Focus Areas - Section 3

Animal Health and Welfare

Disease surveillance and prevention

Dr. Barry McInerney

Key Messages

- Many of the conditions that AFBI see coming through Post Mortem (PM) and the diagnostic laboratories could be controlled and managed successfully at farm level through herd health plans
- Herd health plans, biosecurity and vaccination are the 3 cornerstones of good disease control
- Disease surveillance is an obvious mechanism for measuring the environmental impact of disease in farmed livestock
- Controlling, managing and/or eradicating endemic disease on farm has multiple significant benefits including:
  - increased efficiency
  - improved productivity
  - enhanced profitability
  - positive environmental impacts improving sustainability and
  - critically from a global one health perspective, reduces the need for the use of antibiotics in the face of the AMR (antimicrobial resistance) emergency

Disease surveillance is the continuous, systematic collection, analysis and interpretation of animal health-related data, which is gathered primarily from PM and supporting diagnostic testing laboratories.

1. Crucially it provides assurance of freedom from specified diseases to support certification for export of animals and animal by products
2. It also serves as an early detection system for incursions of exotic diseases which could have major impacts on the national Agri food sector, e.g. recent Avian Influenza outbreaks and African Swine fever which is moving ever eastward on the continent

3. Protecting public health in a One Health Environment – controlling zoonotic disease, reducing the need for antibiotics in the fight against AMR
4. It also serves as an early warning system for new, emerging or re-emerging diseases such as Schmallengberg disease
5. An early detection system for changing endemic disease patterns
6. A measure of effectiveness of statutory disease control programmes
7. Understanding and measuring the impact of animal disease on climate change

Disease surveillance can also interpret the observed environmental impacts of disease and disease control in the context of the animal population at risk. An understanding of the endemic disease burden is also an important factor for farmers in achieving safe and efficient farm businesses.

The 3 cornerstones of good disease control are interlinked and co-dependent and so in a successful disease control program all need to be adequately addressed.

Robust and effective **herd health plans** require the input of not only the farmer and their vet, but also any other professionals involved in day to day management of the farm such as nutritionists, hoof parers, fertility scanners, etc. Herd health plans should detail bespoke approaches to dealing with any on farm disease issues, for example parasites through a testing and dosing program, or respiratory disease through husbandry, environmental management, diagnostic testing and screening, and a tailored vaccination plan.

Biosecurity should address primarily the prevention of entry of disease to the farm by considering how best to deal with high risk activities such as the purchase of animals, visitors, the use of shared equipment between farms and spreading of slurry from other farms. Biosecurity should then also address how to minimize spread of infection on the farm through use of heard health plans, use of isolation/ quarantine pens and crucially hygiene, cleaning and disinfection of farm buildings, pens and equipment.

Vaccination is a key tool to control disease, but it is not a substitute for poor management, husbandry, hygiene and biosecurity. Effective vaccination is significantly depleted where, due to poor hygiene, the burden of disease is so high as to overwhelm any immune response to vaccination. It is also depleted where animals are stressed due to poor husbandry or concurrent procedures such as transport, castration and dehorning, all of which greatly reduce their immune response.

Potential Impacts for Farming for the Future.

The importance of animal health surveillance cannot be understated. Firstly, it safeguards the health and welfare of animals. It also safeguards the safety of food to consumers of fresh or processed food of animal origin. It ensures quality assurance for trade in animals and animal products and it safeguards human health. The veterinary profession and animal health laboratories are in the position to make a major contribution to the management of risks to human health and efforts to address and mitigate environmental effects of farming. An effective and robust disease surveillance system has multiple benefits and is a key tool for farming for the future.

AFBI Cattle Health Scheme

Lindsey Drummond BVM&S MRCVS

Setting industry standards in cattle disease control

Key Messages:

- Optimising herd health should improve herd efficiencies and reduce emissions from livestock.
- Lowering greenhouse gas emissions of cattle herds represents a challenge, with clear opportunities, for industry.

Background

The AFBI Cattle Heath Scheme (CHS) is a CHECS (formerly known as Cattle Health Certification Standards) licensed health scheme, operating since 2007. CHECS, was established by the cattle industry, and its aim is to create robust standards to underpin the control and eradication of the main endemic cattle diseases in the UK and Ireland. Diseases currently included are Bovine Viral Diarrhoea (BVD), Infectious Bovine Rhinotracheitis (IBR), Johne's, Leptospirosis and Neosporosis.

Research findings

In a CHECS survey of health scheme members in 2019 they found that while farmers initially joined its licensed health schemes to accredit the health status of pedigree beef animals before selling, less than a third (30%) participate for that purpose now.

In fact, around 60% of new CHECS cattle health scheme members now join for management reasons, including the aim of having a healthier herd, better disease control and saving money. Many more commercial dairy farmers are now realising the benefit of getting involved, with one in every three new joiners of a CHECS licensed scheme being a dairy herd.

Potential impact for Farming for the Future

Improving herd health is an immediate mitigation measure farmers can focus on, to improve herd efficiency and reduce emissions from livestock.

Membership of the AFBI CHS is an opportunity for farmers to work alongside veterinary professionals to identify health challenges which may be limiting herd performance. Reducing the prevalence of key diseases such as BVD, IBR and Johne's disease will deliver immediate production gains on farm, while reducing emissions. Studies have shown that Johne's disease is estimated to increase greenhouse gas emissions by approximately 25% per litre of milk produced, and by 40% per kg of beef produced (ADAS, 2015. Study to Model the Impact of Controlling Endemic Cattle Diseases and Conditions on National Cattle Productivity, Agricultural Performance and Greenhouse Gas Emissions.).

Simply put, a sick animal has a higher carbon footprint. Improving and maintaining health, while actively looking at reducing disease challenges within herds, is one of the most important factors farmers have within their control to reduce emissions. Lowering greenhouse gas emissions of cattle herds represents a challenge with clear opportunities for industry.

