

Bovine Viral Diarrhoea

Bovine Viral Diarrhoea (BVD) is a viral infection of cattle caused by bovine viral diarrhoea virus. Infection can result in a wide range of clinical signs including:

- Weakening of the immune system, leaving cattle more susceptible to other infections, which often cause scours and pneumonia in calves
- Reproductive problems, including failure to conceive, abortion and birth defects in older cattle
- Calves that survive infection during early pregnancy are born persistently infected (PI) with the virus. Many will develop a fatal condition called mucosal disease in the first two years of life, but some survive to adulthood.
- Following infection, the immune system of all cattle (except PI animals) responds by producing specific proteins called antibodies which aid with recovery and remain in blood and milk as a marker of previous exposure.

Introduction and spread:

- PI calves are the main transmitters of virus to other cattle, with virus present in faeces, milk, saliva, nasal fluid, semen etc. Virus in milk can be detected by bulk tank RT-PCR testing (see below).
- Purchase of PI cattle (possibly as unborn calves in pregnant cattle) is the most important means of introduction.

Impact:

- Economic losses can be very high.
- Persistently infected bulls are excluded from AI centres due to the presence of BVDV in their semen.
- Possible future restriction on live exports.

Bovine Viral Diarrhoea (Antibody)

Test description:

An ELISA to detect antibodies to Bovine Viral Diarrhoea (BVD). The test is used to monitor dairy herds for evidence of exposure to the BVD virus. It can also be used in individual milk and serum samples.

Results interpretation for bulk tank milk samples:

Results are expressed in percent positivity (PP) values and fall within four groups:

- Group 1: < 2.5 PP, undetectable or low level of antibodies
- Group 2: ≥ 2.5 to < 13.5 PP, low level of antibodies
- Group 3: ≥ 13.5 to < 29.5 PP, medium to high levels
- Group 4: ≥ 29.5 PP, high level

Group 1 or 2. Herd free of infection for a number of years (or else only recently infected). Serial sampling eg every 3 months, without evidence of rising values helps confirm this interpretation.

Group 3 or 4 results indicate that active infection with BVDV is currently, or has recently been present in the herd, assuming it has not been vaccinated. This is typically in the form of one or more persistently infected animals, which are efficient transmitters of the virus. To investigate further, a check test can be carried out by submitting blood samples from home bred cattle as follows: 5 from each separately managed group of non-vaccinated animals aged 9-18 months, and 5 first calved heifers.

Result interpretation for individual milk samples:

Results are expressed in PP values:

- Positive ≥ 7 PP
- Negative < 7 PP

Bovine Viral Diarrhoea (Virus)

Test description:

PCR is used to demonstrate the presence of BVD virus in many types of samples such as tissue, serum, swabs or milk. It is a highly sensitive technique that can detect the presence of a pathogen in a matter of hours and has the potential to be a more cost effective method to screen herds for PI animals. It can be used to detect the presence of infected animals within the milking herd by testing a bulk tank milk sample. It is essential that the identification of all animals that contributed to the bulk milk sample that was tested are known.

This test can also be applied to pooled serum samples.

Results interpretation for bulk tank milk samples:

A positive test result confirms the presence of viral RNA indicating at least one BVDV positive animal (PI or acute) among the cows contributing to the bulk tank on the day of the sampling. Further individual testing will be necessary to identify the infected animal/s.

A negative test result is strongly suggestive that there are no virus positive animals in the milking herd.

Infectious Bovine Rhinotracheitis

Infectious Bovine Rhinotracheitis (IBR) is a viral disease of cattle caused by Bovine herpesvirus type 1 (BHV-1) that can also cause a mild venereal infection in adult cattle or a brain infection in calves. Vaccination is an effective means of control, but does not stop carrier animals shedding virus. Marker vaccines can be used as part of an eradication program as they allow vaccinated and naturally infected cattle to be distinguished (this is not possible with conventional vaccines). Infection with IBR can result in:

- Pneumonia, which can be particularly severe in housed beef cattle
- Pneumonia and reduced milk yields in dairy herds
- Abortions.
- Some strains cause only mild symptoms.
- Recovered cattle remain carriers and may excrete virus when stressed. (Note that this is also true of live vaccines). Unless marker vaccines are used, it is not possible to distinguish between infected and vaccinated animals.

