BVDV

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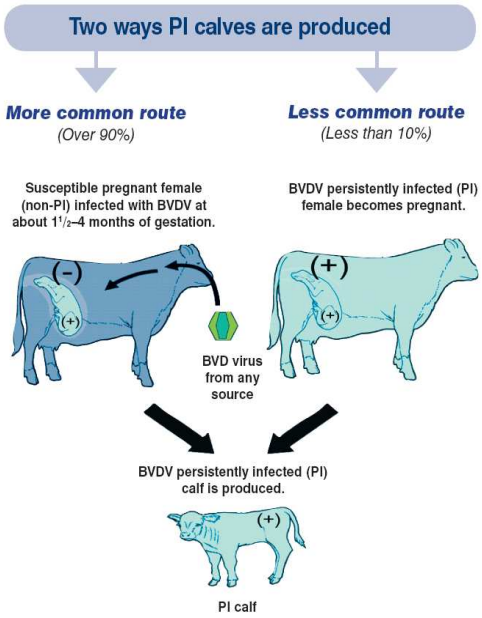
Bovine Viral Diarrhoea Virus (BVDV) has been demonstrated from international trial work from all corners of the globe to cost beef and dairy producers between $15 and $100 per breeder per year in production losses, predominately due to its reproductive impact and immunosuppressive capability. How could a virus capable of so much attributable loss be so poorly understood?

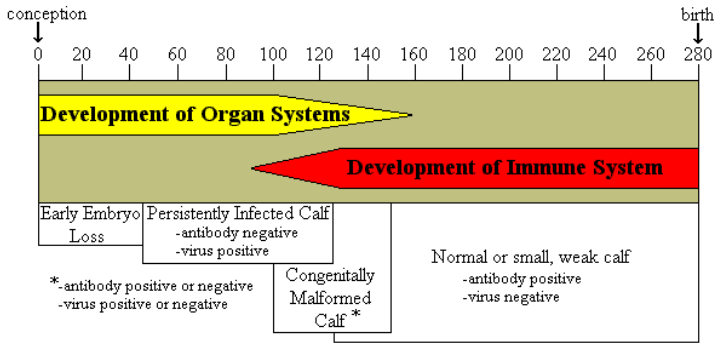
Persistently Infected, or "PI", animals constantly shed massive quantities of the BVDV virus and thereby act as the primary vector for BVDV transmission, not only on farm, from generation to generation, but also between production systems. Understanding how PI's come to exist is paramount to understanding how BVDV is propagated and may provide insight into its unpredictable nature.



PI animals themselves were exposed to BVDV whilst they were still gestating. Either their dam was a PI herself, or their dam was exposed to the virus for the first time whilst pregnant with them. If an unborn calf is exposed to the virus between approximately one and four months of gestation their developing immune system mistakenly assumes that the virus is "normal" and the calf's immune system will never make any attempt to defend against or control the virus. They are born *Persistently* Infected.

PI calves shed tremendous amounts of virus, for their entire, though typically shortened lives. If a PI exposes a normal, non-immune animal, the animal will become viremic, or sick with the virus, however their immune system will usually neutralize the virus and the animal will return to relative normalcy within a couple of weeks. This sort of infection is referred to as *Acute* or *Transient* infection. Animals which have been acutely infected with BVDV do not become *persistently* infected, instead their immune system clears the virus and they become immune to BVDV. Occasionally acutely infected animals will show outward signs of illness as a direct consequence of their BVDV infection, though usually uncomplicated BVDV infection is mild. However, most animals infected with BVDV will suffer varying degrees of immune dysfunction reducing their ability to fend off other infectious agents for up to a couple of months. Acutely infected animals are capable of further spreading the virus to other animals, however they are estimated to only shed between 1,000 and 10,000 viral particles per ml of secretion for approximately 10 days during their infection. A Persistently Infected animal, on the other hand, will shed on the order of 1,000,000 to 10,000,000 viral particles per ml of secretion for its entire life. Without the presence of Persistently Infected animals the BVDV virus simply ceases to propagate in most situations.

