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Prevalence of BVD in Northern Ireland Dairy and Suckler Herds

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Farmer Funded Research

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This booklet reports the results of two studies. The first study "Benchmarking and control of BVDV and IBRV in NI dairy cows" was funded by AgriSearch and DARD.

The second study "Survey to determine the prevalence of NI suckler and dairy herds with evidence of current or recent infection with BVD virus" was funded by AgriSearch and the Department of Agriculture and Rural Development through the Research Challenge Fund. The Ulster Farmers' Union was an additional industry partner who led and provided the secretariat for the BVD Stakeholders Group.

OVERALL SUMMARY

- Bovine Viral Diarrhoea (BVD) is one of the most economically important diseases of cattle, both globally and within Northern Ireland (NI).
- Infectious bovine rhinotracheitis (IBR) is a respiratory disease of cattle caused by a virus. It can also be associated with milk drop and abortion.
- These Agrisearch co-funded studies have played important roles in both the decision by Animal Health and Welfare Northern Ireland (AHWNI) to implement a BVD eradication programme for Northern Ireland and in the structure of the programme.
- In the first study 181 dairy herds were selected providing a geographical spread around NI. Bulk tank milk samples were collected over 3 years to monitor antibody levels to BVD and IBR. In addition, the first sample from each herd was tested for the presence of BVDV virus.
- The second study included 589 dairy and suckler herds from across NI that were undergoing a brucellosis herd test. Blood samples from 5-10 young stock (12-24 months old) from each farm were tested for antibodies to BVD.
- Both studies included questionnaires on herd management. The data has given a picture of current management practices within NI herds.

The results obtained generated the following key messages:

- The first study showed that a high proportion of NI dairy herds were seropositive to BVDV: over 85% had high levels of antibodies to BVD in their bulk milk and in nearly 10% of the herds BVD virus was detected in the bulk milk.
- Identification and removal of persistently infected (PI) animals is essential for BVD control. Most of the dairy herds with active BVD infection (positive for BVD virus in the bulk tank milk) were already vaccinating for BVD.
- A high proportion of NI dairy herds were seropositive to IBR. The use of conventional IBR vaccine makes the results difficult to interpret. It is recommended that only marker vaccines that allow differentiation between infected and vaccinated animals should be used.
- The second study showed that exposure to BVDV is very widespread in NI dairy and suckler herds, 66% of all herds tested had at least one seropositive animal within those tested. In the context of control and eradication, these herds would require

further individual animal sampling.

- This high prevalence of seropositive animals supports a NI programme that directly identifies PI animals (similar to programmes in Switzerland, Germany and Republic of Ireland (ROI)) over those which use initial serological screening to categorise herds (Scandinavian approach). Another advantage is the 'two for one' result. All PI dams will have PI calves so a calf that is not PI will have a dam that is not PI.

INTRODUCTION

Bovine Viral Diarrhoea (BVD) is one of the most important diseases of cattle, both globally and within Northern Ireland. It has a huge negative economic impact. For example, losses from BVD in the Republic of Ireland were previously estimated to be of at least €102 million per year (Stott et al., 2012). This comprises losses of €55 million, €27 million and €20 million in the dairy, suckler and finishing sectors respectively. To appreciate the importance of BVD it is necessary to understand how it impacts on herd performance.

Two main studies have been funded by Agrisearch in order to increase knowledge of the BVDV situation in Northern Ireland herds and are reported here. In the first, bulk tank milk samples from dairy herds were tested for BVDV and infectious bovine rhinotracheitis virus (IBRV) antibody levels by indirect Enzyme Linked Immunosorbent Assay (ELISA) and for BVD virus by real time RT-PCR. In the second, blood samples from young stock from suckler and dairy NI herds were tested for BVD antibodies.

Why were these studies necessary?

- No current knowledge of the prevalence of BVDV in Northern Ireland herds. There is only one previous published bulk tank milk study available for NI from 2001 (Graham et al, 2001)
- In Scotland and ROI BVD eradication programmes are under way
- Useful to inform decision on the design of a BVDV eradication programme for Northern Ireland
- To increase the current knowledge of management practices in NI dairy and suckler herds

What is BVD?

Bovine viral diarrhoea (BVD) is a highly contagious viral disease of cattle caused by a pestivirus called bovine viral diarrhoea virus (BVDV). This virus can also infect sheep and other ruminants.

What does it do?
Although BVDV can cause diarrhoea, the main losses occur when the virus effects susceptible pregnant cows and crosses to the foetus. It is useful to consider four areas:

1. **Effects when BVDV is first encountered as a calf or adult:**
   The majority of BVD infections occur after birth. In this case animals become transiently infected (TI) before recovering and becoming virus-negative, typically within 3 weeks or less. Transient infection may occur without clinical signs but can be associated with diarrhoea, pneumonia and increased susceptibility to other diseases (associated with BVD suppressing the immune system), and a range of reproductive problems in adults (as outlined below). Bulls infected with the virus may have their fertility reduced for several months. As a result of transient infection animals become antibody positive.

2. **General effects on fertility:**
   Embryo loss and return to oestrus, abortion, stillbirth, birth defects and birth of persistently infected (PI) animals. In very early pregnancy (first 30 days) infection with BVD can result in the death and reabsorption of the foetus, presenting as infertility or 'repeat breeding'.

3. **Effect in pregnant cows infected between approximately 30 and 120 days of pregnancy:**
   Some infected foetuses die and can be aborted, mummified or stillborn. If born alive, the unborn calf will be persistently infected (PI) with BVD virus. PI animals shed BVD virus at high levels for life and are the most significant source of infection for other animals. PI animals can look normal, particularly at birth, but may become stunted and ill-thriven. PI animals often develop a severe and fatal wasting condition with diarrhoea and ulceration of the gut and feet, called mucosal disease (MD). This typically occurs between 6 and 18 months of age. Only a small proportion of PI animals survive to adulthood. PI animals are typically antibody negative and virus positive.

4. **Effect of infection in mid to late pregnancy:**
   After day 150-180 of pregnancy, the unborn calf is usually capable of mounting an immune response to BVD infection, resulting in the birth of an apparently normal calf.

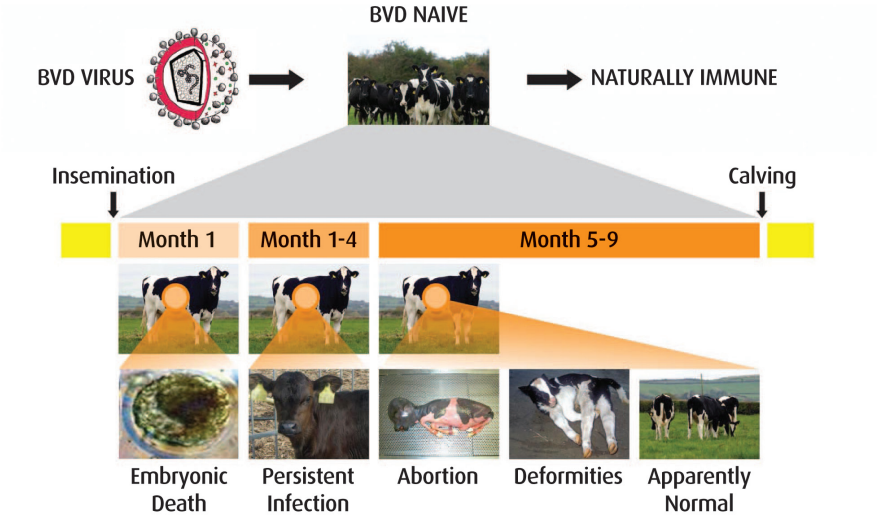
How is BVD transmitted?

