



BVD Control in Beef Cattle



BVD STEERING COMMITTEE

Working to free New Zealand cattle farms from BVD

BVD is one of the most important viral diseases of cattle in New Zealand.

Recent advances in testing have shown that BVD is a serious and widespread issue. We now know that at least 60% of dairy and beef cows have been exposed to BVD, which is causing significant production losses.

Estimates put the annual losses for our dairy farmers at around \$127 million, while for our beef farmers, the cost is around \$3000-\$9000 per 100 cows in infected herds.

Since 2005, the BVD Steering Committee has been an industry leader influencing BVD research, diagnostic testing developments and awareness of BVD. Our aim is to deliver best practice BVD information, management tools and resources to help cattle veterinarians and farmers make decisions that best meet the needs of individual farm situations.

This brochure has been developed to give farmers comprehensive information on the effects of BVD infection, and introduce some management options available to minimise the risk and impact of BVD on your cattle farm and business.

With the assistance of your veterinarian and their BVD Management Toolkit, you can now develop appropriate programmes to define, manage and monitor BVD on your farm.

BVD is not only a threat to individual farmers, but also to New Zealand's economy, which still depends on our primary sector for growth. Our aim is to ensure New Zealand's rural veterinarians and cattle farmers have all the information needed to effectively test for and control BVD.

Let's take action to control BVD on our cattle farms.



BVD STEERING COMMITTEE

Working to free New Zealand cattle farms from BVD

Overview statements

- Bovine Viral Diarrhoea (BVD) is widespread. Most beef herds in New Zealand have been exposed to this virus.
- It causes reproductive losses, an increase in general disease and reduced growth rates. Losses are estimated at \$3000-\$9000 per 100 breeding cows in an infected herd per year.
- Most of the BVD effects go undetected by the farmer.
- The disease is maintained in a herd and spread to other herds by persistently infected (PI) animals.
- PI animals excrete large amounts of the virus throughout their lives. This occurs when an early pregnant (fetus < 4 months old) naïve cow gets infected with BVD. The resulting calf is born PI.
- To control the disease, you must prevent the formation of PI calves by making sure that early pregnant cows do not become infected with the virus.
- Control is a 4-step process.
 - **Assess** the level of risk for your farm.
 - **Define** if BVD is in the herd.
 - **Action** a control plan to mitigate these risks.
 - **Monitor** to make sure it is working.Ask your vet to work through this with you.
- Controlling this disease will have many benefits for you and your stock.
- Vets have the tools to assist you to control this disease.

BVD – the most important viral disease of cattle in New Zealand

BVD (Bovine Viral Diarrhoea) is not an emerging or new disease, but like many diseases, with more knowledge and improved testing, the effects of BVD virus have become apparent. Recent New Zealand research has given a clearer picture of the role BVD virus plays in cattle production. BVD is a hidden disease preventing full production in a number of ways, often without attracting the attention of the farmer or vet.

The prevalence of BVD virus in New Zealand is now well defined:

- About **80%** of New Zealand dairy and beef herds have had exposure to BVD virus.
- At any one time, at least **65%** of beef herds have active virus infections.



What is BVD?

BVD infection in beef cows can cause reproductive wastage, weight loss and probably reduced milk yield. BVD also causes immune suppression, meaning cattle that have an active infection will be more likely to succumb to other diseases. BVD infection can have major impacts during mating and pregnancy. It can cause infertility, embryo loss, abortions (slips), small slow-growing calves, deformed calves, and the birth of dead calves. The most damage is done when BVD infects pregnant cows. If a cow contracts BVD in the first 4 months of pregnancy, she may give birth to a Persistently Infected (PI) calf. PI animals are the main source of infection within the herd.



The effects of BVD on your farm

Main effects of BVD

- ❑ Depressed herd reproductive performance.
- ❑ More cases of general disease in cows and calves (mastitis, scouring, pneumonia etc).
- ❑ Reduced growth rates in young stock.

BVD affects production throughout the farming year. Possible effects are listed as follows.

BVD effects during mating and pregnancy:

- Increased number of services required per conception.
- Increased time between calving and conception.
- Increased number of non-pregnant cows.
- Immune suppression can make cows more susceptible to other reproductive diseases e.g. Neospora abortion.
- Temporary infertility in bulls caused by transient BVD virus infection.
- Cows infected with BVD virus during the first 4 months of pregnancy can give birth to a PI calf. This may result in a large number of PI calves if exposed cows are naïve.