Whilst BVDV exposure outside of the 1st to 4th month of gestation won't produce another PI, exposure to the virus at any stage of the reproductive cycle can have serious financial consequences. BVDV has been shown to significantly impair ovarian function, reducing conception rates directly. Animals exposed within the first 30 days of pregnancy usually suffer early embryonic death. Animals exposed from three and a half months to five months may be born with congenital defects, especially of the eyes and central nervous system. Finally, abortion or stillbirth is a risk at any stage of pregnancy.



Immuno-suppression associated with BVDV has been measured and shown to reduce performance attributable to its catalyst like effect in other disease processes. In a Canadian study, researchers found that the presence of a PI in a group of paddock reared calves reduced weaning weights by 14 kgs. A Kansas Feedlot consultant, in a trial involving over 20,000 feeder steers demonstrated a reduction in profitability of $67.49 per feeder animal co-fed with a PI calf compared to pens without PI exposure. Norwegian veterinarians demonstrated a 7% increase in mastitis in dairy herds with BVDV exposure over those without exposure. New Zealand dairy data demonstrated a 25% increase in Somatic Cell Counts in dairy herds with active BVDV compared to herds with low or no BVDV infection. Similar literature exists in abundance in international literature, however, little has been done in Australia to date.

Many Australian producers are still unaware of BVDV. Some producers have only become aware of the virus after having suffered a "Wreck". For a "Wreck" to occur, a PI must come in contact with a group of animals lacking protective antibodies to the virus. Wrecks can occur commonly, not just on BVDV free farms suffering a PI introduction, but on endemically infected farms wherein different management groups have been commingled. BVDV can often seem to lie "dormant" in a herd only to flare up sporadically in closed herds. Older management groups on endemically infected farms tend to be predominately antibody positive from past exposure to the virus. As these older mobs age any PI's tend to have either been culled or died out. Each year, these old PI-free cow mobs produce a crop of calves which have been reared without exposure to a PI and lacking any protective antibodies. If these susceptible animals are boxed with a PI at an inopportune time, a "wreck" can occur.

A client of mine boxed 335 of his pregnancy tested in calf heifers with a mob of 1st calvers and their calves. All of the adult PI's had died out in the older mobs on the farm, producing groups of replacement heifers without BVDV exposure or immunity. However, one of the 1st calvers and her calf were a PI. Mixing the two mobs together during early pregnancy precipitated a true "wreck". 50 of the heifers never calved with many observed abortions. 50 more calves died prior to weaning of scours and other apparent ailments. Of the remaining 240 calves, an incredible 120 of them were PI's. Those PI's that were salvageable were marketed, the remainder were destroyed.

Where there are PI's there is production loss. The amount of loss can vary significantly from year to year, but I am certain that the averaged annual cost is far more than most Australian producer would be comfortable with. If PI's are in your herd, you are losing money. What can we do about it? A systematic approach is the key to dealing with any infectious agent. Working closely with your veterinarian will help you to turn this disease around. BVDV is reasonably difficult to understand, but relatively straightforward to control.

Step 1: Antibody Screening

If your herd is unvaccinated and has antibodies to BVDV, especially in young stock, then it has been exposed to the virus. If some of the animals have been exposed to BVDV then they have likely been exposed to a PI. If a fair proportion of animals have been exposed to BVDV then the PI is likely to be one of your own.

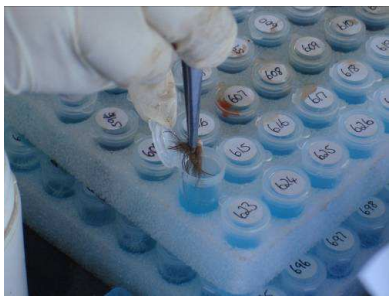
Plan: Bleed 6-10 animals from each of the two youngest management groups and from the older cows.

If you don't appear to have BVDV on your farm then you should lend serious consideration to vaccinating your entire herd. Further you need to pay strict attention to biosecurity (covered later).

If you have BVDV on your farm, let's do something about it! A systematic approach utilizing vaccination, PI removal, and ongoing biosecurity will rid your farm of the virus, protecting you from sporadic "wrecks" and improving your bottom line.