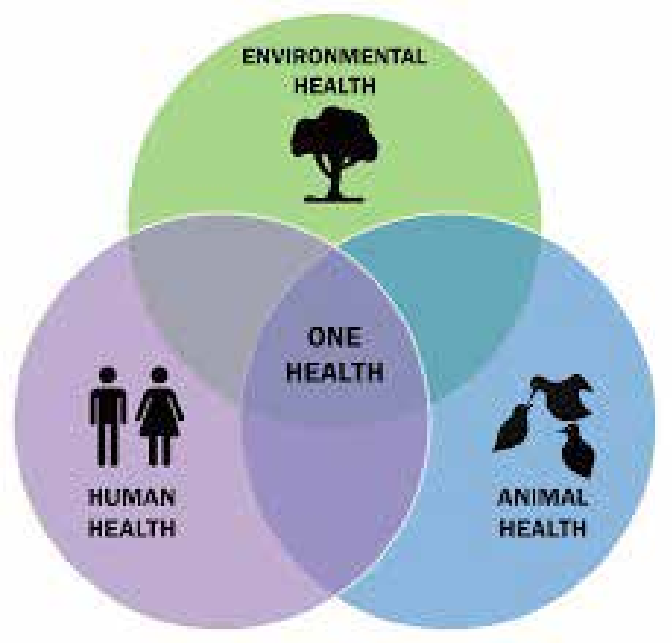
ONE HEALTH – The impact on farming

Catherine Couzens

The Antimicrobial Resistance (AMR) threat in Northern Ireland

Key Messages

- Antimicrobial Resistance (AMR) poses emerging threats in farming in Northern Ireland, with risk to environmental, human, and animal health.
- Surveillance and expert scientific advice play an important role in protecting and sustaining our farming industry. Monitoring the emergence of AMR in animal populations is of vital importance.
- The AMR lab in AFBI is accredited to UKAS 17025 and has been awarded a special member status in EU which means we take part in the major EU surveillance studies. This entitles us to the EU reports while also maintaining our standing within the UK.



Background

AMR is the ability of micro-organisms to resist antimicrobial treatments. Bacteria are becoming more resistant to antibiotics, which is compromising effective treatment of infectious diseases. AMR is seen as a global threat, endangering the environment, human health, and animal health. AFBI is at the forefront of this AMR battle.

AFBI have been monitoring AMR in the major primary production pathogens; Salmonella and E. coli since 2010. Since 2017 we have been carrying out Minimum Inhibitory Concentration (MIC) testing. We use the European Committee on Antimicrobial Susceptibility Testing (EUCAST) for characterizing the wild type distributions and setting Epidemiological cut-off values (ECOFFs) which means we can determine which bacterial isolate, have phenotypically developed resistance to the antibiotics on the given panels being tested.

Research studies

In our UKAS accredited laboratory we isolate and identify the pathogen and run MIC testing. Then we phenotypically identify the antibiotic resistance of the pathogen. The MIC assay is the gold standard for identifying the bacteria's phenotype.

We have been following Commission Implementing Decision (EU) 2020/1729 – the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria. We act as a Special EU Member State, report the results to the Commission annually and the European Food Safety Authority (EFSA) publish the data and results.

Research Findings

We continue to also contribute to the UK total, providing them with the Northern Ireland data each year. The UK Harmonised AMR Monitoring programmes is coordinated by the Veterinary Medicines Directorate (VMD) and follows the EU protocols for monitoring. We isolate and identify

the 4 different pathogens from either poultry or porcine on a biennial basis at a rate compared to the overall UK production; Commensal E.Coli, ESBL (Extended Spectrum Beta-Lactamase), Salmonella and Campylobacter through the Abattoir survey. We also look at pork and beef samples coming through the Border control post survey and as part of the retail meat survey. The results of which are produced in the UK Veterinary Antimicrobial Resistance and Sales Surveillance (VARSS Report)

https://assets.publishing.service.gov.uk/media/660c0569fb0f77001aec668e/_2731579-v7-VARSS_Highlights_2022.PDF

Potential Impact for farming for the future

The monitoring and surveillance of AMR is an important part of tackling its threat. The prevalence and characteristics of the resistant pathogens goes towards informing AMR policies and contributing to the legislation issued. This evidence-based practice is responsible for maintaining our high standards of prevention and control of AMR in NI.

AFBI will work with all our stakeholders to improve knowledge and awareness of AMR amongst farmers, although it is noted that there is already a high level of awareness amongst farmers of AMR and its global threat. We will work with farmers and stakeholders to identify risks and trends in AMR levels.

Reducing antimicrobial usage

Dr Aimee Craig

STrategic AntiMicrobial use in dairy, beef and lamb Production (STAMP)

Key Messages

- Protecting animal health is essential to the sustainability of livestock systems.
- Responsible use of antibiotics is critical.
- Benchmarking and risk awareness tools are available to help inform decisions.

Background

Protecting and enhancing animal health will reduce antimicrobial use (AMU) and assist in tackling the global challenge of increasing antimicrobial resistance. We require a system in place in Northern Ireland (NI) to measure, monitor and reduce AMU. AFBI partnered with AgriSearch, LMC, FarmVet Systems and AHWNI in a DAERA funded project to develop a medicine recording and benchmarking system alongside strategies to reduce AMU on farm.

Research studies

Desktop review: examples of recording and benchmarking AMU were identified across Europe. For example, in the Netherlands, farm-level AMU benchmarking has been mandatory for cattle since 2012. Using online systems to record antimicrobial sales and animal numbers, reports are generated every quarter. Having high AMU has direct consequences for farms with actions to be taken in farms with the highest 20% of AMU values.

Benchmarking tool: A farm-level benchmarking tool for NI was developed in collaboration with project partners and stakeholders and is now operational. This web-based tool draws information from APHIS and veterinary practice IT systems to benchmark AMU with minimal manual data input.

CalfDefend: A literature review was conducted to determine best practice for calf rearing with results built into a survey using the successful Johnes Disease risk assessment, delivered by AHWNI, as a template. Answers were 'weighted' within each question to provide a 'disease risk score' for each category. The survey was road-tested by well-respected vets/advisors. Building on stakeholder feedback and the available science, AFBI began development of a web-app, CalfDefend. The step-by-step style guides the user through, highlighting areas of increased risk of calf ill health and practical measures to reduce that risk.

