Beef Toolkit

1 Assess

2 Define

3 Action

4 Monitor

The order of the four-step process is different for beef than dairy because the entry point is different. For some beef farms, not all these steps may be relevant if the decision is to vaccinate the breeding herd every year.

Contents

Introduction – Beef

The bovine viral diarrhoea (BVD) virus is endemic in New Zealand cattle and is the cause of animal health, welfare and economic losses on infected farms.

Most beef herds in New Zealand will become, or have been, infected with this virus.

What follows is a stepped approach that veterinarians and farmers can use to help manage this important viral infection on farm. It has the flexibility to be implemented according to different farming systems, the relative importance of BVD on farm, financial factors and herd infection levels.

The control measures implemented must be practical and sustainable (financially and physically) and, over time, significantly reduce the economic and animal health and welfare effects of the virus on farm.

For some farms, the most practical and economical approach will be to put in place a "test and cull" policy, followed up with good biosecurity and regular monitoring. For others, the most realistic solution will be to vaccinate the whole herd. Consider screening keeper calves for persistent infection (PI) while gradually improving biosecurity over time.

Whatever the control programme agreed to on a farm, the most important step is the first one.

Tools are now available for farmers to use to:

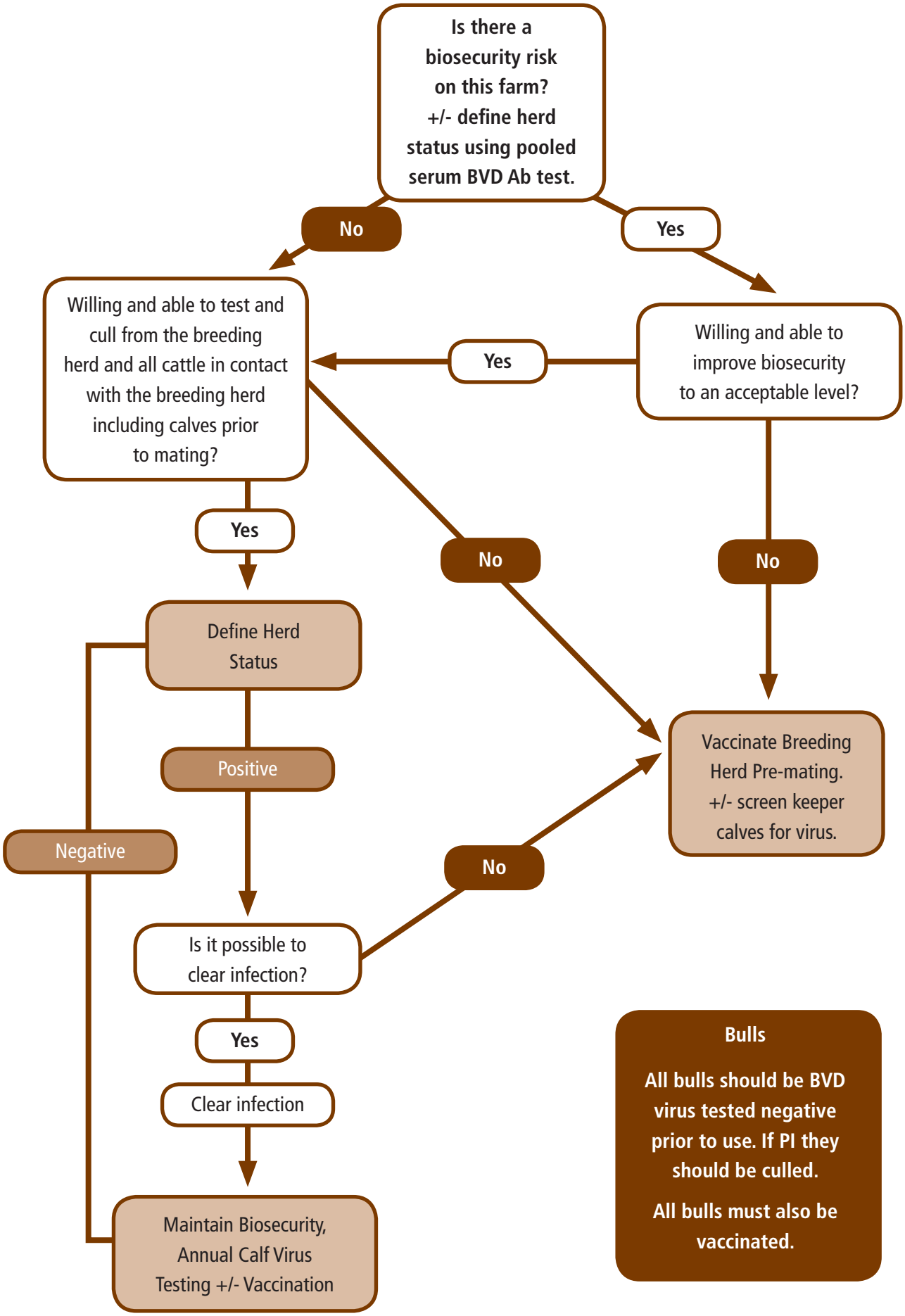
- Establish whether their herds are currently infected.
- Eliminate infection from their farms if the herds are infected.
- Reduce the risk of re-introducing the virus.
- Check that the virus has not been re-introduced.

