluations for Lleyn sheep from 2017, an exciting prospect for the British sheep industry.

Breeding for parasite resistance

Gastro-intestinal roundworm infection is a big concern for the British sheep industry due to the development of anthelmintic resistance. AHDB Beef & Lamb funded a project to create a new EBV, allowing breeders to select stock genetically more resistant to worm challenge and eliminate the most persistently infected breeding lines from the flock.

For several years, breeders have had access to a faecal egg count (FEC) EBV, selecting animals that expel fewer eggs onto pasture. However, the collection of FEC phenotypes is expensive, time consuming and prevents producers from using anthelmintic treatment before sampling.

Glasgow University has found that the antibody immunoglobulin A (IgA) can be detected in sheep saliva when *Teladorsagia circumcincta*, a parasitic nematode, is in its larval stages. IgA interferes with the worms' ability to grow and reproduce in the gut so they shed fewer eggs onto pasture.

In 2013, AHDB Beef & Lamb supported the collection of Saliva IgA and FEC samples by the Performance Recorded Lleyn Breeders group (PRLB). Saliva IgA measurements were taken and validated against FECs to investigate the genetic parameters influencing saliva IgA and an EBV was created. Saliva IgA was found to have a negative correlation with egg output from strongyles parasites, confirming that a high saliva IgA measurement is associated with a low FEC.

Since the beginning of the project, PRLB has collected over 7,500 saliva IgA measurements, resulting in the implementation of a new EBV in the 2017 Signet Lleyn analyses.

CT predictors of meat quality in sheep breeding programmes

The sheep industry has made substantial progress in reducing carcase fat relative to weight and lean meat yield in terminal sire breeds. There is concern, however, that breeding for increased lean growth and reduced fatness may compromise meat quality (eg tenderness and juiciness), partly because it is linked to intra-muscular fat (IMF) levels. On the other hand, selection against carcase fat while maintaining IMF is possible.

X-ray computed tomography (CT) measurement of fat, muscle and bone in the live animal has been used in commercial sheep breeding programmes over the last decade. Research has shown strong negative correlations between IMF and muscle density. Taste panel scores for flavour, juiciness and overall palatability also have negative correlations with muscle density.

An AHDB Beef & Lamb-funded PhD student, Neil Clelland, undertook a literature review and investigated the best image analysis methods and resulting parameters for predicting different meat quality traits. He examined the relationships between CT-measured muscle density, IMF and quality using existing data. A larger dataset was used to estimate genetic parameters for CT-measured traits in live lambs.

The results show that it is possible to estimate intramuscular fat in lamb loin accurately using CT. IMF predicted by CT is heritable, partially independent of overall fatness and has the potential to be included in breeding programmes.

Next steps
These findings can be used to develop breeding programmes to make the best use of modern technology to improve carcase quality while simultaneously maintaining, or even improving, aspects of meat quality.

Retail survey shows beef quality is more consistent

In 2011, AHDB carried out a survey of the quality of beef available to consumers following concern that there was an undesirable variation in the toughness of English beef.

Samples of two popular cuts of beef (sirloin steak and topside roasting joint) were collected from the six major retailers at the time. Tenderness was measured objectively using Warner-Bratzler shear force which replicates the jaw by assessing the amount of force required to shear a piece of meat. This survey was repeated in 2015 and expanded to include the prominent discount retailers. The 2015 survey showed that the tenderness of British/English beef had significantly increased since 2011.
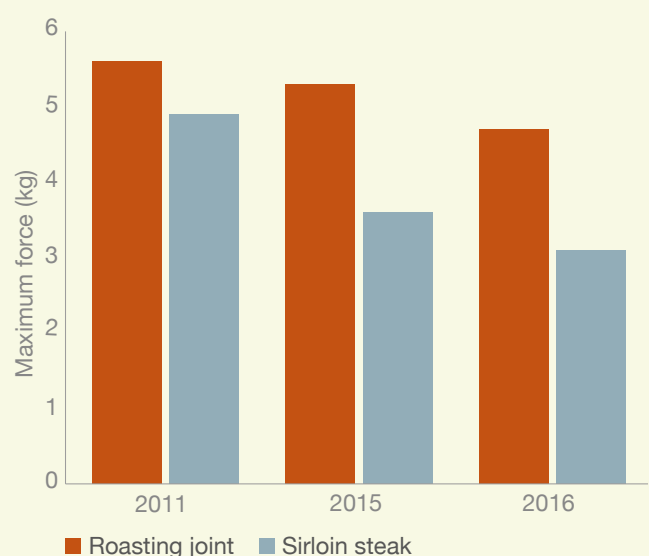
Figure 4. Average shear force results for beef sirloin steaks and roasting joints, 2011, 2015 and 2016

In 2016, the survey was repeated on a total of 80 sirloin steaks and 40 beef roasting joints from the eight major retailers. The recent survey identified that the trend in improving tenderness is ongoing. The results in Figure 4 show that since 2011, British/English sirloin steaks and topside joints have decreased in toughness by 1kg, a force which is detectable by the human jaw. In addition to this, the most noticeable difference is the reduction in variability found within steaks. In 2011, the difference between the most tender and the most tough samples was 7.5kg; this has now reduced to 3.5kg in 2016 which is great news for the industry.

Improving control of liver fluke infection in cattle

Liver fluke has a serious impact on health and productivity in cattle and sheep. A project funded by the Biotechnology and Biological Sciences Research Council (BBSRC), AHDB, HCC, Quality Meat Scotland (QMS) and Agrisearch Northern Ireland aims to improve control of this important parasite.

Surveys have shown that 80% of dairy herds have positive readings on bulk milk tank tests and 21% of cattle show evidence of infection at slaughter.

The project is led by the University of Liverpool and comprises five work packages:

1. Development of herd-level diagnostic tests

The Moredun Research Institute (MRI) compared composite FEC and a new test which detects fluke components in dung (the copro-antigen ELISA). Previous results under laboratory conditions suggested that the ELISA could detect infections earlier and was more sensitive than traditional egg counts. However, the work by MRI suggests this is not the case for cattle and that composite egg counts are the best way of identifying infected herds. Work is ongoing to develop a robust methodology that can discriminate between liver fluke and rumen fluke infection.

2. Understanding the habitat of the snail intermediate host and better understanding interactions between it and cattle

This part of the project, carried out by the Centre for Ecology and Hydrology (CEH), showed that more snails are found in unimproved pasture, particularly in wet areas and where rushes were found. Interestingly, although cattle spent most time grazing improved pasture, dung was dropped in wetter areas where rushes were growing.

3. Identifying possible risk factors for fluke infection on dairy and beef herds

This included modelling work to identify management practices that could be altered to reduce the level of infection. The University of Liverpool recruited 200 dairy and beef farms in England to identify factors that increase a farm's risk of fluke infection. The cattle from each farm were sampled and producers completed a detailed questionnaire to give researchers information on farm management, pasture use and type and other management information. Of the farms tested, 42.5% were fluke positive by composite egg count which, considering 2014 was considered to be a relatively low-risk year for fluke, shows just how common fluke is in British cattle herds.

Figure 5. Field team from the University of Liverpool and CEH collecting snails around a wet area of a field

4. Estimating the cost of fluke to cattle production

SRUC's Epidemiology Research Unit have estimated that fluke costs £162–224 per cow per year in reduced milk yield. Spring/summer-calving suckler herds have higher losses compared to autumn/winter-calving herds and higher losses are experienced in growing heifers originating from suckler herds rather than dairy herds.