Research findings

Insight from the review of European AMU benchmarking systems and an assessment of practicalities informed the development of an AMU benchmarking tool which is now available for use through veterinary practitioners.

"The STAMP online tool provides farmers and their vets with key information that will allow them to make strategic decisions on animal health and how to optimise the use of antimicrobials when they are needed." Dr. Sam Strain, AHWNI

The calf rearing phase was identified as an area of high risk for AMU. Therefore, CalfDefend, when available, will enable health risks during the rearing period to be identified and measures put in place to reduce disease risk and subsequent use of antibiotics to treat ill health.

Potential Impact for Farming for the Future

Use of antimicrobials in food production is of growing concern. Recording AMU is the first step to establishing a baseline from which improvements can be made. Having a robust system in place enables NI to monitor/review and provide assurance of responsible AMU. In parallel to recording usage, strategies to improve animal health will reduce the need for antimicrobials leading to a healthier future for animals and humans. By conveying that at an NI level we robustly monitor and practice responsible AMU at farm and animal level, consumers can be confidant in the supply chain, helping drive the consumption of locally produced food.

This project was funded by DAERA and industry under a Research Challenge Fund.

Dairy cow health and performance

Anna Lavery, Aimee Craig and Conrad Ferris

Reducing antibiotic use - Selective dry-cow therapy (SDCT)

Key Messages

- Antimicrobial resistance (AMR) poses a serious threat to human health. As a result, there is increasing pressure to lower antibiotic use within livestock farming to achieve optimal health for people, animals, and the environment.
- In an AFBI study, different drying-off approaches did not impact milk yield or composition.
- 'Low risk' cows dried-off with teat-sealant only had similar somatic cell count levels and incidence of mastitis in early lactation as 'low risk' cows treated with antibiotics at dry-off.
- A selective approach to dry-cow therapy (SDCT) offers an opportunity to substantially reduce intramammary antimicrobial use on dairy farms.
- If considering adopting SDCT, please speak with your vet who can help develop an appropriate plan at drying-off.

Background

Historically, standard practice on the majority of dairy farms has been to treat all cows with antibiotics at dry-off (Conventional dry cow therapy (CDCT)). However, with improvements in both milking hygiene and cow genetics, average herd somatic cell count (SCC) has decreased in

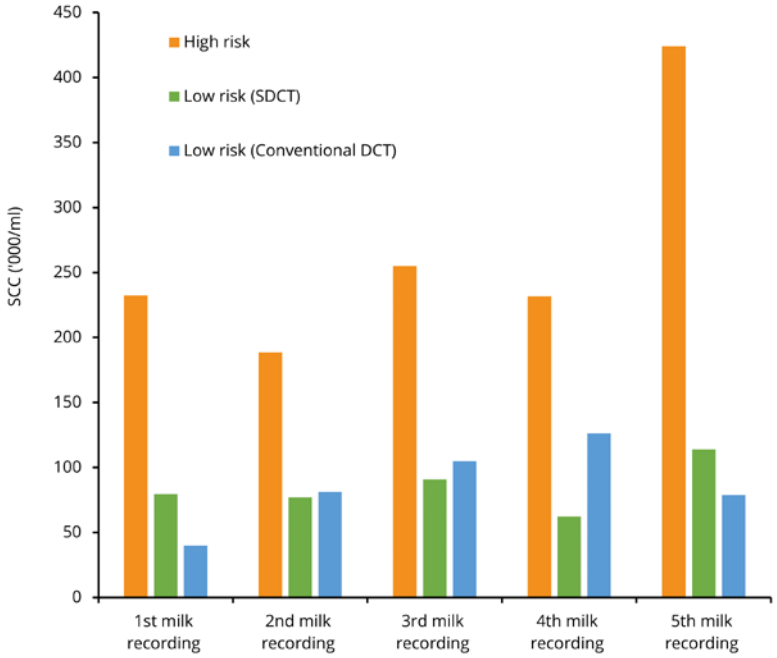


Figure 1. Average somatic cell counts ('000/ml) during first five milk recordings post-calving for 'high risk' cows that received antibiotic plus teat sealant, and for 'low risk' cows subject to either SDCT (teat sealant only) or CDCT (antibiotic plus teat sealant).

recent years, from 248,000 cells/ml in 2011 to 195,000 cells per ml in 2023 (DAERA statistics). There may now be an opportunity for many dairy farms to reduce antibiotic use by utilising Selective dry cow therapy (SDCT). With SDCT antibiotics are administered only to 'high risk' cows which are normally identified based on their milk SCC levels and their mastitis history during the months prior to drying-off. In contrast, cows considered 'low risk' receive no antibiotic treatment and are dried-off using teat-sealant only.

Research studies

The impact of SDCT on performance and udder health was examined in a two-year study within the dairy herd at AFBI Hillsborough. In this study cows were considered 'high risk' if they had a SCC of more than 200,000 cells/ml, or a mastitis case during the three months prior to drying-off. These cows were treated with CDCT (intramammary antibiotics and teat sealant). Cows with SCC less than 200,000 cells/ml and no mastitis cases during the three months prior to dry-off were identified as 'low risk'. These cows were treated with either CDCT, or SDCT (teat sealant only).

Research findings

Treatment did not affect milk yield or composition. 'High risk' cows had an average SCC of 281,000 cells/ml, while 'low risk' cows managed on CDCT and SDCT had an average SCC of 86,000 cells/ml and 83,000 cells/ml, respectively (Figure 1). 'Low risk' cows had a lower incidence of mastitis irrespective of treatment, compared to 'high risk' cows. These findings suggest that SDCT can be adopted for 'low risk' cows with no negative implications for udder health during the subsequent lactation.