BVD is highly contagious, with PI animals being the main source of infection, shedding large amounts of virus in nasal discharges, faeces, urine, semen, milk and saliva. The virus can be spread by direct contact with an infected animal or indirectly by contact with contaminated equipment or visitors.

The identification and removal of PI animals is key to control and eradicate the disease.

Signs that BVD virus may be present in a herd:

- Animals thriving poorly for no apparent reason
- Increased levels of infertility: more 'empty' cows that expected
- More unexplained abortions than normal
- Birth defects in calves: cataracts, brain damage etc.
- More calf scours and pneumonias than normal
- Mucosal disease diagnosed or BVD virus detected
- Sick calves respond poorly to treatment



Study 1: Survey on bulk milk samples from Northern Ireland dairy herds for antibodies to BVD and IBR viruses and for BVD virus

Farm selection

The study population comprised herds carrying out milk recording with a large milk processor in Northern Ireland. During the winter of 2008 an introductory letter seeking participation in the study along with a questionnaire on herd management were sent to 320 producers as proposed by the milk processor. Responses were received from 181 herds (57%).

Sample collection and testing

The first bulk milk samples were collected during 2009 and were tested for antibodies to BVDV and infectious bovine rhinotracheitis virus (IBRV) with two indirect ELISAs, BVDV-Ab Svanovir, Svanova and IBR-Ab Svanovir, Svanova respectively. All first samples were also tested for the presence of BVD virus by real time RT-PCR (AgPath-ID BVDV Reagent Kit, Ambion, Life technologies). All kits were used as per manufacturers' instructions. Samples were tested at the Veterinary Sciences Division of the Agri-Food and Biosciences Institute (AFBI). In addition, individual milks from all first lactation animals from 154 herds were collected. Samples were pooled by herd and tested for antibodies to BVDV, constituting a 'first lactation test'. This is a recognised method for the monitoring of herds for the absence of current infection in herds with a positive BTM antibody test. It is expected that young, susceptible animals in contact with the virus will become antibody positive. The opportunity was also taken to test a subset of the 'first lactation tests' for antibodies to IBR.

All results were reported to herd owners and their nominated vets and individual herd advice was given, helping participating herds to manage and control the disease.

Description of the farms

Farms were distributed across NI (Table 1). Study herds were located in all of the six Northern Irish counties. A higher number of participant herds came from County Antrim, Down and Tyrone and a lower number from Fermanagh and Armagh (Table 1). When the number of programme herds was expressed as a percentage of the total number per county (Agricultural Census in Northern Ireland 2008), herds in Antrim, Down and Londonderry (29% , 25% and 15%) were found to be overrepresented while herds in Fermanagh, Armagh and Tyrone (3%, 7% and 21%) were underrepresented.

The majority of herds had between 101 and 150 milking cows at the time of joining the study (Figure 1). When asked question 31'Do you think your cattle may be affected by BVD?' 46% of herd owners answered 'Yes' while 10% answered 'Yes' to question 32 'Have you had a BVD persistently infected animal in the last 5 years?' (Table 2).

Table 1 Number and percentage of samples tested by County for herds in the bulk milk study

County	Total	% study herds	Census 2008 Expected % Dairy	Census 2008 Number of dairy herds	% tested
Antrim	52	29%	21%	851	6%
Armagh	13	7%	12%	476	3%
Down	45	25%	18%	724	6%
Fermanagh	6	3%	11%	423	1%
Londonderry	27	15%	12%	479	6%
Tyrone	38	21%	26%	1022	4%
Total	**181**			**3975**	**4.5%**

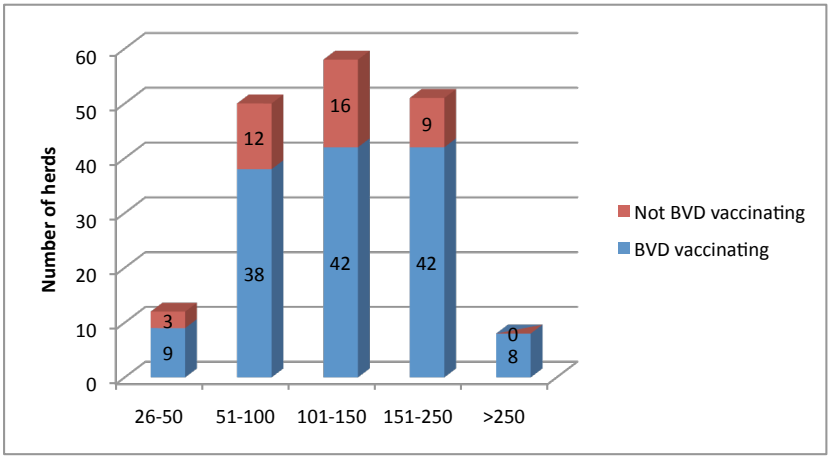


Figure 1: Size of the herds participating in the bulk milk study per number of milking cows and number of herds vaccinating for BVD within each category

Overall 77% of the respondents answered 'Yes' to Q.43a 'Do you routinely vaccinate your herd for BVD?'(Figure 1). This proportion increased to 82% for herds with 151 to 250 milking animals. All herds over 250 milking cows were vaccinating against BVD.

Table 2 BVD status of the herd

	Yes	No	Don't know
Q.31 Do you think your dairy cattle may be affected by BVD?	83 (46%)	31 (17%)	67 (37%)
Q.32 Have you had a BVD persistently infected animal in the last 5 years?	18 (10%)	80 (44%)	83 (46%)

Questions 15 to 20 asked for average yearly number of cattle introduced into the herd for each dairy cattle type and the type of source and question 33a asked 'Do you ever buy in, borrow or hire cattle, including bulls? Herds that answered '0 animals' to questions 15 to 20 and 'No' to question 33a were classified as 'Closed'. All other herds were classified as 'Open'.

The majority of the herds, 72% (131) were considered open on this basis, having bought in, borrowed or hired cattle, including bulls. Larger herds (>150 female animals over 2 years old) had a higher proportion of closed herds than smaller herds (Figure 2).

