# Bulletin

of the International Dairy Federation

410/2007

# Proceedings of the 1st ParaTB Forum

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# Proceedings of the 1st ParaTB Forum

October 19, 2006
Shanghai, China

A meeting of the
International ParaTB Forum

Edited by

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## Foreword

This issue of the Bulletin of IDF contains the proceedings of the first ParaTB Forum, held in Shanghai, China, in October 2006.
The forum is an initiative of the Action Team on Infectious Diseases of the IDF Standing Committee on Animal Health, with the aim of creating a synergy effect among national and regional control programmes on paratuberculosis.
The IDF is grateful to the members of the Action Team for developing and coordinating this initiative, to the authors of the papers for their valuable contribution and in particular to Mr Søren Saxmose Nielsen and Dr David J Kennedy for collating and editing the proceedings.

Christian Robert
Director General
February 2007

# Preface

The ParaTB Forum consists of representatives of national representatives for paratuberculosis programmes from different parts of the world. This first meeting was planned subsequent to the 8th International Colloquium on Paratuberculosis to address issues on control of paratuberculosis that are not covered to a great extent at these scientific meetings.

The objective of the meeting was to provide a basis for discussion on various programmes on paratuberculosis, with sharing of experiences and difficulties, objectives and programme setup for potential future modifications of the specific programs.

This publication contains 7 papers from a meeting of the ParaTB Forum held in conjunction with the IDF World Dairy Congress in Shanghai /China in October 2006.

The papers have not been peer-reviewed. Text edits were made on occasion to increase clarity for the international readership subsequent to contacting the authors. The editors of the proceedings are not responsible for copyright issues pertaining to the content of these Proceedings. All responsibility for meeting copyright infringement rules and regulations for material appearing in these Proceedings rests solely with the authors of each paper.

We acknowledge the International Dairy Federation (IDF) for their support and for hosting the meeting.

# 1. Report from the first IDF ParaTB Forum

Everbright Hotel, Shanghai, China
October 19, 2006
D. Kennedy[1], S. S. Nielsen[2]

## 1.1. Background

A number of countries /states have or are seriously planning to implement surveillance, control or eradication programs on paratuberculosis. These programmes have a variety of structures and models based on current knowledge. The biological basis is being dealt with at scientific meetings, primarily including aspects of the life sciences. Political, behavioural, demographical, educational and similar factors can be as important as biology in the successful implementation of these programs. These aspects are rarely reported at scientific meetings, though the experiences (positive and negative) learned in one program could be beneficial in others. Thus, a forum for exchange of experiences could have a synergy effect for the successful maintenance and development of strategies for control of paratuberculosis globally.

The aim of the ParaTB Forum is to create a synergy effect among national /regional control programs on paratuberculosis through exchange of experiences with control of paratuberculosis in various regions/states/countries. The vision was that the ParaTB Forum would provide an internationally accepted code on paratuberculosis control and eradication programs, aiming at global control of paratuberculosis.

The ParaTB Forum provided a platform for

- presentations of national /regional control or eradication programs on paratuberculosis in dairy herds (goals, type of program, methods and mechanisms involved);
- feed-back on programs that are established or under establishment;
- analyses on how well the program is pursuing the goals set.

All Forum members should represent countries that have a national control or certification program or at least a scheduled plan of having one. Countries that do not have plans, goals and strategies would not be members.

## 1.2. Participation

Representatives of 14 countries and a multinational dairy food processor participated in the meeting. The countries included: Australia, Belgium, Canada, Finland, France, Iran, Japan, Switzerland, New Zealand, Norway, Sweden, United Kingdom and the United States of America.

## 1.3. Programme

The programme of the meeting included presentations of program in 6 countries, a contribution of a review of communication and training paratuberculosis programs, and the view of a dairy processing company (see Table 1). The aims of the programs vary as listed in the table.