5. Pilot intervention study

This study will evaluate the cost and effectiveness of implementing management changes identified within the project.

Figure 6. Adult *Galba truncatula* (ringed) snails

Improving youngstock health

Calf health, particularly control of pneumonia and scours, has been identified by the UK's Cattle Health and Welfare Group (CHAWG) as being a high priority within the industry. Pneumonia and scours collectively cost the UK cattle industry around £71 million annually. These costs are associated with decreased productivity, higher levels of mortality and increased veterinary and labour costs.

Treatment for pneumonia and scours is most effective if it is given as early as possible, therefore, it is important that diseased animals are rapidly identified and treated correctly.

AHDB has funded SRUC to investigate a range of monitoring techniques for detecting early signs of illness in individual dairy-bred calves during the rearing phase. This will allow development of better calf health management protocols based on improved monitoring and more targeted treatment.

Monitoring techniques currently being investigated include those that target a range of different physiological functions, such as core body temperature, activity, feeding behaviour and intake. The monitoring strategies, or combination of strategies, that prove the most reliable predictors of the onset of illness will be identified and used within future trial activity on commercial farms. The project also aims to track calves through to slaughter to assess the implications of early life disease on production efficiency during both rearing and finishing phases.

AHDB Beef & Lamb has also funded two PhDs focusing on calf scours. Scours is the most common disease in young calves, accounting for about 50% of all calf deaths. It is caused by a number of different infectious organisms, including rotavirus, coronavirus, E. Coli, cryptosporidiosis and Salmonella.

Cryptosporidiosis is caused by a parasite called Cryptosporidium and is usually seen in calves less than six weeks old. Calves become infected

with Cryptosporidium when they ingest the parasite's eggs, which reside in the environment in bedding, pasture, soil and drinking water. Hannah Shaw is carrying out an AHDB Beef & Lamb-funded PhD at the MRI. She is looking at how transmission of Cryptosporidium to young calves can be reduced and determining the economic impact of the disease on the long-term health and performance of beef calves.

Fredericka Mitchell is also carrying out a PhD associated with youngstock health and is focusing on Salmonella, a common bacterial cause of scour. Animals infected with Samonella suffer from diarrhoea, loss of appetite and depression. Fredericka is undertaking her PhD at Kingston University and is focusing on developing a rapid pen-side detection method. This would facilitate targeted treatment of infected calves and responsible use of antibiotics, increasing animal welfare and reducing the economic impact of the disease. This PhD is due to be completed at the end of 2017 and the findings will be communicated to beef producers and the wider industry through events and articles.
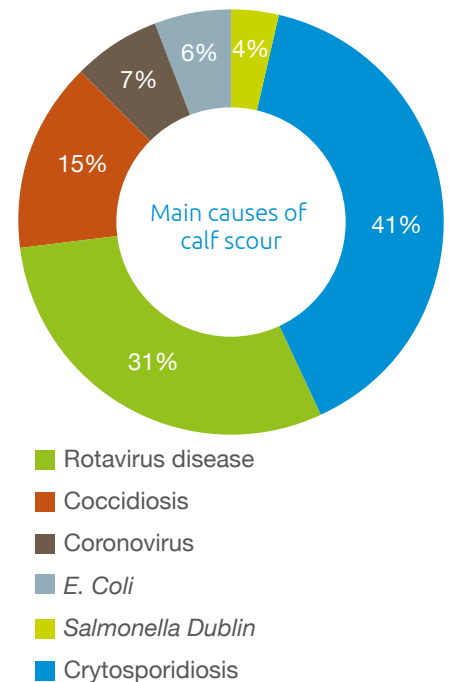
Figure 7. Main causes of calf scour, 2016
Source: APHA with the provision of VIDA data

- Rotavirus disease
- Coccidiosis
- Coronovirus
- *E. Coli*
- *Salmonella Dublin*
- Crytosporidiosis

Next steps

As part of its youngstock work, AHDB Beef & Lamb has developed some new calf rearing resources which are available online.

Developing guidance on controlling mastitis in ewes

Mastitis is an inflammation of the mammary gland typically caused by bacterial infection. Infection affects ewe health, causing pain, loss of udder function, premature culling and death, while lamb growth rates are affected by loss of milk yield.

AHDB Beef & Lamb is currently funding two PhD studentships on ewe mastitis at Warwick University. Both are aiming to reduce its economic impact and improve the health and welfare of the national flock.

Louise Whatford is in the second year of her PhD, 'Best practice to minimise mastitis in sheep'. She performed a detailed literature review to identify risk factors for mastitis and methods to reduce transmission. Louise also circulated a survey to sheep producers to gain an understanding of the factors they think are important in increasing the amount of mastitis. Her first on-farm study involved changing hygiene practices at lambing time and collecting milk and environmental samples plus flock records to understand if changing practices reduced the incidence of mastitis.

Kate Bamford is in the first year of her PhD, 'Persistence and transmission of intramammary pathogens causing acute mastitis: the role of chronic intramammary abscesses'. Kate will be analysing milk samples from ewes with acute mastitis, chronic mastitis and no disease. She will investigate the patterns of bacteria over time to identify those associated with disease and to investigate their survival and persistence in healthy udders. This analysis will lead to an on-farm study to test methods to reduce the transmission of a species or strain of bacteria.

Next steps
Current knowledge on mastitis can be found in the BRP+ document **Understanding Mastitis in Sheep**, available on the AHDB Beef & Lamb website. This will be updated as research work develops new guidance.

Increasing expertise in pathology

Follow Katie on Twitter and get regular updates on her findings.

@katie_waine

Pathology expertise underpins disease diagnosis, monitoring and surveillance and is vital for the health and welfare of the beef and sheep industries. Traditionally dependent on government-funded laboratories, the UK now faces a shortage of farm animal pathologists, with no structured education scheme in place to fill the rapidly declining pool of expertise. In 2015, the extent of the problem was highlighted when Biotechnology and BBSRC listed veterinary pathology as a vulnerable skill.

AHDB Beef & Lamb, along with MSD Animal Health and Farm Post Mortems Ltd, is funding a pathology fellowship at the University of Nottingham which started in February 2017.

The fellowship has been awarded to Katie Waine, who will be spending time with the pathologists at the university and APHA sites over three years. She will be working closely with Ben Strugnell from Farm Post Mortems Ltd. and will visit other fallen stock collection centres to develop her skills with a higher throughput of animals.

Next steps
Katie will be developing articles, webinars and events as part of her fellowship and will include results from Farm Post Mortems Ltd activity. Previous results are available in special BRP bulletins, available at:
beefandlamb.ahdb.org.uk/returns

Improving understanding of contagious ovine digital dermatitis

The Farm Animal Welfare Council challenged the sheep industry to reduce lameness prevalence to less than 5% by 2016 and 2% by 2021.

Recent research work means most of the current, evidence-based lameness control advice for veterinary medicine is based on footrot. However, between 35–53% of farms in England and Wales report contagious ovine digital dermatitis (CODD) as a major cause of lameness.

The aim of the work being conducted at the University of Liverpool is to generate evidence-based advice for CODD control to help reduce the prevalence of lameness. The majority of the funding comes from Biotechnology and BBSRC, with contributions from AHDB Beef & Lamb and HCC.

To understand the bacteria involved in CODD and its role in the disease process, researchers followed a group of store lambs exposed to naturally occurring infection. Regular blood and foot swabs were collected from the lambs, under Home Office licence, as CODD developed and after treatment.