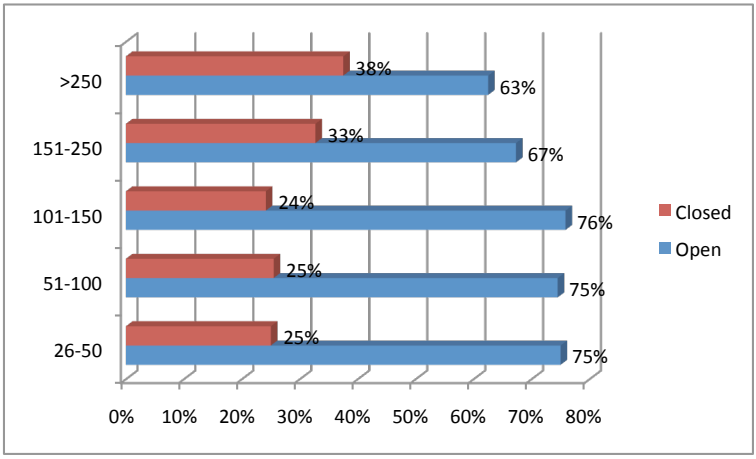


Figure 2: Proportion of herds in the bulk milk study with an open and closed herd management by herd size

Although 24% of respondents answered 'Yes' to Q.33d 'Do you vaccinate purchased stock for BVD?', only one (0.5%) answered 'Yes' to Q.33c 'Do you carry out blood and/or other diagnostic screening at purchase?'. Buying animals that are themselves PI, or pregnant animals carrying a PI calf are common ways of introducing of BVD. Many study participants were therefore at increased risk of introducing BVD infection through purchase. Responses to other management questions can be seen in Table 3. Within the study herds there appears to be a lack of application of general good biosecurity practices. The animal health and welfare status and in consequence, profitability of the herds will improve with better biosecurity.

Table 3 Responses to management practices questions in the bulk milk study

		Yes	No	Don't know
Q.21	Is all the grazing land contained within a single farm boundary?	43 (24%)	138 (76%)	
Q.22	Are any dairy cattle grazed away from the main homestead?	135 (75%)	46 (25%)	
Q.23	Are any dairy cattle housed away from the main homestead?	65 (35%)	116 (65%)	
Q.34a	Do you implement an isolation period for introduced livestock?	42 (23%)	87 (48%)	52 (29%)
Q.35	Do you restrict access of non-essential visitors around the farm?	88 (48%)	90 (50%)	3 (2%)
Q.36	Do you enforce strict disinfection measures for essential visitors (e.g. vets, AI)?	75 (41%)	101 (56%)	5 (3%)
Q.37	Do you provide a separate pick-off/drop-up area for delivery and pick-up vehicles?	16 (9%)	157 (87%)	8 (4%)
Q.48a	Do you ever share or let pasture?	6 (3.5%)	174 (96%)	1 (0.5%)
Q.48b	Do you rent pasture (conacre)?	153 (84.5%)	27 (15%)	1 (0.5%)

RESULTS

BVD antibody in bulk milk

Herds were assigned to four groups with increasing BVD antibody levels (Figure 3). No herds returned a negative result for BVD antibodies (Group 1). Low levels of antibodies were detected in milk from 9 herds (Group 2, 5%). Moderate levels were found in 18 herds (Group 3, 10%) and high levels in 154 herds (Group 4, 85%).

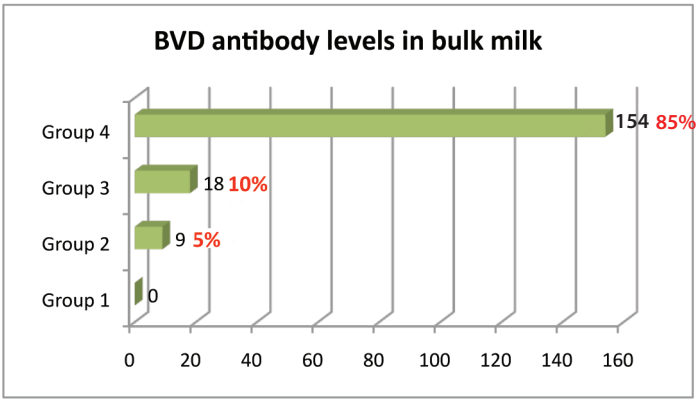


Figure 3: BVD antibody results by group for the first sample of the bulk milk study (181 herds)

None of the herds with a Group 2 result reported vaccinating for BVD. 39% (7) of the herds with a Group 3 result were vaccinating and 86% (133) of the herds with a Group 4 result stated that they were vaccinating routinely for BVD (Figure 4).

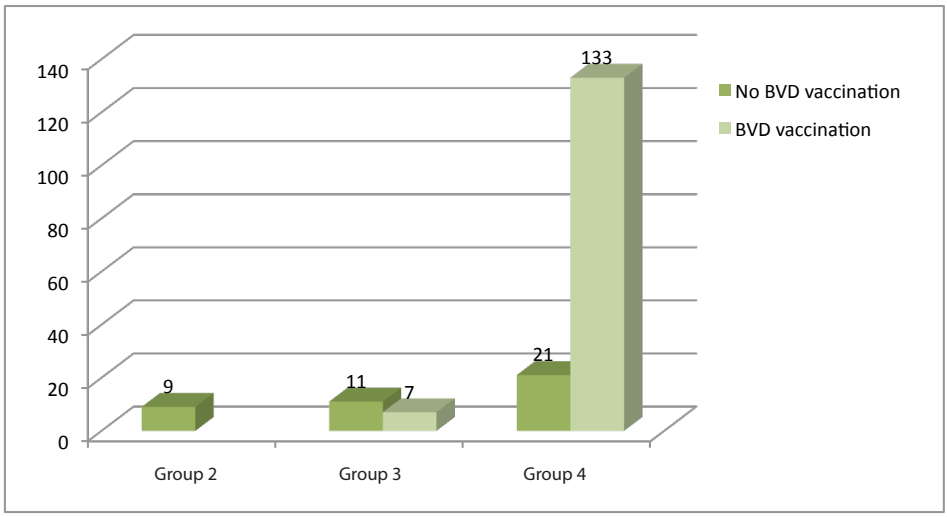


Figure 4: Distribution of herd BVD bulk milk antibody result by vaccination status

Herds with Group 3 or 4 antibody results in their bulk tank milk have a moderate to high prevalence of seropositive milking animals, indicating that there was, or had recently been, active infection with BVDV in the herd. Typically, this would have been in the form of one or more persistently infected animals. The majority of these herds had been vaccinated against BVDV, and it is possible that some of the antibodies detected are related to a vaccinal response. However BVD vaccines are inactivated and tend to induce a low level of antibodies as measured by ELISA. The finding that almost 95% of the herds were in Groups 3 or 4 demonstrates the endemic nature of BVDV in dairy cows in Northern Ireland.

IBR antibody in bulk milk

No antibodies to IBR were detectable in the milk samples from 15 herds (8%). They were detectable in 164 herds (91%) and an inconclusive result was obtained in two herds (1%) (Figure 5).