Getting Started

Read the sections that follow to familiarise yourself with the process and the options available for each action. Become familiar with the options so that you can pick the most suitable for a particular farm system.

Follow the flow diagram on the next page. The rest of this document expands on each element.

Beef Herd BVD Control Framework



Bulls

All bulls should be BVD virus tested negative prior to use. If PI they should be culled.

All bulls must also be vaccinated.

The Four-Step Process

The full Four-Step Process is for beef herds where all biosecurity risks can be mitigated.

1. Assess the BVD biosecurity of a beef herd.
2. Define the BVD status of a beef herd.
3. Actions to control BVD.
4. Monitor the BVD status of a beef herd regularly.

1 Assess the BVD Biosecurity of a Beef Herd

1.1 BVD biosecurity – beef

Becoming BVD biosecure involves setting up and implementing a set of preventative measures designed to reduce the risk of the virus being introduced to and spreading on the farm.

The three words **In**, **Out**, and **Over** can help jog your memory of the key biosecurity areas when talking to farmers.

Improving animals' immunity by vaccination is also a biosecurity measure, but for the purpose of this document vaccination has been separated from biosecurity. However, when formulating a control programme for a farm, it may be helpful to consider vaccination under the biosecurity umbrella.

1.2 How do you assess the biosecurity practices on a particular farm?

Fill out a "risk assessment" questionnaire with the farmer (Appendix 1 or 2).

You can choose between the full and the quick risk assessment questionnaire. The "full risk assessment" questionnaire has all the possible questions you may need to ask the farmer. It is designed to make sure nothing is left out and is the recommended questionnaire to use on the first few farms.

As you become more familiar with the questionnaire, you may find it simpler and faster to use the "quick risk assessment" version. In this version the questions are condensed, but you will need to expand the questions to make sure the farmer thinks of all the possibilities underlying them. Refer to the back of this questionnaire (Appendix 2) for help with this process. Also use your knowledge of what can happen on farm to help with this risk assessment. Depending on the farm/farmer, you may also find it necessary to travel around the farm, looking at the state of boundary fences, river floodgates, land slippages etc that could impact on biosecurity.

The key areas of biosecurity to concentrate on for BVD are:

In Cattle coming on to the property.

People coming on the farm, as well as their instruments and vehicles.

Out Cattle going off the property and returning pregnant at a later date.

Over Contact with neighbours' cattle.

1 Assess the BVD Biosecurity of a Beef Herd

1.3 What is the next step once the questionnaire has been completed?

The questionnaire will identify areas of good biosecurity practice and those that need addressing.

Concentrate on those that need addressing and explore each of them. Are there practical and cost-effective steps that the farmer can take to reduce the risk? If the risk cannot be reduced sufficiently, is there a way to detect a viral incursion early, before it can affect the herd?

For example, if direct contact between cattle across a boundary fence cannot be prevented, think about screening calves for PI before mating. Also consider vaccinating at-risk animals as a means of mitigating any risk. Cattle in the "Out" category are an obvious target group for potential vaccination.

If, after thoroughly exploring all the options, a biosecurity risk still cannot be rectified or mitigated, the only option for controlling BVD is full vaccination of the breeding stock before mating – go to step 3 (page 75).