All the animal work has been completed and the researchers are currently analysing the significant number of samples. This project will determine differences of the bacterial microbiome (the microbial community) in feet with and without CODD and how the microbiome changes after treatment.

AHDB Beef & Lamb has a significant number of resources including manuals, leaflets and videos on lameness which take into account current understanding CODD. These are available at: **beefandlamb.ahdb.org.uk/returns**

Next steps
The final report will be available in December 2018 and will help to provide practical guidance for the treatment and prevention of CODD.

Rumen fluke in cattle and sheep

Until recently, rumen fluke (paramphistomes) was considered to be of minor importance. However, over the last few years, increasing reports of production losses from farmers in Great Britain and Ireland have been due to infection by rumen fluke.

This project, led by Queen's University, Belfast and working with the Agri-Food and Biosciences Institute of Northern Ireland (AFBI), aims to improve our understanding of the spread and biology of rumen fluke in the UK and develop much-needed tools for its rapid diagnosis. The project has three focus areas:

1. Determining prevalence and distribution of rumen fluke in the UK
Using data collated from industry partners (Dunbia, AHDB Beef & Lamb, AgriSearch), the incidence and geographical range of rumen fluke will be determined and a multiplex PCR will be used on intermediate hosts (snails) to investigate the likelihood of co-infection with liver fluke.

2. Understanding impacts on welfare and performance
It is still unclear to what extent rumen fluke infection impairs animal welfare and leads to production losses. Field studies will be conducted to measure the impact of rumen fluke infection on diarrhoea score, bodyweight and welfare of grazing dairy heifers. Metabolic studies using calorimetric chambers will also be carried out to determine the impact of rumen fluke on feed intake and digestibility in sheep.

3. Development of a rapid and specific diagnostic test
Using proteomics, the proteins secreted by rumen fluke will be characterised and selected antigens will be used to develop tests for detection of rumen fluke in faecal samples and bulk milk.

Next steps
This work will provide a platform on which practical control strategies for rumen fluke can be based.

Feed into Lamb

The updated **Feeding the Ewe** booklet used metabolisable energy (ME) requirements published by the Agriculture and Food Research Council (AFRC) in 1993. During recent consultation, industry experts indicated these requirements were adequate but acknowledged there was limited new evidence to challenge the AFRC figures.

AHDB Beef & Lamb is funding work, alongside AgriSearch and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland, at Agri-Food and Biosciences Institute (AFBI) to investigate the maintenance energy requirements of growing lambs, replacements and adult ewes.

A literature review was the first step in the Feed into Lamb project and showed that current estimates of maintenance energy requirements are more than 20% higher than the values calculated from AFRC (1993).

There is also limited data to explain the differences among the breed, sex, health and nutrition status of ewes at different physiological stages.

One study on dry, adult ewes has been completed, with a trial during the summer investigating growing lambs and the final one in October 2017 measuring replacement ewes. Two different breeds are being used to allow a comparison to be made.

This project takes advantage of the new Centre of Innovation Excellence in Livestock (CIEL)-funded equipment at AFBI, which includes individual feeders for ewes where forages can be offered and more detailed analysis from the outputs of the metabolic chambers.

Next steps
The final results will be available in 2018 and may be included in future updates of **Feeding the Ewe**.

Reducing clamp silage losses

Working with Dr Dave Davies of Silage Solutions Limited, the aim of the study was to gain a better understanding of parameters affecting silage quality on English farms, to estimate silage dry matter (DM) losses and to understand the variability both within a clamp and between farms.

Twenty farms were visited and a detailed assessment made of their open silage clamp face. Various attributes were assessed during each visit, including a detailed assessment of nine sampling points across the clamp face. At each point a number of analyses were conducted, including temperature at three depths, silage density and silage chemical and nutritional analysis.

Preliminary results show huge variation in management procedures and subsequent feeding values within the different clamps. Using average dimensions, 26.2% of the volume of silage in the average clamp is within 0.5m of the wall or top sheet. This is the region of the clamp where the poorest management and greatest vulnerability to losses are generally observed. Physical and chemical variations within a clamp were also noted, with a 15% difference in DM seen on a single clamp face.

Temperature is an indicator of clamp management, both during filling and the feed-out phase.

Temperature readings were taken at three depths: clamp face and 12cm and 50cm from the clamp face. Again, there was some variation within individual clamps, with one reading of 49.1°C being recorded.

Next steps
The outcomes of this project will be used to update the BRP manual **Managing grass silage for Better Returns**.

Reviewing beef nutritional standards

Sophie Tyner is completing an AHDB Beef & Lamb-funded PhD at the AFBI of Northern Ireland, focusing on revising current beef nutritional models used within the UK. The current models are based on equations developed over 30 years ago and there is considerable evidence to indicate that these underestimate the nutrient requirements of modern beef cattle. Consequently, there is an urgent need to revise the nutritional standards and produce accurate prediction models for feed intake and ME and protein requirements for cattle produced under a range of systems.

In the first 18 months of her studentship, Sophie focused on two areas. First she reviewed the scientific literature on beef cattle nutrition for a range of animal types (dairy-origin vs suckler-origin, early vs late maturing), gender (bulls, heifers and steers) and production systems (intensive concentrate vs forage-based systems), with the aim of conducting a meta-analysis on the data to develop prediction equations for voluntary feed intake and ME and protein for a range of systems.

Secondly, grazing studies are currently underway to improve our ability to predict performance of cattle at pasture. Sophie's future work will aim to validate these prediction models. This will involve the utilisation of near infrared spectroscopy (NIRS) technologies for predicting forage quality (both grass and grass silage), coupled with forage and concentrate supply and livestock performance on commercial beef farms.

Next steps

Messages will be communicated via a range of channels as the research progresses and will link to other AHDB beef R&D projects.

Developing grazing systems for beef producers

The two-year Beef from Grass project aims to highlight the potential of grass and forage for beef cattle production and will provide practical guidance on how beef producers can improve their current grazing management.

At the start of the project, four mentor grassland beef and dairy producers were linked with four beef producers who wanted to significantly improve their current performance from grass. Working with other industry specialists, the aim is to upskill the improver producers and feed back the key messages to the wider industry.

During the first grazing season, rotational grazing was introduced on each of the improver farms. Fields were split into smaller paddocks using temporary electric fencing and weekly grass growth measurements were taken using either a plate meter or compressed sward stick. Through rotational grazing, grassland utilisation increased by as much as 30% on the improver farms.

The focus for the 2017 grazing season has been to increase grassland utilisation further by extending the grazing period and reseeding any poorly performing paddocks. Farm improvers have been encouraged to outwinter their cattle, which can reduce wintering costs by 45%.

By the end of the project, a blueprint for managing grass for beef cattle will be developed and key performance indicators will be identified which relate to grassland management and profitability from beef.