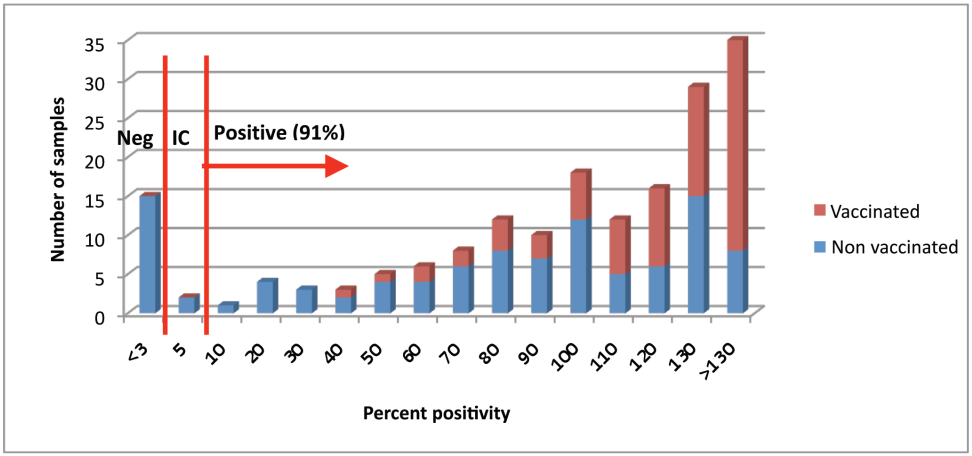


Figure 5: Frequency of distribution of the IBR antibody results in bulk milk (number of herds). Neg: negative, IC: inconclusive

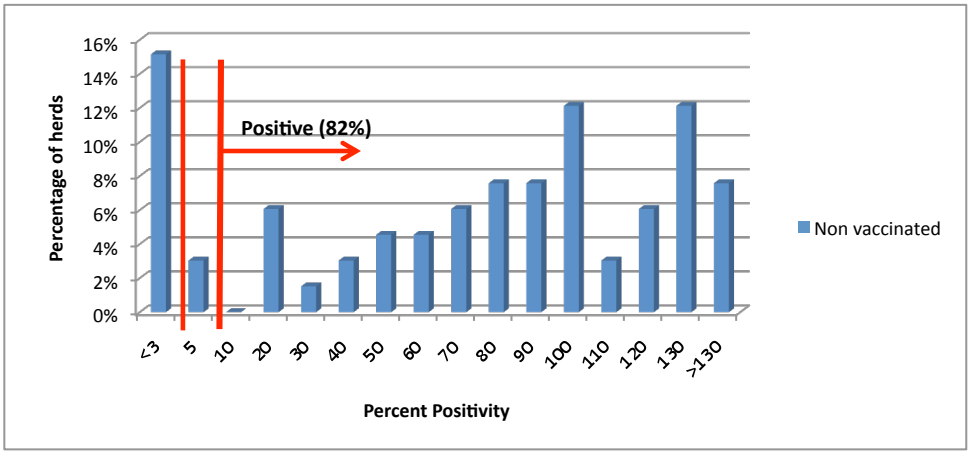


Figure 6: Frequency of distribution of results for non IBR vaccinated herds (percentage of herds)

The use of a conventional vaccine can also produce antibodies to IBR and as a result, a positive bulk milk. However, only 43% of the herds reported using IBR vaccine leaving a further 46.5% of herds where the antibodies were likely to be due to infection. All herds carrying our IBR vaccination with a UK licensed product obtained a positive result in bulk milk. Of the non-vaccinating herds 15% (10) obtained a negative and 3% (2) and inconclusive result (Figure 6, Figure 7). The remaining 82% (54 herds) gave a positive result. **Only the use of marker vaccines allows differentiation of infected and vaccinating herds facilitating not only an easier interpretation but more efficient disease control programmes.**

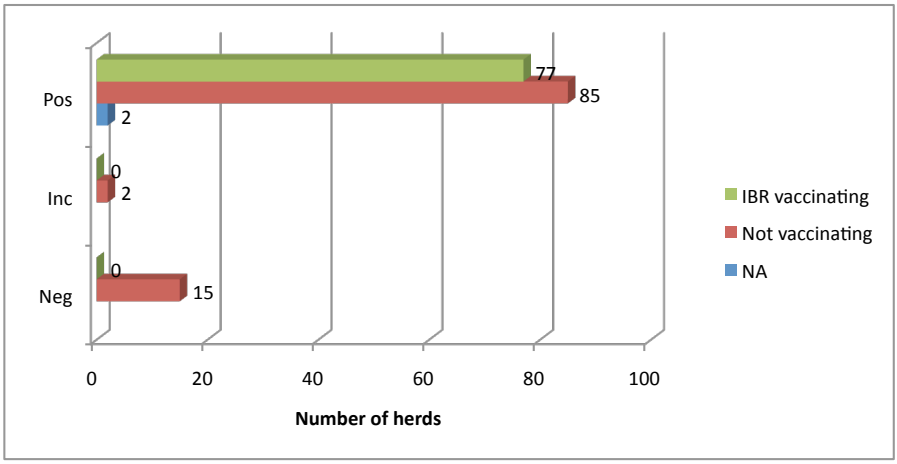


Figure 7: IBR antibody bulk milk result by vaccination status. NA: not available (question not answered).

BVD first lactation samples

When the first lactation samples were tested, only 10 out of 154 were Group 1 with no detectable antibodies. Only these herds would have been considered 'negative' or clear of BVDV. Only two out of these ten herds were vaccinating for BVD. Eight out of the 154 were classified as Group 2 or low prevalence, three of which were vaccinating for BVD. The remainder of the samples gave higher readings. Out of all the first lactation samples tested for BVD, over 90% gave a positive result indicating a possibility of current or recent infection in the herd.

IBR first lactation samples

76% (51) of the 67 first lactation tests for IBR antibodies were positive. 44% (22) of them reported vaccinating for IBR. None of the 16 herds with a negative or inconclusive IBR first lactation result were vaccinating for IBR. Of the (43) non-vaccinating herds 65% (28) gave a positive first lactation test result, 30% (13) negative and 5% (2) an inconclusive result.

BVD RT-PCR in bulk milk

When the first bulk milk sample from each herd was tested for the presence of BVD virus by real time RT-PCR, fifteen of the herds returned a positive result (Ct <36) and three herds were inconclusive (Ct ≥36) (Figure 8). Of the herds giving a positive or inconclusive result, only two were not routinely vaccinating for BVDV. The detection of BVD virus in the bulk milk confirms the circulation of the virus in the herd. Further testing is recommended to identify and remove individual virus positive animals in these herds.