BVD effects during calving:

- Increased calving spread owing to failure of conception and fetal losses.
- An unexpected number of empty cows owing to abortion.

Calf effects and losses due to:

- Abortions and premature births.
- Stillbirths.
- Birth of weak or dummy calves.
- Congenital birth defects.
- Birth of PI carrier animals.
- Poorer subsequent fertility in heifer calves infected in later pregnancy.
- Birth of small calves with poor growth rates.

BVD effects on young stock:

- Reduced appetite.
- Scouring.
- Rough coat and a loss of body condition.
- Poor weight gain.
- Coughing.
- Ulcers in the mouth.
- Premature death of PI animals.
- Calves that are generally more difficult to rear and get to weight targets.

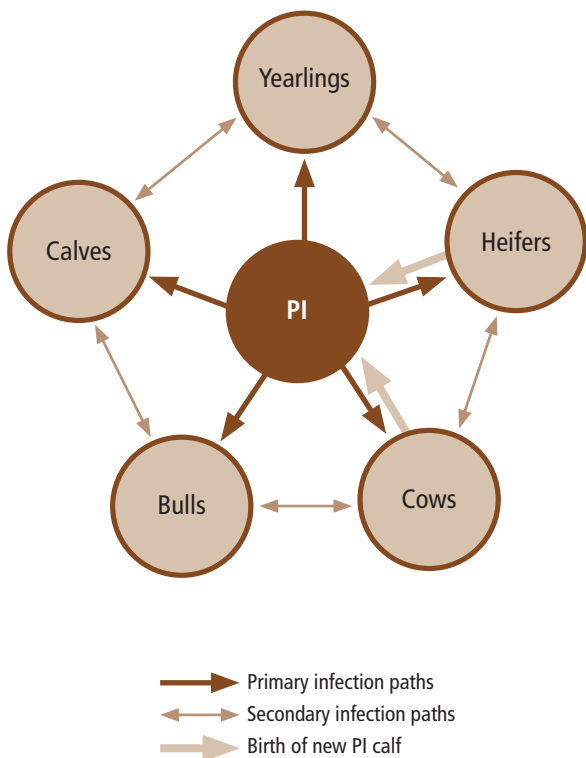
How does BVD behave in beef herds?

BVD behaves differently in beef herds from the way it does in dairy herds. In dairy herds, calves – including PI calves – are removed from their mothers, only to return to the milking herd a couple of years later. This leads to a regular cycle of re-infection every few years. But in beef herds, calves and cows are kept together. This allows a much more dynamic spreading of the disease, back and forth between younger and older animals. This means that PI animals can be in constant contact with susceptible new calves, replacements, bulls and the breeding herd.

The presence of a PI calf in a beef breeding herd can have devastating effects. This is because calves are at foot with cows at the stage of pregnancy when the cows are most susceptible to the effects of BVD infection. The calf spreads millions of viruses every day and can infect many cows, causing early fetal loss or the development of even more PI calves.



BVD virus circulation in a beef herd



Persistently Infected (PI) animals

As the name suggests, a PI animal is an animal that continuously sheds the BVD virus all its life. PI animals result from infection as a fetus (in the uterus) during the first 4 months of gestation. This is the period of time during which the immune system of the fetus is still not sufficiently developed. The calf becomes immune tolerant to the virus, meaning that it does not recognise the virus as something 'foreign'. A PI animal cannot produce antibodies to BVD virus and won't respond to vaccination.

A PI animal is always born that way and never created after birth. After birth, the PI calf becomes a continuous shedder of the virus all its life and is the key component in the spread and continuation of this disease. PI animals often die at a relatively young age from their infection (often called Mucosal Disease) or from other secondary diseases such as pneumonia.

On average 50% of PI cattle die before they are 2 years of age. However, some survive a lot longer and act as long-term carriers of BVD virus, continuing to infect the other animals in the herd. Although some PI animals are sickly or small, others appear normal and do not show signs of illness, and can only be diagnosed by being tested. They can breed successfully but their progeny are always PI, thus continuing the disease in the herd. Surviving PI animals make up less than 1% of the adult cattle population.

PI animals are the most important source of infection for other cattle on a farm.

Key points about PI animals

- ❑ PI animals are always born. They are never created after birth.
- ❑ They are the main source of infection on farm because they are a 'virus factory' and spread large amounts of virus for their entire lives. Control them and you control the disease.
- ❑ They have much higher death rates than non-PI cattle.