Next steps

Throughout 2017, each improver farm will host an on-farm event which will provide an opportunity to learn more about the outcomes of the project. Details will be posted on the events calendar at: **beefandlamb.ahdb.org.uk/events**

New EBVs for CT-scanned animals
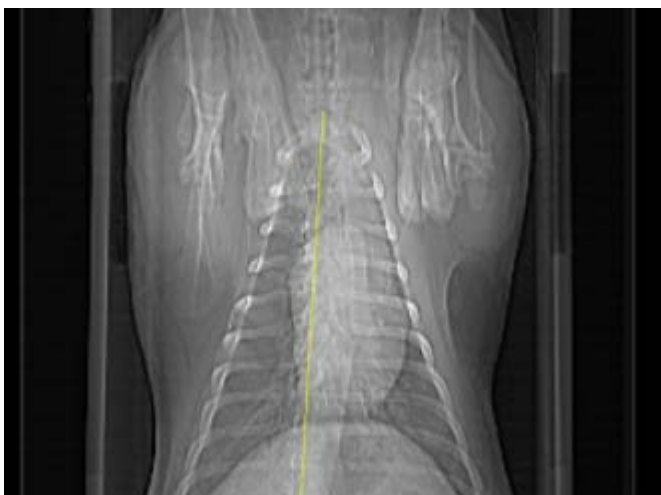
Lambs have been scanned using CT for over two decades. CT images are currently used to produce EBVs for carcase lean weight, carcase fat weight and gigot shape that are implemented in some routine terminal sire Signet breeding evaluations.

AHDB Beef & Lamb is funding a team at SRUC to create new CT EBVs for commercially important carcase traits from over 7,000 past and present CT images.

SRUC have been looking into the variation between individuals in spine traits detected by CT scanning. Included in this are values for total spine length and vertebra number that can then be split into thoracic and lumbar regions. Sufficient variation exists for EBVs to be calculated.

CT images also allow tissue densities to be recorded. This provides a good method of estimating the IMF content in the loin. Producers have been selecting for increased muscle growth in terminal sires for many years. Some of the genes responsible for this will lead to leaner animals with less IMF. The ability to select for improved IMF levels should allow fast-growing lambs to be bred without compromising consumer meat eating quality and the possible financial implications associated with it.

By the end of 2017 the aim is to have EBVs for:

1. Vertebra number and spine length (in both the thoracic and lumbar regions)

2. CT-predicted IMF

3. Eye muscle area in the loin

AHDB Beef & Lamb offers a CT scanning subsidy to English terminal sire breeders who are Signet performance recorded, for up to 15 pedigree ram lambs per breeder. Similar arrangements exist in Scotland and Wales. Visit **www.signetfbc.co.uk** for more information.

Combined breed analysis for terminal sire sheep breeds

SRUC have recently completed research to produce a combined breed analysis (CBA) for terminal sire sheep breeds. EBVs for 12 terminal sire breeds (Meatlinc, Dorset, Texel, Suffolk, Charollais, Hampshire, Bleu du Maine, Beltex, Vendeen, Southdown, Shropshire and Blue Texel) can now be calculated within a single BLUP analysis.

Systems that take into account hybrid vigour and the breed makeup of crossbreds are now routinely used within this multi-breed genetic evaluation.

Next steps

A new phase of research is now planned that will enable the CBA to be used to evaluate new CT carcase traits and commercial phenotypes obtained from the RamCompare project, including measures of carcase weight, days to slaughter, carcase conformation and fat class.

Breed-specific indexing will be undertaken shortly, along with database changes that will enable the delivery of CBA EBVs to industry in 2018.

Preparing for the next phase of RamCompare

RamCompare is the UK's first commercial progeny test and was launched in May 2015. During 2016 and 2017, more than 6,000 slaughter lambs were on trial. The main aim of the project was to identify rams with the most profitable genes for commercial sheep production.

The six farms involved represent a range of UK systems in terms of lambing date and finishing method. Each farm has provided 320 ewes that have been bred to 74 Suffolk, Texel, Charollais and either Hampshire Down or Meatlinc rams.

Selection of year one data

In year one, it was interesting to see the variation between farms in terms of growth rates (see Figure 8). Some of the youngest lambs to hit 40kg did so at around 70 days. On one farm, half their lambs reached 40kg by 100 days. On other units, this midway point was not reached for another 50 days, with lambs growing more slowly due to low grass growth or health challenges. The results demonstrate the potential growth rates that can be achieved from elite genetics and the ability to achieve this from forage.
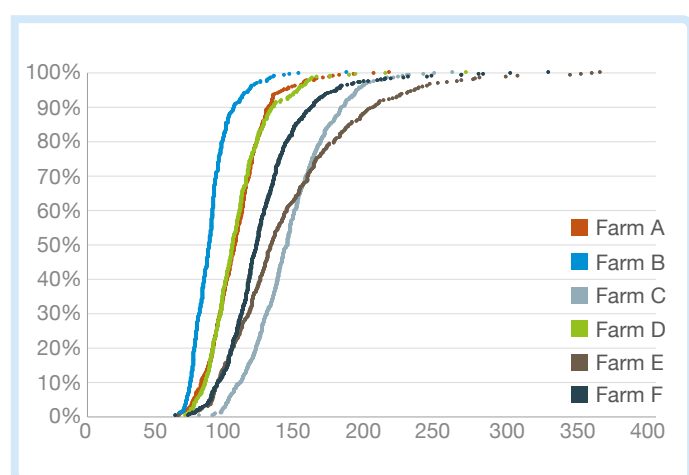
In year one, the project collected over 20,000 carcase phenotypes (see Table 4). These included standard carcase weight, carcase conformation and fat classifications. A proportion of carcases were broken into primals to get weights and to calculate saleable meat yield (SMY). Loins were collected from the carcases with primal weights so that tenderness using the shear force method could be measured.

Top 25 lists

Lists of the top 25 rams will be generated to show how the RamCompare sires have ranked for known EBVs. The lists produced will incorporate the new EBVs developed for days to slaughter, carcase fat, carcase conformation and carcase value. Rams will be listed irrespective of breed.

Figure 8. The time taken for lambs to reach 40kg over the six farms

Next steps

Draft lists will be released at the Sheep Breeders Round Table on 17 November 2017 and will be made available at www.ramcompare.com on the same day.
The lists will be updated with final results in early 2018 as SMY and tenderness data will continue to be collected over the winter. Events will be planned for late spring 2018.

Table 4. The number of lambs with linked slaughter data (carcase, meat yield and tenderness)

Abattoir	Farm	Carcase weight and classification	Primal data	Shear force	Total carcase phenotypes*
Randall Parker Foods	Moat Farm	198	51	48	1,366
	Thistleyhaugh Farm	545	101	76	3,152
	Chawton Park Farm	636	96	86	3,331
	Bradley Farm	441	61	60	2,216
Dunbia	Beili Ficer Farm	370	168	170	3,779
	Bowhill Estate	567	367	233	6,938
Total		2,757	844	673	20,782

*Includes all the weights from the saleable meat yield

RamCompare Phase Two

The project will continue into phase two, incorporating new breeds and additional farms from September 2017 to December 2020. As in phase one, farms involved in phase two of RamCompare will collect data from tupping through to slaughter. For more information, see www.ramcompare.com or follow the project on twitter @RamCompare

Beef systems on arable units

A joint project between AHDB Beef & Lamb and ADAS RSK is currently investigating the concept of integrating beef production into arable cropping systems. Escalating input costs combined with the increasing demand for land now means that starting or expanding beef enterprises can be a challenge. This project will emphasise the practical, economic, environmental and agronomic implications of integrating beef and arable enterprises in a predominantly arable cropping area.

Issues such as herbicide resistance, reduced fertiliser efficiencies and diminishing soil health continue to threaten the viability of over 20% of arable land. From an arable perspective, it is estimated that a direct benefit will come from integrating grazing leys into the rotation, leading to increased soil organic matter content. Initial work has monitored performance of cattle on an existing herbal ley and assessed weed burdens in the subsequent arable crop, along with calculating the potential financial returns for both the arable and beef producer.