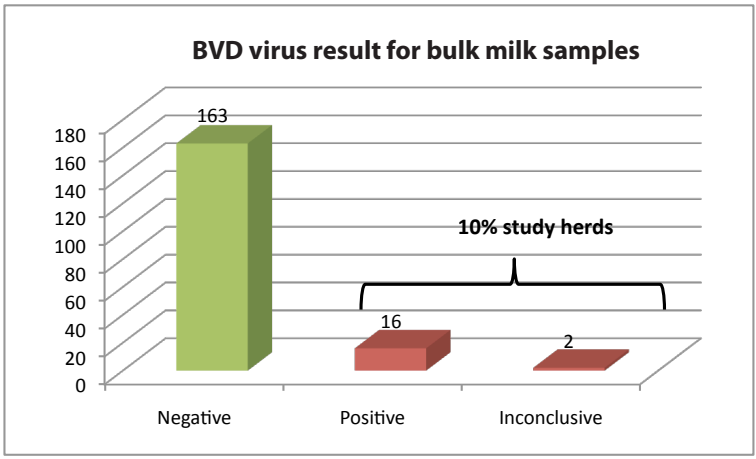


Figure 8: BVD virus result for the 181 bulk milks

Herds with BVD virus positive results in bulk milk:

- 89% (16 out of 18) vaccinating for BVDV (vaccination started from 1999 to 2009)
- All of them had high levels (17 Group 4 and 1 Group 3) of antibodies to BVDV in the bulk milk (Figure 9)
- All of them were IBR antibody positive in the bulk milk (13 vaccinating)

- 45% (8 herds) answered 'Yes' to Q.52a 'Do you have a problem with respiratory disease in your cows?'
- 39% (7 herds) answered 'Yes' to Q.53a 'Do you have a problem with respiratory disease in your calves?'
- 67% (12 herds) answered 'Yes' to Q.55 'Do you have a scour problem in your calves?'
- 67% (12 herds) answered 'Yes' to Q.59 'Do you have infertility problems?'

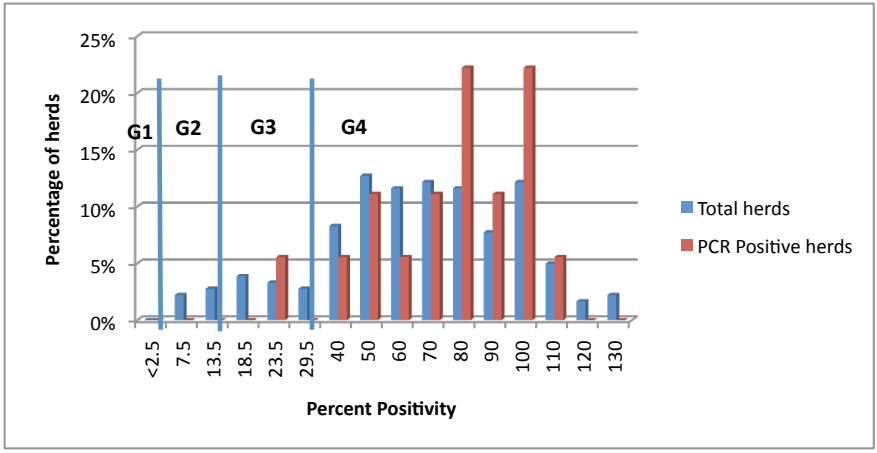


Figure 9: Distribution of the BVD antibody results for all herds and for those PCR positive

Two of the virus positive herds were investigated further. Blood samples taken for the brucellosis eradication programme from all animals over 12 months old were collected, pooled in groups of 25 and tested for BVD virus by real time RT-PCR, with positive pools subject to further testing to identify positive individuals. Virus-positive animals were identified in both cases and the herd owners advised to isolate them immediately and remove them as soon as possible. In addition, both herds were offered tissue sampling tags to BVD test the newborn calves in following calving season. Further virus positive animals were detected in one of the farms by this method. This work allowed us to trial the suitability of this type of BVD testing. Ear notch testing was found to be easy to perform in the farm and convenient, as a vet call out is not required in order to take the sample.

Most of the herds were re-sampled and tested for BVD and IBR antibodies over the following two years. In general there was little change in the levels of antibodies throughout the study. Of the 9 herds with the Group 2 BVD bulk milk result in the first sample six remained at this level which is consistent with the herds being free from infection. The other three (Herds A, B and C) increased the level of antibodies in subsequent samples to Group 3 and Group 4 levels. In herd A the second bulk milk which was tested at the same time as the positive first lactation test (FLT) was Group 2 but the following sample, taken one year later, was Group 3. Herd B after 2 bulk milks with Group 2 results, the third sample was Group 4. At the same time a FLT had a Group 4 result. Herd C had a Group 2 bulk milk followed by a Group 3 FLT four months later. The following bulk milk had a Group 3 result. In summary, all of the three herds had first lactation tests with Group 4 (2 herds) or Group 3 (1 herd) antibodies, providing further evidence of a breakdown.

Most of the 17 herds with a negative or inconclusive IBR antibody result in the initial sample remained negative with only two of the 17 herds becoming positive in subsequent samples. Only one of those two herds had a first lactation test which was positive at the same time as the positive bulk milk, indicating exposure to the virus of the younger milking animals and spread to the milking animals.

Study 2: Serological survey to determine prevalence of Northern Ireland suckler and dairy herds with evidence of current or recent infection with BVDV

Agrisearch, in conjunction with the DARD Research Challenge Fund, funded a study to estimate the percentage of dairy and beef herds in NI which currently have, or recently have had, active infection with BVD virus. The objectives were:

- To generate a statistically valid figure for the percentage of beef and dairy herds which currently have, or recently have had, active infection with BVDV.
- Estimate the greenhouse gas (GHG) savings that such a programme could deliver in terms of the overall mitigation target for agriculture.

Farm selection and testing

A sampling frame for dairy and beef herds was drawn from a national computerised database maintained by the Department of Agriculture and Rural Development (DARD). Only dairy herds with 20 or more dairy cows (n = 2,860) and beef suckler herds with 10 or more female breeding cattle (n = 7,984) were included. These datasets were then

matched against the date of each herd's next brucellosis herd test as blood samples taken during this test would also be used for the BVD survey. A random sample of dairy herds and beef suckler herds (assuming a 70% and 60% participation rate, respectively) was drawn. Each selected herd was marked on the national database to indicate that the herd keeper was to be asked to participate in the survey by DARD Animal Health and Welfare Inspectors (AHWIs) at the time of the brucellosis test. An authorisation form was signed by herd owners to indicate agreement to participate and it was sent to the Agri-Food and Biosciences Institute (AFBI) Veterinary Sciences Division with the blood samples. Each study herd keeper was contacted by phone by lab staff to complete a questionnaire on herd management and vaccinations similar to the one used in the bulk milk study.

Herds were tested for BVD using a young stock check test, with a minimum of 5 and a maximum of 10 homebred young animals (12-24 months of age) per herd tested for evidence of BVD infection. When an animal is infected with BVD the immune system mounts a response, with the production of proteins (antibodies) that are specific for the BVD virus. Therefore examining blood samples for evidence of antibodies to BVD is a means of identifying the recent or current infection status of a herd. An absence of antibodies in the sampled group indicates that they have not been in contact with BVD virus and is strong evidence of absence of current infection in that herd. On the other hand, the presence of antibodies in one or more animals indicates that BVD virus has been circulating in the herd within the last one to two years, and therefore that the herd is currently (or has recently been) infected with BVD, most probably by coming into contact with a persistently infected animal.
A commercial ELISA kit was used to test the blood samples for antibodies against BVDV p80 protein (LSI Vet BVD/BD p80 blocking one step, Laboratoire Service International) as per the manufacturer's instructions.
A total of 5,161 blood samples from 589 herds were collected between April 2011 and June 2012.

