

BVD Abortion in a Vaccinated Dairy Herd

Dr Tracy Anderton BVSc PhD MRCVS



Veterinary Assistant Kenwyn Veterinary Centre, UK

Tracy graduated from Liverpool University in 1994. Having initially worked at Kenwyn she left to complete a PhD at Cambridge. Before returning to us at the practice in 1996 she worked as a large animal intern at Bristol university veterinary school, furthering her interest and knowledge in bovine health.

Farm background

This Cornish farm is an organic dairy herd of 450 milking cows. In total there are approximately 1,200 head of stock kept on several premises including 2 'sister' herds of 250 milking cows each. Youngstock from the farms are mixed and reared together but cows stay on the home farm to which they belong. Heifers are returned to their original farm when they calve in for the first time. The farm rear their own replacements and the only stock that are not bought in are the breeding bulls.

Herd Health

The farm has a comprehensive herd health program. Primary vaccinations for *Leptospira* (Leptovoid, MSD Animal Health) and Infectious Bovine Rhinotracheitis (Bovilis IBR, MSD Animal Health) are given to youngstock from 12 months of age. Thereafter the milking herd is vaccinated against *Leptospira* annually every April and IBR at 6 monthly intervals; pre-housing and pre-turnout. The herd is vaccinated against BVD with Bovilis BVD vaccine (MSD Animal Health). A primary course of 2 doses of 2 ml of vaccine is given intramuscularly at an interval of 4 weeks to bulling heifers aged 12-18 months old. Heifers are vaccinated in August/September. The course is always finished before the heifers go to the bull. There is a lot of animal movement on this holding and to ensure there are no mistakes heifers are freeze branded after the second

vaccination. A freeze branded heifer is a vaccinated heifer. The milking cows have a booster vaccination every April. This ensures that cows are fully vaccinated before the main service period begins in the first week of August. They have a booster vaccination per calving interval as recommended by the data sheets. Heifers that have had a primary course of BVD vaccine are also boosted at this time. Their first booster is approximately at 7 months. Data sheets advise this first booster to be at a 6 month interval. All vaccines are given by a competent, trained member of staff. Vaccine is bought from the veterinary practice and taken to the farm in a refrigerated box. They are stored in the farm fridge until needed and kept in a cool box whilst on farm.

In order to detect any possible persistently infected calves or Pls, Holstein/Friesian female calves are tissue-tested for BVD antigen. Special ear tags are used to remove an 'ear-notch' of tissue which is used for this test.

Historically there has been an ongoing problem in the herd with *Johnne's Disease*. Vaccination (Gudair vaccine, Zoetis AU) has been used to help control this and calves are vaccinated at less than 1 week of age. This was started in June 2009 and stopped in June 2017.

The farm has been under restriction for 6 plus years for Bovine tuberculosis (TB). TB check testing takes place every 60 days and 'reactors' are regularly found. Some but not all of these reactors have visible lesions indicative of bovine TB at post mortem. In addition there are regular incidences of cull cows that are not reactors on the routine TB test but do have TB lesions at post mortem. There have been no clinical cases of TB.

The farm has a seasonal breeding program; the service period begins in the first week of August with the aim of at least 50% of cows served by the end of November. Cows are not served in May, June or July. The farm employs a *Genus* technician running a routine monitoring service (RMS) to aid heat detection and accurate AI service. A bull is not used on the farm with the milking herd. The farm has a weekly veterinary fertility visit.

Presenting problem

Over a period of 6 weeks in the spring of 2018 (March/April) approximately 20 cows aborted. In addition, approximately 20 cows were scanned in early pregnancy but did not have a normal pregnancy; the calves either did not have a heartbeat or there was an empty amniotic sac. Upon examining the service records for these cows, they had been served from 1st October to 26th November 2017, making them approximately 5 months in calf. The cows remained well and continued to milk. Foetuses were not mummified and were 'fresh dead'. After some initial difficulty obtaining an intact, fresh foetus, an aborted foetus was submitted for laboratory examination. The dam had been served on 7th October, was scanned in calf on 14th November and aborted on 30th March 2018 (5½ months gestation).

The aborted foetus was a viraemic animal and positive for BVD detected by PCR. The presence of BVD viraemia in the aborted foetus was taken as the cause of abortion and indicative of active BVD within the herd. The foetus was also positive for *Neospora caninum*. This is also an abortifacient agent. It was likely that both pathogens had a role in the abortion.