The next phase of the project will monitor the impact of establishing temporary grass leys in an arable rotation, starting by taking baseline soil and weed measurements from the preceding crop and then monitoring grass and cattle performance, followed by an assessment of soil compaction, weed burdens and crop yield in the subsequent arable crop.

Introducing grass leys into arable fields has been shown to lead to a 70–80% reduction in black-grass seed bank per year, so after two years, less than 10% of seeds are likely to remain.

Next steps
Additional evidence will be gathered from the AHDB-funded project on soil biology and soil health and will be reported when available.

Connected beef farms

Technology offers huge potential to improve the level of management on beef farms across the country. However, there are limitations in the ability to link data sources to gain maximum value from existing and new information collected on farm.

The aim of the project is to test the concept of exploiting the 'internet of things' (IoT) to deliver commercial benefits for beef producers.

This project is part of a larger initiative led by Molecare Veterinary Services, evaluating the value of sensor connectivity to allow links to multiple technologies and data sources to deliver real practical and economic benefits to commercial farmers. While poultry and dairy farms are involved in the wider initiative, this project focuses on beef cattle farms and is working with a suckler producer and a calf rearer.

Next steps
Results from the project will be communicated to producers throughout the life of the project, to enable best practice to be shared across the wider beef industry.

Evaluating beef finishing units in England

Westpoint Veterinary Group and SAC Consulting are delivering a three-year project which will provide an evidence base for beef finishing systems in England, identifying innovations and best practice on larger units that have the potential to affect animal health, welfare and performance. This project will provide robust data on which English systems can be benchmarked against those seen in the main beef producing regions of the world.

SAC Consulting completed a review of the published scientific literature relating to beef finishing systems in temperate climates across the world. The review focused on cattle performance, animal health and animal welfare and the interactions that exist among these across a range of systems. It was concluded that, while a number of studies have looked at effects on animal health, welfare or performance in isolation, very little evidence exists regarding how these factors interact.

A second work package involved a survey of 32 larger beef finishing units. Farms were located throughout England and had at least 250 finishing cattle places on site. During each visit, information was collected about the system, including nutrition, handling, performance and the outlet for finished animals. Additionally, physical information about the size and construction of animal pens was measured and animal welfare observations were made on a proportion of animals. A wide variety of systems were observed, including intensive bull beef from dairy calves, suckler herds finishing their own offspring and store cattle purchased from markets being finished extensively following a season at grass.

The next stage of the project is to evaluate the effects of a number of interventions on cattle health, welfare and performance by conducting a series of on-farm trials.

The trials will involve collecting data such as animal weights, health events and behavioural patterns, so that these can be linked to the environment in which the finishing animals are kept and the effect of interventions can be assessed.

The findings from the trials will provide an evidence base for cattle health, welfare and performance parameters on large finishing units.

More analysis to do on the Sheep KPI project

The Sheep KPI project, led by independent consultant Lesley Stubbings, Nerys Wright from AHDB Beef & Lamb and researchers from the University of Nottingham, finished in April 2017. Its aims were to develop KPIs to help farmers identify the best information to record using electronic identification (EID) and then how to use it constructively.

A significant amount of data analysis still needs to be done to understand the implications of BCS over several years. One of the key elements coming out of the project is the importance of lamb eight-week weights.

Weighing lambs, plus body condition scoring and weighing ewes, at eight weeks is important because it is just after peak milk yield when ewes could be at their lowest weight and lambs are just starting to eat a significant amount of grass (see Figure 9).

The weight of lambs (in particular twins) at eight weeks is an extremely important indicator of how well lambs will do over their lifetime. A target of 20kg for the adjusted eight-week weight is supported by this project. Sheep producers should weigh at least a representative sample of lambs at eight weeks of age to understand how well lambs and ewes are performing.

Lambs that do not grow well to eight weeks (less than 17kg or 85% of the target) continue to struggle up to and beyond weaning. The percentage of these light lambs is also being developed as a separate KPI.
It is becoming clear that weaning (adjusted 90-day) weights are heavily influenced by eight-week weight, highlighting the importance of the early growth period.
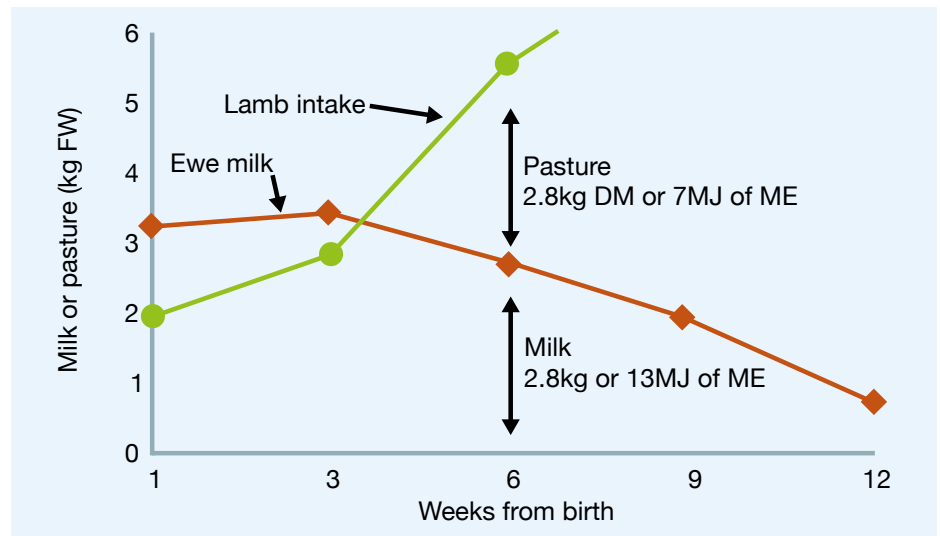

Figure 9. The milk-to-grass transition for lambs reared as twins. Source: Beef & Lamb NZ

Challenge Sheep

The aim of Challenge Sheep is to develop best practice for managing replacements and to understand how implementing these guidelines can reduce replacement costs through lower premature culling of ewes.

The Sheep KPI project gathered and analysed data from three flocks in England. One of the key areas identified by this project was the impact of the rearing phase of the ewe lambs on their performance as shearlings (and later into life). For example, one of the project farms had an issue with lungworm in shearlings and the impact on their performance was seen for at least two production years after they were treated.

The Sheep KPI project has also demonstrated a greater proportion of light lambs (defined as less than 17kg at eight weeks) come from shearling mothers. There is a significant cost to these lambs as they will be on farm longer before reaching finishing weight or sold as lighter stores.

In 2015, while the number of shearlings accounted for 27% and 24% of the ewes in two of the project flocks, the number of light lambs from the shearling mothers was greater at 46% and 35%. It should also be noted that the shearling groups also scanned fewer lambs on both of these farms.

Challenge Sheep has recruited 13 flocks from across England, representing a range of lamb production systems. Around 250 replacements that enter the flocks in 2017 and another 250 replacements in 2018 will be monitored until 2023, through the use of EID equipment. Information will be gathered on their weight and BCS at various points through the year and lamb performance and health records will be collected. Reasons for ewes leaving the flock will be recorded and compared to similar data for mule replacements from the Defra-funded Longwool project (see Table 5).

Hayley King, the project coordinator, is working with the producers and their software providers to analyse the huge amount of data being generated.