Transiently Infected (TI) animals

Most animals that become infected with BVD virus for the first time will develop a transient infection. The only animals that don't are fetuses that are less than 4 months of age (in utero). As defined above, these become PI animals.

A transient infection is a BVD infection that lasts for about 2 weeks and is followed by a strong immune (antibody) response that usually lasts for several years. These animals remain immune to further infections for several years. All cattle that become infected with BVD virus will develop a transient infection as long as they are a fetus older than 4 months. For example, BVD infection of a 180 day fetus or 6 month calf or adult cow can only result in a transient infection. A naïve cow that is 60 days pregnant will become transiently infected (TI) when exposed to BVD virus, whereas her fetus will be born PI if it's not aborted.

Transient infection is the most frequent infection type in a herd. The greater the number of TI animals in a herd, the greater the economic effects. TI animals may pass the virus on to naïve animals; however, they are only a minor source of infection relative to PI animals. This is because TI animals shed only small amounts of virus, and only for a short period of time.

Key points about TI animals

- Transient infections occurs in all cattle infected after the 4th month of gestation (4 month old fetus).
- Transient infection in early pregnant cows is the main way that PI animals form. The only other way a PI animal is formed is when a PI cow gives birth to a PI calf.
- Once an animal recovers from a transient infection, it will be immune to further infection for several years.
- TI animals may be a minor source of infection for other cattle.



How does BVD spread?

PI animals continuously shed millions of viruses through their skin, saliva, nasal secretions, semen, milk, urine, faeces etc. They are 'virus factories'.

Direct animal-to-animal spread is the most common way an animal becomes infected. This can be via semen, milk, saliva, urine, faeces, placenta and birth fluid. The indirect spread of BVD virus through communal stock yards, stock trucks and carried around on footwear etc. is possible but less common than direct animal-to-animal spread.

The virus is quite fragile outside the animal, but in ideal circumstances it may be able to survive in the environment for a week. It has also been shown experimentally that the airborne spread of the virus can be up to 10 metres, so the virus can infect naïve cattle through and over neighbours' fences.



The cost of BVD Virus

As knowledge about BVD increases both in New Zealand and internationally, researchers and scientists have been able to estimate the cost of BVD in beef herds.

BVD virus infection is widespread in New Zealand beef herds (with approximately 65% of herds having active infections), much higher than in dairy cattle.

A study of the effects of reproductive diseases found that between mating and pregnancy testing, BVD had the effect of reducing overall pregnancy rates by an average of 5% in herds that had active virus infections. Data also suggests that about 2% of New Zealand beef herds will experience a decrease in pregnancy rates of at least 15% due to BVD. These figures do not include abortions that may have been caused by BVD virus.



Cost to an average beef herd per 100 cows

Assume weaner heifers and steers average \$400 each, and the replacement cost of an empty cow is \$200.

Loss of weaners (5 x \$400)	\$2000
Replacement cost of empty cows (5 x \$200)	\$1000
Total cost/100 cows/year	\$3000 5% empty rate
Total cost/100 cows/year	\$9000 15% empty rate

These figures do not take into account the effect of BVD in calves and the cost of immune suppression, ill health and reduced growth rates.

Key points on the cost of BVD

- BVD infection impacts economically on many areas of a beef enterprise.
- Individually these effects are usually too small to be noted by the farmer.
- Collectively, they add up to a significant cost to the farm.

BVD Control

Every beef farm is unique, therefore there is no universal BVD control programme that 'fits' all farms.

It's highly recommended that a risk assessment analysis be carried out with a vet who has been trained in BVD management before a management plan is put in place, and that you work closely with this vet whilst implementing and monitoring the plan to ensure it has a successful outcome.

The control measures implemented must be practical and sustainable both financially and physically. They must also significantly reduce or limit the economic, animal health and welfare effects of BVD virus on the farm.

Setting up a BVD control programme on an individual farm is a 4-step process:

- 1 Assess** BVD biosecurity status of the beef herd.
- 2 Define** BVD status of the beef herd.
- 3 Action** the most appropriate control plan for your farm.
- 4 Monitor** BVD status of the beef herd regularly.

1

Assess BVD biosecurity status of the beef herd

Becoming BVD biosecure involves setting up and implementing steps to limit the risk of the virus being introduced to and spreading on the farm. The three words **In**, **Out** and **Over** cover the key biosecurity areas.