Herd description
Breeding herds located in all of the six counties of Northern Ireland were included in the study. A higher number of sampled herds came from County Down and Tyrone and a lower number from Armagh (Table 4). When the number of herds was expressed as a percentage of the total number of breeding herds per county (based on APHIS descriptive statistics for 2011), herds from all counties were proportionately represented. 3-4% of herds within each County were sampled in the study and at a Northern Ireland level, 3% of the total herds were tested (Table 4).

Table 4 Number of herds tested by County

County	Total	% study herds	APHIs 2011 Expected %	APHIS 2011 Number of herds	% tested
Antrim	85	14%	13%	2455	3%
Armagh	58	10%	8%	1545	4%
Down	152	26%	22%	4149	4%
Fermanagh	80	14%	15%	2871	3%
Londonderry	98	17%	15%	2768	4%
Tyrone	116	20%	26%	4833	3%
Total	**589**			**18621**	**3%**

Herds were allocated to a herd type according to the distribution of the breed of cows over 24 months according to information provided by the herd owner. Those with ≥80% of beef suckler cows were considered suckler herds and those with ≥80% of dairy cows, dairy. Those herds which did not fit in either category were considered of dual purpose. 225 participating herds (38%) were suckler herds, 337 (57%) were dairy and 27 (5%) were dual purpose herds (Table 5). DARD data for 2011 shows that there is a larger number of suckler herds than dairy or dual purpose (breeding herds). Thus 13% of all dairy herds were tested in the study whilst only 1.6% of the suckler and 1.4% of dual herds were included.

For both suckler and dairy herds, the number of herds to be sampled was determined using standard statistical methods to generate a prevalence figure accurate to ±5%, with 95% confidence. In practice a 95% confidence interval with a 5.3% margin of error was obtained for dairy herds and a 95% confidence interval with a 6.5% margin of error was obtained for suckler herds

Table 5 Number and percentage of herds by type

	Number	In study Percentage	Number	2011 APHIS Percentage	Tested
Suckler	225	38%	14052	75.5%	1.6%
Dairy	337	57%	2620	14.1%	13%
Dual	27	5%	1949	10.5%	1.4%

The herds in the study had up to 800 female animals over 2 years old. Although the inclusion criteria required dairy herds to have a minimum of 20 breeding animals and suckler herds to have a minimum of 10 at the time of herd selection, at the time of testing three suckler herds had less than 10 female breeding animals, with another 3 containing 10 females (Figure 10).

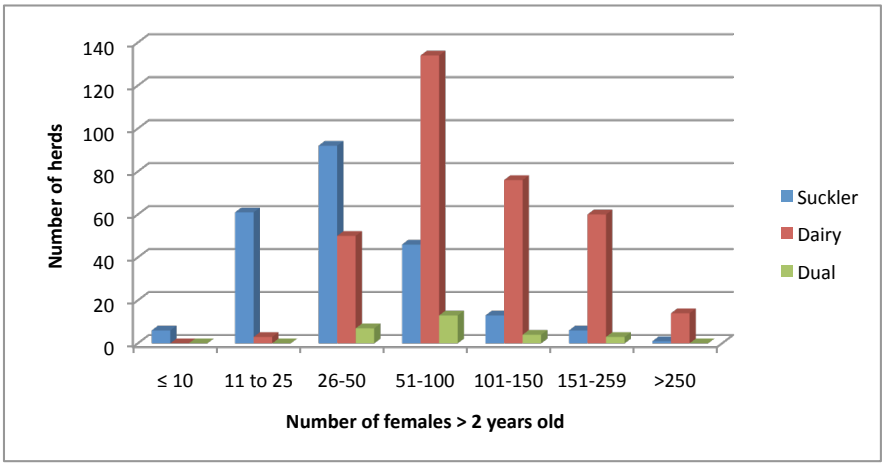


Figure 10: Distribution of herds by herd size (based on number of breeding cows) and type

Overall, 42% of the herds in the study vaccinated the adult herd for BVDV (Figure 11), with this most commonly practiced in dairy herds (51%). 6.5% of the herds reported vaccinating the calves for BVDV. However, a larger proportion of the herds (21%) were vaccinating calves for pneumonia and some of the pneumonia vaccines used have a BVD component, so the actual proportion of herds with BVD- vaccinated calves may be higher. Of the overall 21% of herds vaccinating for IBR, 70% were using a marker (gE deleted) vaccine when used with the appropriate test. Marker vaccines allow differentiation between vaccinated and infected animals. IBR vaccination was most commonly practiced in dairy herds.

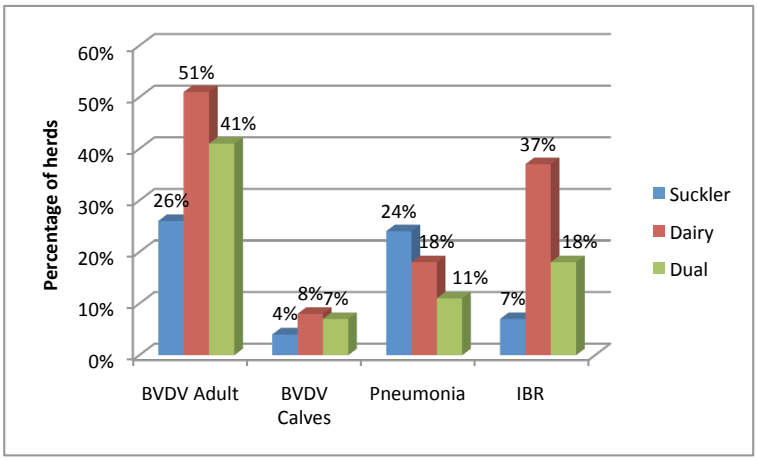


Figure 11: Vaccinations per herd type

Herds were classified as closed if they consistently answered "no" to ever adding animals to the herd i.e. if they answered "no" to having added animals over the previous year as well as "no" to the question on ever adding or borrowing animals. The majority of the herds (492, 84%) had at some point bought in, borrowed or hired cattle (including bulls). Of these, 393 (67% of total herds) had purchased cattle within the previous 12 months. Larger herds (>150 female animals over 2 years old) had a higher proportion of open herds than herds between 50-150 breeding cows (Figure 12). These results are different from those found in the bulk milk study where larger herds (>150 females) had a higher proportion of herds operating a closed herd policy than smaller herds (<150 breeding females).