Scientific workshops will be held throughout the project to gather expert opinions and to ensure that information is communicated back to consultants, advisers, vets and researchers.

The 13 flocks will hold events each year to communicate the data from Challenge Sheep and the Sheep KPI project to producers. A series of press and BRP articles, twitter updates, newsletters and webinars will be planned to ensure the results are communicated to the wider industry. Surveys will be conducted throughout the programme to track changes in the attitudes of producers who are attending events and those who haven't attended.

Next steps
The project team will work with the farms' vets to collect information on health status and to collect benchmarks for antimicrobial use. This will inform AHDB's activity on antimicrobial use.

Table 5. Percentages of mule ewes culled/died by reason and by age up until 1 January 2007
(percentage of total number in age group at beginning of year)   Source: Longwool project

Reason for culling/death		Age of ewe at culling/death (yrs)					
		2	3	4	5	6	7+
	Total number of ewes	1803	1611	1392	1167	886	568
Culling	Teeth/mouth condition	0.2	0.4	3.4	10.0	22.1	18.3
	Udder condition	4.0	4.6	5.8	6.3	5.2	3.5
	Prolapse	0.7	0.6	0.6	1.2	0.9	0.5
	Foot/leg problems	1.3	1.4	1.0	1.0	1.1	0.2
	Other injury/abnormality	0.4	0.3	0.3	0.3	0.3	0.2
	Poor body conidition	0.2	0.2	0.4	0.9	4.0	4.2
	Barren twice	0.0	1.5	0.4	0.4	0.8	0.7
	Subtotal	**6.9**	**9.0**	**11.9**	**20.1**	**34.4**	**27.6**
Death	Pregnancy-associated	0.1	0.2	0.3	0.3	0.2	0.0
	Lambing-associated	1.0	1.5	0.9	0.6	0.3	0.5
	'Internal' sickness/disease	1.9	1.9	1.2	0.9	0.3	0.4
	Injury	0.3	0.2	0.1	0.0	0.0	0.0
	Unknown reason	0.4	0.4	1.0	0.8	0.2	0.4
	Gone missing	0.1	0.4	0.9	0.4	0.3	0.0
	Subtotal	**3.8**	**4.6**	**4.4**	**3.0**	**1.3**	**1.3**
	Total	**10.7**	**13.6**	**16.3**	**23.1**	**35.7**	**28.9**

Highlighting the value of data in beef production systems

The effective use of accurate data is an essential component of managing any successful business. Tracking a small number of KPIs that closely predict business success can help identify strengths and weaknesses and monitor performance over time.

Working with the University of Nottingham, AHDB Beef & Lamb has funded the Beef KPI project, looking at evaluating how measuring and recording information on farm can significantly improve how beef businesses are run. As part of this project, a small group of producers, along with industry professionals and researchers, are working together to evaluate current KPIs and looking at what data is most critical to tracking enterprise performance and how that could be presented to help make better decisions.

A range of KPIs have been developed that relate to both suckler and store/finisher systems (Table 6). This allows beef producers to select those KPIs which are most relevant to their business.

Further analysis is being undertaken to help identify those KPIs which are best able to predict overall herd/farm performance. A survey has been distributed to beef producers to assess attitudes and barriers to data recording and monitoring.

Table 6. List of main key performance indicators developed as part of the project

Category	KPI
Performance – fertility	• 200-day weaning weight per kg cow or heifer bred • % calving in the first three, six and nine weeks of calving period • Average age at first calving
Performance – growth and carcase	• Average daily liveweight gain (kg) • % of prime slaughter cattle hitting target carcase specification
Financial	• Total cost per kg output • Total cost per head per day
Health	• % of cattle on holding treated with antibiotics • Herd replacement rate (%)

Next steps
A number of articles and events have already been delivered to the industry as part of this project and more are planned throughout 2017.

Outdoor dairy beef

With around 52% of UK beef production coming from the dairy herd, these calves represent a substantial opportunity for beef producers wishing to buy-in growing cattle for finishing or dairy farmers wanting to increase output from their dairy system.

Latest figures from AHDB Dairy show that 24% of semen sales to dairy producers are from beef sires.

This project aims to assess the feasibility of rearing and finishing native beef-cross and Holstein-Friesian male calves from the dairy herd, using predominantly grass and fodder beet with minimal reliance on cereals or other bought-in concentrates, apart from the initial rearing phase. Currently there are 35 Holstein-Friesian and 34 Hereford crossbred calves on the study. Growth rates during the rearing phase were 1.0 and 0.9 kg/day, respectively.

These calves were turned out in April and will graze into the autumn of 2017 when they will be transferred to a fodder beet crop for over-wintering.

The fodder beet will be supplemented with baled silage and the cattle will receive an iodine bolus. Next spring the cattle will be rotationally grazed on pasture again with the aim of finishing them before their second winter.

Next steps
As well as cattle performance, stocking rates and grass covers, effects on soil compaction in the fodder beet crop and overall financial results will be compiled as the study progresses with regular updates communicated to the industry.

Beef Feed Efficiency Programme

The four-year Defra and AHDB Beef & Lamb-funded Beef Feed Efficiency Programme will demonstrate how feed efficiency traits can be measured and selected for in beef cattle using facilities installed on commercial farms.

The records will identify those feed-efficient cattle that eat less than others but grow at the same rate. This will provide significant opportunities for beef producers to cut the cost of production by reducing feed costs.

With nearly 950 cattle already recorded, this major industry project is progressing well. Recent news that a third recording unit is being established in Scotland to integrate with this programme brings added momentum.

Interim results

Results to date have shown a range of feed efficiency among different sire groups. Actual feed intake of the more feed-efficient cattle has tended to be around 12% lower than that of the less feed-efficient cattle, yet growth rates are similar. Across 100 growing cattle gaining 200kg of liveweight, the resultant feed cost savings would amount to over £2,200.

Next steps

The programme is aiming to collect sufficient records from Limousin-sired cattle by the end of 2018 to produce a feed efficiency EBV. After that point there are plans to extend the facilities to other breeds to ensure the investment benefits the whole industry.

SHAWG helping develop targets for antimicrobial use in the sheep industry

The Sheep Health and Welfare Group (SHAWG) is an independent body with membership that reflects the range of organisations involved in the sheep industry. There are currently over 20 members.
More information on the group can be found at:
www.shawg.org.uk

It was established in 2009 and has financial support from AHDB Beef & Lamb. It acts as a link between representatives of the sheep industry and government departments and their agencies.

During 2017, SHAWG started to provide secretariat function to the Responsible Use of Medicines in Agriculture (RUMA) sheep task force. The task force has been asked by RUMA to develop best practice guidelines and targets for the sheep industry to demonstrate responsible use. These will be reported at the RUMA conference in late 2017.

CHAWG helping collect antibiotic use data and set targets for the cattle industry

The Cattle Health & Welfare Group (CHAWG) is an independent body of industry stakeholders that meet to address relevant cattle health and welfare issues. The group is funded by AHDB and further information about it can be found at **www.chawg.org.uk**

Recent work has focused on the challenges facing the cattle industry in reducing its antibiotic use and monitoring usage trends over time. Work commissioned by the Veterinary Medicines Directorate (VMD) enabled CHAWG to scope out existing mechanisms for collecting antimicrobial usage data across the dairy and beef sectors. This has been extended to consider how a national system of data collection could work and what reduction targets would be appropriate.

