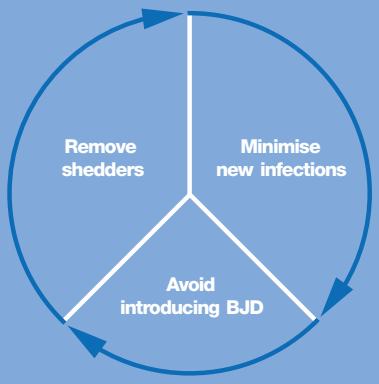
Dairy BJD Technotes

Best practice recommendations for managing bovine Johne's disease in Australian dairy herds



Produced for veterinarians and herd advisors

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February 2008

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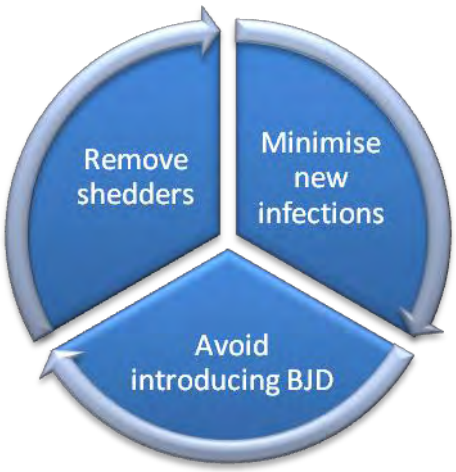

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Dairy BJD Technotes: best practice recommendations for managing bovine Johne's disease in Australia dairy herds.

Published by Dairy Australia.

Foreword

We are pleased to introduce the *Dairy BJD Technotes*, a resource that serves both as a technical reference and as a tool of trade for all professional dairy advisers.

The Australian dairy industry has embraced the challenge of reducing the economic, social and trade impact of bovine Johne's disease (BJD) by encouraging all dairy farmers to implement world-best practices to control BJD.

The environment regarding the control of BJD has changed dramatically in recent years. In 2003, government and industry agreed to implement a less-regulated approach to BJD, with individual farmers taking more responsibility for its management. This manual is designed to provide best-practice advice as we move into this less-regulated environment.

The *Dairy BJD Technotes* provide clear consistent messages using up-to-date scientific knowledge on BJD management under Australian conditions.

The Frequently Asked Questions section at the rear of the manual provides succinct answers to specific issues relating to BJD.

What are the Dairy BJD Technotes?

The *Dairy BJD Technotes* are an information resource for people who advise Australian dairy farmers on issues of BJD management, including veterinarians, factory field staff, dairy herd advisers, herd improvement staff, consultants and State agriculture departments. The Technotes provide an agreed set of best-practice recommendations for the management of BJD under Australian conditions.

The *Dairy BJD Technotes* describe:

- the rationale for each recommendation;
- the scientific background to each recommendation; and

The *Dairy BJD Technotes* are part of an overall dairy industry program designed to improve the capabilities of advisers who manage BJD in dairy herds by:

- providing standard recommendations on BJD control;
- increasing industry awareness and understanding of BJD; and
- encouraging interactions on BJD between different professional disciplines.

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Introduction

BJD in the Australian dairy industry

Key points

- BJD is relatively common in dairy herds in South Eastern Australia, particularly in Victoria.
- BJD control benefits both the dairy industry and individual farmers.
- Australia has a national industry strategy for managing BJD.
- Many countries are actively managing BJD through different strategies.
- Control of BJD centres around three key areas:
  - minimising new infections in calves;
  - avoiding introducing BJD; and
  - removal of cattle that are shedding *Mptb.*

Introduction

Bovine Johne's disease (BJD) is a chronic, incurable disease of adult cattle. Its symptoms include diarrhoea, reduced milk production, weight loss and – eventually – death. Infection is acquired as a young calf and generally no clinical signs are seen until animals are at least four years old. The presence of the disease in a herd is notifiable and, in some States, movement restrictions may be placed on cattle from affected herds. The disease is difficult to detect in live animals.

Preventing exposure of susceptible young calves, only introducing low-risk cattle and thoughtful application of testing and culling to remove shedders are the keys to controlling its spread.

The environment regarding the control of BJD in Australia has changed dramatically in the past few years. The dairy industry has been actively participating in new strategic directions established by government, animal industry groups and Animal Health Australia. The Australian dairy industry is committed to managing the spread and impact of BJD by actively engaging all producers in its control in a less-regulated environment. The dairy industry's vision is to have all farmers implement measures to reduce their risk of having or spreading BJD.

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BJD: the disease

Occurrence in Australia

BJD is a relatively common disease in the dairy regions of South-East Australia. It is also present in many dairying countries around the world. There are no exact figures available on the prevalence in Victoria. It is known that at least 15% of herds are infected but the true number is likely to be two or three times that. Many dairy farmers may not realise that their herds have BJD because definitive diagnostic testing may not have been done.

A typical 200-cow dairy herd infected with BJD could expect to see a handful of clinical cases each year. These may present as an animal initially down in milk production and losing weight, followed by chronic, unresponsive diarrhoea and eventually death. If the herd was blood tested, around 2% (four animals) may be detected. However, the sensitivity of the blood test is low and there are likely to be around 10% (20 animals) infected.

Pathogenesis

Cattle are usually infected when less than 12 months of age. However, due to a long incubation period, clinical disease is often not seen until the affected animal is 4-5 years old or older.

As the bacteria lodge and multiply in the wall of the small intestine, the animal responds by producing inflammatory cells. This combination of bacteria and cells leads to a thickening and distortion of the gut wall. Eventually, the gut fails to absorb water and nutrients. Infection causes diffuse or segmental granulomatous enteritis affecting the intestinal tract from the duodenum to rectum, but most commonly changes are found in the distal ileum and ileocaecal valve region. Grossly, the mucosa has a corrugated appearance that does not disappear when stretched.

Supershedders

Recent overseas studies, using quantitative faecal culture within infected herds, have shown that a small proportion of infected animals excrete extremely large numbers of organism ($>10^5$ Colony Forming Units per gram of faeces). These 'supershedders' may excrete numbers of bacteria equivalent to many hundreds of infected cows and contribute greatly to contamination of the farm environment.

Transmission

Infection is generally acquired as a young calf following ingestion of faeces on contaminated surfaces and on contaminated milk, feed and water. Faecal contamination of the dam's udder is a significant source of infectious material to the newborn calf. Infected cattle may excrete the organism for 12-18 months prior to the onset of clinical disease.

Vertical (dam to daughter) transmission is also possible via *in utero* infection during gestation (see also Dairy BJD FAQ 1), although this pathway probably accounts for only a small proportion of infected newborn calves from subclinical cases.

Once ingested by the calf, the organism appears to remain relatively quiescent within the animal for many years, making detection difficult.

Johne's disease currently affects cattle, sheep, goats and deer in some parts of Australia, and a wider range of animals overseas. Alpaca are susceptible however there have been no cases in Australia for more than 10 years. Sheep are generally affected by a different strain of *Mptb* and infection of cattle with the sheep strain of *Mptb* is rare (see also Dairy BJD FAQ 2).

Clinical signs

Clinical disease is the terminal stage of a slow, chronic infection and may be precipitated by stress factors such as parturition, poor nutrition, heavy milk production, concurrent parasitism or bacterial infections, social stress and mineral deficiencies.

BJD presents as a syndrome of chronic and progressive emaciation and diarrhoea. In dairy cattle, the first sign is often a gradual drop in milk production. Affected animals then develop chronic diarrhoea, begin to lose condition, and develop rough hair coat and dry skin. Cattle gradually lose weight and become emaciated while maintaining a good appetite. The diarrhoea may improve for short periods and then return with increased severity. The faeces are usually green and bubbly. In the latter stages of disease, cattle may develop 'bottle jaw', a soft fluid swelling under the jaw. During the terminal stages, the appetite is lost; there is ventral oedema, emaciation, debilitation, frank blood in the diarrhoea and death. The clinical course may last from one to six months or longer.

Diagnosis

Diagnosis is based on detecting an immune response (antibodies) to *Mptb*, or the presence of *Mptb* in faeces and internal organs by culture or histopathology (see also Dairy BJD FAQ 10).

Differential diagnosis

When mature cattle exhibit signs of chronic weight loss and diarrhoea there are many diagnostic possibilities. The symptoms may be linked to chronic liver fluke and internal parasitism, or less commonly to abomasal phytobezoars, enzootic bovine leucosis, mucosal disease, copper deficiency, left displaced abomasum, intestinal tract neoplasia, right side heart failure, fat necrosis or chronic salmonellosis.

Treatment

There are no satisfactory treatments available for BJD. No drugs are approved for the treatment of infection with *Mptb*. Some treatment protocols have been described but are expensive and require lifelong medication.

Control Strategies

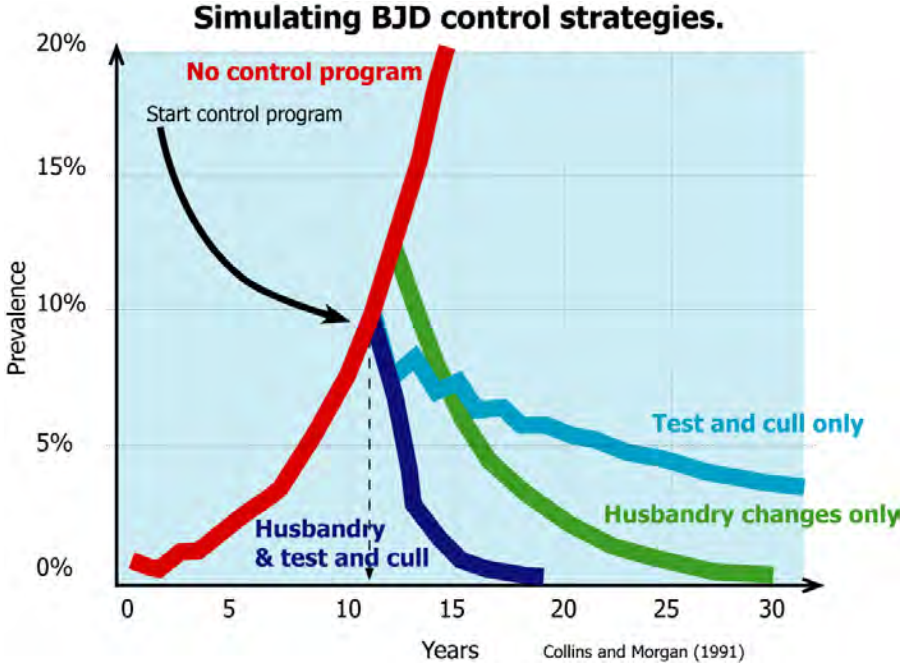
Control of BJD centres around three key areas: minimising new infections in calves; avoiding introducing BJD; and removal of cattle shedding *Mptb*.

Specific recommendations have been developed for these key areas and are presented in Technotes 1 to 3.

Relative effectiveness of different strategies

BJD computer-simulation models have been developed that are useful to compare the effectiveness of different control strategies (see Figure 1). The results show that hygienic calf-rearing strategies on their own are effective in limiting the spread, but they require many years to reduce the 'within herd' prevalence. When factors such as the cost of repeated testing are allowed for, management strategies such as low-risk herd introductions and hygienic calf rearing become cost-effective risk reduction options.