In many cases it is advantageous to obtain an overview of the herd's BVD status before proceeding to vaccination. Knowing the herd's BVD status could influence the decision whether to vaccinate the breeding herd or not. If this is the case proceed to Step 2 "Define the BVD Status of a Beef Herd".

Supportive documents

Appendix 1: Full Risk Assessment for BVD Virus Introduction in Beef Herds

Appendix 2: Quick Risk Assessment for BVD Virus Introduction in Beef Herds

Appendix 3: Actions to Control BVD in Beef Herds – Checklist. This gives you most of the options for each of the biosecurity risk areas

2 Define the BVD Status of a Beef Herd

2.1 Define the herd's exposure level with a pooled serum BVD Ab test for each age group

This is the starting point for defining the BVD status of an age group of animals in a beef herd. The level of antibody in the serum is proportional to the herd's level of BVD exposure. Antibody is expressed as a sample to positive control (S/P) ratio: the higher the BVD Ab S/P ratio, the more antibodies are present in the pooled sample, indicating a higher prevalence of seropositive cattle in the group.

This test can only be applied to cattle older than 10 months once colostral immunity has waned.

To define the BVD status of a beef herd:

- Collect 15 random serum samples from each category of stock run separately on the farm. Sample just the cows in the cow-calf mob.
- Request that each group of 15 samples be pooled and a BVD antibody (Ab) test performed (pooled serum BVD Ab tests).
- If there is a group of calves less than 10 months old that have been reared separately from a young age, sample them individually for the virus. Refer to 2.1b.
- If a group has a positive result, proceed to 2.2.

2 Define the BVD Status of a Beef Herd

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2.1a Interpretation of results

- **S/P ratio <0.17**

  There is no evidence of exposure to the BVD virus in this group of animals.

- **S/P ratio 0.17-0.75**

  This group is unlikely to be currently infected. There is no need to search for any PI animals in this group, as the probability of finding one is low.

- **S/P ratio ≥0.75**

  This group is either currently infected or has recently been exposed to the virus. If control is the desired result and biosecurity can be ensured, the next step is to identify any PI animals in all the age groups of cattle on the farm.

  If eradication is not the desired result and/or biosecurity cannot be enhanced, proceed to "BVD Vaccination" on page 73.

2 Define the BVD Status of a Beef Herd

2.1b Defining the BVD status of calves less than 10 months old

In most beef herds, calves are run with cows until weaning, often at about eight months of age. If there is a PI calf present in the herd, the cows will have high antibody levels. High antibody levels in the cows could also be due to past BVD virus exposure and the infection has cleared. If the cow has low antibody levels, the calves will generally also have low antibody levels.

Note that:

- if calves have been removed from their dams shortly after birth (e.g. because they have been rejected or the cows have died or not had milk) and reared as in the dairy industry, their BVD status might be quite different from that of the cow-calf herd. In this situation, the removed calves need to be tested as a separate group.
- if the farm operates a very extensive system, there may not be enough contact between cows and calves for the cows' status to reflect the calves' infection status. In this case, all calves would need to be tested as well.

The antibody test is not suitable for calves due to the presence of colostral antibody. Each calf must be screened by taking either a blood or an ear notch sample and examining it for the presence of the virus. Polymerase chain reaction (PCR) and/or ELISA technologies are used for this purpose.

The decision on which sample to take and which test to request will depend on the relative importance of convenience and cost. However, as colostral antibody can interfere with the ELISA test on blood and ear notches it is important to wait until calves are older than 35 days of age before sampling.

2 Define by Screening the BVD Status of a Beef Herd

If a beef herd has good biosecurity, or biosecurity can be improved to a good standard, the next step in controlling BVD is to determine whether the farmer is willing and able to screen all cattle on the farm for persistent infection (PI) and remove them.

This is the most rapid way to become BVD free and includes testing calves before the start of mating, either in the season that control begins or in the next season to prevent further generations of PI (see 2.2a).

If clearing infection is not possible it is recommended that the breeding herd be vaccinated before mating. Refer to "BVD Vaccination: Herds known to be infected or of unknown BVD status" on page 74. The "BVD Vaccination" section outlines how strategic vaccination and testing can lead to a BVD-free herd over time.

2.2 Testing methods

Either blood or an ear notch sample is taken and examined for the presence of the BVD virus. PCR and/or ELISA technologies are used for this purpose.