Introduction and spread:

- Purchase of carrier animals is the main source of new infections
- Spread is mainly by the respiratory route

Impact:

- Losses due to disease
 - Recovered (carrier) bulls are excluded from AI centres as they may shed virus in their semen
 - Barrier to the export of live cattle to other regions or countries within Europe, where the disease has already been eradicated.
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Test description (IBR conventional antibody)

An ELISA to detect antibodies to Infectious Bovine Rhinotracheitis (IBR) in bulk tank milk. The test is used to monitor dairy herds for the presence of IBR infection. It can also be used in individual milk and serum samples.

Results interpretation:

Results for bulk tank milk samples are expressed in PP values and fall within three groups:

- Negative: < 3 PP
- Inconclusive: 3-5 PP
- Positive: > 5 PP

Results for individual milk samples are expressed in PP values:

- Positive \geq 8 PP
- Negative < 8 PP

Test description (IBR gE marker):

An ELISA to detect antibodies to the gE antigen of Infectious Bovine Rhinotracheitis (IBR) in individual milk, serum and bulk tank milk samples. The test is used to monitor bovine animals vaccinated with the IBR marker vaccine for the presence of IBR infection. The presence of antibodies to gE indicates exposure to the IBR virus and/or conventional vaccines, while animals that have received the marker vaccine are negative on this test.

Results interpretation:

Results for milk samples are expressed S/N ratio and fall within two groups:

- Negative > 0.8
- Positive \leq 0.8

	IBR conventional test	IBR gE marker test
Marker vaccinated animals	Positive	Negative
Regular vaccine/infected animals	Positive	Positive

Johne's disease (paratuberculosis)

Johne's disease (or paratuberculosis) is a common infectious disease of cattle caused by a bacterium called *Mycobacterium avium* subspecies *paratuberculosis* (Map). Infection normally leads to chronic weight loss and diarrhoea. Other symptoms can accompany infection such as reduced fertility and depressed milk yields. Disease typically progresses slowly to death. Currently there are no effective treatments available for diseased animals. A vaccine is available but its usefulness is limited.

Most animals are infected orally in the first few months of life but calves can be born infected. The bacterium is shed in the faeces which can then contaminate teats, milk, water, meal and the environment. Infected cows can also shed the bacterium directly into the milk.

Test description:

The test used is an ELISA which is designed to detect antibodies to Map in blood and milk. It should be noted that detectable antibody levels tend to appear relatively late during the progression of disease so negative results should not necessarily be interpreted as evidence of absence of infection. The Johne's bulk milk test will only give a positive result consistently in a herd with a high level of infection. Therefore a negative result does not rule out Johne's infection within the herd and further testing of individual animals may be required.

Results interpretation:

An S/P ratio is calculated which measures the relative level of antibody in the sample being tested compared to negative and positive controls. For bulk milk and individual_milk samples the results are put into 3 categories;

≥ 30%	Positive
20-30%	Inconclusive
≤ 20%	Negative

Leptospirosis

Leptospirosis is a zoonotic disease caused by bacteria of the genus *Leptospira*. In the UK, the two serogroups which affect cattle and humans belong to the serovar *Leptospira* Hardjo (*Leptospira borgspetersenii* serovar Hardjo (HB) and *Leptospira interrogans* serovar Hardjo (HP)). Infection with *Leptospira* can result in:

- Milk drop.
 - Infertility and abortion (usually during the second half of pregnancy).
 - Birth of weak calves with a poor survival rate.
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- *L. Hardjo* localises in the kidneys and the male and female genital tracts after infection and is shed in the urine. Some animals excrete it continuously for a short time and then stop; others shed either continuously or intermittently for life.

