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Contract session: BVD bulk milk testing

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Introduction

Bovine Viral Diarrhoea (BVD) is a highly prevalent and infectious viral disease found in cattle in New Zealand, and in many other countries around the world. It is a widespread disease and it is estimated that up to 60% of NZ dairy and beef cows have been exposed to BVD (BVD Steering Committee 2017, <http://www.controlbvd.org.nz>).

The BVD virus (*pestivirus*) has damaging effects on the health, reproductive performance, growth, and productivity of a dairy herd and sometimes causes death. The production losses are significant; estimated annual losses for NZ dairy farmers are around \$127 million. The cost for our beef farmers is around \$3000-\$9000 per 100 cows in infected herds (BVD Steering Committee 2017, <http://www.controlbvd.org.nz>). BVD is a serious threat to our farmers, but also to New Zealand's economy.

If an early pregnant (less than four months pregnant) naïve (no previous exposure to BVD, so very little natural immunity to infection) cow becomes infected with BVD, the resulting calf is born persistently infected (PI). BVD may also result in abortions, still births, deformed calves and repeat breeding. PI calves are usually ill-thrifty and have poor immunity and may develop mucosal disease, a highly fatal form of BVD (Ames 1986). There are however, a significant proportion of PI calves that appear normal and healthy and will go undetected, spreading virus to susceptible animals.

The disease is maintained and spread to other herds via PI animals which spread enormous amounts of virus constantly throughout their lives. The virus is spread among animals through all bodily fluids (saliva, urine, faeces, mucus, milk and on occasion semen and embryos), but most often through nose-to-nose contact and mating. There is no cure for a PI animal and early culling is strongly recommended.

Prevention of early gestation cows from becoming infected with BVD virus, thereby preventing PI calves, is the most important step towards control of the disease.

BVD bulk milk monitor pack

Options for BVD Bulk milk testing for NZ dairy herds were limited prior to the release of the Livestock Improvement Corporation (LIC) BVD Monitor pack in August 2009. A structured plan for controlled and timely monitoring of BVD virus within the herd is paramount for enabling robust diagnoses on a herd level. Bulk milk testing for BVD is a convenient method to test a large number of

milking cows at once.

Long-term protection of herds is important for BVD control. The annual BVD Monitor Pack consists of two dairy company samples collected in spring approximately two to three weeks apart for both polymerase chain reaction (PCR) & antibody enzyme-linked immunosorbent assay (ELISA) testing. Ideally these are carried out once all cows have calved and near the start of mating. A repeat antibody ELISA test in late lactation is used to monitor BVD exposure after mating.

The LIC Animal Health Laboratory was the first NZ laboratory to have validated PCR (Life Technologies, USA) and extraction methods for bulk milk samples for herds over 1000 cows. The PCR test is sensitive enough to identify a single PI cow within a herd. Extensive LIC validation trials of a bulk milk BVD antibody ELISA screening test (IDEXX Laboratories Inc., USA) were also completed successfully.