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**Table 1.** Presentations given at the meeting, with type of programme presented

| Subjet | Type of Programme |
|---|---|
| Developments in the approach to managing paratuberculosis in Australia | Assurance, control, certification & surveillance |
| An Overview of the Voluntary Bovine Johne's Disease Control Program in the United States of America | Certification |
| Plans for a Paratuberculosis certification and eradication program in Finland | Certification & Eradication |
| Control programme for paratuberculosis in Denmark | Control |
| Current surveillance and control program on paratuberculosis in Japan | Control & Surveillance |
| Johne's disease control in New Zealand | Control |
| A dairy company's view on the control of paratuberculosis | Control requirements |
| An International Review of Communication and Training in National JD Programs | |

## 1.4. Issues arising from presentations

The major points arising from discussion that followed each presentation included:

### 1.4.1. Australia

The Australian programme has been operating for a decade and the industry has taken greater ownership of the new approach. It was emphasised, that farmers have learned that paratuberculosis may be present in the herds in the endemic areas, and therefore, they need to be aware of how to manage it. The most important message being: "Protect the next generations".

### 1.4.2. United States

The US program is being reviewed in light of data indicating that the assumptions (for instance on test sensitivity and within herd prevalence) may not be correct and that the desired levels of confidence are not being achieved. Although it is estimated that 70% of herds are infected, the within herd prevalence is relatively low so that owners of infected herds see little benefit of remaining in the Test Positive stream as most already test at Level B. Most States are putting these herds into the Management component of the Program and the Test Positive Component may be scrapped.

### 1.4.3. Denmark

Denmark's new program is unique in using a milk ELISA with high sensitivity and low specificity to categorise cows into six risk classes based on the probability of infection. This categorisation also takes into account a drop in milk yield as indicative of infection.

### 1.4.4. Finland

Finland appears to have a low prevalence in its mainly small herds. This combination gives rise to the challenge of designing a test-strategy, which can be used for certifying freedom of infection in small herds, when the test-sensitivity is low. This appears to be a universal problem in low-prevalence areas.

### 1.4.5. Japan

Japan is currently reviewing its test and cull program with a view to standardising policies and implementation procedures among the 46 prefectures. Although managers were concerned with the continuing number of about 800 annual "cases" detected, the data presented indicated a very low rate of occurrence of cases as a proportion of tests conducted (approx 0.1% to 0.2%). The majority were categorised on the basis of immunological results, usually two ELISAs conducted more than 2 weeks apart.

### 1.4.6. New Zealand

It is estimated that most NZ dairy herds are infected but the rate of occurrence of clinical disease is reported to be falling steadily from about 2% per annum ten years ago and is now estimated to be less than 0.5%. A significant factor is thought to be the continuing trend to milking larger herds on more valuable land and the resulting early removal of calves to calf sheds and then rearing of heifers off-farm. While this desirable physical separation is a feature, so is the feeding of pooled colostrum and milk which is usually considered a risk for transmitting infection.

Culling on production is not considered to be a significant factor in identifying subclinically infected cows for culling and reducing the proportion of heavy excretors as probably only 5% of culling is based on production and studies at Massey University have not demonstrated a production loss in infected cows (S Norton, PhD project).

Given the herd prevalence of infection and that wildlife and domestic deer are considered a potential source/reservoir of potential exposure to cattle, NZ is looking more towards vaccination and selection of resistant cattle to manage the disease. This will be supported by modelling.

### 1.4.7. Nestech Ltd

The Company sees animal health risk management as a component of the whole of chain approach to food quality and feels that cooperation between authorities, farmers and the dairy industry is needed to achieve substantial results against paratuberculosis and animal diseases in general.

## 1.5. Updates from other countries

### 1.5.1. Belgium

A producer/industry funded voluntary program is being run for the country's 12,000 herds where it is estimated that 30% of herds and 1% of cattle are infected. The program is similar to that in the Netherlands and classifies herds into four risk categories.

### 1.5.2. Canada

See McKenna SLB et al. 2006.Proposed Canadian Voluntary National Johne's Disease Prevention and Control Program. Canadian Vet J, vol 47, 539-541.

A CD of the program and resource materials is available from Cathy Olson, csolson@shaw.ca

### 1.5.3. Norway

Goats are the main infected species and cattle paratuberculosis is associated with goats. Control is conducted on premises with both cattle and goats.

