

# Testing for bovine Johne's disease

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### What are the available diagnostic tests?

Two types of diagnostic tests are available to test for bovine Johne's disease (BJD) in live cattle.

1. Blood test (serology) – to detect antibodies in the blood (less accurate, but quick and less expensive). The blood test or serological test for blood antibody is called the absorbed ELISA test.
2. Faecal culture – to detect bacteria being shed in the dung (more accurate, but time consuming and costly). Faecal culture for BJD can be undertaken in two ways:
  - conventional culture; or
  - Bactec culture.

Both actually culture or grow the bacteria.

### What are the advantages and disadvantages of the different types of tests?

The blood test is relatively cheap, rapid and suited to large-scale sample testing as a herd screening test. The blood test is also highly specific, that is, it is very reliable in disease-free cattle – approximately

1 in 200 animals will produce a false positive result.

When a positive blood test is detected in a herd test as part of a testing program such as the CattleMAP, those cattle are then tested by faecal culture. If the cattle that are blood tested positive are then found to be faecal culture negative, the herd is declared 'test negative'.

It can take 21 weeks to confirm a negative result from a conventional faecal culture test. It takes 9 weeks to confirm a negative result from the more rapid Bactec culture test, which is more expensive than the conventional culture test. During the culture procedures, a number of steps are involved to increase the likelihood that normal faecal bacteria are removed and will not impair the test's ability to detect the bacteria that cause BJD.

Bactec culture also relies on detection of growth in a liquid medium, which by itself is not specific for the bacteria that cause BJD. So if growth occurs in Bactec, it must be subjected to additional tests, including a PCR (polymerase chain reaction) test, to confirm or deny the presence of these organisms. This can delay resolution of the status of an animal if growth occurs late in the incubation period of the test.

The following table can be used as a guide to compare the cost, time taken and accuracy of the diagnostic tests. Over recent years, faecal culture methods have improved greatly.

Test	Lab cost <sup>†</sup>	Time	False positives	Sensitivity	
				Clinicals <sup>†</sup>	Subclinical <sup>†</sup>
Faecal culture – conventional	\$19–\$22	21 wks	0%	90–100%	30–50%
Faecal culture – Bactec	\$39 <sup>‡</sup>	9 wks	0%	90–100%	30–50%
Absorbed ELISA (blood test)	\$6-9 <sup>**</sup>	1–2 days	1%	90%	25–30%

\* Approximate cost per test includes GST, and can be affected by the number of samples per herd. ‡ Bactec cost excludes further examination by PCR (\$82 incl. GST), which is only necessary where growth is detected. See text for details. † See text below for details. \*\* CattleMAP ELISA testing is at the lower rate



## **Why is it difficult to detect infected animals?**

The organism which causes BJD is slow-growing, in fact one of the slowest growing bacteria known. BJD also progresses slowly. This means that it may take years after infection occurs for the organism to be shed in the dung.

Most infected cattle do not shed reasonable amounts of the BJD bacteria in the dung until after 2 years of age.

Once the number of organisms reaches a threshold, diagnostic tests are able to detect them. At this early stage, although some gut damage has occurred, the cattle are unlikely to show any clinical signs of BJD – they are referred to as ‘subclinical BJD cases’. As cattle become more severely affected and start to show clinical signs, for example weight loss and scouring, they may shed 100 million BJD bacteria in every gram of dung.

As the disease progresses, it becomes easier to detect infected animals using tests that rely on the shedding of BJD bacteria in dung or on detecting antibodies to BJD bacteria in the blood. This means that in herds where the disease is prevalent, there are more likely to be a number of cattle which are detectable by faecal culture or blood test.

Conversely, when there is only one or a couple of infected cattle in a large herd, these may escape detection until the disease has progressed sufficiently to render them positive in the available diagnostic tests. However, because these animals are not shedding large numbers of organisms prior to this progression, they are a much lower risk as a source of disease to other cattle.

## **Why can't diagnostic tests give me an absolute assurance that animals are not infected?**

Because of the slowly progressive nature of the disease, there are no diagnostic tests that can detect every infected animal.

Most cattle are infected as calves, and the disease then remains dormant until adulthood; in other words the bacteria are kept in check by the host. It is believed that stress factors can turn the tide in favour of BJD bacteria. The bacteria then multiply and trigger the production of antibodies and the shedding of organisms in the dung.

## **Can the tests be made more sensitive?**

By combining tests, we can detect a larger number of infected animals. This may be done by using the tests at the same time or, to save costs, by alternating tests over time. For example, we can

detect more infected animals if we alternate the blood test one year with the faecal culture test the following year, rather than use the blood test alone.

The ELISA test (blood test) measures the blood antibody levels and gives a numerical result. Animals that fall above a particular score (the cut-off point) are classified as ‘test positive’, and those that fall below, as ‘test negative’. By altering this cut-off point in infected herds, we can detect more infected animals, but at the cost of identifying more false positive cattle.

## **When are diagnostic tests used?**

Diagnostic tests for BJD can be applied in several situations, the most common being:

1. herd assurance testing as part of the BJD Cattle Market Assurance Program (CattleMAP);
2. herd surveillance testing as part of an industry-driven program (e.g. to provide information in support of a claim for ‘Protected Zone’ or similar low prevalence area status);
3. herd traceforward or traceback testing resulting from a confirmed case in another herd;
4. herd control testing in an infected herd;
5. testing of individual cattle for movement, as required for interstate, overseas or show entry movement, or for other movements that are required, to reduce the risk of disease spread.

## **How do I reduce the risk of my herd getting BJD by using available tests?**

The available tests are suitable for adult cattle over 2 years. The accuracy of the test increases in older animals.

Younger cattle are unlikely to have developed the disease to a stage where either shedding organisms in the dung or production of antibodies in the blood is above a detectable threshold.

The chance of an infected animal being detected on a single test depends on the stage of the disease. Herd-based testing that is repeated over time is required. This minimises the possibility of a herd which still contains infected cattle posing a risk to other livestock.

The risk of introducing BJD is decreased if the herd of origin has been tested as part of the CattleMAP. In purchases from non-assessed herds, testing of introduced cattle is of some but limited value because it represents only a snapshot of the animal at a given point in time.

Repeated testing of such introductions can provide greater assurance that the purchased animals are likely to be BJD-free.

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