In

Cattle coming on to the property, including their fetuses. People coming on to the farm as well as any contaminated equipment and vehicles.

Out

Cattle going off the property and returning pregnant at a later date – e.g. heifers grazing off the farm.

Over

Contact with neighbours' cattle across the boundary fences.

Fill in a risk assessment questionnaire, which will identify all the biosecurity risks on your farm (see the example opposite).

Concentrate on the biosecurity risks that need addressing and decide whether there are practical and cost-effective steps that can be taken to reduce the risks. If the risks 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 animals before mating. Also consider vaccinating at-risk animals as a means of mitigating any risk.

If, after thoroughly exploring all options, a biosecurity risk still cannot be rectified or mitigated, the only option will be full vaccination of the breeding herd before mating.

Even if it is decided to implement a full herd vaccination policy, it is still recommended that you define the BVD status of the herd.

Quick risk assessment for BVD virus introduction in beef herds

- 1 **In** Do any untested or pregnant (tested or untested) animals ever come on to the property (e.g. grazing stock, cows, heifers, calves, bulls, freezer beasts)?
Yes ☐ No ☐
- 2 **Out** Are any heifers, cows or carry-over cows away from the home farm during pregnancy?
Yes ☐ No ☐
- 3 **Over** Is contact possible between your cows and cattle from other farms, such as a neighbour's?
Yes ☐ No ☐
- 4 Do you vaccinate for BVD?
Yes ☐ No ☐

If yes, which age group(s)?

If any of questions 1, 2 or 3 are answered yes, this herd is at risk of introducing BVD virus if steps are not taken to mitigate this risk.

Discuss a BVD management plan with your vet.

2

Define BVD status of the beef herd

The purpose of this step is to determine if the herd is currently infected with BVD. This information has a bearing on the type of control plan that is devised for your farm.

To define the BVD status of a beef herd:

1. Get your vet to collect 15 random blood samples from each category of breeding stock run separately on the farm. Just sample the cows, not their calves.
2. Your vet will request that a pooled BVD antibody test is performed on each group of 15 samples.
3. Groups of calves less than 10 months of age that have been reared separately need to be sampled for the virus. Your vet will advise you on this.

The level of antibody in the blood sample is proportional to the level of BVD exposure in the herd. Antibody is expressed as an S/P ratio; and the higher the S/P ratio, the more antibodies present in the pooled sample, indicating a higher prevalence of infected or previously infected cows in the herd.

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

Your vet will be able to guide you on the interpretation of the S/P ratio.

If eradication is not the desired outcome and/or biosecurity cannot be enhanced, proceed to a BVD vaccination programme.

3

Action the most appropriate control plan for your farm

The goal of the plan is to put steps in place to minimise the risk of early pregnant cows or heifers becoming infected with the virus, leading to the birth of PI calves. PI animals are the main source of infection and the main mechanism for maintaining infection within a herd. Removing any PI animals and preventing PI animals forming or entering the property is a major component of controlling BVD.

There are basically 3 types of action available to help prevent PI animals being born or entering the herd:

1. Test incoming untested animals (including bulls and calves born on the property) for the virus and cull any PI animals identified.
2. Vaccinate cows and heifers with a fetal protective vaccine to protect them during their pregnancy and vaccinate bulls used for mating.
3. Change management practices to reduce the risk of virus introduction or pregnant cow exposure. For example, prevent direct contact between untested trade cattle and the breeding herd (cows/heifers).

For each of the risks identified by the risk assessment questionnaire, consider if one or more of these options is practical for your situation.

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, with a fetal protective vaccine.

This also applies to herds not currently infected, if the risks of becoming infected are significant owing 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 chance of the PI calf being kept and it will run with the herd during mating, leading to the further generation of PI animals.

If biosecurity is adequate or can be improved to an acceptable level, the following options can be considered.

- If the herd is clear of infection, carry out annual monitoring while maintaining biosecurity. However, if biosecurity standards slip and cannot be improved, it will be necessary to vaccinate the breeding herd.
- If the herd is infected:
 - Detect and remove all PI animals (from breeding cows, heifers, calves, bulls, steers and unborn fetuses) or
 - Vaccinate all breeding stock with a fetal protective vaccine to prevent a further generation of PI calves.

As long as good biosecurity is maintained, both options should eventually lead to a clear herd. The vaccination route will take longer as it will take some time for existing PI animals in the herd and young stock to be removed by attrition.