Step 2: PI Removal

PI animals are the primary vector for transmission of the virus. Their presence will confound attempts to control the disease. Identifying and removing PI's especially in the most at risk management groups is paramount to success. Whilst there are many ways of identifying PI's, the simplest technique is ear notch testing. PI's have tremendous amounts of virus in their peripheral tissue, allowing a small bit of ear, such as from ear marking to serve as a usable sample. Ear notch testing has an advantage over some blood based tests as it can be performed on animals at any age, unlike other testing modalities which can be interfered with by maternal antibodies from colostrum. We at Swans Veterinary Services have established the first commercially available laboratory in Australia to test ear notch tissue for Persistent Infection. We utilize the IDEXX BVDV HerdChek Antigen Capture ELISA in our own purpose built laboratory and have tested over 50,000 samples working with over 100 different veterinary clinics throughout Australia.



Plan: Whilst blood testing suggests PI's are present in your herd, prior to joining, test all animals that will have opportunity for contact with pregnant animals.

Step 3: Biosecurity

Biosecurity is paramount to control of BVDV. Preventing the introduction of PI's, cows carrying PI's and allowing acutely infected animals to overcome BVDV is the goal of biosecurity measures. Acute infections usually only last a couple of weeks. Quarantining all introductions for a month after entry will reduce the likelihood of introducing acute BVDV and other transient diseases. All introductions should be tested to confirm that they are not a PI upon arrival. The most common means of introducing BVDV to a herd is through the purchase of "Trojan Cow", a healthy preg tested in calf female carrying a PI calf. All pregnant animals should be tested on arrival and their offspring tested as soon as possible after birth before being allowed to be introduced to the rest of the population. Animals which were pregnant and exposed to other animals, such as animals returning from shows, should be treated as introductions. Quarantine them for 30 days and test their progeny at birth. Defending your farm from reintroduction isn't difficult, but it does require attention. One of my own producers cleaned up his entire farm only to go on to purchase a $4,000 PI bull.

Plan: Quarantine all introductions to the farm for 30 days after arrival and test them to confirm they are not PI. Test any pregnant animals at arrival, and test their progeny at birth before being allowed to commingle. Treat show animals or any other home reared animals which have been off farm as introductions. Quarantine them and test their progeny when they calve if they were pregnant.

Step 4: Vaccination

Vaccination with Pestigard will help to prevent acute transmission of the virus, will protect against biosecurity breaches, and fend off virus brought in by contaminated equipment or visitors. Further if reintroduction of a PI does occur, a sound vaccination program will significantly reduce the PI's impact. A primary course of two vaccinations no less than four weeks apart but no further than six months apart is required to initiate initial immunity. Thereafter an annual booster is required. I recommend primary vaccination two and a half months prior to heifer joining, a booster one month prior to joining, then an annual booster thereafter, either 2 weeks prior to calving or one month prior to joining. Annual boosters at pregnancy testing is acceptable, though suboptimal.

Active immunisation with Pestigard® is an effective and economical solution to controlling BVDV

	Heifers		Cows*	1st Season or New Bulls		Bulls*
Schedule	Primary Course		Annual Booster	Primary Course		Annual Booster
Timing	1st Dose: 6-8 weeks pre-joining	2nd Dose: 2-4 weeks pre-joining	2-4 weeks pre-joining	1st Dose: 6-8 weeks pre-joining	2nd Dose: 2-4 weeks pre-joining	2-4 weeks pre-joining
Farm Management Flexibility	1st Dose may be given up to 6-months pre-joining		May be given at pregnancy testing or branding. Pregnant cows can be vaccinated†	1st Dose may be given up to 6-months pre-joining		
Pestigard®	✓	✓	✓	✓	✓	✓