### 1.5.4. Sweden

A limited outbreak in beef cattle has been contained and paratuberculosis appears to have been eradicated. There has never been a case in dairy cattle but active surveillance is planned and may utilise a new approach to evaluating the confidence gained from employing a mix of surveillance tools. This approach may also assist other countries to plan surveillance where they wish to increase their confidence in freedom or evaluate the probability that surveillance systems will detect infection at very low prevalences.

### 1.5.5. United Kingdom

Extension has been undertaken in the past two years but there is little economic benefit to encourage producers or industry to start a control program. Individual farmers are implementing various animal health programs to improve their market access or profile. Department for the Environment, Food and Rural Affairs (DEFRA) is surveying 100 dairy herds across the UK and will report in 2007 but will not fund control.

## 1.6. Communication and training

It was noted that
- Farmers are being very effective in educating other farmers in the Danish and US programs.
- Training casual and foreign workers is a major challenge
- DVDs are effective tools and can be subtitled or dubbed.
- Risk assessment and management should be included in undergraduate veterinary training and other curricula for other advisors
- Success stories are good messages, but the stories need to be communicated more broadly, so that success stories can be shared.

## 1.7. Discussion

### 1.7.1. Objectives

While paratuberculosis represents a risk to the dairy industry at all levels and the participants supported action to reduce the spread and impact of paratuberculosis, the national objectives vary depending on their circumstances and resources. Objectives range from educating farmers and encouraging them to implement voluntary prevention and control through to long-term eradication and confirming presumed current free status with a significant regulatory input.

The objective or strategy that IDF can pursue globally is to facilitate international awareness and understanding and appreciation of the risk posed by paratuberculosis and the strategies that are being employed by countries. It was agreed that meetings of the ParaTB Forum would be valuable opportunities to openly and respectfully share information and insights on paratuberculosis control. Publication of their outcomes would also inform other dairying countries and organisations.

The role of the OIE in setting global standards was discussed as was the recent history of review and an alternative Code Chapter which has resulted in the deletion of the old Chapter from the Code. Any future OIE standards should be technically sound and not unjustifiably discriminatory against countries and farms implementing successful programs.

## 1.8. Next Meeting

It was agreed that an appropriate interval for updating and reporting progress on national and regional programs would be every 2-3 years and that most Forum members would probably attend International Colloquia on Paratuberculosis (ICP). The ParaTB Forum should focus of dairy cattle with other species only considered when they may risk factors for paratuberculosis in dairy cattle.

The next Forum is therefore proposed to be held with the 10th ICP in Minnesota USA in 2009. Michael Carter and Søren S. Nielsen undertook to organise the meeting.

Issues to be addressed at next meeting include:

### 1.8.1. Risk

- What is the business risk?
- Is there any further information on the proposed food safety risk?

### 1.8.2. Performance monitoring

- What are the outcomes we want to achieve?
- Which control measures are actually being implemented?
- Which performance indicators can we use /rely on to measure achievements?
- What have the individual programmes learned?
- What is working / what is not?
- Why is it working /why is it not working?

### 1.8.3. Implementation

- How do we deal with low-prevalence herds?
- How should international trade be managed and what is the role of OIE?
- How is effective communication carried out?
- Presentations of success stories

## Acknowledgement

The meeting expressed its thanks to the organisers, especially Dr Søren S. Nielsen.

# 2. Developments in the Approach to Managing Paratuberculosis in Australia

D.J. Kennedy[1]


## Acknowledgement

This paper is based on the work of a large number of other people and their industry and government organisations who have been committed to developing an effective and sustainable national approach to managing paratuberculosis in the Australian cattle industries over the past 10 years.



## Abstract

The national approach to controlling paratuberculosis in the dairy industry is managed under the umbrella of Animal Health Australia's National Bovine Johne's Disease Strategy by Dairy Australia (DA) and Australian Dairy Farmers (ADF) working with dairy processors and State governments.