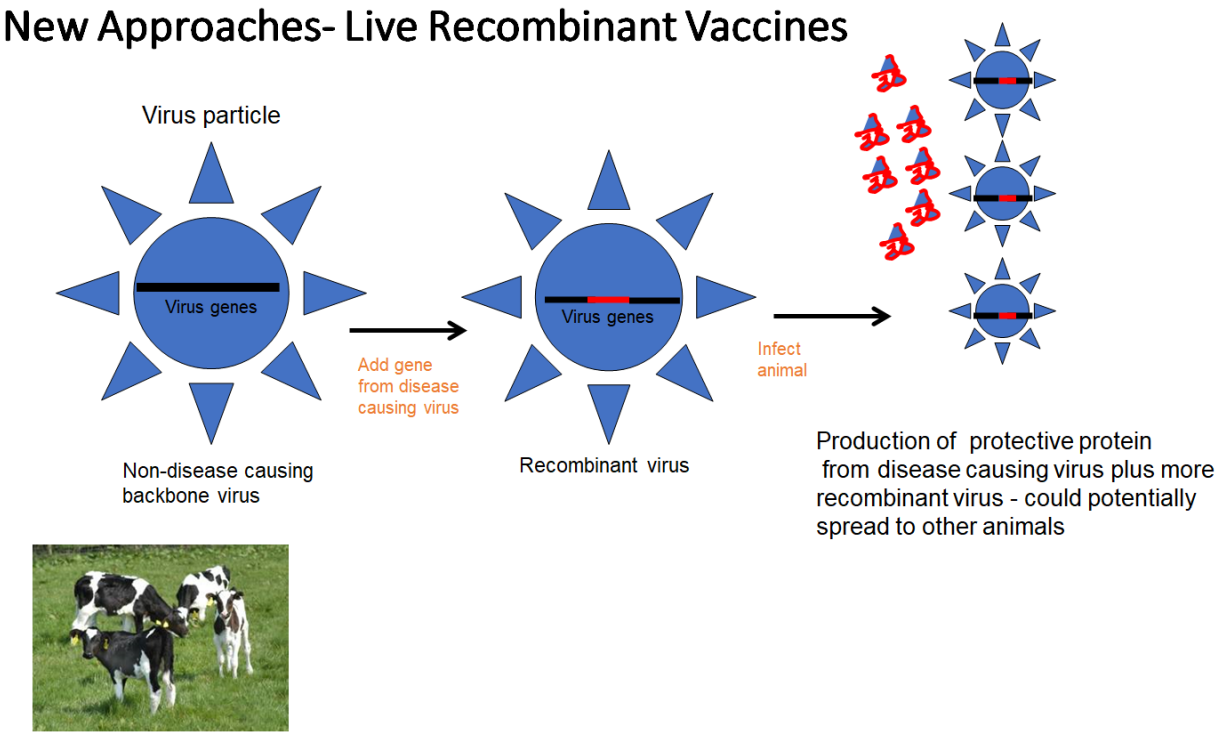
Potential Impact for Farming for the Future

There are approximately 3,200 dairy farms and 319,000 dairy cows in Northern Ireland. If 70% of Northern Ireland farms adopted SDCT, and 50% of cows within those farms did not receive antibiotics at dry-off, then this would reduce antibiotic dry-cow treatments within Northern Ireland by 35%. This represents a major reduction on antibiotics use in the dairy industry and a major contribution to reducing the risk of AMR. FarmVet Systems can provide a decision support tool for SDCT, which imports data from milk recording organisations and animal health records, providing a list of which cows should receive antibiotic dry cow therapy or teat-sealant only.

Bovine Respiratory Disease (BRD)

Louise Cosby

A multipronged approach



Key Messages

- To protect against Bovine Respiratory Disease (BRD) we need to:
- Understand the immune response to BRD associated virus infection in calves.
- Understand how and when secondary bacterial infections occur.
- Design more efficient vaccines which work in the presence of maternal antibodies and can be given directly to newborn calves.

Background

Bovine respiratory disease (BRD) is a multifactorial disease of cattle commonly referred to as shipping fever, which presents as viral and bacterial pneumonia. BRD is the costliest disease in the beef industry and is the biggest cause of mortality in calves aged one to five months.

The initial insult has previously been reported to be the result of viral infection, with bovine respiratory syncytial virus (BRSV), bovine herpes virus type 1 (BoHV-1), bovine parainfluenza-3 virus (BPiV3), bovine viral diarrhoea virus (BVDV) or bovine coronavirus (BCoV). The viral infection is thought to suppress the host's immune response and allow colonisation of the lower respiratory tracts by pathogenic bacteria. We need to better understand when and how bacterial colonisation occurs so treatment can be improved. A long term aim is also to breed cattle which are more resistant to the BRD associated viruses as well as to produce more effective vaccines which can be given to calves.

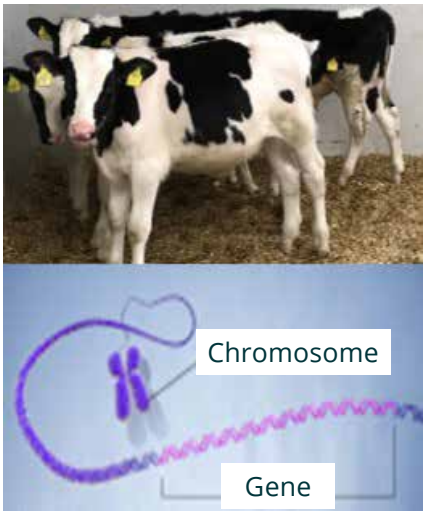
Research Studies and Findings

AFBI Virology Branch with teams at Teagasc (ROI) and the University of Missouri (USA) have identified genes which are activated by infection with BRSV or BoHV-1.

These genes are all involved in the function of the immune system with variation in response in different calves. With teams at Teagasc and the US Department of Agriculture (USDA) we are also currently looking at the changes in the microbiome (collection of bacteria, fungi and viruses) in the respiratory tract of calves, over several weeks, after virus infection.

Current vaccines for the BRD associated viruses on the market mostly provide inadequate protection due to interference by maternal antibodies if given to newborn calves. These vaccines are therefore mainly given to pregnant cows so that the antibodies they produced can pass to calves. This 'passive' immunity has limited effect and BRD viral vaccines, which can be given to calves, are therefore crucially needed to stimulate 'active' mucosal immunity to protect the epithelial lining cells of the respiratory tract as the main target of the viral infection.