Figure 1.Results of simulating the outcome, over 30 years, of different BJD control strategies. BJD is introduced into herd at year 0 and different control strategies implemented at year 10. Husbandry changes are focused on hygienically rearing calves.



Benefits of control for farmers

Reduced deaths, reduced premature culling and improved slaughter weights

Farmers who are active in managing BJD can reduce the economic impact of the disease spreading through their herd. Deaths from clinical cases are just the tip of the iceberg; losses also manifest through premature culling and lower slaughter weights for cull cows.

Improved milk production from non-infected cattle

Many studies have shown that cattle infected with BJD produce less milk than non-infected herdmates, without showing overt signs of disease. In the lactation prior to breaking down with clinical disease, milk production is reduced by around 5-15%.

Potential to increase returns with good BJD management

Herds that can provide a high level of assurance that they are a low risk for BJD can attract more interested buyers and consequently higher prices for cattle. Participation in market assurance programs can also increase the opportunities for access to prospective buyers from across Australia because of the ability to move between zones. This is particularly relevant for stud breeders. Property values may also be affected by the BJD status of cattle on the property.

Hygienic calf-rearing programs help to reduce spread of other infectious diseases of calves

Anecdotal evidence suggests that by minimising the exposure of calves to sources of adult cow faeces, their overall health can be improved. While no major studies have been documented, farmers have reported less calf disease and lower mortality after implementing BJD control programs for calves.

Benefits of control for dairy industry

International market risk-management

Animal health status has the potential to be used as a technical barrier to trade and impair market access. It is in the best interests of the Australian dairy industry to be pro-active in BJD control and minimise the potential for loss of market access through undesirable trade restrictions due to BJD. Countries such as the Netherlands, Sweden, Norway, the US, Canada and Japan all actively manage BJD. Japan aims to eradicate BJD from its national herd and has a major national program in place.

BJD is considered by many importing countries in their animal health statements; many require various testing procedures and assurances prior to export.

Consolidate Australia's already favourable animal disease status

Australia has an enviable position in the world because it is free of major cattle diseases such as tuberculosis, brucellosis, BSE and foot-and-mouth disease. This status allows relatively easy access into international live animal markets. In recent years, dairy farmers have benefited through the export of tens of thousands of dairy heifers. Australia also has a good reputation in terms of residues in milk and meat.

Australia is the only country that has recognised BJD-free dairy regions (Western Australia). In Australian dairy herds where BJD is present, the within-herd prevalence is also generally much lower than reported from overseas countries.

Public health and safety

There has been considerable interest in the hypothesis that Crohn's disease in humans is caused by consumption of products containing *Mptb*. Some studies have reported finding *Mptb* in human patients with Crohn's disease. This has raised interest in the issue and driven further research work. There has also been international publicity on the Crohn's theory. If a definitive link between BJD and Crohn's were to be established there would be major implications for the dairy industry. (See also Dairy BJD FAQ 9)

BJD reduces overall dairy industry productivity

On-farm losses due to BJD are generally considered modest in comparison to mastitis, metabolic diseases, fertility and lameness. Subclinical cattle produce around 5-15% less milk in the 12-18 months prior to breaking down with clinical disease. When this is extended across the whole of the dairy industry there is a significant loss of on-farm production attributable to BJD.

International BJD programs

At least 15 countries are active in BJD control, either through compulsory national, or voluntary national or regional programs. Major consortiums around the world working on BJD include: the International Association for Paratuberculosis, International Dairy Federation, International ParaTB Forum, North American Johne's Disease Integrated Program and, recently, the European ParaTB Tools Project. These groups are working to co-ordinate new research and consolidate existing knowledge on Johne's disease.

There are strong regulatory programs in place for BJD in Japan, Sweden, Norway and the Czech Republic. These have a heavy focus on surveillance and eradication in known infected herds. In Denmark, France, Israel and the Netherlands there are voluntary programs in place, co-ordinated by the dairy industry or farmer organisations. Similarly, the US federal government has taken a lead role in co-ordinating and funding activities with various other organisations, especially the States and universities, in a voluntary national BJD control program. In Mexico, a university is taking the lead in implementing a voluntary program.

Co-ordinated national voluntary programs are in advanced stages of development in Canada and Ireland. Voluntary regional programs operate in the Basque Country of northern Spain and in northern Italy. Finland is planning an initial national voluntary program that will move to a mandatory program.

New Zealand has no active program in place for BJD control, although there is a recent move, driven by the deer industry, to develop a industry approach to control.

State and National management

BJD has been present in Australia since at least the 1920s. Historically, the approach adopted by some States was to apply movement restrictions on cattle from infected herds to limit the disease's spread. From the beginning, this approach was not received favourably by farmers.

Recently, Animal Health Australia, the cattle industries and government have agreed to work towards achieving a national, less-regulated approach to the management of BJD in Australia. There is a growing realisation that we are now in the era of managing BJD as an ongoing endemic disease and that complete eradication is not possible.

Australian BJD Strategy

The Australian National BJD Strategic Plan forms the agreed framework for the approach to management. The goals of this plan are to:

- minimise the contamination of farms and farm products;
- protect the status of non-infected herds; and
- minimise BJD's social, economic and trade impact at herd, regional and national levels.

The National Dairy BJD Steering Committee is made up of representatives from milk companies, food safety authorities, farmer representative organisations, Animal Health Australia and State animal health departments. The group makes decisions on matters relating to BJD issues in the Australian dairy industry.

Victoria, South Australia and NSW all have BJD advisory groups to provide input to the running of the various programs. The National BJD Steering Committee, comprising of members from dairy, beef, alpaca and goat industries, oversees the operation of the National BJD Strategic Plan. This plan is updated annually and is managed by Animal Health Australia.

BJD Zoning

At present, for the purposes of BJD management Australia is divided into four geographical zones designed to minimise further spread. Zones are classified as *Residual*, *Control*, *Protected* or *Free* depending on the level of BJD and the control measures that are in place. Specific requirements must be met in order for an area to be zoned in a particular way.

Zoning also provides a level of assurance, particularly when tested or CattleMAP stock are not available. Cattle from the Free zone are considered to have the lowest risk of BJD infection, followed by those from a Protected zone, a Control zone and finally a Residual zone. Specific requirements often must be met in order to move animals between zones. These may include blood testing prior to stock movements.

Residual zone

BJD infection is endemic and no or minimal regulatory measures are enforced. At present, Tasmania is a Residual zone.

Control zone

BJD is present in this zone but it is a notifiable disease and there are control measures in place. There may be restrictions on movement of cattle into this zone from residual zones.

Victoria, and parts of NSW and South Australia are currently Control zones.

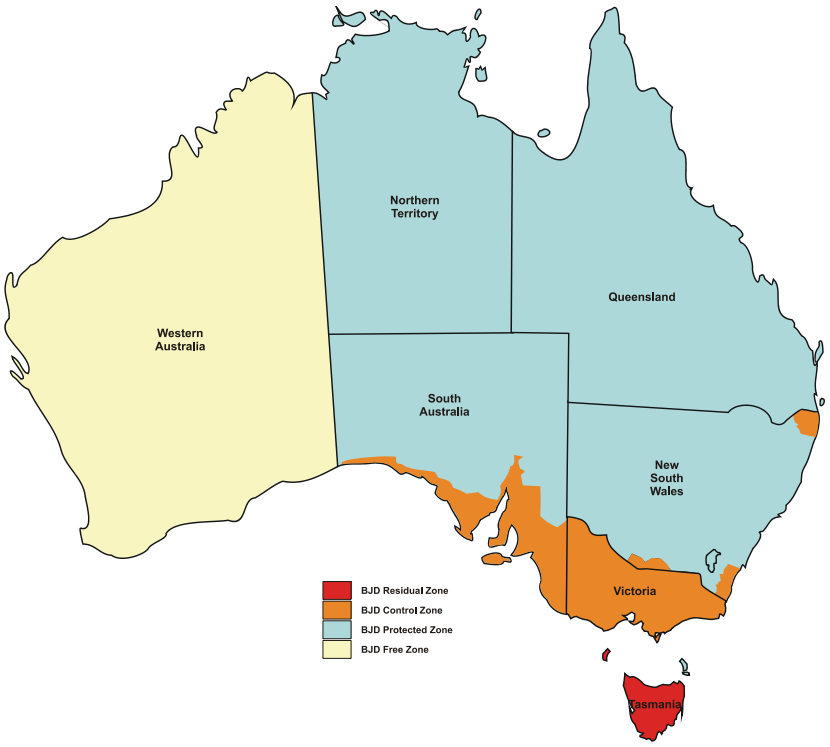
Protected zone

BJD occurs only sporadically and strict control measures are in place. Queensland is a Protected zone, along with parts of NSW and South Australia.

Free zone

There are no known or suspected BJD herds in this zone, strict controls are in place if BJD is suspected, and continued monitoring is required to maintain this status. Western Australia is a Free zone.

Figure 2. BJD zones in Australia. Animal Health Australia, October 2007.



Further information

Further reading

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Websites

Animal Health Australia http://www.animalhealthaustralia.com.au

International Association for Paratuberculosis http://www.paratuberculosis.org

Victorian Department of Primary Industries http://www.dpi.vic.gov.au/

NSW Department of Primary Industries http://www.agric.nsw.gov.au/reader/bjd

Department Primary Industries Water Environment Tasmania http://www.dpiwe.tas.gov.au/

Primary Industries Resources South Australia http://www.pir.sa.gov.au/pages/agriculture/annhealth/

Extensive Johne's information sites run by the University of Wisconsin. http://johnes.org/

Canadian Site http://www.agr.gov.sk.ca/

Identifying and Managing BJD risks

BJD: a whole farm approach

BJD risk assessment

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Identifying and Managing BJD risks

BJD: a whole farm approach

Key points

- BJD management practices should be incorporated into all dairy farming systems, regardless of BJD status.
- Set realistic goals based on each individual's resources and capabilities.
- All farmers should aim to provide a level of assurance that their herd is a low risk for BJD infection.

Introduction

Whether or not a herd is known to have BJD, steps can be taken to minimise the risk of either introducing it or spreading it within the herd. All farmers should evaluate how feasible it would be to implement the recommendations outlined in *Dairy BJD Technotes* 1 to 3 in their own farming system.

Adherence to this program can then be used to provide assurance to prospective buyers that cattle are a low risk for BJD. The majority of dairy farmers in Australia, of which Victoria is the major dairying State, cannot provide any assurance on the risk of BJD being in their herd. Many of these farmers may be unwilling to join an official BJD program because of the stigma of the disease, however are many practical things that can be done on-farm today to help minimise the risk of spreading or introducing *Mptb*.

Assess the current systems and practices for BJD risks

A risk assessment template is included in the *Dairy BJD Technotes* and should provide a broad measure of on-farm BJD risks. Repeating this assessment annually will provide farmers with a measure of their progress.