Other priority work areas include farm health planning, Bovine Viral Diarrhea (BVD), surveillance and reporting and dairy cow welfare.

Developing Sheep Expertise

AHDB Beef & Lamb has brought together 16 consultants, advisers and vets for the first Developing Sheep Expertise group. The details of the members can be found at **beefandlamb.ahdb.org.uk/returns/developing-sheep-expertise**

The first meeting was held in November 2016 and focused on nutrition, with a workshop led by Kate Phillips. There was a visit to a sheep farm where ewes were grazed on forage and cover crops over the winter and then a training session on presentation skills by Susie Emmett of Green Shoots.

The second meeting was held in January 2017 and focused on health around lambing, with Alasdair Winearls from Mount Vets leading a post-mortem session and other members of the group explaining how they use health data with their clients. There was a session on costings and Stocktake, which was followed by some in-depth training on mineral and trace element nutrition by Pete Bone of Ruminant Mineral Nutrition Consultancy.

The third meeting, held in May 2017, focused on ewe and lamb performance with Lesley Stubbings leading body condition scoring and worm control workshops. James Hadwin, a member of the first Developing Beef Expertise group, discussed his approach to consultancy and used a local farm as a case study.

The fourth meeting will be led by Fiona Lovatt in September 2017 and will look at production-limiting diseases and replacement management. Ian Cairns, another member of the first Developing Beef Expertise group, will use a local farm as a case study to show how he uses physical and financial performance to provide guidance to clients.

The final meeting will be held before the Sheep Breeders Round Table in November 2017. Sam Boon from Signet Breeding Services will talk through EBVs and the changes that are happening in sheep performance recording.

AHDB Beef & Lamb - Knowledge exchange delivery

2017 sees the start of an expanded KE programme for AHDB Beef & Lamb. The AHDB 2017–20 strategy, 'Inspiring Success', identifies the need to improve production consistency and competitiveness which is a key priority for KE activity. This will be delivered through the AHDB Farm Excellence Platform, which aims to help businesses drive productivity through farmer-to-farmer and stakeholder collaboration. We will continue to deliver activity under the Better Returns Programme (BRP), with the delivery of events, shows and a range of tools and resources. In addition, we are launching a Supply Chain Programme to work with producers, processors and retailers/foodservice companies to drive more consistent product through the supply chain.

In 2015, 45% of lambs and 48% of cattle failed to meet target specification for fat or carcase conformation. The proposed activity to address this can be broken down into three main technical areas:

- Selection for slaughter and understanding market requirements

- Animal health and nutrition

- Genetic improvement

This work will include the following activities:

- Supply Chain Interactions - working with retailer supply chains to identify their ideal specification and then monitor and improve the numbers of stock hitting that target

- Strategic Beef and Lamb Farm Programme – these farms will focus on medium to long-term activity including health, nutrition and genetics in order to optimise output and produce more stock that will hit target specification

- Genetics and Breeding – working with both dairy and beef producers to increase the use of beef EBVs when choosing a bull, including understanding market requirements, use of sexed semen and artificial insemination on beef farms

- Train the Trainer – increasing the number of trainers who can deliver live selection for slaughter KE messages

Other current projects

Title	Why	Institution	Area						Completion date
			Realising genetic potential	Building sustainable plant and animal health	Managing resources efficiently and sustainably	Driving precision technology	Facilitating trusted food	Honing business and technical skills	
BBSRC Animal Health Research Club	To improve understanding of resistance to pests and diseases in farm animals			x					Jul 17
Lamb PAR	To investigate the implications of integrating sheep into arable systems				x				Sep 17
Genetics of trace element deficiencies in sheep	To understand the variability between animals for trace element deficiencies	Nottingham, Roslin	x	x					Nov 17
Feed planning tool development	To understand how to develop a feed planning tool for UK systems	Farmax			x	x			Nov 17
GRASSS-TECH	To investigate the feasibility of measuring grass yield and quality using satellite sensing technologies	ADAS			x	x			Feb 18
Optimising sulphur management to maximise oilseed rape and farm profitability	To demonstrate the benefit of organic manures as a source of sulphur within cereal rotations	ADAS			x				Feb 18
Satellites to improve agri-food systems	To investigate novel methods to assess grass growth	ADAS			x	x			Mar 18
Tackling neonatal lamb losses	To investigate the causes of lamb losses between scanning and rearing	SRUC		x					Mar 18
LIDEH Business Plan	To share existing data better	VBMS (Buckingham) Ltd				x			Mar 18
Recommended Grass and Clover List (RGCL)	To update the RGCL	BSPB			x				Mar 19
SUREROOT	To understand grass and clover root interactions for crop production and soil structure	Aberystwyth		x	x				Mar 19
Sustainable Agricultural Research and Innovation Club (SARIC)	To support innovative projects that improve the efficiency, productivity and sustainability of UK crop and livestock sectors	Various	x	x	x	x	x	x	Mar 19
iSAGE	To enhance the sustainability, competitiveness and resilience of the European sheep and goat sectors	32 partners	x	x	x	x	x	x	Mar 20
Soil Biology & Soil Health Partnership	To understand what the key soil health metrics are for the UK	NIAB-TAG		x	x				Dec 21

Studentships

Generally, AHDB Beef & Lamb funds three PhDs a year. However, when other sources of funding are available, such as CASE studentships, then AHDB Beef & Lamb can be involved in more. Some of the studentships are jointly funded with AHDB Dairy or other organisations. More details on the annual studentship call can be found on page 43.

Who	What		When	Where	Additional Funding
Tessa Walsh	Development of a pen-side diagnostic test for fluke infection in sheep and cattle	Beef and sheep	Oct 14–Sep 17	Liverpool	
Fredericka Mitchell	Rapid pen-side detection of *salmonella* from calves with scour	Beef	Oct 14–Sep 17	Kingston	
Jennifer McIntyre	Markers of anthelmintic resistance in gastro-intestinal parasites of ruminants	Beef and sheep	Oct 15–Sep 18	Glasgow	KTN CASE
Hannah Shaw	Control of cryptosporidiosis in calves	Beef	Oct 15–Sep 18	Moredun	AHDB Dairy
Grace Cuthill	Diagnosis of fluke infective stages in the environment	Beef and sheep	Oct 15–Sep 18	Moredun	
Graham McAuliffe	Intensive pastoral production systems for beef – impact and value	Beef	Oct 15–Sep 18	Bristol	Bristol, QMS
Lynsey Melville	Development of molecular tools for the rapid assessment of benzimidazole resistance and investigation of possible factors in resistance development in Nematodirus	Sheep	Jan 15–Dec 18	Moredun	
Louise Whatford	Best practice to minimise mastitis in sheep	Sheep	Oct 15–Dec 18	Warwick	
Naomi Prosser	What really causes footrot in sheep	Sheep	Oct 15–Dec 18	Warwick	BBSRC CASE
Hanne Nijs	Developing an efficient, validated, sustainable on-farm syndromic surveillance system for beef cattle and sheep	Beef and sheep	Jan 16–Dec 18	Warwick	Warwick
Zoe Willis	*Dichelobacter nodosus* metapopulations and epidemiology of footrot in endemically infected flocks	Sheep	Oct 15–Sep 19	Warwick	KTN CASE
Elaina Lima	Evidence-based farm decisions for lamb production	Sheep	Oct 16–Sep 19	Nottingham	
Scott Jones	The impact of Maedi-Visna on breeding flocks	Sheep	Oct 16–Sep 19	Nottingham	
Sophie Tyner	Reviewing beef nutritional standards	Beef	Oct 16–Sep 19	AFBI	Agrisearch
Nerys Wright	Strategic use of body condition scoring to improve performance in commercial sheep flocks (part time)	Sheep	Jul 14–Jun 20	Nottingham	
Kate Bamford	Persistence and transmission of intramammary pathogens causing acute mastitis: the role of chronic intramammary abscesses	Sheep	Oct 16–Sep 20	Warwick	CASE
Bethan John	Defining the genetic diversity of free living and intra-molluscan stages of *Fasciola hepatica*	Beef and sheep	Oct 16–Sep 20	Liverpool	BBSRC, DTP, CASE

