The risk of buying pregnant cattle

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Summary

After a two-year effort to control bovine viral diarrhoea (BVD) in 2012 and remain accredited free for four years in a row, a farm in the North East of England became re-infected in 2017 by buying-in pregnant heifers. Three BVD persistently infected (PI) calves were born and removed within three months; however, the infection had a significant impact on the health of that year's crop of calves that, aggravated by adverse weather conditions, were severely affected by secondary diseases (pneumonia and cryptosporidiosis).

Farm background

The owners of this farm run a beef herd and a sheep flock, with approximately 450 suckler cows (including 70 replacement heifers), 150 to 200 fattening cattle, 13 bulls (Charolais, Limousin and Aberdeen Angus) and 900 breeding ewes. The farm is divided into three units: the bottom and top yards that are separated by a road and a third new shed located a mile away from the other two yards. Additionally, there are three hill farms where cows are sent to graze after they have been scanned and confirmed in-calf. The farm runs a spring and an autumn calving herd, with 12-week calving periods that usually extend from February to April and August to November. Spring calving takes place at the main farm, while the autumn cows mainly calve at the hill farms.

This is an open herd: bulls, replacement heifers and fattening cattle are bought into the farm every year; although replacement heifers are mostly homebred. Cattle are sourced mainly through the market but also through private sales. On arrival, all bought-in stock are blood sampled and tested for BVD antigen (Ag) and Johne's disease serology. Bulls are sourced from BVD-free accredited breeders and are semen tested every year before being turned out with the cows. Calves are vaccinated at two weeks old with Rispoval® RS+PI3 Intranasal (Rispoval® 4 until 2012) (Zoetis UK Limited). Yearlings receive Tracheine and Rispoval® RS+PI3 Intranasal in October. Homebred replacement heifers receive a first dose of an inactivated non-cytopathogenic BVD vaccine (Bovidec®, Elanco Animal Health) at the end of September or start of October, followed by a second dose four weeks later, when they are gathered to go out with the bull. Cows and bulls receive their annual booster at the same time. Replacement heifers are usually bought-in already vaccinated for BVD. The farm is a member of the BVDFree England scheme and the Premium Cattle Health Scheme (PCHS) for BVD and Johne's disease.

There are four neighbouring herds at the main farm and contact with their cattle is possible with three of these. One of these neighbours is working to double-fence its fields. Contact with neighbouring cattle is also possible at all the hill farms. The BVD status of the neighbouring farms is unknown.

Barcelona

Previous BVD history on the farm

This herd has been vaccinating against BVD for more than ten years; however, cattle were not tested for BVD until 2011, when it was decided to check the herd status to investigate a pneumonia outbreak in calves. During that year other farms in the area were also working to control and eradicate BVD from the region.

In December 2011, antibody (Ab) check tests performed in four different management groups revealed high seroprevalence levels amongst the calves, confirming the presence of BVD on the farm. This was followed up with a PI hunt that started in January 2012. All adult cattle were blood sampled and tested for BVD antigen and the spring and autumn 2012 calf crops were antigen tag tested at birth. Two PI cows were identified and culled; they had both been bought-in animals. All of the 2012 calves tested negative for BVD antigen.

In 2013 two antibody check tests (spring and autumn) were still positive, this was attributed to some of the calves being present in the farm before the PIs were removed. In February 2014 the farm passed its first clear antibody check test, which was the first PCHS qualifying test. In October 2014 the farm had its second clear antibody check test and became PCHS accredited BVD free. Since then, the BVD status of the herd has been monitored by performing twice yearly antibody check tests in the spring- and autumn-born calves. As a result of becoming BVD negative, the vaccination protocol in calves changed from Rispoval® 4 to Rispoval® RS+PI3 Intranasal.