Laboratory Report – examination of Foetus

(MICR1) Aerobic Culture

Sample	Tissue
Site	Spleen
Aerobic Culture	No growth after 48 hours
<i>Salmonella</i> Culture	Not Isolated

(FNEOSP) *Neospora caninum* PCR

Animal Reference	NO ID
<i>Neospora caninum</i> PCR	DETECTED @ Ct 35

(FBAGB) BVD Antigen PCR

Animal Reference	NO ID
(FBAGBX) BVD Antigen PCR	DETECTED @ Ct 34

This assay will not differentiate positive findings as a result of exposure to Bovine Viral Diarrhoea Virus from those caused by Border Disease Virus exposure. However, as Border Disease infection is much rarer than BVD infection in cattle, the likelihood of this positive result being in response to Border Disease exposure/infection is low.

Listeria Enrichment

Culture	Not Isolated
---------	--------------

Investigation

A blood sample of the dam was negative for BVD antigen; she was not a PI animal. Therefore, the dam must have been exposed to the BVD virus during pregnancy with subsequent infection and abortion of the foetus. The source of infection is nearly always a PI animal.

A bulk tank sample was negative for BVD antigen. The PI animal was not in the milking herd.

Name	Result	Units	Interval (SAMPLE)	Submitted Samples
		1x milk (in preservative)	(FBAGM) BVD Ag	PCR (bulk milk)



This test was repeated twice more over the next 2 months, and continued to test negative. It was concluded that there were no PI cows in the milking herd.

The best method of finding a PI in the youngstock is by blood sampling each individual animal for antigen. The number of youngstock on this farm meant that this was neither practical nor cheap. Instead, individual serum from each of 10 heifers were sampled for BVD antibody to check for exposure to the virus. These heifers had not been vaccinated and were old enough to no longer have maternal antibody to BVD. Of the ten animals, 9 had an antibody of zero but 1 animal had a high titre. She had been exposed to BVD virus, and it is logical to conclude exposure to a PI animal.

BVD Antibody Titres on 9-12 month old unvaccinated heifers

Miscellaneous Test Result

Access No	Animal ID	BVD antibody ELISA
03249/1	6815	1% (Negative)
03249/2	6813	1% (Negative)
03249/3	6763	122% (Positive +++++)
03249/4	6779	1% (Negative)
03249/5	7023	1% (Negative)
03249/6	6778	0% (Negative)
03249/7	6780	-4% (Negative)
03249/8	6825	1% (Negative)

(XBVDA) BVD Antibody ELISA.

BVD antibody ELISA: Negative: <=20%;
Positive: > 20% (+) to > 100% (+++++)

At this point, the farm decided to stop any further testing. It was felt that the PI animal could be anywhere and would entail extensive testing, time and expense. Vigilance was maintained for any youngstock showing signs of clinical BVD.

Tissue testing of calves is continuing and to date 2 calves are positive for BVD (verbal report from farmer, written results to

come). These will be blood tested for antigen in 1 months time to confirm whether they are PI animals and culled or transiently infected animals. Either way, this is more evidence that BVD is active within the herd and there has been a breakthrough in the vaccine protection.

Conclusion

Despite the lack of an identified PI animal, based on the positive laboratory results listed above, a diagnosis of active BVD in the herd was made. Despite a solid vaccination program, an abortion storm, due at least in part to BVD had still occurred. A diagnosis of BVD was surprising; the herd has been vaccinated against BVD for at least 10 years, and was thought to have broad and long-lasting immunity against the virus. Furthermore, the vaccination program follows data sheet protocols; handling, storage and administration of the vaccine is good. Yet the vaccine alone has been unable to contain the effects of BVD on the cows of this farm. This does not necessarily constitute a vaccination failure and it is likely that without the use of the vaccine the problems occurring within the herd would be magnified; resulting in poor fertility parameters, poor calf health and so on.

The owner had similar comments: 'I am surprised that BVD is the reason that cows are aborting as I believed that the vaccination program we were on would protect the herd. I know that BVD makes it more likely that calves will get pneumonia or that they won't respond to treatments but was not aware of this type of effect in the cows. It seems that we need to do more to stop this disease on our farm. It would be great if we could find the PI animal but I think the cost and expense of this would be too much. I would rather spend our efforts monitoring the herd and tag and testing all the calves.'

On this farm, in addition to vaccination, further action is required to control the effects of BVD:

- Reduce the BVD challenge – detect and cull any PI animals.
- Quarterly bulk tank samples for BVD antigen especially when a group of heifers have recently calved into the herd.



- All calves, not just the replacement heifers will be tissue sampled for antigen.
- Monitor BVD - Naïve, unvaccinated groups of heifers blood sampled for BVD antibody at regular intervals.
- Concurrent disease – ensure that everything possible is done to minimise the effects of concurrent diseases such as TB, Johne's and IBR that may play an immunosuppressive role in the herd and affect the vaccines efficacy. Blood samples from groups of adult cows can be taken to monitor to check that they have sufficient BVD antibody levels after vaccination.
- Consider the possibility of a BVD type 2 being present on the farm and switch to a BVD vaccine that covers that strain.