Work closely with your vet to develop an action plan that will work on your farm.

Herd vaccination as a means of control

A well managed and implemented vaccination programme is likely to reduce viral transmission and the consequent production of PI calves in BVD-infected beef herds. It will also limit the economic and animal health impacts of viral introduction to BVD virus free herds.

For vaccination to be useful as part of a BVD control programme, it must provide protection of the fetus and therefore prevent PI animals being born. In order to achieve this:

1. To ensure fetal protection is provided during the first 4 months of pregnancy, the vaccine must be administered at the correct time. Refer to the vaccine manufacturer's recommendations for this information.
2. Only vaccines with an approved label claim for fetal protection must be used.
3. The date of vaccination and the identification of all animals that have been vaccinated should be recorded on a farm database.

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 of, or the entire herd, it is important to determine the level of biosecurity practised on the farm by going through the 'risk assessment' questionnaire with your vet. Explore ways to reduce any biosecurity risks it identifies that will help to control BVD, no matter whether a whole-herd BVD vaccination programme is opted for or not.

Where the biosecurity risk is limited to one group of cattle e.g. animals that go off the farm and return pregnant, consider just vaccinating this group if the biosecurity risks are minimal for the remaining breeding stock.

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

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

4

Monitor progress

Once the control plan has been put in place it's very important to monitor progress for 2 reasons:

1. To identify whether control procedures are improving the infected herd's BVD status. In other words, is the plan working?
2. To detect as quickly as possible any new viral introduction in an uninfected herd to minimise the impacts on the herd.

There are 2 ways to monitor a herd's BVD status:

1. Do an annual pooled blood antibody test from 15 mixed-age cows.
2. Determine the virus status of the replacement calves using skin or blood samples.

There are benefits and limitations for each of these monitoring methods and the best approach for your farm needs to be worked out with your vet.

This section provides more detail about some of the steps to control BVD

Defining and monitoring the BVD status of your herd using the pooled antibody test on blood samples from 15 mixed-age cows

This is a simple, inexpensive test that can be used to both define and monitor the BVD status of your beef herd, but preferably more than 3 months after vaccination.

- To do this test, ask your vet to bleed 15 randomly selected mixed-age cows. This can be done at any time of the year.
- A S/P ratio greater than 0.75 indicates that the herd is infected or has been exposed in the last few years.
- A S/P ratio less than 0.75 indicates that the herd is virus free and has been for many years.
- If the test is used as an annual monitor, a change in value (S/P) of more than 0.25 warrants further investigation. Possible reasons for this increase include:
 - Some or all of the herd has been vaccinated since the previous test.
 - Immune cows have been bought or immune heifers have entered the herd.
 - There has been BVD infection since the previous test.

Dealing with bulls that are used during mating

Test and vaccinate bulls

It should be farm policy that all breeding bulls are tested for BVD virus (this is a single lifetime test), and if negative, vaccinated (twice, 4 weeks apart initially, then annually).

A PI bull can have a serious impact on reproductive performance in 3 ways:

1. **Non-venereal spread of the virus to other bulls and cows.**
2. **Venereal spread of the virus in the semen.**
3. **Poor semen quality.**

In particular, the introduction of a PI bull to a naïve herd at mating may have a devastating effect on herd fertility and result in a large number of PI calves.

Testing for the virus

All untested bulls that are going to be used for breeding need to be tested for BVD virus by using either a blood or a skin test. Blood samples from a large number of bulls can be tested using the pooled BVD PCR virus test to reduce cost. Discuss the best option with your vet.

A positive test result usually means the bull is a PI. Occasionally it may be a TI. A follow-up positive virus test result from a blood sample collected 3-4 weeks later will confirm that the bull is a PI and must be culled. A follow-up negative virus test result 3-4 weeks later will confirm that the bull was TI and may be suitable for breeding.

However, the BVD virus infection may cause poor semen quality resulting in poor fertility. As the semen production cycle is about 8 weeks, a TI bull may not be suitable for breeding in that season.

Vaccinating bulls

BVD virus negative bulls must be vaccinated prior to mating to prevent transient infections and immune suppression. A transient infection can result when an unvaccinated BVD virus negative bull is exposed to the virus either before or after being joined with heifers or cows at mating.

It is best practice for bulls to be vaccinated when they are tested to limit the risk of BVD virus negative bulls becoming a TI. Vaccination should be completed at least 2 months before use so that the bull cannot become a TI within 8 weeks of mating and affect semen quality.