The 2018 outbreak

The timeline of the outbreak is summarised in Figure 1. At the end of July 2017, a group of 17 pregnant heifers were bought-in. Contrary to most of the bought-in replacements, this group of heifers had not been vaccinated against BVD by the seller and the BVD status of the farm of origin was unknown. On arrival, they were isolated, tested for BVD antigen (all negative) and started on a primary course of Bovidec® (two doses four weeks apart). The field where these heifers were "isolated", however, was rented at another farm and was not double-fenced, with cattle grazing in the neighbouring fields. In early 2018, a BVD outbreak would be diagnosed at this neigh-

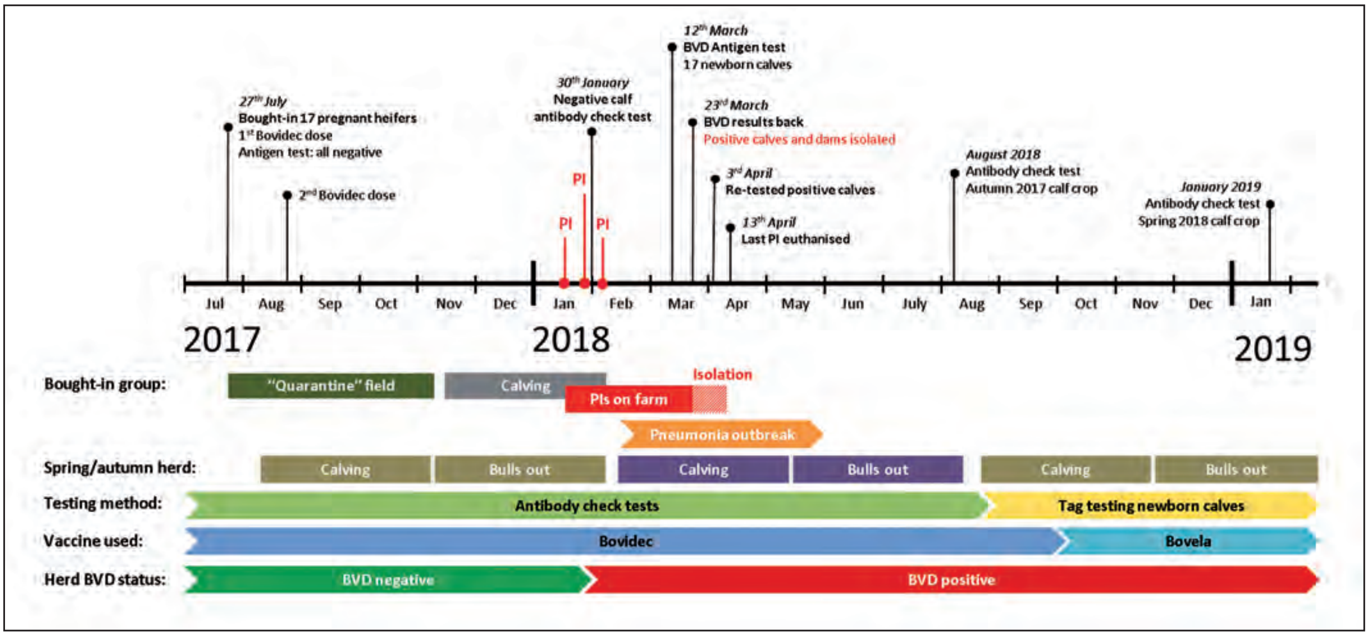

Figure 1. Timeline of the 2018 BVD outbreak at this farm.

bouring farm. An 18-month old PI was identified and it was confirmed that this animal had been grazing in the field next to the bought-in pregnant heifers. At the time of entering the "isolation" field, 14 out of the 17 heifers were between 88 and 124 days pregnant (Table 1) and would therefore have been at risk of producing a PI calf. At the end of November 2017 the heifers were moved to the top yard at the main farm, to then be moved to the bottom yard as they approached calving. They calved over a period of 12 weeks, between 14th November 2017 and 5th February 2017. Two weeks later the cows and calves were moved to the new shed at the main farm, where they were housed next to a group of 30 autumn-calving cows.