We (AFBI in collaboration with Queen's University Belfast) have used genetic technology to generate 'recombinant' vaccines against some of the BRD associated viruses which can be administered intranasally. These vaccines have another safe virus as a backbone with a gene from a BRD associated virus inserted in this backbone. This virus gene is chosen as it is known to stimulate a protective immune response. These vaccines do not cause disease themselves and can be administered intranasally and infect the mucosal lining inducing rapid local immunity, followed by whole body immunity.



Potential Impact for Farming for the Future

We should eventually be able to selectively breed cattle which have the highest natural immune response to the BRD viruses. Recombinant combination vaccines would also give cattle a high level of protection against BRD and could be given to young calves, ideally prior to stressful events (e.g. transport, de-budding and castration). As these vaccines are administered by the respiratory mucosa, this allows farm staff with minimal training to readily carry out herd vaccination programmes. Furthermore, vaccination against viruses would stop the secondary bacterial infections and reduce the need to give animals antibiotics.

Bovine Viral Diarrhoea (BVD) and Border disease in Northern Irelands sheep and cattle populations.

James McConville

Composition of pestiviruses responsible for BVD and Border disease and implications for sustainable agriculture.

Key Messages

- Northern Ireland has been undertaking a 'BVD eradication scheme' in cattle, but pestivirus prevalence in non-bovine populations should also be monitored to prevent reservoirs of infection emerging that could scupper the eradication of BVD.
- There is an increased genetic diversity of BVD virus in Northern Ireland. This highlights the need for genotypic surveillance of all pestiviruses to detect the presence of novel strains and to tailor vaccines and treatment accordingly.
- Modern diagnostic and surveillance methods are needed as we move to fully eradicate BVD.
- Accurate pestivirus diagnosis, surveillance, control, and treatment will have positive implications for reducing the carbon footprint of farms and antimicrobial resistance (AMR).
-

Background

BVD in cattle is caused by Pestiviruses A and Pestivirus B and Border disease in sheep is caused by Pestivirus D. Northern Ireland has embarked on a compulsory BVD eradication scheme in 2016, which continues to date. A better understanding of the composition of the pestiviruses in Northern Irelands cattle, sheep and goats supporting the eradication of BVD in cattle and Border diseases in sheep.

Research studies

One study examined the prevalence of pestivirus infection in Northern Irelands sheep and goat population (DOI: 10.1002/vetr.1) and another looked at the composition of BVDV genotypes in an outbreak of BVD in Enniskillen (DOI: 10.1002/vetr.4150).

Research findings.

Around half of Border Disease infections were due to BVDV (pestivirus A) rather than Border disease virus (pestivirus D).

Pestivirus prevalence has decreased in Northern Ireland's sheep population from 1999 to 2018. This may be due in part to the reduction of BVD infection in cattle thanks to the BVD eradication scheme (Figure 1 - next page)

Genotype BVDV 1e has been found for the first time in NI, indicating an increase of genetic diversity in BVDV 1 (pestivirus A), which could have implications for vaccine design, treatment and highlights the need for continued pestivirus genotypic surveillance (Figure 2 - next page).

Potential Impact

Livestock agriculture is directly responsible for a significant proportion of greenhouse gas (GHG) emissions, predominantly methane and nitrous oxide.

The UN Food and Agriculture organization (FAO) considers animal health vital for sustainable

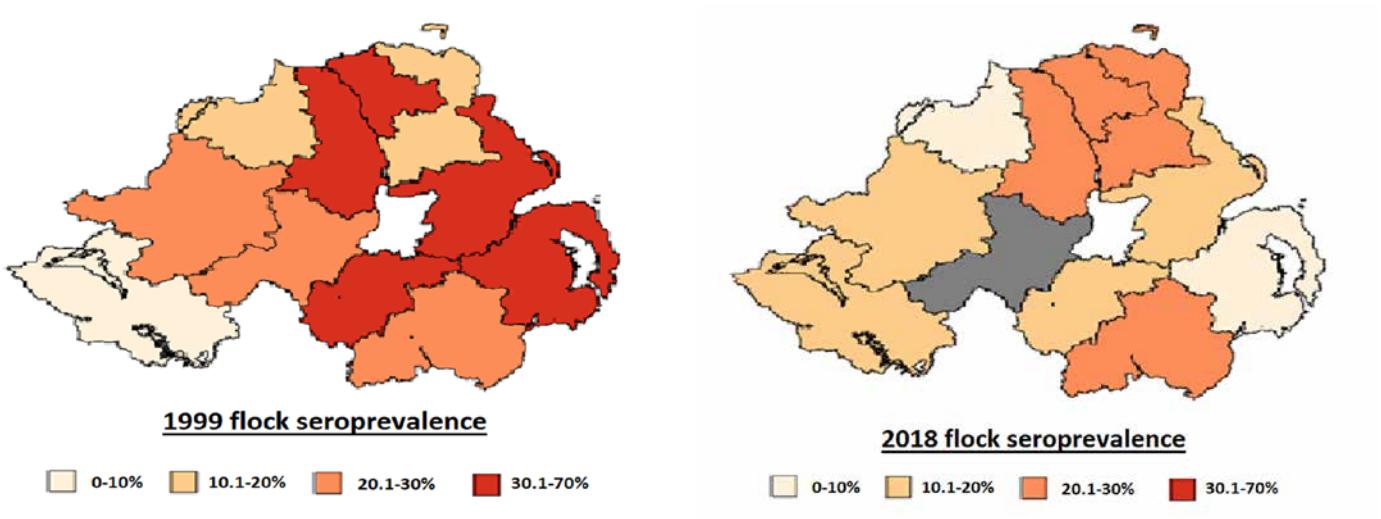


Figure 1. Sheep flock pestivirus prevalence by DVO in (a) 1999 and (b) 2018

livestock production because animal disease can affect mortality, morbidity and productivity.

According to the FAO "Improving animal health can help cut GHG emissions but more granular approaches to measuring progress are vital if countries are to be able to include it in their national climate commitments…"

More accurate pestivirus diagnosis and surveillance will not only improve animal welfare but can also mitigate climate change by reducing direct and indirect GHG emissions from livestock farming. The impact of effective animal disease control can then be assessed in terms of GHG emissions and Northern Irelands sustainable agriculture goals.

