

The cost of not vaccinating: a case study



Boehringer Ingelheim Animal Health's 2020 BVDzero case study award scheme culminated recently with two virtual online sessions in which the authors of the top 10 studies presented their cases. Paul Crawford, a self-employed veterinary consultant and farmer based in Larne, presented a bovine viral diarrhoea case report of incursion into a naïve herd in Northern Ireland, and we present the details of his report here

Bovine viral diarrhoea (BVD) is a worldwide disease of cattle that is of economic and welfare significance. It can be controlled and has been eradicated in several countries already. The virus generally causes a short-term infection. Clinical signs include fever, respiratory signs, drop in milk production, diarrhoea, embryonic death, abortion and occasionally death. These animals are only transiently infected (TI), as they recover from the infection when virus shedding stops. However, infection during the first third of pregnancy results in the unborn calf becoming persistently infected (PI) as the calf's immune system will fail to recognise the virus as something foreign and the virus remains active in the calf throughout its life. The PI calf's immune function is damaged permanently leaving it more susceptible to other diseases eg. pneumonia. Most PIs fail to thrive and will die between six and 24 months. They either succumb to other disease or the BVD virus changes (mutates) and the animal develops mucosal disease. This is invariably fatal. PIs' continual shedding of virus is the main source of infection to other cattle.

Many studies have indicated a positive cost benefit analysis favouring control and eradication of BVD. Control of the disease instead relies on a combination of identification and euthanasia of PIs and vaccination. The main risks for BVD entering a herd are the movement of livestock (including boundary contact), personnel and equipment.

HISTORY AND BACKGROUND

This coastal family farm milked approximately 250 mainly Holstein Friesian cows. A block calving pattern starts in August for six months. Cows are housed through the milking period. Some cows graze during their dry period when possible. All calves are retained and reared as dairy replacements or for beef.

The housing for adult dairy stock, replacement heifers and the main calf house as well as the parlour, cattle footbath and crush facilities are under one continuous roof. This, effectively, creates one airspace with common walkways and collecting yards.

One block of land surrounds the dairy unit while further

blocks spread over a seven-mile radius are used for grazing and silage production. There is a total of 672 acres. Few boundary fences meet the recommended 3m buffer width. Approximately 25 herds graze fields adjacent to one or more farm boundary.

Dairy replacement heifers were summer grazed in their first and second season away from the main unit. In September (2016) as they approach 14 months of age, they returned to the dairy unit to be observed for bulling and subsequent artificial insemination (AI). A sweeper bull was used from early 2017 onwards. Family, full time, part time and occasional staff are employed.

PREVIOUS BVD TESTING ON THE FARM

The herd was enrolled on the Northern Ireland BVD eradication scheme prior to the 2016 calving season. This was the first year of testing on the farm and all calves tested negative. Discussion was held between the farmer and his regular vet around vaccination, the farmer did not perceive that he had a problem and vaccination was declined. In August 2017, calving started and a batch of 79 tags were submitted for testing in late August.

Twenty-one of these samples came back positive and 58 were negative. The farmer elected to retest 14. All retests were positive.

In September and November, a further 25 animals and a single animal tested positive (respectively) by tag testing. A total of 47 PIs were identified and during the same period 104 calves tested negative.

The 47 calves were culled directly because of a positive test; 20 of these were female and the majority of those would have been dairy-herd replacements.

Additional mortality arose during the period when PIs were on the farm because of an increase in the number and severity of cases of respiratory disease. Fatal cases of suspected acute BVD were seen in test-negative calves. This included one calf with haemorrhagic syndrome, tongue and oral ulceration.



Figure 1: One PI (yellow arrow) was missed and only slaughtered in February 2019 when, due to poor growth, it was retested and proven blood ELISA positive. Pen mates are one year younger.

ANALYSIS OF THE RESULTS

Given the number of PIs on the farm at the time, it had to be assumed that a virus would be circulating in the milking herd and bulling heifers. As the breeding season was

about to start when the first positive results came through, an immediate decision was made to vaccinate all at-risk females. The availability of a single-dose vaccine with rapid onset of immunity was ideal in this situation.

Table 1.