During February 2018, the veterinary surgeons were called out to the farm multiple times to examine and treat calves with pneumonia. The outbreak started in the 2017 autumn-born calves at the top yard, where pneumonia problems are recurrent due to poor ventilation, but it then spread to the bottom yard and the new shed, affecting calves between one and three months old (spring 2018). The severity of the clinical signs in this young group of calves raised the suspicion that there might have been BVD amongst them. In March 2018, when the youngest bought-in calf reached four weeks of age, all 17 calves were blood sampled and tested for BVD antigen. Three calves tested positive (Table 1). The positive calves and their dams were isolated immediately in a separate, empty shed a mile away from the rest of the stock (Figure 2) and the calves were tested again 21 days later. A second positive result confirmed their PI status. The dams were not tested again as they were antigen negative on arrival and it was assumed that the PI calves would have been the result of a transient infection (TI).

Figure 2. The three dams and PI calves in isolation after the first test.

Calf	Calving date	Approx. gestation days on arrival	Days old at test	BVD Ag results	
				12/03/2018	03/04/2018
1	14/11/2017	166	118	Negative	
2	25/11/2017	155	107	Negative	
3	24/12/2017	126	78	Negative	
4	26/12/2017	124	76	Negative	
5	29/12/2017	121	73	Negative	
6	31/12/2017	119	71	Negative	
7	02/01/2018	117	69	Negative	
8	04/01/2018	115	67	Negative	
9	08/01/2018	111	63	Negative	
10	14/01/2018	105	57	Negative	
11	15/01/2018	104	56	Negative	
12	16/01/2018	103	55	Positive	Positive
13	17/01/2018	102	54	Negative	
14	21/01/2018	98	50	Negative	
15	26/01/2018	93	45	Positive	Positive
16	29/01/2018	90	42	Negative	
17	05/02/2018	83	35	Positive	Positive

Table 1. Estimated gestational day of the dam on arrival at the farm. Highlighted in grey are the foetuses that would have been at risk of becoming PI. In red are the three calves that were confirmed as PIs.

Herd health impact of the outbreak

Initially, non-PI calves were the worst affected by clinical disease. They presented with pneumonia, diarrhoea and high temperatures. A total of six calves died out of the group of 17, on top of the three PIs (9 out of 17 animals, 53% mortality). The PI calves appeared clinically normal, until two succumbed and died of bronchopneumonia. The post-mortem findings in one of the PIs are shown on Figures 3 and 4. The third PI was euthanised on 13th April. Two more post-mortem examinations on dead, non-PI animals also confirmed bronchopneumonia. Some of the affected animals were still being treated months later. The dams never showed any clinical signs.

In addition to pneumonia, during spring 2018 this herd also suffered a cryptosporidiosis outbreak. The infection was first confirmed in calves and was likely worsened by the immunosuppressive effect of transient BVD infections. Several calves were affected and needed treatment, but none died. However, the outbreak then spread to the lambs through farm workers that worked both at the calving and lambing pens. The morbidity and mortality amongst the flock was high, hundreds of lambs were lost (cryptosporidiosis was confirmed in several faecal samples and post-mortem examinations). The adverse weather conditions during spring 2018 also contributed to the worsening of the outbreaks. One of the farm workers was also affected by cryptosporidiosis.

There have been no abortions in the herd during autumn 2017 or spring 2018. Of the 2018 autumn-calving cows, 31 out of 261 were not pregnant (12%), but this figure could not be contrasted to previous years. One of the barren cows was found to have a mummified foetus; this cow was in the group of 30 that had direct contact with the PI calves. The three PI calves were present on the farm between 16th January and 12th April 2018. The bulls were out with the autumn calving herd between 10th November 2017 and 1st February 2018; therefore, cows could have been anywhere between 16 days before being served and 153 days pregnant, which leaves a big window of exposure to reproductive effects, and the fertility of the herd could still be affected during the rest of 2018.

Figure 3. Pleurisy and adhesions in one of the PI calves.