More accurate disease diagnostics, that specify responsible pathogens at a genotypic level, will facilitate more targeted treatments and this will result in more prudent use of anti-biotics thereby impacting upon AMR, with knock on effects in terms of One Health.

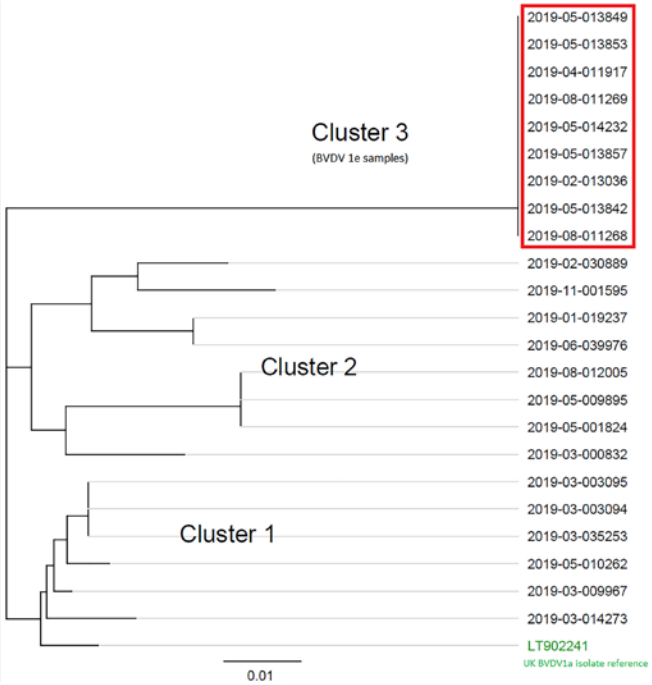


Figure 2. Phylogenetic tree of BVD outbreak in Enniskillen.

This work was funded by DAERA.

Dairy Heifer Rearing

Gillian Scoley and Erica Chisholm

Using precision technology as a tool to help monitor calf health

Calf wearing a commercially available activity monitor

Key Messages

- Calf ill-health is an area of concern, with high mortality and morbidity rates in the UK
- Illness in early life can have long term negative consequences for production efficiency
- Diagnosis and treatment of ill-health at an earlier stage minimises losses and allows animals to reach their full genetic potential
- Use of precision technologies can detect behavioural and physiological changes that will help to predict ill-health in calves

Background

Disease incidence in calves is high, with a recent report by the Royal Veterinary College indicating that more than 40% of calves on commercial farms suffer from pneumonia and up to 30% experience scour. Behavioural patterns and clinical signs that may be indicative of ill-health can be inconsistent, and frequent or continuous observation of calves is often costly, labour intensive and impractical in a commercial farm setting, particularly where calves are group housed. As a result, disease can progress to a more severe form by the time treatment is administered with potentially poor response to treatment, a reduction in animal performance

Feeding behaviour information from an automatic feeder

and increased risk of mortality. As such, systems which can detect changes in behavioural or clinical signs associated with ill-health in calves at an earlier stage are of interest, as this could lead to earlier intervention which would result in reduced effects of disease, reduced antimicrobial usage and improved production efficiency.

Research Studies

Feeding behaviour and activity data was collected via automatic feeders and commercial activity sensors from sixty group housed Holstein-Friesian calves over the first ten weeks of life. Birth weight, sex and daily live weight was recorded together with incidences of ill-health. Data from the sensors and feeders along with individual animal data was analysed using machine learning techniques to determine if the information from the devices could be used either individually or in combination as a means of predicting behavioural or physiological changes indicative of ill-health in dairy origin calves.

Research Findings

Daily live weight, calf activity level, birth weight and drinking speed were determined as factors that could be useful in predicting the likelihood of a calf becoming ill. Results suggested an increase in general activity level were linked to a reduced likelihood of a calf becoming sick.

Potential Impact for future farming

Calf disease costs the UK cattle industry ~£80m per year, with an average cost of £43 per calf due to pneumonia alone (Scott, 2016). Using early prediction indicators this figure could be cut by an estimated 15%; assuming NI makes up a quarter of the UK's calf livestock, there is potential to reduce the impact of economically important diseases such as pneumonia on NI cattle livestock by £2-3 million/year. Using real-time data from precision technologies such as automatic feeders and activity monitors as an aide to animal management together with other animal and environmental factors offers the opportunity to detect calf ill-health earlier than traditional methods alone, with the benefits of improving animal welfare and performance alongside reductions in antimicrobial usage and carbon footprint as a result of improved health.

Targeted selective treatment (TST) and diverse sward types for dairy origin calves and sheep

Nicole Henry and Francis Lively

Using targeted treatment and Multi species swards as a combined approach to ensure the continued efficacy of anthelmintic drugs.

Key messages

- Multi species swards (MSS) can offer performance benefits due to a greater level of nutrients and protein compared to grazing on perennial ryegrass swards (PRG).
- This greater performance can reduce anthelmintic usage when applying liveweight gain based targeted selective treatment (TST).

Background

Anthelmintic resistance (i.e. resistance to wormers) creates challenges for sustainable livestock farming and limits the productivity of livestock due to reduced anthelmintic efficacy against parasites. Instead of treating all animals in a group, which is commonly practised, targeted selective treatment (TST) is a method of gastrointestinal nematode control that treats only a proportion of the flock based on the consideration of indicators such as faecal egg count (FEC), daily live wight gain (DLWG) or dag score. When TST is utilised, there have been reports of a reduced number of anthelmintic treatments administered while not compromising productivity of animals (Busin et al., 2014). This helps maintain a population of untreated, susceptible (non resistant) nematodes within the animals and on pasture, thus helping to dilute worms with anthelmintic resistance genes. The herbs present in multispecies swards (MSS – grass, clover and herbs) have been reported to reduce the need for anthelmintic treatment as they contain plant secondary metabolites that can have anthelmintic properties (Marley et al., 2002).

Research studies

This work sought to investigate the effect of TST and MSS on anthelmintic usage and performance of grazing dairy origin calves and sheep relative to grazing perennial ryegrass.