	Date of birth	Date of conception	Window of susceptibility
First case	Aug 6	Oct 28	Nov 27 - Feb 25
Final case (block)	Sep 12	Dec 4	Jan 3 - Mar 3
Outlying final case	Sep 27	Dec 19	Jan 18 - Mar 18

Calf test	Dam	
	Heifer	Cow
Positive	5	42
Negative	0	104

Heifers were significantly under-represented in the pool of PI dams. No calves born to heifers were PI after August 20. Were the rest of the heifers already immune? Was this the source? The source of infection risks identified were categorised as to their relative risk of being the source of BVD introduction based on the dates infection was thought to be circulating in the breeding herd

RISK OF INTRODUCTION RATIONALE

Both foot trimmer and vet were observed to maintain good levels of cleanliness and hygiene. However, their direct contact with multiple animals means any small biosecurity break would have a high chance of onward transmission. While visitors to the farm often came direct from their own farms, they did not often have direct physical contact with livestock; however, occasional direct and frequent indirect contact could occur. The silage-contracting vehicles, meal and milk lorries never had direct contact with livestock though would drive through areas in which cattle may be walked through, and were washed with aerosol and run off heading into animal housing. Returning livestock seem the most likely source of infection.

COST OF OUTBREAK

Business cost

- One full line of heifers was lost from the parlour. In addition, they would have calved prior to entering the milking herd. It is also likely that around the time of infection of the pregnant cows, several of these will have suffered early embryonic death or aborted.
- Currently the surviving heifers are yielding on average 34L/day meaning a loss of production of £174 a day. The profit margin from the 28 beef animals was also lost from

Table 2: Source and risk of infection.

	Livestock related	Equipment related	Human transfer
HIGH	The bulling heifer cohort were brought back to the main dairy unit in batches from approximately 15th September	Slurry spreading is undertaken by contractor and own machinery. Occasional sharing of the farm's tanker, pump and transfer hoses occurs	Staff on the farm all either have work on other farms in the area or their own farm or are involved in agri- contracting
	Dry cows were returned from grazing in batches fortnightly from early July throughout the summer and early autumn	Shared use of livestock trailer	
	Sweeper bull used with the heifers		
	Stale cows were grazed around the main dairy unit for a number of weeks over the late summer		
MEDIUM		Foot trimmer's crush	Visitors to the farm many from livestock farms
			Vet
LOW		Silage contracting vehicles returning to yard	Meal deliveries. 1-3 lorries a week
			Milk tanker every other day

the business and several thousand pounds for calf death and morbidity around the time of the outbreak.

Emotional cost

- Speaking about the outbreak, the farmer said: "When I started getting all these results back, I was totally devastated. What was going to happen? Was the whole herd going to be affected? It was a very worrying and stressful time. It took an emotional toll. It was a lot of stress on the family and on family life. Lots of anxiety and worry."
- His wife added: "For someone not as mentally well as him, it [the results] could have had a detrimental effect. He had the emotional support of his family, but someone who is a lone farmer could have suffered even more. Farmers don't talk about their emotions, but they should. There should be more support for them."
- While the economic costs of the disease have been well documented there is less literature available on the human/emotional cost of an outbreak. The nature of the testing process means a drip feed of anticipation and bad news over an extended period of time. Extensive social effects research has been published in the wake of the 2001 Foot and Mouth outbreak. When an outbreak of this magnitude occurs on a family farm it creates stress and worry. In the face of extensive outbreaks, the testing authorities should consider opportunities to offer support to farm families or direct them to local support services.

DISCUSSION AND CONCLUSION

Vaccination of the herd could have prevented the outbreak, financial losses and emotional toll. As we head into a world that is progressively being cleared of BVD, we must never lose sight of the importance of vaccination to protect herds, regions and countries where the disease has been successfully eradicated. The cost in animal welfare, farmer mental health and faith in disease-control programmes is far too high to leave a naïve population exposed to reintroduction from rogue PIs or trans-boundary, accidental spread by man, beast or machine.

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This report and images are republished courtesy of Boehringer Ingelheim. The BVDzero Awards aim to promote the proactive investigation and management of both clinical and subclinical BVD in cattle herds. Presentations from all the BVDzero case study award finalists can be viewed on www.youtube.com/c/BVDzero