Figure 4. Abscessation in the ventral lung lobes.

Control and eradication

To control the outbreak, all calves born from autumn 2018 will be tag tested at birth and, should any positive animals be found, these will be isolated, re-tested 21 days later and culled if confirmed as PI. The autumn 2017 and spring 2018 calf crops will be screened with BVD antibody check tests when they reach 9 to 18 months old. In October 2018 the BVD vaccine will change to Bovela® (Boehringer Ingelheim), calves will continue to be vaccinated with Rispoval RS+PI3 Intranasal. Although the herd will remain open, no more pregnant cattle will be bought-in and all new stock will be isolated, tested for BVD antigen and antibody and vaccinated if required. Special attention has been paid to the cleaning and disinfection of the sheds this year, to help control cryptosporidiosis and prevent the spread of BVD virus. Talks have been held with the owners of the farm where the heifers were initially "isolated" and it has been agreed to double-fence the fields with a three metre gap.

Cost of the outbreak

The biggest cost of BVD on this farm has been the losses of the three BVD PI calves and those caused by secondary disease (pneumonia and cryptosporidiosis). The cost of veterinary treatments, visits and laboratory fees has also been higher than in previous years. Between January and May 2018 the farm had already had as many veterinary visits due to pneumonia (to examine individual calves or investigate the outbreak) as in any of the worst previous years (Figure 5). Animals that have been affected by secondary diseases have also needed extra feeding and there was an additional cost to maintaining the affected dams and PI calves in isolation.

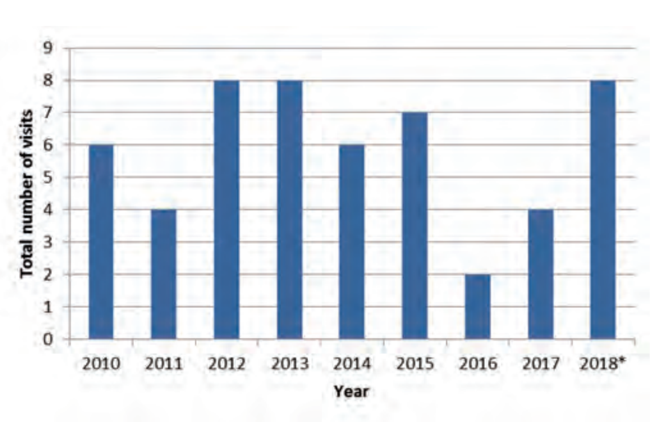

Figure 5. Total number of veterinary visits due to pneumonia per year (*1st January to 31st May 2018).

Going forward, tag testing of the calves has been estimated to cost approximately £2,700 per year, compared to roughly £500 for the twice yearly veterinary visits and calf antibody check tests that were used to monitor the herd's status. However, this is the best method to ensure that PI calves are identified as soon as possible, before the disease spreads further. In addition, there could be further losses associated with the potential birth of new PI calves and/or reduced herd fertility. The cost of the vaccination will also increase from approximately £1,728 for 533 doses of Bovidec® (380 cows, 70 heifers and 13 bulls, plus 70 booster doses for the heifers; excluding VAT, prices obtained from the veterinary practice's management system) to £2,544 for 463 doses of Bovela® (single dose for the 380 cows, 70 heifers and 13 bulls; excluding VAT), but savings will be made in man hours and handling cattle since heifers do not need a booster with Bovela®.

Farmers' perceptions

Discussing the outbreak with the farmers, they explained that prior to controlling BVD in 2011-12 they did not know much about BVD. They associated the disease with diarrhoea in calves but were not aware of all the negative consequences the virus can have in the herd. Years ago they started vaccinating "because everyone did it". They heard from a neighbour that their fertility had improved after starting to vaccinate and they followed the example. The same effect was felt on this farm and it was perceived that calving periods were shortened. The farmers were not aware of the existence of "Trojan" cows; they did not know that virus-negative cow could be carrying a positive, PI calf. Meetings organised by the veterinary practice helped raise awareness and learn about BVD.