Set realistic goals

The goals of a BJD program will be different from farm to farm. For various reasons, not all farmers with infected herds would be prepared to implement a test and control program. However, there are many practices that could be implemented to minimise the risks across the farm operation.

Farmers primarily concerned with showing and selling cattle would prefer to be in a position to offer potential buyers a high level of assurance that their cattle are a low risk of being infected with BJD.

The table below provides examples of different approaches to BJD, depending on the level of assurance desired.

Table 1. Examples of different approaches to BJD based on desired level of aggressiveness.

	Aggressiveness of BJD management		
Components	**Low**	**Moderate**	**High**
Farmer	"I want to start somewhere with BJD but not test and not spend much!"	"I'm keen to get a higher Dairy Score and really start getting on top of BJD."	"I'm all out for achieving the highest level of assurance on BJD I can!"
Testing	Not initially, but consider it once all calves reared under 3-Step Plan are >4 years old.	Test whole herd to assess current prevalence or presence of BJD.	Regular whole herd testing of 2+ year olds or join CattleMAP.
Calf rearing	Implement a hygienic calf program (e.g. 3-Step Calf Plan) and/or other measures that require minimal changes to current system.	Implement a hygienic calf program (e.g. 3-Step Calf Plan) and/or other measures that require minimal changes to current system.	Audited hygienic calf-rearing program (e.g. JDCAP)
Herd introductions	Make low risk herd introductions – use Dairy Score (4+)	Make low risk herd introductions – use Dairy Score (7+)	Closed herd – no introductions or only CattleMAP (Dairy Score 8+)
Culling policy	Cull high-risk animals based on non-testing data (e.g. clinical cases, cohorts, direct progeny)	Cull high-risk animals based on herd test and consider further preferential culling.	Aggressively cull all high-risk animals.
Other measures	Remove goats and alpaca, fix fences.	Consider off-farm rearing of calves.	Secure all fences. Restrict access to calf area by personnel.

Many commercial dairy farmers, who concentrate on milk income and sell only a few heifers and calves, may not wish to invest heavily in BJD. However, there are a number of practices that could be implemented to minimise the potential for new infections and help avoid introducing BJD.

Farmers with infected herds need to be aware that BJD cannot be eradicated quickly. Many herds that enrol in an approved test and control program take a number of years to have a series of annual negative whole herd tests and may never eliminate the infection. (See also Dairy BJD FAQ 10)

Plan for the future

If farmers see themselves selling their herds in the near future, being able to offer some assurance that cattle are low risk for BJD may bring financial rewards. The herd is a valuable asset and should be managed carefully. BJD has the potential to make cattle less attractive to some buyers. BJD assurance demands are expected to increase over time and international market pressures may force change at any time.

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Identifying and Managing BJD risks

BJD risk assessment

Introduction

The following set of questions is designed to help farmers quickly identify areas for improvement in terms of managing the risk of BJD.

Minimising new infections	Poor	Could be better	Good
Do you take steps to manage the cleanliness of the calving environment?	Not very often.	Sometimes.	Yes, always, strip graze calving paddock. Yes, always clean calving pad weekly.
Do you have a system in place to remove calves at least twice daily?	No.	No, however I do try to get them out once or twice a day.	Yes, always, at least twice a day.
Do you separate calves from their mothers in the calving area?	Occassionally, however I usually move them up lane to yards.	Quite often.	Yes, always catch them in the calving area.
Do you feed milk from sick or medicated cows (i.e. blue milk) to your calves?	Sometimes.	Rarely.	No, never, always discard blue milk.
Do you take steps to prevent milk and colostrum for calves from being splashed with adult faeces?	I occassionally discard a contaminated bucket.	I usually discard a contimated bucket.	Yes, always, lids on vats and chuck away milk with any muck in it.
Do you feed pooled colostrum or milk to calves?	Most of the time.	Sometimes.	No, never, milk is from replacer powder or low-risk cows.
Do you have elevated feed bins, hay racks and water troughs for calves?	No, feed on the ground.	Some.	Yes, all feed goes into elevated bins.

Do you use tank or town water for calves?	No.	Not really, but we do sediment out canal water.	Yes, always, only tank or town water.
Do you use milk replacer?	Very rarely.	Sometimes.	Yes, always use it if we can't get enough low-risk milk.
Do you graze calves where dairy effluent runoff is present or pasture has been sprayed?	Sometimes	I try to avoid it.	No, never.
Do you use on-farm milk pasteurisation units?	No.	Sometimes.	Yes,.
Do you use different equipment to handle feed and faeces?	No, same.	Sometimes.	Yes, always use dedicated feed-only equipment.
Is the calf-rearing area separate from adult cattle and not exposed to effluent runoff?	No.	Sometimes.	Yes.
Do calves have access to any adult manure, boggy-swampy areas or open drains when they are less than 12 months old?	Yes.	Sometimes.	No, never.
Do you rear calves off-farm?	Not usually.	Sometimes	Yes, always.
Do you encourage everyone, including service personnel, contractors to clean boots, vehicles and equipment before entering the calf area?	Not usually	Usually.	Yes, always, we have signs and tell everyone and its part of staff training.
Do you ever put adult cattle, alpaca, goats or deer in the calf-rearing areas?	Sometimes.	Very rarely.	Never.

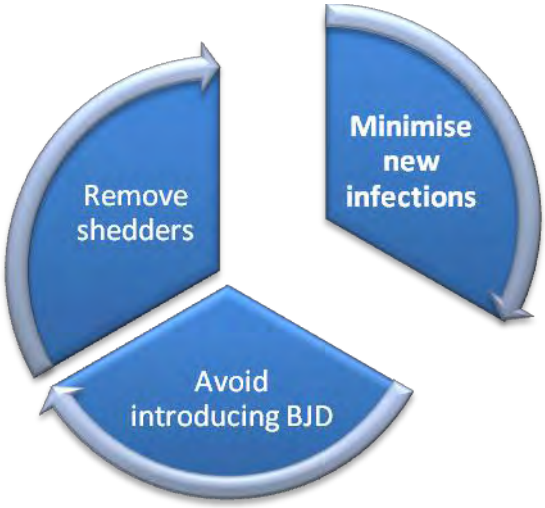
Avoiding introducing BJD	Poor	Could be better	Good
Do you source cows from low-BJD risk (high Dairy Score) herds?	No.	Sometimes.	Yes, always from highest *Dairy Score* we can get.

Do you protect your calves from exposure to manure of introduced stock?	Very rarely.	Usually.	Yes, always, calves never go near.
Do you source bulls from low-risk sources?	Not usually.	Sometimes I ask about it.	Yes, always from highest *Dairy Score* we can get.
Do you use semen and embryos to reduce the risk?	No.	Sometimes.	Yes.
Do you agist out only animals older than 12 months?	No.	Sometimes.	Yes, always, only adults go away.
Do you test cattle for entry to shows?	No.	Sometimes.	Yes, always find out what is needed.

Removing shedders	Poor	Could be better	Good
Do you understand the diagnostic tests for BJD?	No.	No, but I am going to read up on it.	Yes, I know what they do and how best to apply them.
Do you use BJD test results and other information to preferentially cull cattle?	No.	Sometimes.	Yes, always get rid of high-risk cows.
Do you cull test-positive cattle as soon as possible?	No.	Sometimes, but we usually let them milk out.	Yes, always cull once we get test results.
Do you understand the regulatory implications of having a test-positive herd in your region?	No.	No, but I will ask about it.	Yes.

Technote 1

Minimise New Infections



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Technote 1

Minimise New Infections

Key points

- Protecting calves from sources of *Mptb* is critical to minimise new infections.
- Implement measures to minimise any contact with adult faeces.
- Resistance develops with age, and by 12 months, infection is difficult to establish

Introduction

Minimising new infections is a critical part of the whole process of managing BJD. Whether or not a herd has BJD, safeguards can be put in place to limit the potential for spread, should it ever enter the herd. **Calves up to 12 months old are most susceptible** to infection and all efforts should be made to protect them from sources of *Mptb*. Establishing infection with BJD is probably a cumulative product of the degree of exposure to *Mptb* and the duration of time they are exposed.

Managing the calving area

BJD Recommendation # 1	
☆ **Ensure cows calve in a clean environment**	
Why?	Muddy and muck-filled calving areas are not only a risk for spreading BJD but also environmental mastitis pathogens such as *E. coli* and *Streptococcus uberis*. *Mptb* can survive for prolonged periods in the shade and moist or damp conditions. Calving cows in a paddock rather than a calving pad has been associated with a lower risk of spreading BJD.
How?	Contamination of the calving area can be managed by strip grazing the calving paddock. Use a moveable electric fence wire to minimise heavy contamination in a particular area. Calving pads should be scraped out regularly.

BJD Recommendation # 2	
☆ **Implement a system to remove calves from their dams at least twice daily**	
Why?	Reducing the time a calf is exposed to adult cattle faecal material is essential to reduce the dose of *Mptb* a calf receives while highly susceptible. The longer a calf remains in a contaminated environment the greater the dose it may receive.
How?	Build it into the farm system. Dedicate time to it. Have all the necessary equipment to pick up calves ready to go (e.g. trailer hooked up to quad bike). Inspect calving cows twice daily.

BJD Recommendation # 3	
☆ **Separate calves from their mothers in the calving area**	
Why?	Moving calves out of the calving area with their mothers and into cattle yards can expose calves to concentrated sources of adult faeces in laneways and yards.
How?	Pick up calves directly from the paddock or calving pad.

Feeding calves

BJD Recommendation # 4	
☆ **Avoid feeding calves milk from sick or medicated cows**	
Why?	Feeding waste milk ('blue milk') to calves has been associated with higher infection rates than the rate in herds where waste milk was not fed.
How?	Discard 'blue' milk appropriately.

BJD Recommendation # 5	
☆ **Prevent manure splashing into colostrum and calf milk storage**	
Why?	Faeces may contain *Mptb* and poses a risk to calves. *Mptb* will survive in biological fluids for extended periods.
How?	Place lids on milk storage tanks/vats and discard manure-splashed milk. Install a pump to move milk to the calf-feeding area.

BJD Recommendation # 6	
☆ **Avoid using pooled colostrum and milk from high-risk cows**	
Why?	Pooled colostrum may contain sufficient numbers of *Mptb* to infect calves. However, there is relatively little published information to support this. Cows identified as high risk should not have their milk used for calves.
How?	If the herd has been tested, high-risk cattle should be known and their milk/colostrum not used for calves.

BJD Recommendation # 7	
☆ **Use elevated feed troughs, hay racks and water troughs when feeding calves**	
Why?	The further the feed is away from the ground, the less likely it will become contaminated with faeces.
How?	Elevate feed troughs as required.

BJD Recommendation # 8	
☆ **Use tank or town water for calves where possible**	
Why?	*Mptb* can be transferred and survive in water. Water sources that could be exposed to effluent and farm runoff, such as irrigation channels, present a risk of waterborne transmission.
How?	Consider installing rainwater tanks with first-flush water diverters on downpipes. Sedimentation of potentially contaminated water may help to reduce the concentration of *Mptb.*

BJD Recommendation # 9	
☆ **Consider using milk replacer**	
Why?	Powdered milk replacer is a low-risk feed for calves and avoids the risk that milk and colostrum will transfer *Mptb* to calves.
How?	Source and feed suitable high-quality milk replacer.