Upcoming PhDs

Five new PhDs will start in October 2017:

What	Species	When	Where	Additional Funding
Optimising the use of footbathing for control and prevention of lameness in sheep	Sheep	Oct 17–Sep 20	Nottingham	
A study to quantify usage patterns and understand perceptions towards antimicrobial use on beef and sheep farms	Beef and sheep	Oct 17–Sep 20	Nottingham	
System-wide evaluation of pasture-based sheep production – impact and value	Sheep	Oct 17–Sep 20	Bristol	
System-wide evaluation of pasture-based sheep production systems based on high- resolution primary data	Sheep	Oct 17–Sep 21	Bristol	BBSRC, DTP
The role of lambs, time and space in persistence of *Dichelobacter nodosus*, the causal agent of footrot	Sheep	Oct 17–Sep 21	Warwick	BBSRC, DTP

Notes:
AFBI = Agri-Food and Biosciences Institute, BBSRC = Biotechnology and Biological Sciences Research Council, (i)CASE = (industrial) Collaborative Awards in Science and Engineering, DTP = Doctorate Training Partnerships, NERC = Natural Environment Research Council, SIG = Sheep Improvement Group, QMS = Quality Meat Scotland, KTN = Knowledge Transfer Network

R&D Process

The AHDB Beef & Lamb 2017–2020 strategy identifies accelerating innovation and productivity growth through coordinated R&D and KE as priority. In order to meet the target of a 5% increase in profitability per hectare of producers who benchmark with AHDB, research will focus on the following areas:

- Driving greater on-farm uptake of genetic potential by increasing the use and understanding of EBVs
- Improve the efficiency of meat production through improved nutrition and management
- Improved animal health and welfare, while reducing costs and driving uptake of best practice of on-farm medicine use

Process

R&D is managed by the AHDB R&D team, in consultation with the R&D Committee.

Project proposals can come to AHDB Beef & Lamb in response to a tender (specific area) or a call (more general area), or as unsolicited proposals. Applicants who are submitting unsolicited proposals are encouraged to discuss them with R&D staff prior to submission to ensure the subject is appropriate and to prevent unnecessary work.

Proposals are submitted on the appropriate template and reviewed by staff, including testing the investment based on its cost-benefit and fit with AHDB strategy, before going to the Beef & Lamb R&D committee. The committee meets six times per year and any proposal needs to be received by the R&D team around two months prior to the meeting to allow time for review. Proposals may be subjected to peer review if additional expert opinion is needed.

The R&D committee can recommend funding (subject to contract), request revision and re-submission or can reject the proposal. The applicant will be informed and an R&D team member will work with them as appropriate. If the proposal is successful, a contract will be signed and then the work can begin.

AHDB Beef & Lamb works closely with Hybu Cig Cymru (HCC), Quality Meat Scotland (QMS) and AgriSearch through a collaborative R&D Committee of staff representing the UK red meat levy organisations.

This committee group has quarterly teleconferences or meetings to discuss joint projects or ideas, with the aim of one face-to-face meeting per year. This is aimed at avoiding duplication and maximising co-funding opportunities.

Studentships

AHDB generally funds fifteen PhD studentships per annum and issues a call for PhD studentships in early summer for a deadline in September. Applicants are expected to demonstrate that their proposals meet the priorities of at least one of the AHDB sector divisions participating in the programme.

The winning applicants are informed in January and the supervisor is expected to recruit a student, generally to start in October.

AHDB has an annual studentship seminar where all PhD students present their work. It provides a good opportunity to gain experience of presenting and builds their awareness of other projects AHDB is funding.

Impact Day

AHDB Beef & Lamb holds an annual workshop in September aimed at consultants, advisers and vets. Its objective is to highlight current knowledge exchange programmes and to communicate the results of recent R&D work. Beef and sheep advisers or consultants have an important role in communicating best practice and the latest science to levy payers. It also provides a networking opportunity.

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Glossary

(i)CASE (Industrial)	Collaborative Awards in Science and Engineering
AFBI	Agri-Food and Biosciences Institute of Northern Ireland
AFRC	Agriculture and Food Research Council
AHDB	Agriculture and Horticulture Development Board
APHA	Animal and Plant Health Agency
BBSRC	Biotechnology and Biological Sciences Research Council
BCS	Body condition score
BRP	Better Returns Programme
BVD	Bovine Viral Diarrhea
CBA	Combined breed analysis
CEH	Centre of Ecology and Hydrology
CHAWG	Cattle Health and Welfare Group
CIEL	Centre of Innovation Excellence in Livestock
CODD	Contagious ovine ditigal dermatitis
CT	Computed tomography
DM	Dry matter
DMI	Dry matter intake
DTP	Doctorate Training Partnerships
DUP	Digestible undegraded protein
EBV	Estimated breeding value
EID	Electronic identification
ELISA	Enzyme-linked immunosorbent assay
FEC	Faecal egg count
GS	Grass silage
HCC	Hybu Cig Cymru (Meat Promotion Wales)
IgA	Immunoglobulin A
IMF	Intra-muscular fat
IoT	Internet of things
JSRV	Jaagsiekte sheep retrovirus
KE	Knowledge exchange
KPI	Key perfomance indicator
KTN	Knowledge Transfer Network
LS	Lucerne silage
ME	Metabolisable energy
MP	Metabolisable protein
MRI	Moredun Research Institute
NERC	Natural Environment Research Council
NIRS	Near infrared spectroscopy
OPA	Ovine pulmonary adenocarcinoma
PRLB	Performance Recorded lleyn Breeders Group
QMS	Quality Meat Scotland
R&D	Research and development
RC	Red clover silage
RGCL	Recommended Grass and Clover List
RUMA	Responsible Use of Medicines in Agriculture
SBM	Soyabean meal
SHAWG	Sheep Health and Welfare Group
SIG	Sheep Improvement Group
SMY	Saleable meat yield
SRUC	Scotland's Rural Colleage
UWCW	Urea-treated whole crop wheat
VMD	Veterinary Medicines Directorate

Contact the team

	Name	Job	Contact Details	Areas of interest
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	Dr Liz Genever	Beef & Lamb Senior Scientist	07790 378 349 liz.genever@ahdb.org.uk	Sheep production Sheep health Sheep breeding Grass and forage management
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	Stephen West	Signet Breeding Specialist Advisor	07717 476 126 stephen.west@ahdb.org.uk	Sheep breeding Beef breeding Pedigree marketing
	Dennis Homer	Meat & Livestock Technical Services Manager	07775 884 866 dennis.homer@ahdb.org.uk	Meat science Selection for slaughter Ultrasound measurements
	Karen Morris	Livestock Science Team Coordinator	024 7647 8828 karen.morris@ahdb.org.uk	Contracts Invoices Committee papers Studentships

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