The decision on which sample to take and which test to request will depend on the relative importance of convenience and cost. However, as colostral antibody can interfere with the ELISA test on blood and ear notches it is important to wait until calves are older than 35 days of age before sampling.

Transiently infected (TI) animals may return positive results. These animals will be non-viraemic 10-14 days later, and there is an option to retest in three or four weeks. A second positive result will confirm that they are PI, while a negative retest result will be consistent with a TI.

2 Define by Screening the BVD Status of a Beef Herd

2.2a Animals to test

To ensure all the PI cattle on the farm are identified, all the cattle on the farm must be sampled. For example, if there are PI cattle in the youngstock, testing just the mixed-aged cows will not be enough, and the converse may also be true. If cows are pregnant at the time of testing, the foetuses must be tested once they have been born but before the next mating period (see 2.2b).

Farms often have other cattle at times, such as dairy grazers, steers for meat, grazing cattle for friends/family, cattle for fundraising projects, bull calves and mature bulls for mating. If these animals have direct or indirect contact with any pregnant animal on the farm, they need to be screened for PI as well.

2.2b Testing next year's calves

If there are pregnant cows on farm at the initial screening, the resulting calves must be screened for the virus after they are born the following season – and because calves and cows are together on New Zealand beef farms, these calves must be tested well before mating to reduce the risk of BVD infection perpetuating. If it is not possible to test all calves before mating, it is important to consider vaccinating the breeding herd to prevent the next calf crop becoming infected.

3 Actions to Control BVD

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Choosing the most appropriate way to manage viral introduction risk will depend on the level of biosecurity practiced on farm.

If biosecurity is inadequate or cannot be improved to an acceptable standard, the only realistic way to control this disease is by vaccinating all the breeding stock every year before mating. Even if the herd is not currently infected, the risks of becoming so are significant due to factors such as stock trading, extensive boundary fences and problems in identifying stock. In addition, having even one cow produce a PI calf as a result of the virus being introduced has huge consequences, because there is a high (close to 100%) chance of the PI calf being kept and it will run with the herd during mating – leading to the further generation of PIs.

If biosecurity is poor, there is little point in determining the herd's BVD status. Just vaccinate.

There are other options available where biosecurity is good or can be improved to an acceptable level. They depend on the herd's BVD status:

- If the herd is clear of infection, annual monitoring while maintaining biosecurity is an option. However, if biosecurity standards slip, it will be necessary to vaccinate the full breeding herd.
- If the herd is infected:
  - All PIs (from breeding cows, heifers, calves, bulls, steers and unborn foetuses) are detected and removed, or
  - All breeding stock can be vaccinated to prevent a further generation of PI calves.

Both options should eventually lead to a clear herd, but the vaccination route will take longer as it will take some time for existing PIs in the herd and youngstock to be removed by attrition. Once the herd has been confirmed clear, the approach can revert to annual monitoring while maintaining biosecurity. Refer to Appendix 3.

Screening animals to find a PI is also an action to control. This has been covered previously on pages 70 – 71.

3 Actions to Control BVD

BVD Vaccination

A well managed and implemented vaccination programme is likely to significantly reduce the transmission of the BVD virus and the consequent production of PI calves in BVD-infected herds.

It will also limit the economic and animal health impacts of the virus being introduced to BVD-virus-free herds.

Vaccination therefore fulfils one of the objectives of on-farm BVD control by minimising the risk of BVD viral infection in susceptible (non-immune) cattle.

3.1 Integrating vaccination into a BVD control programme

Vaccination is likely to be a major part of any BVD control strategy in beef herds, because maintaining a good standard of biosecurity can be challenging.

Before deciding whether to vaccinate part or all of the herd, it is important to determine the level of animal biosecurity practiced on farm by going through the "risk assessment" questionnaire with the farmer. Explore ways to reduce any biosecurity risks it identifies, emphasising that improving biosecurity will help to control BVD no matter what the final chosen control strategy.

Successful vaccination must protect the foetus and therefore prevent PIs being born. To achieve this:

- The vaccine must be administered at a time and in a way that results in good immunity to prevent foetal infection during the first four months of pregnancy. Refer to the vaccine manufacturer's recommendations for this information.
- Only vaccines with a label claim for foetal protection must be used.
- The vaccination date and identification of all the animals that have been vaccinated must be recorded on a farm database.