BJD Recommendation # 10	
☆ **Consider on-farm milk pasteurisation of milk for calves**	
Why?	Heat treatment of milk is highly effective in reducing the number of viable *Mptb* which, in turn, reduces the risk of milk transmitting the disease. Mycoplasma infections can also be controlled by pasteurisation.
How?	Source information on small-scale milk pasteurisers.

BJD Recommendation # 11	
☆ Use different equipment to handle faeces and feed	
Why?	Inadvertent faecal contamination of feed could occur and risk transmission of BJD.
How?	Designate and mark equipment as 'Feed Only'.

Locating calf-rearing areas

BJD Recommendation # 12	
☆ Ensure the calf-rearing area is separate from adult cattle and not exposed to effluent runoff	
Why?	Adult cattle faeces could contain an infectious dose of *Mptb*. Because of the prolonged survival of *Mptb* in the environment, runoff is a risk.
How?	Calves should not graze where adults have been in the last 12 months. Select paddocks for calves up to 12 months old that do not receive runoff from adult cow paddocks.

BJD Recommendation # 13	
☆ Fence off open drains, boggy and swampy areas of calf paddocks	
Why?	Sites where adult faeces could collect should be avoided as they may contain sufficient numbers of *Mptb* to infect calves.
How?	Fence off affected areas to reduce possibility of calves accessing them.

BJD Recommendation # 14	
☆ Consider rearing calves off-farm	
Why?	In some situations it may not be possible to implement measures to minimise the risk of calves becoming exposed to adult faeces and *Mptb*. Dedicated calf rearers and heifer-raising enterprises may provide a better alternative, provided they are actively managing the risk of BJD.
How?	Evaluate the systems each contract rearer is using for BJD risk.

Managing people, animals and machinery

BJD Recommendation # 15	
☆ **Encourage everyone, including service personnel and contractors, to clean boots, vehicles and equipment when entering calf areas**	
Why?	Muddy boots and equipment could transfer *Mptb* into the calf-rearing area, where it may be ingested by calves.
How?	Minimise human traffic in/out of calf area. Wear dedicated boots in the area. Clean equipment/vehicles going into the area.

BJD Recommendation # 16	
☆ **Keep adult cattle, goats, deer, alpaca/llamas out of calf-rearing areas**	
Why?	BJD can be spread by goats, deer and alpaca/llama. These species may also become infected with BJD from cattle.
How?	Never put adult cow, goats, deer or alpaca in the calf paddocks.

BJD Recommendation # 17	
☆ **Never graze calves where dairy effluent has been sprayed**	
Why?	*Mptb* is readily cultured from on-farm sources of dairy effluent. An infectious dose of *Mptb* may be ingested by calves grazing sprayed pasture.
How?	Never spray calf grazing areas with effluent.

Further information

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Larsen A.B., Merkal R.S., Cutlip R.C. (1975). Age of cattle as related to resistance to infection with Mycobacterium paratuberculosis. *American Journal of Veterinary Research* 36: 255-257

Poddubskii I.V., Shchurevskii V.E., Alikaeva A.P., Gazarkh Z.S. (1974). Age susceptibility and resistance of cattle to paratuberculosis. *Trudy Vsesoyuznogo Instituta Eksperimental'noi Veterinarii* 42: 218-234.

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Websites

Information on water sedimentation techniques

http://www.itdg.org.pe/fichastecnicas/pdf/Water%20supply%20for%20food%20processing.pdf

Notes

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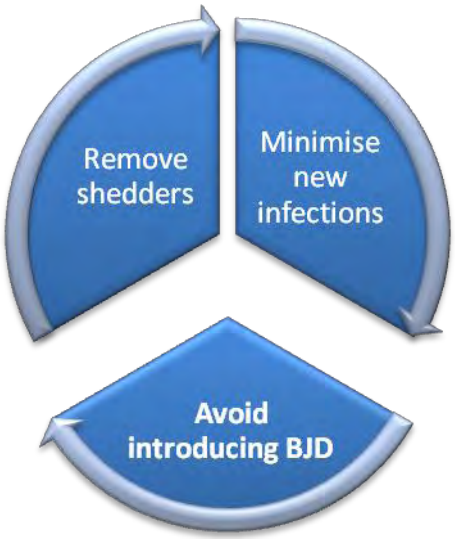
Technote 2

Avoid Introducing BJD



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TECHNOTE 2

Avoid Introducing BJD

Key points

- BJD is usually introduced into a herd through a single infected animal.
- Take steps to know the risk with stock introductions.
- Use the *Dairy Score* to assess the risk of BJD.
- If you don't know the risk, protect your calves from exposure.
- Semen and embryos are low risk for spreading BJD.

Introduction

BJD comes on the back of a truck! Most herds become infected by introducing a single infected animal that goes on to infect many calves. Once introduced into a herd, BJD is difficult to completely eliminate. Some farmers may not consider bulls as introductions, yet they may be shedding BJD and thus a risk.

When introducing cows and bulls - know the risk

BJD Recommendation # 18	
☆ **Minimise the risk with herd expansion - source low-risk animals**	
Why?	BJD is relatively common in dairy herds in south-eastern Australia. It is risky to buy cattle from non-assessed herds that cannot provide any assurance that they are low risk for BJD.
How?	Ask for the *Dairy Score* (see Dairy BJD FAQ 4) of each animal purchased. The lowest-risk cattle have the highest assurance scores.

BJD Recommendation # 19	
☆ **If you don't know the risk - protect your calves**	
Why?	Farmers who introduce cattle from herds that cannot provide any assurance on BJD should take steps to minimise the risk of calves becoming infected.
How?	See Dairy BJD Technote 2 – Minimising new infections

BJD Recommendation # 20	
☆ **Source bulls from low-risk herds**	
Why?	Bulls could be shedding *Mptb*. If they have access to calves, they pose a risk to them. Breakdown with clinical BJD is a real issue with bulls.
How?	Keep bulls away from calves up to 12 months old. Source bulls from low-risk sources using the *Dairy Score* to assess their risk.

BJD Recommendation # 21	
☆ **Consider using only processed semen and embryos**	
Why?	There is a very low risk of embryos transferring *Mptb* from infected donors. Processed semen is similarly a low-risk source of genetic material. Recipient animals should be sourced from low-risk herds.
How?	Use the *Dairy Score* to assess the risk with recipients. Ensure embryos are washed to International Embryo Transfer Society guidelines. Ensure semen is from a reputable AI centre. See also Dairy BJD FAQ 6.

Agistment, cow parking and showing cattle - minimise the risk

BJD Recommendation # 22	
☆ **Consider 'parking' only cattle that are 12 months and older**	
Why?	Calves are most susceptible to infection with BJD. Calves sent out on agistment ('parked') may become infected unless the risk is managed.
How?	Assess the host property for BJD risk. Avoid agistment if the risks cannot be adequately managed on the host property.

BJD Recommendation # 23	
☆ **Find out in advance if movement into the show area requires testing**	
Why?	Agricultural shows generally require cattle to provide a level of assurance on their risk of having BJD. This may require testing, which needs time to be completed prior to movement. Interstate movements may require more extensive testing and herd history.
How?	Obtain the BJD information specific for each show.

Further information

Key papers

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Websites

Federated Council of Australian Agricultural Societies and State members www.fcaas.org.au

Victorian Farmers Federation http://www.vff.org.au

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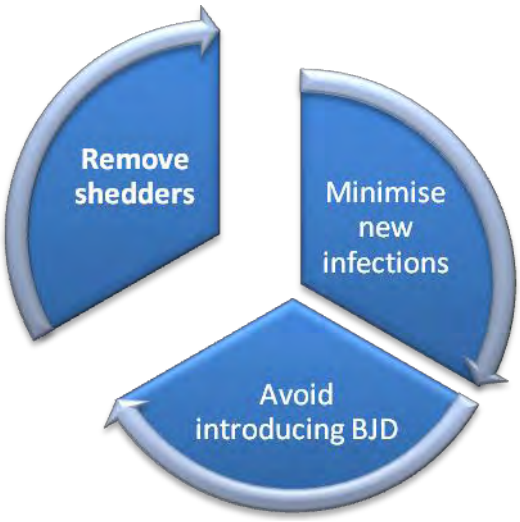
Technote 3

Remove Cattle Shedding BJD



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Technote 3

Remove Cattle Shedding BJD

Key points

- Removal of cattle that are shedding BJD helps reduce environmental contamination and *Mptb* build up.
- Blood testing will not identify all infected animals, but is useful to identify and cull those animals most likely to be shedding *Mptb.*
- High-risk groups of animals can be identified from testing results and preferentially culled.
- Testing and culling is most effective when combined with management procedures such as hygienic calf rearing.

Introduction

The detection and removal of animals that are shedding BJD is important to reduce the level of environmental contamination with *Mptb*. However, the current diagnostic tests will not find all infected animals. Before entering into a testing program farmers need to be aware of the regulatory implications, costs and potential benefits.

Finding and removing shedders

BJD Recommendation # 24	
☆ **Understand the use of diagnostic tests for BJD**	
Why?	The implementation of diagnostic testing needs to be considered carefully, along with the regulatory implications, costs and expected benefits.
How?	See Dairy BJD FAQ 10 for more information.

BJD Recommendation # 25	
☆ **Use testing results for culling decisions**	
Why?	Testing of individual animals is useful not only for identifying those individuals that test positive and removing them from the herd, but also for identifying high-risk groups.
How?	Ensure cattle are individually identified with sire/dam information. Cull immediate offspring of clinical cases and cohorts of infected cattle. More aggressive culling of closely related and high-risk groups can be considered, depending on the herd manager's goals. (See also Dairy BJD FAQ 10)

BJD Recommendation # 26	
☆ **Cull test-positive cattle from the herd as soon as possible**	
Why?	Test positive (ELISA) are likely to be shedding BJD in most cases because the closer an animal is to breaking down with clinical BJD, the better the test's sensitivity.
How?	Cull blood test reactors. Offspring of infected cattle should also be considered for culling. (See also Dairy BJD FAQ 10)

BJD Recommendation # 27	
☆ **Understand the regulatory implications with test-positive cattle in your State**	
Why?	Regulatory implications of having a BJD-infected herd vary from State to State. Animal health authorities may place certain requirements for infected herds to comply with.
How?	Contact your State's BJD Co-ordinator or local government animal health veterinarian for specific advice.

Further information

Key papers

See also Dairy BJD FAQ 10

Jubb T., Galvin J. (2000). Herd testing to control bovine Johne's disease. *Vet Microbiol* 77: 423-428.

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Notes

Frequently Asked Questions

Dairy BJD FAQs

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Dairy BJD FAQ 1

Can calves be born already infected with BJD?

Key points

- Progeny from BJD infected cows can be born infected with *Mptb.*
- There is an approximately 9% *in utero* infection rate from subclinical cows.
- There is an approximately 40% *in utero* infection rate from clinical cows.
- Reducing the number of advanced infections will help to reduce importance.
- Cows with clinical signs of BJD are at high risk of producing an infected calf.
- Maternal progeny of clinical cases should be culled.