Following decades of control by the various State governments, Australia started a collaborative industry and government national program to control paratuberculosis (Johne's disease) in all affected species in 1995. Cattle type M paratuberculosis is endemic in the dairy industry in south-eastern Australia but rare or absent from the northern and western parts of the country. In the endemic regions, the emphasis in the program has shifted from regulatory control of known infected herds and of cattle movements to focus more on industry risk management and voluntary uptake of agreed herd testing and calf hygiene programs. The relative risk presented by herds is reflected in a new National Dairy BJD Score.


## 2.1. Introduction

Cattle type paratuberculosis, called bovine Johne's disease (BJD) to differentiate it from infection with the sheep type of M paratuberculosis, was first diagnosed in Australia in an imported bull in quarantine in 1911 and subsequently in Australian bred cattle in Victoria in 1925 (Albiston 1965). The early history of the control of JD in Australia has been recorded in Milner and Woods (1989). The numbers of known infected cattle herds, increased significantly from the 1950's. These were mainly dairy herds but BJD has also been confirmed in farmed goats (1977), alpaca (1991) and red deer (1999).

BJD occurs principally in dairy herds in south-eastern Australia where most of Australia's 9,500 dairy herds are located. Surveillance results indicate that it is rare or absent in the smaller dairy industries in Western Australia and Queensland. The available data also indicates that BJD is also very uncommon even in the section of the beef industry in south-eastern Australia that does not mix with the dairy industry (See Figure1). These differences in occurrence of BJD across the country and between beef and dairy cattle have been major drivers of policy and programs.

Until 1995, State governments ran their own regulatory programs aimed at reducing the risk of introducing BJD infected animals and/or to eradicate or control infection. The approaches typically involved testing and culling test reactors and high risk groups in the herd and some form of quarantine. Less emphasis was placed on the management of calves. Live vaccine was also imported from the United Kingdom (Weybridge) and used in infected cattle herds in Tasmania and Victoria during the 1980s and early 1990s.

In 1995, concern about the spread of paratuberculosis in several livestock industries and its long term impacts, amongst the cattle industries in particular, led to the first national program for Johne's disease under the auspices of the National Farmers' Federation. The program's main aims were to increase understanding of JD and its control, implement a national standard for herd accreditation

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and provide a coordinated approach to research. The funding came from the dairy and red meat industries and from the Commonwealth and State governments.

The first of several national voluntary herd accreditation programs for paratuberculosis, the Australian Johne's Disease Market Assurance Program for Cattle (CattleMAP) was launched the following year (Kennedy and Neumann, 1996). Uptake of CattleMAP has remained low among commercial dairy herds in the large south-eastern dairying region where BJD is most common. The MAPs did not offer these herds any advantage as they programs have a strong focus on repeated negative herd testing and investigating suspected infection. People whose herds were found or suspected to be infected were often penalised by government restrictions and market discounts while the majority of infected herds remained undetected and uncontrolled.