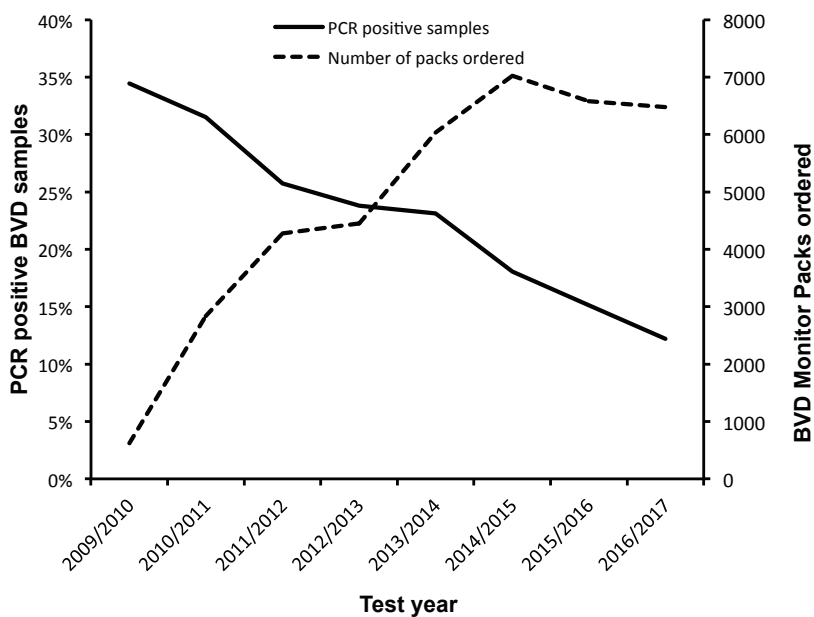
The PCR test provides important information about the herd's current BVD virus status. In case of a positive PCR result on a bulk milk sample, it is important to know the underlying reason. An acute infection in non-immune cattle can cause a positive PCR result. Acute infection results in transient viremia and can also allow viral spread until immunity is developed about two weeks later (Hill 2007). Alternatively, there may be a milking PI cow(s) in the herd, which will produce consistent positive PCR results. If two different bulk milk samples, collected two weeks apart result as PCR-positive, it is likely that at least one PI cow is currently milking in the herd. A search for the PI cow(s) on individual animal samples can then begin.

The BVD Monitor Pack displays the test results for a herd for every sample tested (BVD PCR and or BVD Antibody) in a graph. BVD antibody levels can remain high for years after exposure. When using the BVD Monitor pack for several years, trends in antibody levels can be clearly visualised. This information is very important when following trends in a herd's BVD virus exposure and creates important information for further decision making and actions.

BVD bulk milk testing results from 2009 to 2017

The number of LIC BVD Monitor Packs ordered between year 2009 and 2017 has steadily increased from year 2009 (621 packs) to 2014 (7020 packs) (Fig. 1). During the past two years, this number has decreased to

Figure 1 BVD monitor packs ordered and the number of positive BVD PCR bulk milk samples identified during 2009-2017.



6475 packs. This is more than half (54.3%) of the 11918 national dairy herds (total herds in 2015/16; DairyNZ and LIC, 2016 <https://www.dairynz.co.nz>) tested for BVD using the LIC BVD Monitoring Pack. This increase in uptake of BVD testing may be one of the reasons why there has been a continuous decline in positive LIC BVD Bulk Milk PCR tests over the past eight years (Figure 1).

Close to 35% of all suppliers (herd dairy supply number) tested during the 2009/2010 season, had at least one positive PCR test in the BVD monitor pack. This number has declined to 12% during the 2016/17 season.

The BVD Monitor Pack must be used as part of a broad control programme to mitigate the risks of BVD infections. BVD control measures must include good biosecurity with screening of all imported stock, including any natural-mating bulls, testing of replacement heifer calves, maintenance of farm boundaries, as well as potential use of vaccination must be considered to be part of a successful programme (Voges 2007).

Other BVD testing and recording

It is possible to order individual bulk-milk BVD PCR and/or antibody ELISA tests, using either dairy company bulk milk samples or by submitting custom-collected bulk milk samples directly to the lab. These tests are convenient for following up after addition or removal of milking cows, or for confirmation of current BVD status.

The LIC BVD PI Hunt detects individual BVD positive animals present at the LIC herd test and can be

completed after a virus-positive bulk milk BVD test. The herd-test samples from a selected group of animals (age group, low producers etc.) are tested with a BVD antigen ELISA test (IDEXX Laboratories). This test method is efficient and allows the latest herd test data set to be used for choosing animals to test. Alternatively, the LIC Animal Health Laboratory offers a BVD test on blood samples by PCR, by antigen or antibody ELISA or on ear-tissue samples by antigen ELISA.

All individual animals BVD tested through the LIC Animal Health Laboratory can obtain a lifetime BVD status, if the result is requested to be uploaded to LIC's animal performance management system MINDA® (Management Information Dairy Animals). When a BVD status for an animal is recorded on MINDA, this status will follow the animal for its lifetime, even

when sold and moved to a new owner. This makes recording of a herds' current BVD status easy to keep track of and maintain from year to year as a part of a BVD prevention programme.

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