Prenatal transmission

The transfer of infection from cow to calf is well recognised with a number of infectious diseases of cattle, including BJD. Although BJD is generally regarded as an enteric infection, the organism can disseminate to extra-intestinal sites. This includes sites such as the uterus, liver, supra-mammary lymph nodes and udder. The likelihood of dissemination increases with the extent of clinical infection such that most clinical cases, and animals in advanced stages of the disease, are likely to have disseminated *Mptb*.

Foetal culture studies

Many studies have reported on cultures taken from the foetus of cows in different stages of infection and at different stages of gestation. Samples collected at slaughter from subclinical cases or latently infected cattle are reported to have approximately 9% foetal infection. Similar samples collected from clinical cases were culture positive in approximately 40-50% of cases.

Table 2. Summary of major studies reporting on foetal infection with *Mptb*.

Author	Year	No. foetuses	% infected foetus	95% CI*	Status of cow
Ridge	1993	87	9.2	4.1 – 17.3	Subclinical
De Lilse	1980	19	5.3	0.13 – 26.0	Subclincal
Kruip	2003	19	0	0 – 17.7	Subclinical
Seitz	1989	20	25	8.7 – 49.1	Subclinical
Sweeney	1992	58	8.6	2.9 – 19.0	Subclinical
	Totals	**203**	**9.4**	**5.7 – 14.2**	
Ridge	1993	12	50	21.1 – 78.9	Clinical
Seitz	1989	14	28.5	8.4 – 58.1	Clinical
	Totals	**26**	**38.5**	**20.2 – 59.4**	

*CI=Confidence Interval

Significance of *in utero* transmission

While *in utero* transmission of BJD clearly does occur, its significance is generally considered much less than risks presented to the newborn calf in the early postpartum period. Transfer of faecal material from the udder of the calf's own mother is perhaps its greatest risk of infection.

Culling the most recent calf from a clinical case is necessary to avoid the high risk of transfer to the foetus, either via *in utero* infection or immediately postpartum. These calves should not be retained in the herd. It has also been speculated that calves infected *in utero* may progress to clinical disease at an earlier age.

Managing *in utero* infection

The key control point with reducing the potential impact of *in utero* infection is that it is more likely in animals with advanced disease. Thus, minimising the number of cattle that enter clinical stage is important. Similarly, culling the calves of all clinical cases is an important control strategy.

Future studies

Studying the process of *in utero* infection is difficult. The aims of future research would be to understand the mechanism of access of *Mtpb* to the uterus, whether the immune status of the cow influences *in utero* transmission to the foetus and the consequences of *in utero* infection

of the foetus. It is also uncertain how the application of vaccination for Johne's disease in cattle would alter the rate of *in utero* infection in cows or its impact in calves.

Further information

Key papers

Whittington R.J., Windsor P.A. (2007). In utero infection of cattle with *Mycobacterium avium* subsp. *paratuberculosis*: A critical review and meta-analysis. *Vet J.*

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Dairy BJD FAQ 2

Can sheep with ovine Johne's disease (OJD) infect cattle?

Key points

- Sheep with OJD can infect cattle however the risk is low.
- Rare cases of OJD in cattle have been documented when calves less than six months old grazed the same pastures as OJD infected sheep.
- Sheep may also become infected with BJD and the risk of transmission to calves would be very high.
- Avoid running sheep with or on pasture likely to be grazed by dairy calves or heifers.

Cattle infection with OJD

Ovine Johne's disease (OJD) is a relatively common disease in sheep flocks in South Eastern Australia. Due to the significant research investment in OJD the issue of cross infection from sheep to cattle has recently been investigated. In Australia several cattle herds are known to have become infected with OJD.

Strain host preference

Distinct strains of *M.paratuberculosis* have been described with different host preferences. Traditionally, the strains have been referred to as C-type and S-type, for cattle and sheep host preference. However, recent studies show that infection can be established in either host with either strain, but OJD much prefers sheep to cattle. All new isolates of *Mptb* in cattle are now routinely strain typed.

Field data suggests that even when cattle are exposed to large doses of S-type *Mptb* infection does not become established in most cases.

Test reaction

Cattle infected with OJD have been reported to show ELISA reactions similar to cattle naturally infected with BJD. Faecal culture and strain typing is necessary to distinguish between C- and S-strains of *Mptb*.

OJD and environmental contamination

Field data suggest that in order for cattle to become infected with OJD, calves less than six months old must graze on heavily OJD contaminated pastures. The long survival time of *Mptb* requires careful management of contaminated land.

Management

In recognition that the transfer of OJD from sheep to cattle is possible but a rare event, the best management advice would be not to graze young calves on pastures grazed by sheep infected with OJD.

In most dairying situations, young calves would not ordinarily be exposed to sheep manure and in general the risk to dairy cattle is low. However, this situation would be more likely in a sheep/beef enterprise.

The grazing of adult cattle on pastures grazed by sheep infected with OJD probably presents little risk of infection.

Further information

Key papers

Maloney, B.J., Whittington R.J. (2008). Cross species transmission of ovine Johne's disease from sheep to cattle: an estimate of prevalence in exposed susceptible cattle. *Aust Vet J.*

Maloney B.J. ,Whittington R.J. (2007). Cross species transmission of ovine Johne's disease – Phase 2 Cattle. Project Number OJD.016. Final report prepared for MLA. Web

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Dairy BJD FAQ 3

What is the risk of spreading BJD via irrigation canals and shared waterways?

Key points

- *Mptb* survives for long periods in water and sediments.
- *Mptb* becomes widespread in the environment of infected cows and readily spreads from manure to water.
- In the US, up to 50% of samples collected from parlour exits, floors of holding pens, common alleyways, lagoons, manure spreaders and manure pits were contaminated.
- *Mptb* is likely to be present in drainage from contaminated sites.
- The risk of BJD spread in irrigation and shared waterways is potentially high if herds with high prevalence are present in the catchment.
- In practice, the risk is probably lower than that due to stock acquisition.

Mptb in waterways

Many dairy farmers in the irrigation districts of Australia are concerned that their herd will become infected with BJD via shared waterways and irrigation channels.

Mptb is well adapted for survival outside of cattle. Survival in the environment under ideal conditions has been reported to be up to 12 months.

Survival in water

Mptb can survive in water for prolonged periods. The environment in and around an infected dairy farm is likely to have *Mptb* widely disseminated. Drains and other sources of effluent are likely to contain appreciable quantities of *Mptb*. The discharge of effluent into waterways is likely to lead to some degree of water contamination. It is possible to quantify the amount of *Mptb* in water, but this is largely done as a research tool. In practice, dairy farmers should not allow effluent to escape into waterways.

Management of the problem

Calves are most susceptible to infection with *Mptb* and water sources that could potentially contain infectious material should be assessed for their likely risk.

Tank water or town water would generally be considered low-risk sources of water. Sedimentation of canal water in a tank could be a possible method of reducing *Mptb* numbers, however, research would be needed to confirm this. The Victorian Johne's Disease Calf Accreditation Program requires that water be sourced from tanks or town water.

Although tank water collected from roof runoff may appear an ideal solution, faecal material on the roof (e.g. milking shed) where water is collected may get washed into the tank. Ideally first-flush water diverters should be attached to downpipes to discard any solid material washed off when it first starts raining.

The risk of adult cattle (>12 months) becoming infected with BJD through drinking contaminated water is low.

Field evidence for water spreading BJD

A recently concluded thirty-three year epidemiological study on BJD in a sub-tropical environment in Australia found no evidence for transmission other than via introduction of infected animals or sharing contaminated land.

Further information

Freeman P, Jordan D. (2005). A thirty-three year history of the epidemiology, diagnosis and eradication of bovine Johne's disease is a sub-tropical environment. *8th International Colloquium on Paratuberculosis,* Copenhagen, Denmark.

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Whittington R.J., Marsh I.B., Reddacliff L.A. (2005). Survival of Mycobacterium avium subsp. paratuberculosis in dam water and sediment. *Appl. Environ. Microbiol*. 71: 5304-5308.

Websites

Dairying For Tomorrow http://www.dairyingfortomorrow.com/

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Dairy BJD FAQ 4

What programs are there in Australia for BJD control and market assurance?

National Dairy BJD Assurance Score

The National Dairy BJD Assurance Score is a voluntary, risk-based trading system, based on self assessment, for farmers to better manage the risk of BJD. Using the existing programs, the *Dairy Score* ranks the risk, on a 0 to 10 scale, of cattle being infected with BJD. The 10-point scale recognises the benefits of good BJD practices: the higher the score, the lower the risk. Recognition is given to herds enrolled in approved control programs, hygienic calf-rearing program, single test negative herds and the cattle BJD market assurance program.

The *Dairy Score* is part of a national approach being developed by cattle industries and governments that are working towards a national, less-regulated approach to managing BJD. It provides clear steps, allowing farmers to make progress with BJD using existing herd classifications..

The *Dairy Score* recognises a range of BJD assurance measures. These include auditable hygienic calf-rearing programs, such as the Victorian Johne's Disease Calf Accreditation Program or the dairy company 3-Step Plan; testing; control program participation; and the Australian BJD Market Assurance Program for cattle (CattleMAP).

The *Dairy Score* is part of the National BJD Strategic Plan endorsed by government and the cattle industry. The Plan aims to minimise the contamination of farms and farm products; protect the status of non-infected herds; and minimise BJD's social, economic and trade impact at herd, regional and national levels.

Full details of the *Dairy Score* are contained within the booklet, 'Pathways to Progress with BJD' available from the website, www.dairyaustralia.com.au/bjd.

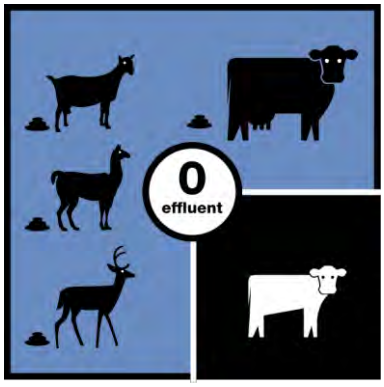
3-Step Calf Plan

A voluntary, industry-driven program containing three essential steps for minimising the spread of BJD has been developed. The 3-Step Calf Plan is included as a best practice recommendation in all dairy company on-farm quality assurance manuals. Implementation of the Plan can also be used to improve the *Dairy Score* (see above) of cattle reared under this program.

Table 3. The 3-Step Calf Plan.

STEP 1

Calves should be taken off the cow within 12 hours of birth. Prompt calf removal reduces the exposure to potentially infectious material from either the dam or the environment. Young calves are most susceptible to infection.



STEP 2

Management of the calf-rearing area should ensure that no effluent from animals of susceptible species comes into contact with the calf. Effluent containing faecal material from cattle or goats, alpaca and deer is potentially infectious to calves. By keeping the calf-rearing area free of effluent sources, calves will also be less likely to develop other infections.