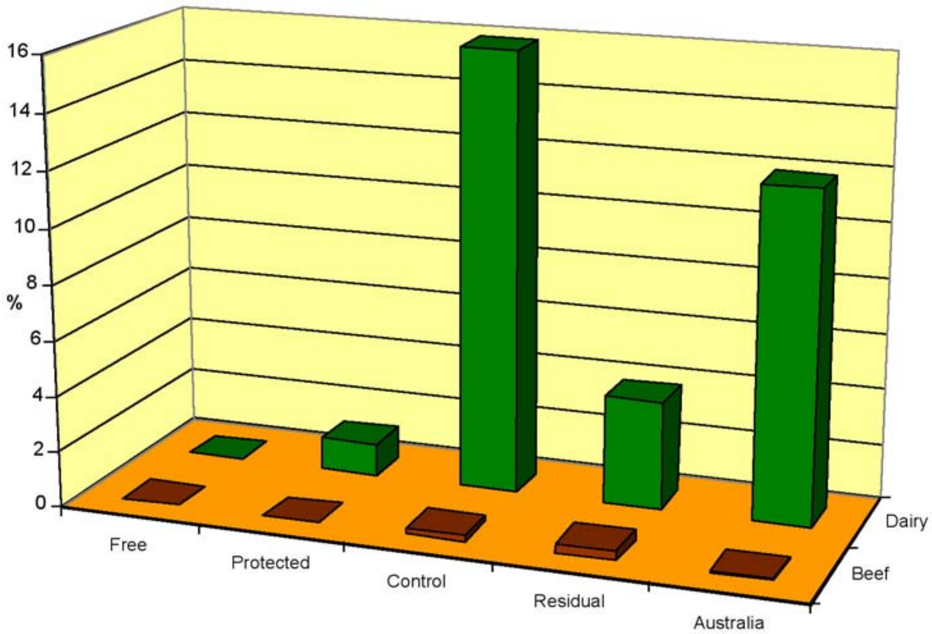


**Figure 1.** The herd prevalence of known BJD infection in Australia for beef and dairy herds by zones, June 2004 (Source: Animal Health Australia).

Animal Health Australia (the Australian Animal Health Council Ltd) took over the reins of national level management of Johne's disease in 1997 to maintain consistency and harmonisation across the affected industries and across the different State and Territory jurisdictions. In the ensuing 10 years, greater national collaboration has been achieved in research and surveillance and other national standards for diagnostic tests (Australian and New Zealand Standard Diagnostic Procedures) and for regulatory disease control (Standard Definitions and Rules).

## 2.2. Objectives of the current program

After a review of progressive and the then current knowledge of BJD, Animal Health Australia, the cattle industries and governments considered options for the long-term sustainable management of BJD and endorsed a National BJD Strategic Plan for three years in 2003 with goals to:

1. Reduce contamination of farms and farm products by M paratuberculosis;
2. Protect the status of non-infected herds and regions; and
3. Reduce the social, economic and trade impact of BJD at herd, regional and national levels.

It also noted that national eradication of BJD was not technically feasible or economically justified in the foreseeable future but that specific areas and individual herds or regions may eradicate infection to retain or progress to free status.

The three goals and associated major objectives for the next three years were updated in 2006 to:

**1. Minimise contamination of farms and farm products by M. paratuberculosis.**

1.1 Minimise contamination of animal products with M paratuberculosis.
1.2 Minimise exposure of humans to M paratuberculosis from infected cattle.
1.3 Minimise contamination of the farm environment.

**2. Protect non-infected herds whilst minimising disruption to trade.**

2.1 Reduce the spread of BJD between regions and production sectors while minimising disruption to trade.

**3. Minimise the social, economic and trade impact of BJD at herd, regional and national levels.**

3.1 Provide assistance to affected producers.
3.2 Reduce prevalence of BJD in both the dairy and beef sectors.
3.3 Remove the stigma associated with BJD infection and reduce emotional stress.

## 2.3. Program structure

Animal Health Australia's management of the program is funded by the national dairy and beef farmers' associations (Australian Dairy Farmers and the Cattle Council of Australia, respectively). The national steering committee comprises representatives of these farmer organisations and of the dairy and beef research and development corporations (Dairy Australia and Meat and Livestock Australia, respectively), a representative of the other livestock industries affected by BJD and of the government.

The dairy industry's component of the Strategic Plan is overseen by a national industry steering committee that includes representatives of dairy farmers, milk processors and food standards bodies. Animal Health Australia and the governments also have representatives on the steering committee. Dairy Australia manages most of the national research and communication projects on BJD in the dairy industry while state governments, dairy processors and private veterinary services implement most of the on-farm programs. There are also steering committees in the infected states that determine the most appropriate policies and implementation strategies given the particular state's level of infection, objectives and availability of funds.

## 2.4. Australian JD Market Assurance Program for Cattle

The original CattleMAP (Kennedy and Neumann, 1996) has been amended on a number of occasions over the past decade, notably in 2000 to make it a more formal quality assurance program. Progress and the details and reasons for these changes have been presented at subsequent Colloquia of the International Association for Paratuberculosis (Kennedy and Allworth, 1999; Kennedy et al., 2003). The main elements of the MAP are:

- Supervision by a veterinarian who has been trained on paratuberculosis and approved by the State.
- Risk assessment of the herd's history and management.
- A paratuberculosis risk management plan for the herd.
- Minimum standards for animal introductions.
- Investigation of suspect cases.
- ELISA testing of the herd every second years or of a large representative sample of cattle over two years of age to advance status.
- Risk based sampling and ELISA testing of higher risk animals within the herd to maintain status.
- Follow up investigation of reactors by faecal culture or post-mortem and histopathology.
- Annual program review with the approved veterinarian.
- External audit every three years.