Approaches to consider for clearing infection include:

- Vaccinating the breeding herd annually.
- Vaccinating the breeding herd for a few years, and screening all calves for the virus before mating.
- Testing all cattle on farm and removing any that are virus positive.

3.1a Herds where biosecurity is good or can be managed

Herds that are known to be clear of BVD infection

If there are no significant biosecurity issues (all cattle coming on farm are tested virus free, nose-to-nose contact with neighbouring cattle is unlikely, and any cattle that go off and return pregnant are fully vaccinated), it may not be necessary to vaccinate the whole herd. Instead, an annual monitoring programme (e.g. pooled serum BVD Ab tests) may be all that is required.

Where the biosecurity risk is limited to just one group of cattle (such as animals that go off the farm and return pregnant, or those that graze an area of the farm where they have contact with cattle of unknown BVD status), consider vaccinating just this specific group.

Herds known to be infected or of unknown BVD status

If the farm has good biosecurity practices, but the herd is known to be infected or has an unknown BVD status, the next step is to control or eliminate the impact of herd infection while maintaining biosecurity.

As most beef calves are kept and run with their dams throughout mating, there is a high risk of PI calves causing infections in pregnant cows – leading to more PIs. Any beef herd control programme must deal with this risk by either:

- screening all calves for the virus before mating and removing all PIs from the breeding herd immediately (see "Define the BVD Status of a Beef Herd" on page 67) or
- vaccinating all breeding stock to prevent further generations of PI calves.

Any failure to deal with PI calf propagation by one of these two methods poses risks to the success of the control programme.

When the herd is considered free of BVD based on negative results for a whole herd virus screen, or pooled serum BVD Ab tests have been low for a number of seasons, consider adopting the practices outlined at the top of this page.

3.1b Whole herd vaccination

Herds where there is a biosecurity risk that cannot be managed.

If a farm has inadequate biosecurity, whole-herd vaccination becomes an essential component of the BVD control strategy.

All cattle that become pregnant should be fully vaccinated before mating to prevent the generation of PI calves and further propagation of the BVD virus. Young, non-pregnant stock may also be vaccinated to prevent transient infection causing short-term disease and reduced growth rates. This procedure should continue annually until the biosecurity risk is minimised.

Once full vaccination has been decided on, the vaccination programme needs to be well managed and conscientiously implemented to achieve the best possible result (no PI calves born). All vaccinated animals should be recorded, including the vaccination dates.

3.2 Testing and vaccinating breeding bulls entering a beef herd

It is strongly recommended that all bulls entering a farm be virus tested negative every year – especially if full-herd vaccination does not take place.

Where bulls are used as sires, it is imperative that they be virus tested negative and fully vaccinated, irrespective of the herd's BVD or vaccination status.

3.2a Steps to take when buying bulls

Test all bulls for the BVD virus and confirm they are virus free before any contact with the herd – ideally before they arrive on the farm. Testing can be done at any age, as one negative test result proves that the bull is not PI. The tests can be done using:

- blood samples – tested by PCR or antigen ELISA*
- skin samples – tested by antigen ELISA.

If the vendor or agent states that the bulls have been tested and vaccinated, ask for a veterinary certificate for each bull as proof that it has been tested virus free and is not persistently infected (PI) and has been vaccinated. If this is not forthcoming, then either purchase from a different source where proof is provided or get the bull retested and revaccinated.

3.2b Why are PI bulls so dangerous?

- Bulls' mating behaviour means PI bulls are very effective at introducing the BVD virus to a property and spreading it throughout the herd.
- The timing of the introduction and spread can result in large numbers of PI calves being born the next season in non-immune herds.
- PI bulls are often sub-fertile.

**BVD Ag Elisa test is not used in animals under 35 days old.*

3.2c Testing and vaccinating breeding bulls entering a beef herd

Why is it strongly recommended to BVD vaccinate virus-negative bulls?

- protects them from the immune-suppression effects of the BVD virus if they get infected
- protects them from the negative reproductive effects of BVD infection
- prevents them bringing transient infection onto the farm if they are exposed shortly before arrival or during transport
- prevents them spreading transient infection on the farm.

An efficient, cost-saving procedure is to give the initial vaccination when sampling the bull for the virus, then the second injection four weeks later if the virus test is negative.

4 Monitoring the BVD Status of a Beef Herd

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4.1 Why monitor?