STEP 3

Calves up to 12 months old should not be reared on pastures that have had adult stock or stock that are known to carry bovine Johne's disease on them during the past 12 months. Cattle develop age-related resistance to Johne's. By the time cattle are 12 months old they are at low risk of becoming infected.

South Australia, DairyManaJD

Dairy ManaJD is a voluntary BJD control program launched in South Australia during 2005. To enrol in DairyManaJD a herd must have cattle tested, cull any blood test reactors, agree to a calf management program and be subject to audit. Infected herds that enrol in the program are not subject to quarantine, but can sell on disclosure of their *Dairy Score* to other herds.

This program has seen a positive response from dairy farmers. As of December 2007 around 90% of dairy herds in South Australia had enrolled and been tested in the program. The program is funded by the South Australian beef cattle industry.

Johne's Disease Calf Accreditation Program (JDCAP)

The Johne's Disease Calf Accreditation Program (JDCAP) is managed by DPI Victoria. Calves reared under this program are considered a very low risk of having BJD. The requirements of the program comprehensively address all the major routes of transmission of BJD. The program is audited and administered on-farm by approved private veterinarians. In 2003 JDCAP was made a mandatory component of the Victorian TCP (see TCP information below).

Beef Only

Beef Only is a market assurance program for beef cattle to provide assurance that they are low risk of BJD. *Beef Only* cattle are beef cattle that have minimal contact with dairy cattle and have not grazed pasture that previously was used to run adult dairy cattle. The assurance from *Beef Only* comes from each herd's own biosecurity and a history of trading only within that low-risk sector of the cattle industry.

As a result of experiences with testing beef herds and following extensive trials of *Beef Only* sales, the beef cattle industry and State animal health authorities agreed in July 2004 that cattle from herds that qualify as *Beef Only* represent a low risk for bovine Johne's disease. Subsequently, they also agreed that breeding cattle originating from herds that qualify as *Beef Only* will be able to be traded into the bovine Johne's disease Protected Zones in Queeensland, New South Wales, South Australia and Tasmania without the herd of origin having to be tested.

Beef herds in Victoria that meet the *Beef Only* standard, and declare it on an Animal Health Statement, are able to move cattle through much of Australia without testing. Cattle from untested *Beef Only* herds are not eligible for entry to CattleMAP herds, Western Australia or the Northern Territory.

A *Beef Only* herd is one that:

- does not include animals that have been part of a herd which is classified as Infected, Suspect or Restricted according to the National Johne's Disease Standard Definitions and Rules for Cattle;
- has not grazed with dairy cattle or dairy-cross cattle at any time during the previous five years, unless those dairy cattle were from a herd enrolled in the Australian Johne's Disease Market Assurance Program for Cattle (Cattle MAP);
- has not, at any time in the past, grazed on land, that had, in the 12 months before the arrival of the beef herd, had been grazed by adult dairy cattle (2 years old or older) unless the adult dairy cattle were part of a CattleMAP herd;
- has only introduced into the herd or onto the property(s), cattle that have came from herds which are of the same (Beef Only) or higher status (BC-TAS, MN1, MN2, MN3) for bovine Johne's disease and came with an Animal Health Statement or bovine Johne's Disease vendor declaration; and

- ensures that all cattle that leave the property are identified with an appropriate National Livestock Identification Scheme device.

CattleMAP

The Australia Johne's Disease Market Assurance Program for cattle (CattleMAP) is a voluntary, industry-driven, national program to identify, protect and promote herds that have a low risk of being infected with BJD. Herds that have an 'Infected' or 'Suspect' status are ineligible to enter CattleMAP. While the CattleMAP does not guarantee that a herd is free of BJD, the higher the status, the greater the assurance that the herd is not infected. Herds are given a status based on the number of whole herd tests done with all negative results (Monitored Negative, MN). There are three MN levels; MN3 is the highest assurance level.

CattleMAP gives buyers confidence that the cattle they purchase have a low risk of having BJD. Very few dairy herds in Victoria are currently enrolled in CattleMAP, although in NSW there are around 180 herds participating.

Victorian Test and Control Program (TCP)

In 1996, Victoria introduced a voluntary Test and Control Program (TCP) for BJD infected herds. This program aims to contain the spread of the disease within and between herds. It incorporates whole herd blood testing, culling of test positive cattle and management to control BJD. The program provides owners of infected properties with a clear and structured opportunity to eradicate BJD. In herds where BJD is well established this process can take many years. Herds that successfully complete the Test and Control Program can, with the approval of the Chief Veterinary Officer (CVO) and sometimes further testing, apply to join CattleMAP. Approximately 400 Victorian dairy herds current participate in the program.

A feature of the Victorian TCP has been a marked reduction in the number of cattle showing clinical signs of BJD, thereby reducing the amount of BJD contamination on the farm. The number of blood test positive cattle in a herd declines substantially once a large proportion of the herd has been born after the start of the program.

All BJD Infected herds can apply to participate. It is mandatory for dairy herds to be participating in JDCAP prior to the commencement of testing. Subsidised testing is for dairy cattle four years and older. Compensation is payable for the culling of test positive cattle.

Further information

Contacts

State BJD Co-ordinatorsWebsites

Dairy Score information; www.dairyaustralia.com.au/bjd, or www.animalhealthaustralia.com.au

DAIRY AUSTRALIA
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Dairy BJD FAQ 5

How can BJD contaminated land be managed?

Key points

- *Mptb* can survive for long periods in the environment (up to one year).
- *Mptb* survival is enhanced in shaded environments where temperature fluctuations are moderated.
- Approximately 90% of viable bacilli die each month in exposed locations.
- Moisture is not required for survival, but low-lying areas (that may be moist or boggy) accumulate contamination and could be potential hot spots.
- Options for contaminated land management include:
  - leave land vacant for at least 12 months;
  - graze species not susceptible to BJD for 12 months;
  - graze cattle destined for slaughter at less than 24 months;
  - grow crops on the land;
  - graze only adult cows (>12 months) but not calving on land;
  - rotationally graze calves and heifers with healthy adult cattle; and
  - fence off low-lying areas and manage watering points.

Options for contaminated land

Many farmers may be faced with the situation of acquiring land for use by calves and wish to know how to minimise the risk of BJD. Because *Mptb* can survive for prolonged periods (up to one year) under the right conditions, precautions should be taken to reduce the risk. *Mptb* is also resistant to freezing.

Note: In order to change the official status of a herd, prior approval of the decontamination method would be needed. Consult the local Department of Agriculture Animal Health staff before taking any action.

A number of options exist for safely managing this land:

Graze species not susceptible to BJD for 12 months

Cattle, goats, deer and alpaca are all susceptible to infection with the cattle strain of BJD. Species such as sheep and horses are more suitable for grazing such land and could be used to decontaminate the land of BJD for a period of 12 months. These species would not contribute to further contamination of the land because they would not be actively shedding *Mptb*. Sheep could also be tested to confirm that they are not infected with OJD prior to introduction. (See also Dairy BJD FAQ 2 on Ovine Johne's Disease and BJD)

Grow crops on the land

The land could be used for cutting hay or other crops for 12 months.

Graze cattle destined for slaughter at less than two years of age

Young cattle destined for slaughter could be used to decontaminate the land for a period of 12 months. Because of their age, these cattle would not be likely to be shedding *Mptb* and further contaminating the land.

Graze only adult cows older than 12 months but not calving on land

Provided adult dairy cows do not calve on this land this is another option. Beef cattle could also be grazed, provided any suckled calves are destined for slaughter at less than two years of age.

Leave land vacant for 12 months

For many farmers this is not likely to be a realistic option for financial reasons.

Further information

Key papers

On-farm control and diagnosis of paratuberculosis, *International Dairy Federation Bulletin No. 364*. 2001.

Schroen, C., Kluver P., McDonald W., Butler K., Condron R., and Hope A. (2000). Survival of Mycobacterium paratuberculosis in the environment. *Meat & Livestock Australia, Sydney*.

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Whittington, R.J., Marsh I.B., Reddacliff L.A. (2005). Survival of Mycobacterium avium subsp. paratuberculosis in dam water and sediment. *Appl Environ Microbiol* 71:5304-5308.

Websites

DPI Victoria Ag Note 0920. Bovine Johne's disease: alternatives for affected land. March 2003 Available from http://www.dpi.vic.gov.au/animalhealth

NSW DPI http://www.agric.nsw.gov.au/reader/bjd

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Dairy BJD FAQ 6

Can BJD be spread by semen and embryos?

Key points

- The risk of spreading BJD through semen from infected bulls is low.
- *Mptb* may be present in semen of infected bulls and this risk is greater in clinically infected bulls.
- Bulls are routinely screened for BJD prior to collection of semen in AI centres.
- Embryo transfer is an effective method of preventing transmission of BJD from infected donors.
- BJD is unlikely to be transmitted by embryo transfer if the embryos have been washed as recommended by the International Embryo Transfer Society.
- Embryo recipients should be sourced from low-risk herds.

Semen

The risk of spreading BJD via frozen or fresh semen from infected bulls is considered to be low, even though *Mptb* has been found in the semen and accessory sex organs of infected bulls. Artificial insemination (AI) centres routinely test bulls for BJD and follow protocols to source low-risk bulls. However, large-scale field studies evaluating the importance of semen as a method of transmission have not been performed. Diagnostic tests to detect *Mptb* in semen have been described.

Experimental inoculation into the uterus with extremely large doses of *Mptb* has produced infection in the cow. However, this is not likely to occur with AI.

Embryos and IVF

Hygienically collected embryos present minimal risks for spreading BJD. The zona pellucida provides a physical barrier to the penetration of infectious agents. *Mptb* can be recovered from uterine flushings of cows with clinical BJD. However, the recommended embryo washing procedures (see IETS Manual) are highly effective in preventing adhesion of *Mptb* to embryos. *Mptb* does not enter embryos or oocytes. Embryos have been safely collected from heavily infected herds over many years and the resulting transfer has not resulted in transmission of BJD.

Cattle used as recipients of embryos should be carefully selected to minimise their likelihood of having BJD. Low-risk recipients should be sourced.

Further information

Key papers

Ayele W.Y., Bartos M., Svastova P., Pavlik I. (2004). Distribution of Mycobacterium avium subsp. paratuberculosis in organs of naturally infected bull-calves and breeding bulls. *Vet Microbiol* 103:209-217.

Chiodini R.J., Van Kruiningen H.J., Merkal R.S. (1984). Ruminant paratuberculosis (Johne's disease): the current status and future prospects. *Cornell Vet* 74: 218-262.

Bielanski A., Algire J., Randall G.C., Surujballi O. (2006). Risk of transmission of Mycobacterium avium ssp. paratuberculosis by embryo transfer of in vivo and in vitro fertilized bovine embryos. *Theriogenology* 66: 260-266.

Kruip T.A.M., Muskens J., v. Roermund H.J.W., Bakker D., Stockhofe-Zurwieden N. (2003). Lack of association of Mycobacterium avium subsp. paratuberculosis with oocytes and embryos from moderate shedders of the pathogen. *Theriogenology* 59:1651-1660.

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Wentink G.H., Frankena K., Bosch J.C., Vandehoek J.E.D., van den Berg T. (2000). Prevention of disease transmission by semen in cattle. *Livestock Production Science* 62:207-220.