During 2011-12, the farmers felt that eradicating BVD from the herd had a significant, positive effect on the calves' health. It was also noticed that the antibiotic usage on farm dropped. After all the efforts put into controlling the disease, they were very disappointed to discover that they had become re-infected by buying-in cattle, which was avoidable. This year, pneumonia and cryptosporidiosis have been perceived as the main complications of the outbreak. The farmers know that they have recurrent pneumonia problems in one particular yard and in older calves; however, they felt that this year has been the worst for pneumonia in younger calves, especially those that were in contact with the PIs. They have not noticed any worsening of the herd's fertility compared to previous years.

Regarding accreditation, the perception is that there is an advantage to being BVD free when selling animals and the farmers are hoping to be able to go back to being an accredited herd as soon as possible. However, their perception is that, in England, a lot of producers are not fully aware of BVD yet or are not applying any measures to control it in their herds. The BVDFree England scheme is helping, but there is still work to be done and without the scheme being compulsory there is still risk of buying infection in. The farmers also believed that changing to Bovela® would make it easier to comply with the vaccination protocols. It will be easier to handle heifers and start animals on the new protocol with a single injection, and they are not worried about the extra cost.

Discussion

Despite the progress made by compulsory and voluntary BVD eradication schemes in Europe, BVD is still endemic in many countries (Ståhl and Alenius, 2012). Buying cattle into a herd (especially when purchasing pregnant dams or cows with calves at foot) and contact with neighbouring cattle remain as two of the most common sources of BVD infection (Gates et al., 2014; Reardon et al., 2018). Both factors played a role in this outbreak; however, it could not be confirmed if the heifers got infected before or after being bought-in. On arrival at the farm, the dams were only tested for BVD antigen; knowing that they had not been vaccinated by the seller, an antibody test would have helped establish if the heifers had already been exposed to the virus prior to the sale. Some studies have also suggested that pregnant dams that are carrying a PI foetus have higher BVD antibody titres than dams that carry non-PI foetuses (Lindberg et al., 2001). If this group had been antibody-tested, the positive dams could have been isolated until their calves were born and tested for BVD-virus, to avoid bringing the disease into the herd.

The fastest way to identify a PI calf is tissue testing an ear notch sample at birth. In this case, tissue tags were not available and the calves were blood sampled at one month old. Despite the delay in testing and removing the confirmed PIs, their isolation will have helped to reduce the spread of the infection. The existing vaccination protocol will have also helped reduce the impact and spread of the virus. However, transmission of BVD has been described in the absence of PI cattle (TI animals, personnel, contaminated equipment and environments, other species, etc.) (Niskanen and Lindberg, 2003; Lindberg and Houe, 2005) and the efficacy of BVD vaccines can be affected by many factors (e.g. compliance with protocol, on farm storage temperatures, the animal's immune function) (Fulton et al., 2005; Meadows, 2010; Rauff et al., 1996), therefore tag-testing the next calf crop will be essential to detect any further spread of the disease.

Immunosuppression and respiratory disease are recognised as important complications of BVD infection (Ridpath, 2010) and these were responsible for the biggest losses in this herd. Although BVD can affect cattle fertility at any stage (Grooms, 2004), no negative effect was observed on this herd's fertility. A monetary estimate for the cost of this outbreak was not provided. However, a study in Scotland cited the cost of BVD in an endemic farm at £37 per cow per year (Gunn et al., 2004). For a 450-suckler cow herd this would result in a loss of £16,000 per year. The cost of the prospective control measures has been estimated at approximately £5,244. This is clearly cost effective.

This case highlights the importance of applying strict biosecurity rules to prevent BVD infection and is an example of how easily accredited farms can become re-infected if the protocols are not followed. Given the fact that this herd will remain open and that contact with neighbouring cattle is still possible, the risk of infection will remain high. Vaccination protocols and close monitoring of the herd's status will be key to ensure that the farm remains BVD-free once the accredited status is regained.

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