Introduction and spread:

- Usually introduced by the purchase of infected cattle.
- Infection spread by contact with infected urine, infected bulls, sheep or contaminated water or pasture.

Impact:

- Losses due to disease in cattle.
- Risk of infection in humans, with flu-like symptoms and severe headaches. Dairymen in the parlour are at particular risk and herd owners should be aware of their responsibilities under the Control of Substances Hazardous to Health (COSHH) regulations.

Test description:

The Bovine *Leptospira* ELISA detects the antibody to both *Leptospira*: HB and HP. It can be used to test either sera or milk (bulk tank or individual animals).

Results interpretation:

Results for bulk tank milk samples are expressed as percent positivity:

Negative:	≤ 3 PP	(negative and/or unvaccinated)
Low Positive:	$\geq 4 \leq 10$ PP	(a few seropositive cows)
Medium Positive:	$> 10 \leq 50$ PP	(mix of infected and susceptible animals)
High Positive:	> 50 PP	(highly infected/vaccinated)

Results for individual animal milk/sera are expressed as percent positivity:

Negative:	Sera ≤ 5 PP Milk ≤ 3 PP	(negative and/or unvaccinated)
Inconclusive:	Sera $\geq 6 \leq 12$ PP Milk $\geq 4 \leq 10$ PP	(a retest is recommended after a few weeks. If the sample is inconclusive after retest, the animal can be considered negative depending on the herd history)
Positive:	Sera > 12 PP Milk > 10 PP	(exposed to infection/vaccinated)

Fasciola hepatica (Fluke)

Bovine fasciolosis or liver fluke is an important parasitic disease of ruminants. It is caused by a trematode, *Fasciola hepatica*, a parasite that becomes established in the bile ducts of ruminants and many other species including horses and **humans** worldwide, following a period of migration and development in the hepatic parenchyma.

Test description:

An ELISA to detect antibodies to *Fasciola hepatica* in bulk tank milk, individual milk and blood samples. The test is used to evaluate the sanitary state of dairy herds regarding the infection with fluke.

Results interpretation:

- 0: no or very weak infection
- +: low level of infection
- ++: medium level of infection
- +++: strong level of infection

Notes:

- It is important that at the time of interpreting the results the following factors are taken into consideration:
 - time of the year
 - stock structure (groups of animals with and without grazing experience)
 - fluke treatments already administered
 - climate and environmental conditions (mud snail-infested sites). In **Ireland** the weather in June, July and August will have a profound effect on fluke incidence throughout the succeeding 12 months.
- Antibody persists for up to 20 weeks after infection, even if the animal has been treated.
- An animals treated in the autumn cannot be differentiated from an untreated animal for around 12 weeks.
- Please note that this test has not been yet validated under Irish conditions.
- To confirm individual infection, a faecal sample should be submitted.

Bovine Respiratory Syncytial Virus (BRSV)

BRSV is a common virus that affects cattle all over the world and has an economic impact in beef and dairy producers. In the UK it is the most frequently identified respiratory pathogen in calves up to 12 months old and is one of the most important causes of respiratory disease in cattle.

Test description:

The test used is an ELISA which is designed to detect antibodies to BRSV in blood and milk.

Results interpretation:

Result interpretation for individual milk samples are expressed in PP values:

- Positive ≥ 10 PP
- Negative < 10 PP

While not validated for bulk tank milk samples, values of ≥ 10 PP indicate the presence of individual positive cows among those contributing to the sample.

Bovine Parainfluenza Virus Type 3 (PI3V)

PI3V is a common virus of cattle and one of the viruses associated with the bovine respiratory disease (BRD) complex. It causes mild disease but can be of real significance when it results in secondary bacterial infection causing pneumonia

Test description:

The test used is an ELISA which is designed to detect antibodies to PI3V in blood and milk.

Results interpretation:

Result interpretation for individual milk samples are expressed in PP values:

- Positive ≥ 10 PP
- Negative < 10 PP

While not validated for bulk tank milk samples, values of ≥ 10 PP indicate the presence of individual positive cows among those contributing to the sample.