Website

International Embryo Transfer Society https://www.iets.org/

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Dairy BJD FAQ 7

Does early calf removal affect the welfare of the cow or calf?

Key points

- Early calf removal has little or no impact on the welfare of the cow or calf.
- Separating calves from their mothers after more than 12 hours has been reported to be more likely to result in increased cow vocalisations and stress signs.
- Cattle are highly sociable animals and keeping young stock separate from adults has no measurable impact on welfare.
- If animals are sick, their welfare is adversely affected. The dairy industry has an ethical responsibility to minimise disease in livestock and implement calf programs to manage BJD.

Background

There is a growing community concern for the welfare of dairy cattle. Dairy farmers recognise the need to manage their animals well and good animal husbandry delivers good animal welfare outcomes. In particular,calves are the focus of public attention and attract the attention of animal welfare lobby groups.

Early calf removal

The scientific literature indicates that early weaning is unlikely to compromise the welfare of either the calf or the cow, provided appropriate management practices are in place.

Research studies support the observation that early separation of calves may have little or no substantial behavioural or physiological effects on their dams. Furthermore, there is consistent evidence that any effects on the behaviour of the cow may actually be reduced with early separation. For example, cows separated from their calves shortly after birth showed reduced vocalisations in comparison to those separated four or more days after the birth of their calves. Furthermore, research has shown that separation from the calf results in only a moderate short-term stress response in the cow.

There is some suggestion in the literature that the exhibition of less-intense maternal behaviour in the cow and attachment in the calves may be a result of relaxed selection accompanying the transition from the wild to captive environments. Furthermore, certain behaviours important for survival in nature may lose much of their adaptive significance in captivity.

Non-nutritive sucking, in which sucking behaviour is redirected to pen fittings and pen-mates, is a common problem in early weaned calves. In contrast, while allowing the calves to

remain with their dams for four or more days has been shown to reduce 'fearfulness' of unfamiliar calves and increase social activity, it has also been shown to increase both the number of vocalisations after separation and 'fearfulness' of humans. Therefore, while early weaning may have a range of behavioural effects, some of which have clear adverse welfare implications, such as non-nutritive sucking and fear responses, there are common industry management practices available that can be utilised to reduce or eliminate many of these harmful behavioural effects. For example, the use of artificial teat-feeders and *ad libitum* access to milk may decrease or prevent non-nutritive sucking.

Preventing contact with other animals

Cattle are social animals and require contact with members of their species, both during rearing and in adulthood, to maintain their welfare. There is no evidence in the literature that cattle, having been reared in an adequate social environment, are adversely affected by the absence of contact with other species. There is ample guidance in the literature for rearing calves and replacement heifers off pasture or indoors for extended periods of time. These reports indicate that artificial rearing can indeed protect calf welfare if undertaken properly. Therefore, in relation to the animal welfare implications of early separation of calves from other species and rearing calves off pasture or indoors, the scientific literature suggests that such practices can be undertaken without compromising calf welfare as long as good industry management practices are imposed.

Conclusions

It is axiomatic that if animals are sick their welfare is adversely affected. The dairy industry, as part of its management responsibilities under a duty of humane care of their animals, has an ethical responsibility to minimise disease in livestock. The scientific literature suggests that early separation is likely to have little or no negative welfare implications for the calf or cow as long as the good industry husbandry practices are in place.

Further information

Key papers

Hemsworth P.H., Lauba M. (2006). The animal welfare and ethical issues associated with hygienic calf rearing programs to control BJD. Report to Dairy Australia.

Krohn C.C. Jonasen B., Munksgaard L. (1990). Cow-calf relations. II. The effect of 0 versus 5 days suckling on behaviour, milk production and udder health of cows in different stabling, 678. Report from the National Institute of Animal Science, Denmark, Frederiksberg.

Dairy BJD FAQ 8

Can floods spread BJD?

Key points

- *Mptb* can survive in soil and water for up to 12 months.
- Heavy rainfall, leading to flooding of dairying regions, can disrupt daily farm routines, and result in water and sediment deposits remaining for prolonged periods.
- Young calves are most susceptible to infection, but develop age-related resistance; and by 12 months of age they are considered unlikely to become infected.
- Priority should be given to ensuring calves are not exposed to flood water sediment or effluent from adult cattle.
- Flood water is likely to contain very low concentrations of *Mptb*, thus calves drinking flood water represent a low risk of contracting BJD.
- Sediment may contain *Mptb* and grazing by cattle less than 12 months of age should be avoided.
- Disrupted boundary fences present risks with the mixing of young stock with adults.

Introduction

Heavy rainfall and floods can cause major disruption to dairy farming routines and BJD management. Dairy farmers may become concerned with the potential for spread BJD from neighbouring farms. Floods may also create the potential for the on-farm spread of effluent and adult faecal material to susceptible calves by disrupting normal routines.

The issue arises intermittently in Australia when heavy rainfall leads to flooding. This tends to be confined to those geographical regions with a history of flood events, and especially those farms located close to waterways and irrigation channels.

BJD is a notifiable disease, and in some States subject to regulatory control measures, thus making farmers anxious about the potential of flooding to inadvertently infect their herd.

Floods can cause severe disruption to hygienic calf-rearing practices, resulting in the potential for breakdown in efforts to minimise exposure to adult manure. Flood water may also result in contamination of parts of the farm with effluent from adult cattle, posing a risk to young calves.

Farmers enrolled in BJD programs - such as the Australian Bovine Johne's Disease Market Assurance Program, Victorian Test and Control Program, DairyManaJD, Johne's Disease Calf Accreditation Program (JDCAP), the 3-Step Calf Plan or CattleMAP - may have concerns regarding their continued eligibility for these programs.

Post-flood management

Calves are most susceptible to infection with *Mptb* and all efforts should initially be directed to minimise their exposure to effluent and faecal material from adults.

On-farm flooding

Farmers should aim to move calves out of flooded calf paddocks onto higher (and drier) ground that has not been grazed by adult cattle within the previous 12 months. Temporary off-farm rearing of calves could also be considered if no dry ground is available. Ideally, calf-rearing facilities should be located on high ground, not normally subjected to flooding. This helps to prevent potential exposure to effluent in run-off during normal operations.

Cow parking

For some flood-affected farmers, the short-term parking (agistment) of dairy cattle on other properties may be their only viable option. Farmers receiving these cattle should take care to manage the risks of BJD. Farmers should use the National Dairy BJD Assurance Score to better assess the risk with introduced cattle – the higher the score the lower the risk.

Farmers sending calves under 12 months old off-farm should minimise the risks of them acquiring BJD. Ideally, these calves should join another herd that has implemented the 3-Step Calf Plan or JDCAP.

Managing post-flood effluent and sediment deposits on calf paddocks

Sediment deposits that result when water levels decline could contaminate the land with viable *Mptb*. Farmers should initially avoid grazing these areas with cattle less than 12 months old until the risk of BJD has been reduced.

Adult cattle (>12 months old) can safely graze contaminated areas with minimal risk of becoming infected with BJD. The problem then arises as to when it is safe to graze calves less than 12 months old.

The contaminated land could be made safe in a number of ways:

- leave land vacant for 12 months and use the pasture for hay or silage;
- graze land for a period of 12 months with stock unlikely to be shedding *Mptb* and that are also low risk of becoming infected themselves, such as 12-24 month old heifers or steers;
- graze land with adult sheep destined for slaughter or horses for 12 months; or,
- graze land with cattle less than 12 months old provided they are sold directly to slaughter at no more than 24 months of age.

Following the decontamination period, calves could safely begin grazing previously flooded and sediment contaminated areas.

Farmers with herds enrolled in a formal BJD program should seek specific advice on the

appropriateness of each of the above recommendations in respect to their herd's program.

BJD programs

If flooding has disrupted a BJD program, farmers are advised to seek specific advice on a case-by-case basis from their local veterinarian or government animal health officer.

Further information

Key papers

International Dairy Federation (2001). Mycobacterium paratuberculosis. *IDF Bulletin No. 362*.

International Dairy Federation (2001). On-farm control and diagnosis of paratuberculosis. *IDF Bulletin No. 364.*

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Dairy BJD FAQ 9

BJD and milk quality assurance: what are the issues?

Key points

- The suggestion that there is a link between BJD and Crohn's disease has been around for decades and continues to be thoroughly investigated by the medical community.
- The current evidence currently does not support the theory that animal products pose a risk to human health in terms of Crohn's disease.
- The cause of Crohn's disease is unknown. Although a range of bacteria and the measles virus have been investigated over the years, the specific cause or causes of Crohn's disease have not been identified. However, several papers on *Mptb* and Crohn's are published each year.
- Pasteurisation is highly effective in killing *Mptb.*

Introduction

For many years, medical scientists have investigated a possible link between BJD and Crohn's disease because of some similarities in the gut changes.

Crohn's disease, known as 'regional enteritis', is a chronic, inflammatory bowel disease of people. Symptoms may include abdominal pain, diarrhoea or constipation and may mimic appendicitis or bowel obstruction. Patients with Crohn's disease may suffer from inflammation of the bowel over a long term, resulting in debilitating weakness and weight loss.

The cause of Crohn's disease is unknown. Although a range of possibilities has been investigated over many years, the specific cause of the disease has never been identified. Crohn's disease appears to be caused by several factors working together to cause the body's immune system to over-react to unknown factors in the bowel.

Food Safety Authorities Review

The hypothetical link between Crohn's disease in humans and *M.paratuberculosis* still remains unsubstantiated. The dairy industry has taken guidance from Australian peak food safety authority – Food Standards Australia New Zealand (FSANZ) – in respect to the proposed Crohn's disease link.

The conclusion of the 2004 FSANZ report on the issue was: "…at present there is insufficient scientific evidence to prove or disprove a conclusive link between Johne's disease (or *Mptb*) in ruminants and some cases of Crohn's disease in humans."

Mptb and Crohn's: the issues

Mptb is found in some Crohn's pateints

Studies of an association between *Mptb* and Crohn's disease have produced conflicting results. Many mycobacteria normally found in the environment have been isolated from Crohn's disease patients. *Mptb* has been detected in some patients with Crohn's disease, but the findings are inconsistent.

Some studies have found a statistical association between the detection of genetic material (DNA) from *Mptb* in patients with Crohns disease, however positive results have also been reported in patients with other inflammatory bowel diseases and also in healthy people. The detection of DNA does not indicate that the organisms are present or that the specific organism has caused the disease. Bowel tissue that is already inflamed may be vulnerable to infection or exposure to various bacteria that would otherwise pass harmlessly through. The inflammatory reaction in the bowel of Crohn's disease patients may be an allergic reaction to these gut inhabitants.

Crohn's occurs in regions where BJD is not present

Crohn's disease occurs in regions where BJD does not occur and it is not more common in regions and countries where BJD is common. Crohn's disease does not occur more commonly in people who work with animals.