Previously unvaccinated bulls require **2 vaccinations** 3-4 weeks apart followed by a single **booster** at least 2 weeks prior to mating every year after that. (Refer to the manufacturer's recommendations.)

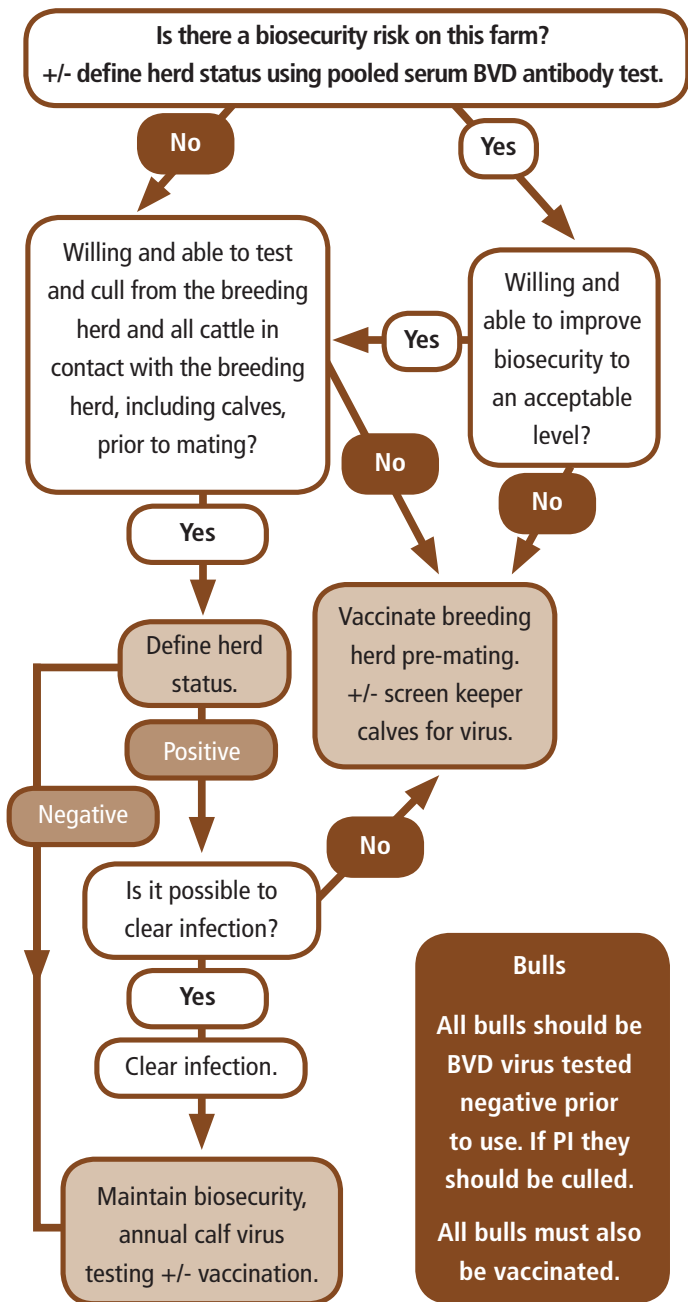
Vaccination will not have any effect on a PI bull, so testing is essential.

Certification

Bulls should be certified BVD virus negative and vaccinated as best practice.

When purchasing bulls it's recommended that a signed official certificate be sighted as proof that the bulls are virus negative and have been vaccinated twice 3-4 weeks apart. If not, the purchaser will need to get the bulls tested and vaccinated before use.

Beef herd BVD control frame work



Quick risk assessment for BVD virus introduction in beef herds

Name

Date

Address

Vet

Herd Size

1 In Do any untested or pregnant (tested or untested) animals ever come on to the property (e.g. grazing stock, cows, heifers, calves, bulls, freezer beasts)?

Yes ☐ No ☐

2 Out Are any heifers, cows or carry-over cows away from the home farm during pregnancy?

Yes ☐ No ☐

3 Over Is contact possible between your cows and cattle from other farms, such as a neighbour's?

Yes ☐ No ☐

4 Do you vaccinate for BVD?

Yes ☐ No ☐

If yes, which age group(s)?

If any of questions 1, 2 or 3 are answered yes, this herd is at risk of introducing BVD virus if steps are not taken to mitigate this risk. Discuss a BVD management plan with your vet.



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Produced in partnership with



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Animal Health