Monitoring a herd's BVD status annually is generally recommended once the status has been defined and control procedures put in place.

The purpose of this monitoring is to:

- Identify whether control procedures are improving the infected herd's BVD status.
- Detect as quickly as possible any new viral introduction in a non-BVD-infected herd to minimise its impact on the herd.

4.2 Monitoring methods

There are two main ways to monitor a beef herd's BVD status:

- Undertake a pooled serum BVD Ab test from 15 mixed-age cows.
- Determine young calves' virus status using skin or serum samples.

4 Monitoring the BVD Status of a Beef Herd

4.2a Undertaking a pooled antibody test from 15 mixed-age cows

In this monitoring method, sera collected at random from 15 mixed-age cows are pooled into one sample and tested for BVD antibody (a "pooled serum BVD Ab test").

This method is ideally undertaken in mid-spring, once most cows have calved and before mating. However, as this is unlikely to be practical on most farms, sampling at other times is satisfactory.

What is a significant increase in pooled serum BVD Ab S/P ratio?

A change in the pooled serum BVD Ab S/P ratio of >0.25 is considered interesting and may warrant further investigation. Smaller changes in the ratio (<0.25) in either direction are not considered significant and probably don't warrant further investigation.

What if there is a significant increase in pooled serum BVD Ab S/P ratio?

- Has the herd been vaccinated since the previous test?
- Have immune cows been bought or are the new entrant heifers immune?
- Has there been BVD infection since the previous test?

If the herd has not been vaccinated for BVD and cows have not been bought in, a new infection is the most likely reason for an increase in the pooled serum BVD Ab S/P ratio.

Virus screen all youngstock conceived between the two annual tests.

Screening youngstock has two results:

1. A positive test in one or more calves will confirm that the BVD virus was introduced to the breeding herd during the previous pregnancy.*
2. It enables the removal of any PI calf before it can cause more harm to the herd. If mating begins before PI calves are removed, action will be needed in the subsequent season.

** A failure to find a PI calf in this group does not rule out viral introduction to the breeding herd during pregnancy. For example, the PI could be a calf that has since died or been sold.*

4 Monitoring the BVD Status of a Beef Herd

4.2b Determining the virus status of young calves using skin or serum samples

In this monitoring method, all calves are screened for the virus during their first few months of life. This must be done before mating, so that any viral incursion resulting in the birth of a PI calf is detected and eliminated before causing potentially widespread infection during mating and the creation of more PI foetuses. Refer to 2.2.

4.2c Which monitoring test is best?

There are advantages and limitations for each method.

Pooled serum BVD Ab test – 15 mixed-age cows

Advantages

- It is simple and cheap and therefore relatively easy to sell to farmers.
- It will detect a new PI animal introduced to the farm earlier than the calf virus screening test provided the PI has access to the mixed-age cows.

Limitations

- An increase is not always due to viral introduction – see 4.2a.
- The test is unlikely to be sensitive enough to detect the exposure of one or two animals in the herd to a PI animal in a neighbour's herd. If such exposure results in the birth of a PI calf, calf virus screening has distinct advantages.
- Further testing is required to identify the PI animal.
- The test does not determine if the PI animal is in the herd or in another class of stock that has significant contact with the herd (e.g. the PI animal could be a calf of one of the cows or PI could be in a neighbour's herd).
- May only be effective if there is substantial contact between age groups on the farm.

4 Monitoring the BVD Status of a Beef Herd

Calf screening for virus before the start of mating

Advantages

- It directly identifies any PI animal, so it can be culled early – reducing the risk of more infection in the herd.
- It will detect the exposure of the herd to a PI in a neighbour's herd earlier than the pooled serum BVD Ab test, as long as the infected dam(s) produces a live calf.
- Calves that will go to sale when older have their status set early in life.
- Feed is not wasted on any PI calves, and the other calves' growth will be improved.

Limitations

- Access to calves before the start of mating is not possible in most beef herds.
- Unless the herd is very small, this test is more involved and much more expensive than the pooled serum BVD Ab test.
- It will not detect the introduction of a PI animal to the farm as early as the pooled serum BVD Ab test if the introduced PI animal is not a calf or does not have a calf, and the PI animal has exposure to the herd.
- Herd vaccination needs to be known to interpret the results of this test.