Calves

Parasite infections were compared over 2 months in 4 groups of dairy origin calves rotationally grazing either PRG only or MSS (containing chicory, ribwort plantain, white clover, red clover, perennial ryegrass and timothy). Nematode faecal egg counts (FECs) and liveweights were monitored every 2-3 weeks. Individual calves were treated with an anthelmintic when daily liveweight gain was less than 0.65kg/day.

Sheep

Over 270 weaned lambs were allocated to three grazing sward groups: (i) PRG with white clover (PRG/WC) (ii) MSS (same species mix as for the calves study) or (iii) 50/50 PRG/MSS, and monitored from July to October 2023. Liveweights and FECs were measured every 2 weeks. The selective treatment was applied based on DLWG and dag score (Bath and van Wyk, 2009). The threshold for treatment was a DLWG of less than 150g/day and/or a dag score over 3.

Research findings

Calves

Cattle performed better when grazed on MSS, gaining an extra 0.26 kg /day. As a result of the TST approach, anthelmintic treatment for animals grazing MSS was delayed for 24% of the group by 14 days compared to the calves grazing on PRG. Overall, FECs were similar for the two groups.

Sheep

The type of sward did not affect the dag score and no clear patterns were observed throughout the season in terms of FECs. Liveweight gain was significantly higher for MSS compared to 50:50 and PRG with white clover by 34 g/day and 5 g/day respectively. As a result, since a TST approach was used based on DLWG, the average number of anthelmintic treatments per lamb was significantly greater for PRG/WC than the MSS group.

Potential Impact for Farming for the Future

Implementing TST alongside rotational grazing on multispecies swards containing herbs can reduce the number of treatments issued thereby reducing anthelmintic use. Treating those individuals most in need helps to maintain '*in refugia*' parasite populations (not exposed to the wormer), thus contributing to the dilution of resistant worms on the pastures and to a reduction in the selection pressure for anthelmintic resistance.

This reduces treatment costs and environmental impacts i.e. negative effects of anthelmintic residues on dung beetles. The short-term economic savings for a typical flock and herd are minimal, when solely taking into account the cost of treatment (approximately 75p per calf and 25p per lamb and per treatment). However, the additional and long-term benefits of a more strategic use of anthelmintics mean that the products will be available for future use and the risk of future resistance is reduced, which justifies their adoption on farm.

References

Busin, V., Kenyon, F., Parkin, T., McBean, D., Laing, N., Sargison, N.D., and Ellis, K. 2014. The Veterinary Journal, 200(2), 248-252.

Marley, C., Cook, R., Keatinge, R., Barrett, J., and Lampkin, N. 2002. Veterinary Parasitology, 112, 147–155.

This project was funded by DAERA as part of a PhD study.

How to tackle endemic diseases through a participatory approach

Aurélie Aubry and Adewale Henry Adenuga

Towards better control of sheep scab

Key Messages

- The main barriers to the adoption of effective strategies to reduce sheep scab include lack of training, fear of state control, costs of diagnosis and treatments and emotional pressure when the flock is affected by the disease.
- A self-reporting scheme, developed in NI in partnership with farmers, vets and scientists proved very successful to change attitudes towards a previously taboo disease.

Background

Sheep scab, caused by infestation with the ectoparasitic mite, Psoroptes ovis, is an endemic disease present across the British Isles. It has a substantial detrimental impact on sheep welfare, the psychological well-being of farmers caring for them, as well as an economic cost to the industry. Despite this, limited research has been carried out into the distribution of scab throughout Northern Ireland (NI) or into understanding the barriers to the uptake of best practice control.

Research studies

A partnership was established with farmers, vets, research and disease control organisations and successfully secured funding from the Biotechnology and Biological Sciences Research Council (BBSRC) to develop a framework to better inform and tackle endemic diseases using sheep scab as a case study. This project increased awareness and promoted best practice. A self-reporting scheme was successfully developed and implemented as part of the project.

The data collected was also analysed and modelled to undertake pilot investigations into the social and environmental impact of scab in NI.

Research findings

The main barriers to the adoption of effective strategies include knowledge gaps in sheep scab mite biology and of effective treatment and prevention strategies. Poor practice, including use of unauthorised treatments, as well as farmer fear of state control and the costs of diagnosis and treatment are also key aspects that future control programme need to consider.

Socioeconomic data from the project provided new insights into other important factors such as a lack of cooperation and coordinated effort among farmers in affected cluster areas. The prevalence of the short-term (conacre) land rental system in NI and the availability of mobile sheep dipping contractors can also act as a barrier to effective and sustainable control measures. Importantly, there is clear evidence of the emotional pressure that can result from the diagnosis of the disease on farms, leading to a feeling of helplessness.

The collaborative work carried out as part of this project addressed a number of these issues. It enabled vets to visit over 100 farms to discuss scab and ensure its accurate diagnosis (using blood samples) and treatment. By starting with the end-user, this approach drove engagement with farmers and vets, underpinned by research and ultimately delivered a positive animal health and welfare impact on-farm.

Potential Impact for Farming for the Future

Data from the project and the literature indicate that the main performance indicators affected by sheep scab are ewe live weight and body condition (leading to increased mortality and culling rate), followed by lambing percentage and lamb growth. Using modelling approaches at farm-level, we were able to show that reducing the prevalence of sheep scab can significantly reduce the farm carbon footprint. These effects are driven by the improvement in the flock's overall performance, with the reduction of non-productive animals and the increase in overall product (kg of lamb per ewe). To improve these assessments at both farm and regional levels, more records are needed to quantify accurately the impacts of the disease on flock performance as well as within-flock prevalence levels.

Acknowledgments

The author would like to acknowledge significant contributions from the other members of the NI sheep scab project team (BBSRC award BB/W020521/1) including Stewart Burgess (Moredun Research Institute), Paul Crawford (Paul Crawford Veterinary Services), Sam Strain and Sharon Verner (Animal Health and Welfare Northern Ireland). This project was funded by BBSRC.

Animal welfare

Stephanie Buijis

An essential component of sustainable livestock systems

Figure 1. Early detection and treatment of lameness in cattle not only contributes to improved animal welfare, reduces associated production losses, contribution to economic sustainability.