Some overseas retail milk has been found to contain viable *Mptb*

There have been a number of overseas studies that indicate some *Mptb* may be present in retail pasteurised milk samples. These studies indicate that some *Mptb* do indeed survive commercial pasteurisation methods; pasteurisation is not effectively done in some facilities; or that retail milk is contaminated after the pasteurisation process.

However, these results are not universally accepted due to technical issues associated with the laboratory techniques. Nonetheless, these studies have furthered interest in the dairy industry to adopt measures that minimise the potential for exposure of consumers to *Mptb*.

Pasteurisation is effective in killing *Mptb*

Many laboratory experiments have shown that pasteurisation reduces the concentration of *Mptb* in artificially laden samples many thousand-fold. The efficacy of pasteurisation at 72°C for 15 sec to kill bacteria and prevent human illness has been widely studied. Included in these studies is considerable work on the heat resistance of *Mptb*.

A number of milk processors have responded to the research work by increasing their pasteurisation temperature from 72°C to 74°C because significantly more *Mptb* is destroyed. However, there are some implications for cheese manufacturing by implementing this

change.

Raw milk could contain *Mptb*

Mptb can enter raw milk directly as a result of excretion into the milk or indirectly as a result of faecal contamination from cows with clinical BJD or sub-clinical shedders. It has been estimated that raw milk is contaminated with around 10 mg of faeces per litre of milk. Faeces from infected animals may contain 1,000,000 organisms per gram and thus this contamination may represent a significant source of exposure to *Mptb.*

The sale of raw milk has been illegal in Australia for many decades.

Australian dairy industry response

As part of the dairy industry's continual improvement process, the industry is actively encouraging all Australian dairy farmers to implement measures that limit the potential for spread of BJD. Emphasis has been placed on the importance of hygienic calf rearing as a practical on-farm management procedure to be incorporated into routine dairy farming practice as means of limiting the spread of BJD.

Further information

Key papers

Food Standards Australia and New Zealand. Association between Johne's disease and Crohn's disease: A Microbiological Review. *Technical Report Series No. 35. December 2004*. ISBN 0 642 34593 7.

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Dairy BJD FAQ 10

How useful are the diagnostic tests for BJD?

Key points

- Imminent clinical cases are readily detected by the serum ELISA.
- The closer an animal is to being clinical, the more sensitive the serum ELISA.
- Specificity of the serum ELISA is around 99.8%.
- Faecal culture is slow but 100% specific.
- High-risk groups of cattle can be identified following a whole herd test.

Introduction

Two types of tests are commonly in Australia used for the diagnosis of BJD. These are blood tests to detect antibodies to the BJD bacterium (i.e. ELISA) and tests to detect or grow the BJD bacterium in manure or tissue samples (i.e. faecal culture and PCR/gene probes).

Blood tests are cheap, easy to perform and ideally suited to large-scale testing programs. Faecal culture is expensive and slow, taking at least eight weeks to get a positive result and 12 weeks for a negative result,. The absorbed ELISA method is used to remove cross reacting antibodies to other mycobacteria, which improves test specificity.

Testing live cattle

Blood samples collected from adult cattle are the most common method of testing for BJD in herds where *Mptb* has been previously cultured. Blood sampling is often done in late lactation and is commonly undertaken at the same time as pregnancy testing or other herd treatments.

Blood test results are usually available within 1-2 weeks and culling decisions can be made quickly. Many export protocols (e.g. China) require testing of cattle for antibodies to BJD.

Both faecal culture and blood testing may be used on the same animal or groups of animals to increase the chance of detecting infected cattle. The tests can be conducted at the same time, with animals positive to either being considered infected. Alternatively, the tests can be used in series so that an animal that is positive to one test (e.g. the ELISA) is then tested with another (e.g. faecal culture), to confirm the presence of BJD. In this case, only animals positive to both tests are considered infected.

In general, cattle less than two years of age are not tested for BJD because the test results in animals under this age are unreliable.

Testing at post-mortem

To diagnose BJD from samples collected from a slaughtered animal, the culture methods that

are used on faeces may be applied to tissues such as lymph nodes and gut. In addition, the tissues are examined under the microscope to identify the distinctive chronic inflammatory process and staining of bacteria in the tissues. A positive culture or microscopic examination confirms the animal had BJD, but some mildly infected animals may be classed as negative.

Culture vs blood testing

Because the BJD bacterium grows slowly, it takes many years to produce significant lesions in an animal. Antibody levels are only detected late in the course of the disease and most animals do not pass significant numbers of BJD bacteria in their manure until about the same time. Consequently, none of the diagnostic tests are able to detect all infected animals – the animals in the early stages of infection are likely to be test negative, whatever diagnostic test is used.

Faecal culture is about 10 times more costly to perform than the ELISA blood test and takes 2-6 months to produce a result.

Table 4. Stage of infection within the animal and estimated performance of the serum ELISA and faecal culture.

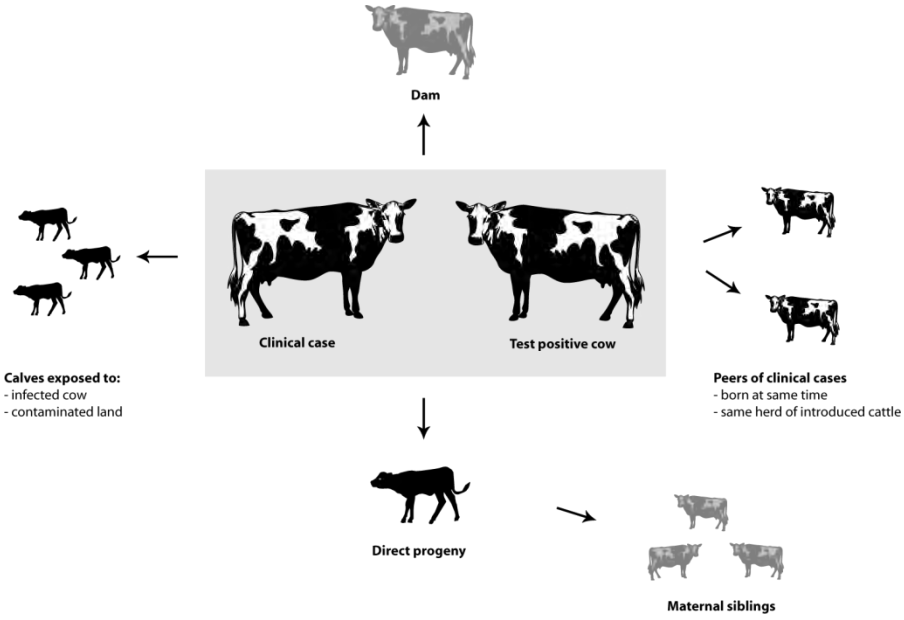
Stage of disease	Test method	Estimated sensitivity
Latent	ELISA	5% to 15%
	Faecal Culture	30%
Subclinical	ELISA	20% to 30%
	Faecal Culture	50%
Clinical case	ELISA	90%
	Faecal Culture	90%

Using test results

In Victoria, more than 700,000 cattle have been tested as part of the government-run BJD Test and Control Program (TCP). Removal of test reactors has resulted in a dramatic decrease in the number of clinical cases in participating herds. From this TCP data, the ELISA sensitivity in 2, 3 and 4-year-old animals at the first test round in herds that had been tested multiple times was 1.2, 8.9 and 11.6% respectively, but remained between 20 and 30% in older age-groups. However the testing process is expensive and many herds are unable to completely eradicate the disease (i.e. no test reactors at two year intervals).

High-risk groups of cattle can be identified and preferentially removed from the herd using the results of a whole herd test. More aggressive culling may improve the probability of reducing future test reactors (see Figure 3).

Figure 3. Identifying high-risk groups based on clinical cases and test reactors.



Farmer expectations from a Test and Control Program

Following a whole herd blood test, animals that return positive test results are to be culled from the herd. High-risk groups of animals will also be identified and a preferential cull list drawn up. Ideally, all high-risk animals, and those that return positive tests, should be culled immediately.

An annual herd test is usually performed to identify infected animals. In an average herd, 1% to 2% of the herd will test positive. Over time, fewer and fewer animals should test positive, provided management practices are in place and working. For many herds the complete elimination of infection, based on serial negative herd test results, is not achieved

until many years into a control program.

In a published analysis of the Victorian TCP over a 10-year period, only 30 of 542 herds successfully completed the program by having three successive negative whole herd tests. During the same period 91 herds dropped out of the program. Clearly, many farmers have become 'fatigued' by the TCP and lose interest when they continue to get reactors each year.

The repeated testing and removal of reactors from an infected herd results in the retention of non-reactors. Thus, the ELISA test sensitivity may decline in an infected herd as a testing program proceeds. This will further decline because most of the remaining infected animals will be young and not likely to react.

Further information

Key papers

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Ridge S.E., Morgan I.R., Sockett D.C., Collins M.T., Condron R.J., Skilbeck N.W., Webber J.J. (1991). Comparison of the Johne's absorbed EIA and the complement-fixation test for the diagnosis of Johne's disease in cattle. *Aust Vet J* 68: 253-257

Glossary

BJD – bovine Johne's disease, the disease resulting from infection with the cattle strain of *Mycobacterium avium* subsp. *paratuberculosis* (*Mptb).*

Clinical case – An animal showing signs consistent with BJD.

Cow parking – The short-term placement of cattle from one herd into another herd.

ELISA – An Enzyme Linked Immunosorbent Assay performed on serum to detect antibodies to *Mptb*.

High-risk group – Cattle that have been identified as having a high risk of being infected with *Mptb*, as identified through a herd test and/or information from clinical cases. High-risk cattle include direct progeny of clinical cases, animals introduced from the same herd as the infected animal, and calves exposed to sources of *Mptb*.

Latent infection – An animal infected with *Mptb* in the very early stages, not showing obvious signs and unlikely to react to any ante-mortem testing procedure.

Mptb – *Mycobacterium avium* subsp. *paratuberculosis*; the causative agent of Johne's disease.

Notifiable disease – Each State and Territory has a list of notifiable animal diseases that are of national concern. There is a legal requirement for anyone who suspects or diagnoses a disease on the list to immediately notify their relevant State or Territory animal health authority. The requirement to report notifiable disease is contained in individual State and Territory legislation.

OJD – Ovine Johne's disease, the disease resulting from infection with the sheep strain of *Mptb*.

Pass-through - The passive excretion of *Mptb* in the faeces of cattle as a result of ingesting *Mptb* from feed or the environment.

Reactor – An animal that has had a positive reaction to an immunological test for BJD.

SDRs – Standard Definitions and Rules for the control of BJD in Australia.

Shedder – An animal excreting *Mptb* in its faeces. They may be further defined based on numbers of organism per gram of faeces. Cattle shedding *Mptb* contribute to the build up of the organism in the farm environment.

Subclinical infection – An animal infected with *Mptb* but not showing signs of disease.

Supershedder – An animal not showing signs of clinical BJD but shedding extremely large quantities of *Mptb* in its faeces.

Test and Control Program – A herd management program for BJD that includes testing, removal of reactors and management to prevent new infections.

Zone – A geographical region in which efforts are made to contain BJD. Areas declared by legislative or administrative action to enable the exclusion, control or eradication of JD infection, in accordance with the SDRs.

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