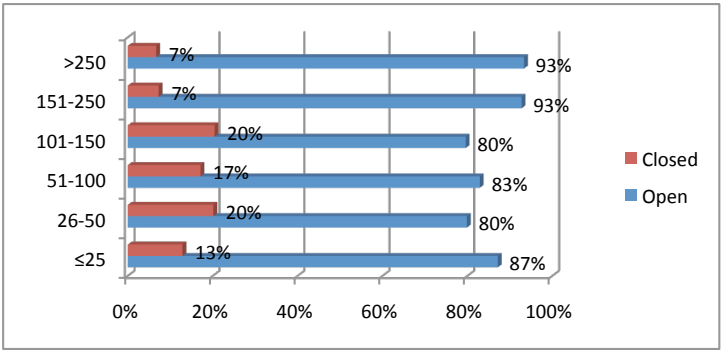


Figure 12: Proportion of herds with an open and closed herd management by herd size

The addition of persistently infected animals or pregnant dams carrying a PI calf is the most common way of introduction of BVD virus into a herd. Operating an open herd policy and failing to isolate and test the animals before mixing them with the rest of the herd, carries an increased risk for introduction of BVDV. Responses to other management questions can be seen in Table 6.

Table 6 Responses to management practices questions in the seroprevalence study

		Yes	No	Not answered
Q.38	Do you ever buy in, borrow or hire cattle, including bulls?	492 (83.5%)	97 (16.5%)	
Q.39	Have you purchased any cattle in the last year?	393 (67%)	196 (33%)	
Q.42	Do you isolate introduced cattle before mixing them with your herd?	305 (52%)	187 (32%)	97 (16%)
Q.45	Have you used outfarms or conacre during the last 12 months?	449 (76%)	140 (24%)	
Q.47	Have you shared or let pasture for cattle use over the last 12 months?	18 (3%)	571 (97%)	
Q.48	Have you used artificial insemination during the last 12 months?	370 (63%)	219 (37%)	
Q.49	Have you used a bull during the last 12 months?	511 (87%)	78 (13%)	
Q.50	Have you used embryo transfer during the last 12 months?	35 (6%)	554 (94%)	
Q.51	Have you shared equipment such as livestock trailers with neighbours during the last 12 months?	47 (8%)	542 (92%)	

This study shows that biosecurity in herds in Northern Ireland could be improved.

RESULTS

A total of 5,161 animals in 589 herds were sampled and tested. The serum samples were tested for antibodies to BVDV p80 protein. Of all the individual samples tested, 1,184 (23%) were high positive, 656 (13%) were low positive and 3,321 (64%) negative. The distribution of individual results can be seen in Figure 13.

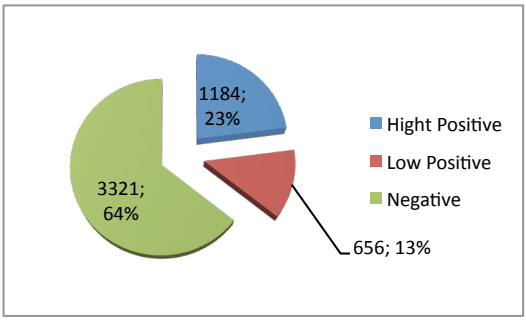


Figure 13: Distribution of results for individual samples tested for BVDV p80 antibody (LSI Di)

In 34% of the herds (202) all animals were negative for the presence of antibodies to BVD virus (termed seronegative); in 14% of the herds (83 herds) all animals were seropositive (Figure 14). In the remaining 52% of herds, one or more animals were positive for BVD virus antibodies. In summary, 66% of the herds had at least one seropositive animal, indicating that they had been in recent contact with the virus (the estimated prevalence of herds with at least one seropositive animal was calculated at 67.37% (62-72.5%)).

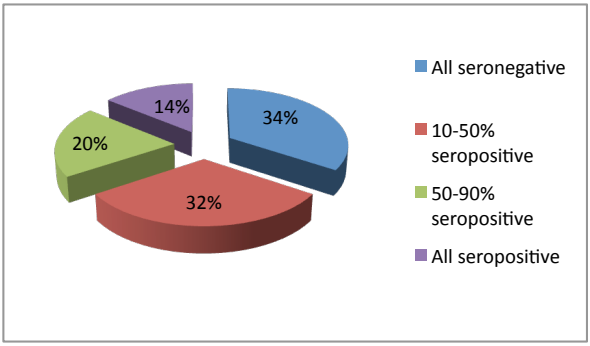


Figure 14: Distribution of herds with no seropositive, all seropositive, 10-50% seropositive and >50% seropositive animals

Obtained apparent prevalence estimates of herds with at least one seropositive animal were adjusted by taking account of the sensitivity and specificity of the test used. True prevalence of herds with at least one seropositive animal was estimated at herd level and stratified by herd type based on the proportions of dairy and suckler cows (Table 7). Prevalence levels were similar between the different herd types, suggesting that herd type may not influence whether the herd is seropositive or not.

Herds were also separated between those vaccinating for BVD and those not vaccinating and the prevalence was estimated for the two groups (Table 8). The result was slightly higher for vaccinating (72%) than for non vaccinating herds (63.6%).

Table 7 Number of seropositive herds, estimated herd seroprevalence and number of seropositive animals per herd type and for all herds in the study

	Seropositive herds	Prevalence	Seropositive animals
Dairy	218/337	65.98% (58.93-73.02)	1100/3158
Suckler	151/225	68.54% (59.58-77.49)	640/1766
Dual	18/27	68.06% (42.38-93.73)	101/237
All herds	387/589	67.37% (62-72.5)	1841/5161

Table 8 Estimated true herd prevalence for herds vaccinating for BVD and not vaccinating.

	Seropositive herds	Herd seroprevalence
BVD vaccinating	169/240	72% (62.9-81.1)
BVD not vaccinating	218/349	63.6% (56.92-70.27)
All herds	387/589	67.37% (62-72.5)

True prevalence was estimated for herds in the different size groups. The larger the herd, the more likely it was to be seropositive. Larger herds were more likely to be vaccinating the herd for BVD but, as we saw in the bulk milk study, these herds seemed to have higher seroprevalence, reinforcing the point that vaccination alone is not enough to protect herds against BVDV.

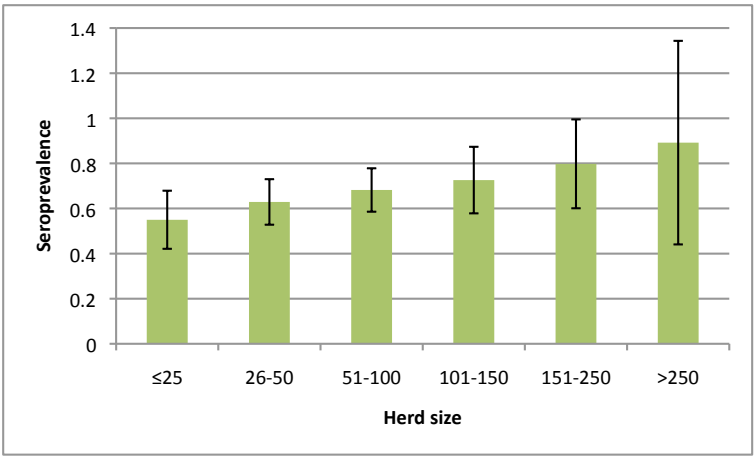


Figure 15 Estimated prevalence by herd size

Added benefits of BVD eradication for the carbon footprint of the NI dairy and beef industry

The figures from the Agrisearch/DARD study were used to estimate the greenhouse gas (GHG) emission savings that an eradication programme could deliver, in terms of the overall mitigation target for agriculture. The eradication of BVD from NI dairy herds, based on combining a 2% improvement in milk production per animal with a 3% reduction in replacement rate would result in CO2e savings equivalent to £3.64 million/ year from the dairy industry alone (£40/t CO2e). Based on the analyses of the dairy sector, it is estimated that a 3% improvement in replacement rate in the beef industry will lead to a 1.5% reduction in GHG emissions. This amounts to an estimated 43,500 tonnes of carbon equivalents estimated at £1.74 million. Under UK legislation, extending to NI, The Climate Change Act 2008 provides a legal framework to reduce emissions of GHGs by at least 80% below 1990 levels by 2050. Agriculture accounts for around 8% of all UK emissions. The savings obtained from the eradication of BVD in NI would make a big contribution to DARD's Greenhouse Gas Reduction Strategy and Action Plan, and the commitment to meeting targets for reduction in emissions.