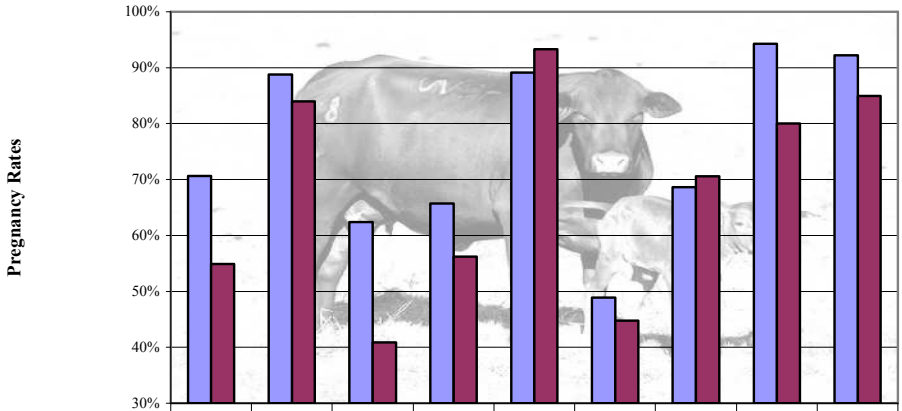
Protective immunity is expected to develop within 14 days of the second dose.

**Previously unvaccinated cows and bulls will require a primary course of vaccination consisting of two doses of vaccine, with an interval of 4 weeks - 6 months between doses. The primary course of vaccinations should preferably be completed 2-4 weeks prior to joining/insemination.*

† If a cow is pregnant with a PI calf, vaccination will have no effect on the status of the PI calf.

Pestigard has proven efficacy. In our own trial work we administered two doses of Pestigard to a proportion of heifers prior to joining from 8 different Esperance properties. The vaccinated proportion of heifers had a 15.9% better conception rate than the non-vaccinates.

Effect of Vaccination of Heifers with Pestigard upon Pregnancy Rates



	1090/566	116/50	593/335	35/16	74/30	45/29	102/51	35/15	90/40
Vaccinates	70.64%	88.79%	62.39%	65.71%	89.19%	48.89%	68.63%	94.29%	92.22%
Non-Vaccinates	54.95%	84.00%	40.90%	56.25%	93.33%	44.83%	70.59%	80.00%	85.00%

Number of Vaccinates/Number of Nonvaccinates

Plan: Initiate a Pestigard vaccination plan, either over the entire herd, with young stock, or guided by antibody testing. Primary vaccinations 2.5 and 1 month prior to joining, then annual boosters as appropriate for management.

Systematic Control:

Following are the two basic control strategies which I advocate for controlling BVDV. Optimally, as outlined in the first option, all PI's are removed from the farm prior to joining. However, many of my clients are too busy to handle calves at foot prior to joining, so we have developed the second option which I feel will be successful, however over a longer term. Once a producer has rid their farm of PI's and hence BVDV exposure, ongoing biosecurity and vaccination are important to maintain BVDV freedom.

Option 1: (European-based eradication strategy, best for seedstock herds)

- Ear notch test all calves.
    - Ear notch test dams of all positive calves.
- Ear notch test cows without calves.
- Ear notch test all replacement heifers.
- Ear notch test all bulls.
- Vaccinate all animals soon to be joined, including bulls.
    - Option: Only vaccinate younger reproducing females such as heifers, 1st calvers, etc. to extent believed necessary either from serological data or from intuition. (On endemically infected farms, older animals are more likely to have antibodies from natural exposure.) (Speak with your veterinarian.)
- Annual boosters to all vaccinated animals.

Option 2: (Often the best option for busy commercial operations)

- Ear notch test all replacement heifers.
- Ear notch test all "poor doing" calves at marking.
    - Ear notch test mothers of all positive calves.
- Ear notch test all young bulls.
- Vaccinate all replacement heifers and young bulls
- Annual boosters to all vaccinated animals
- The following year give boosters to last years heifers and bulls and ear notch test and vaccinate any new heifers and bulls. Over time our efforts should result in a PI free and completely vaccinated herd.

PI's are the primary vector for BVDV transmission. Their ability to continually shed the virus at massive levels for their entire lives has proven an exceptionally successful adaptation to ensure the propagation of the virus from year to year in most endemically infected Australian herds. However, this adaptation is also the virus's Achilles heel, as we now have the technology to easily test for them and efficacious vaccines to help protect their potential victims.

Over 70% of Australian farms are actively infected with BVDV. Australia did not have the tools to successfully manage BVDV. We now have the tools! What are we waiting for?

For further information please feel free to contact Dr. Bergman at enoch@swansvet.com or reach him at 0427 716 907.