Key messages:

- Working towards truly sustainable agriculture requires much more than minimizing the carbon footprint
- High animal welfare contributes to the optimization of many aspects of sustainability
- Methods of achieving high animal welfare can lead to synergies or trade-offs with other sustainability aspects

Recently, sustainability seems to have become almost synonymous with reducing the carbon footprint. Reducing this footprint is of course a crucial aim. However, the concept of sustainability is much wider than that, as shown by the 17 different sustainability goals of the UN, or the original three pillars: environmental, social and economic sustainability.

Because some ways to improve animal welfare can be in conflict with attempts to reduce carbon, we are at risk of thinking animal welfare and sustainability are incompatible. This is incorrect though, as animal welfare actually contributes to sustainability in many ways.

Animal welfare is high when animals are healthy, well-nourished, safe and able to satisfy their behavioural needs, and pain, fear and distress are avoided. Under such circumstances, animals will thrive and this leads to a host of sustainability benefits: more efficient growth and increased longevity will contribute to reducing the carbon footprint, dependance on antimicrobials is minimized, and the societal acceptance of the production system is increased which also contributes to its economic sustainability.

Where animal products produced in a high-welfare system can be sold at a premium this can have additional benefits for economic sustainability.

The question then becomes: how do we achieve high welfare, and will the way we do this conflict with other aspects of sustainability? Or, if we change production systems to improve other aspects of sustainability, how will this impact on animal welfare?

At the open day, we show several examples of recent AFBI projects on animal welfare and explain how these contribute to sustainability, or where trade-offs between improved animal welfare and other components of sustainability occur. Examples of such research are frequent at Hillsborough. For instance, in our work on robotic milking systems we found that providing cows with reduced mobility priority access to the milking robot made them visit it more frequently and at more regular intervals, which benefits both animal welfare and productivity. Further research on the impact of robotic systems on animal welfare on commercial farms is currently ongoing. Our research on low protein diets for pigs uncovered a trade-off between environmental and animal welfare concerns: low protein diets are favourable in terms of reducing nitrogen excretion but increased harmful social behaviours in finishing pigs. In another project, we are investigating if agroforestry can help optimize animal welfare whilst reducing the environmental impact of outdoor pig rearing systems.

Figure 2. Outdoor pig production can boost pig welfare by providing opportunities for natural behaviour, but can lead to environmental issues like soil erosion if not managed properly.

Potential Impact for Farming for the Future:

Optimizing animal welfare can help farmers to increase the environmental, social and economic sustainability of their farm in many ways. When the method of achieving high animal welfare leads to trade-offs with other aspects of sustainability a careful weighting of factors is necessary. Animal welfare research provides essential data for such weighting.

Chemical Residue Testing Of Agri-Food Samples

Anna Gadaj

Past Present Future

Key Messages

- Chemical residue testing of products of animal origin is essential in order to protect consumers health and support the export and trade of NI producers.
- Statutory residue testing is performed in NI almost exclusively by AFBI fulfilling both UK and EU legislative requirements
- When and as required AFBI provide advice and deliver an emergency response capability for government and industry

Chemical Surveillance Branch (CSB) provides Department of Agriculture, Environment and Rural Affairs (DAERA), the Food Standards Agency (FSANI) and industry testing of agri-food samples, expert advice, and statutory research / analytical method development in the areas of veterinary drug residues, chemical contaminants, pesticides and marine biotoxins (which will be collectively referred as "chemical residues" in this article).

As NI's Official Laboratory (OL), AFBI undertakes chemical residue testing on behalf of the designated competent authorities to fulfil their legal obligations and demonstrate compliance with relevant domestic and EU legislation, protect human and animal health, ensure fair practices in trade and enable NI to export globally as well as to promote the wholesomeness of NI food products.

Residue monitoring takes place in NI through statutory testing schemes and additional testing in response to findings and/or emerging problems is undertaken, e.g. in the case of veterinary drugs, the Multi-annual National Control Plan (MANCP) covers a percentage of animal production, whereas the Meat Inspection Scheme identifies suspect animals in abattoirs. Analysis turnaround times vary depending on the testing scheme e.g. 5 working days in the case of Meat Inspection and Closantel Fast Track samples - critical as carcasses are detained pending laboratory results.

Complex sample matrices including tissue and body fluids from cattle, sheep, pigs, poultry; shellfish and fish; milk and eggs, as well as animal feeding-stuffs are analysed employing state-of-the-art, accredited (ISO/IEC 17025) methods, allowing residue detection to low levels (µg/kg).

Currently, screening utilising both bioassays and mass spectrometry (MS)-based methods is followed by confirmation using additional MS-based methods in the case of suspect samples, providing quantification and identification.

A move toward fully MS-based monitoring employing multi-analyte and multi-class methods is envisaged, however this must be managed in line with availability of instrumentation and

experienced staff. Furthermore, the possibility of shifting residue analysis from a target-oriented approach towards a non-targeted approach employing high resolution mass spectrometry (HRMS), has recently been demonstrated but the full power and limitations of HRMS technology has yet to be established.

Changing demands in the scope of testing, in terms of commodity groups (e.g. live animals, products of animal origin, animal by-products and derived products etc.), target analytes (e.g. emerging compounds) and calls for increased sensitivity (e.g. reporting to less than 10% of the Maximum Residue Limit (MRL)) has required AFBI scientists to continuously develop and improve analytical methods in terms of sample extraction/clean-up techniques and to employ novel technologies enabling testing to continue to meet legislative requirements e.g. a new method for detection of antiparasitics in eggs covers approximately 50 analytes.

Furthermore, in recent years CSB scientists have been required to investigate residue related problems either as part of an emergency response (e.g. zilpaterol) or with a view to reducing non-compliance within the industry (e.g. phenylbutazone, closantel).

Potential Impact for Farming for the Future

Chemical residue monitoring is critical beyond food and feed safety and depending on the scope of testing and sensitivity of analytical methods employed, it can contribute to areas such as antimicrobial resistance (AMR), environmental and exposure studies etc.

This work is funded by DAERA.