How do we interpret these results?

The figures from both studies indicate that BVD virus infection in Northern Ireland herds is very widespread. Eradicating the problem represents an opportunity to significantly improve profitability, with additional benefits for animal health and welfare. For example, it has recently been estimated that eradication in the Republic of Ireland would give a cost benefit ratio of 10:1 over the six years of the programme, i.e. a return of ten euro for each one spent. In addition, eradicating BVD would make an important contribution to DARD's target commitments on reduction of CO2 emissions within the Greenhouse Gas Reduction Strategy and Action Plan.

A recent study in Scotland found that 69% of the herds had no recent exposure to BVD virus (Brulisauer et al., 2010). This lower prevalence favours the approach taken in BVD eradication programmes in Scandinavian countries where herds are initially tested by spot test of young stock or bulk milk antibody testing and only those with evidence of exposure undergo follow up testing (whole herd individual screening), to identify and remove PI animals. The prevalence levels that this study has found in Northern Ireland imply that following this approach, 62-72.5% of the herds would need to undertake follow up testing. A more direct approach, such as the Swiss approach (Presi & Heim, 2010) where animals are tested for BVD virus, would be more appropriate for the current situation in NI. On top of the high seroprevalence, other similarities with the Swiss situation are the high density of farms as well as the high level of contact between farms and of animal movements. The testing of young calves for virus has also the advantage to give in case of a negative result, a result for the corresponding dam.

The number of dairy farms with a positive result for IBR antibodies is very high. However, current use of conventional vaccine interferes with the interpretation of these results. A ban on conventional vaccine use, as it is current practice in the Republic of Ireland and other EU Member States, would assist not only with the routine diagnosis of the disease in farms but also contribute to the implementation of any future programme for the control of IBR in Northern Ireland.

Improving the biosecurity measures within NI herds will be key in the control of endemic diseases including BVDV and IBR. Animal health and welfare as well as productivity and profitability of the herds will improve with better biosecurity.

Animal Health & Welfare NI
BVD Eradication Programme
www.bvdni.com

The Northern Ireland BVD Eradication Programme

The results of the Agrisearch/DARD study have been taken into account in the design of the NI BVD eradication programme, supporting the decision to use tag testing of calves. To facilitate the running of this programme, a BVD implementation group (BVDIG) has been established, comprising representatives from; AFBI, Agrisearch, Animal Health and Welfare NI, Association of Veterinary Surgeons Practicing in Northern Ireland, CAFRE, DARD, Dairy Breed Societies, National Beef Association, NI Agricultural Producers' Association, NI Livestock Auctioneers Association, North of Ireland Veterinary Association, Livestock and Meat Commission and the Ulster Farmers' Union.

The NI eradication programme has begun with a voluntary period in 2013, with a compulsory phase proposed to start in 2014 dependent on decision by DARD. More information is available on: www.bvdni.com.

The programme is based on testing ear punch samples collected using tissue sample-enabled official identity or management tags for BVD virus and is designed to identify

calves persistently infected (PI) with BVD virus as soon as possible after birth to enable their rapid culling. Where PI calves are detected in a herd, further testing is required to identify any other PI cattle that may be present and to prevent spread through trade. It is envisaged that each herd will complete three years of tissue tag testing of calves followed by a further three years of lower intensity surveillance.

Farmers can join the programme by simply ordering tissue tags from a supplier who has been designated by the BVDIG for this purpose. Management tags (bearing the animal's tag number) will also be available to be used alongside any official tags still in your possession. Details of designated suppliers are available from AHWNI (ww.bvdni.com) or 028 8778 9126. Note that tags will be supplied on a tag and test basis i.e. the price of tags will include the cost of testing. You will receive pre-addressed packaging for submitting samples to the testing laboratory with your tag delivery.

When you order your tags you will be required to give an undertaking to comply with the programme guidelines and to give permission to allow: details of your tag order to be transmitted to the AHWNI database that will manage the programme; the database to access your herd details on APHIS; the testing laboratory to transfer the results to the database and the results to be used and shared by the programme. As part of the tag order process you will also be able to provide your mobile telephone number (for reporting results by text message) and to nominate a veterinary practice to access your results on the database.

Programme Guidelines (see below)
1. Tag all calves at the earliest opportunity but not later than 7 days after birth. Note that calves should be dry before tagging.

Programme Guidelines
Comment: Early testing of calves reduces the risk of their becoming transiently infected (TI) and giving a positive virus result, even though they are not persistently infected. Avoiding TI animals will reduce the need for confirmatory re-testing. It also allows for key on farm management decisions to be made at the earliest opportunity. It will also help ensure that each calf is correctly matched to its dam. This is vitally important to the success of the programme, because if the calf is not PI, the dam cannot be PI either. In this way, the programme provides a two-for-one test. If the calf is PI the dam may also be PI, and needs to be tested (see 4 below).

2. Test all calves born into the herd, including stillbirths, using a tissue sample-enabled tag purchased from a designated tag supplier.

Comment: This is necessary to ensure that virus-positive calves are not missed and that infection, if present, is identified and dealt with as quickly as possible.

3. Samples should be returned to the designated laboratory of choice at the earliest opportunity but not later than 7 days after sampling
Comment: This ensures that the samples submitted are suitable for testing when received in the laboratory and that the information necessary to make key management decisions on the farm is available at the earliest opportunity.

4. Carry out all necessary follow up testing following the discovery of a PI animal, which at minimum includes the testing of the dam of the positive calf, and if found positive the other offspring of the dam.
Comment: This is necessary in order to identify and remove all PI animals from your herd as quickly as possible.

5. A PI animal must not be moved off farm (sold) and should be isolated from other cattle until it is culled or slaughtered. This also applies to animals requiring follow up testing (see 4 above).
Comment: PI animals are the main source of infection for cattle in their own and neighbouring herds.

NOTE: Results from herds that comply with these guidelines in the voluntary year of the programme will count as one of the three years of tag testing anticipated in the Northern Ireland programme.

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Notes

Notes

For further information or to request a copy of the the full scientific report detailing the experimental tests and statistical analysis contact

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