## 2.5. National Dairy BJD Score

In the past two years the national dairy industry and interested governments have developed a national scoring system to rank all dairy herds for their paratuberculosis status. The National Dairy BJD Herd Score ranges from 0 to 10 with the higher scores giving greater assurance, based on negative herd testing and management (http://www.animalhealthaustralia.com.au/aahc/programs/jd/nbjdsp$/ndas.cfm).

Most dairy herds have no official history of paratuberculosis and have not tested negative for assurance purposes. These are classified as Non-Assessed herds and, effectively, they are not involved in JD control and are free to operate without constraints; however these herds represent a significant risk of spreading paratuberculosis in the endemic regions. Currently the Dairy Score ranks these Non-Assessed herds at the same level as moderately infected herds (Score 3) but they will be demoted to score 0 in mid-2008 if they have not either tested or implemented the 3 Step Calf Rearing Plan (See below). In southern Australia, dairy processors are including the 3 Step Plan as a desirable component in their on-farm QA programs. Calves reared under the plan earn an added point in the Dairy Score.

The dairy industry has agreed on a basic level of management that will be recognised as lowering the risk of becoming infected in dairy cattle younger than 12 months. Called the 3 Step Calf Rearing Plan it requires that:

1) Calves should be taken off the cow within 12 hours of birth.
2) Management of the calf rearing area should ensure no effluent from animals of susceptible species comes into contact with the calf.
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 BJD on them during the past 12 months.

## 2.6. State herd control programs for paratuberculosis

Animal health is a responsibility of the individual states and territories in Australia. Victoria and South Australia have significant voluntary paratuberculosis control programs in their dairy herds, utilising funds collected from state levies.

### 2.6.1. Victoria

The voluntary Victorian Test and Control Program (TCP) for infected herds commenced in 1996 and was reviewed by Jubb and Galvin, 2000. The program was based largely on annual ELISA testing of adult cattle, culling of test-positive cattle with compensation and rearing calves to reduce the risk of exposure to the faeces of adult cattle. The TCP reduced clinical disease in the 600 herds that were enrolled but many could not consistently achieve the negative herd tests required to be released from the program.

The government veterinary service and cattle industry reviewed and rebadged the program as TCP2 in 2003. To help prevent calfhood infection, the program now includes a thorough calf rearing program called the Johne's Disease Calf Accreditation Program (JDCAP). Initial ELISA testing of cattle over 2yo and thence annually of cattle over 4yo is subsidised. Reactors are to be culled to slaughter before the end of their current lactation with compensation paid at AUD300 per reactor in addition to the carcase value. To encourage early removal of reactors, compensation of only AUD100 is paid for clinically affected cattle which are slaughtered at knackeries or on the property. A herd will completed the program by having three consecutive annual negative herd tests or by achieving one negative herd test in a herd that comprises only cattle that have been reared under JDCAP (King and Ross, 2005). Cattle reared under the JDCAP earn an additional 3 points under the Dairy Score.

Participation in the JDCAP is managed through a signed agreement between the owner and an approved veterinarian (Ridge and Jeffers, 2005). The main elements of the JDCAP are:

- The farm must be initially inspected and approved by the approved veterinarian.
- All replacement calves must be separated from their mothers within 12 hours of birth.
- Cows must calve in an area that is free of dairy effluent or large amounts of manure.
- The calf-rearing area must be free of any dairy effluent or cow manure.

- Only clean water, preferably from a tank, bore or town supply, must be supplied for calves for drinking and for preparing calf milk-replacer.
- Only milk from low-risk cattle or calf milk-replacer must be fed to calves.
- Once calves are weaned they can only graze paddocks that have not been grazed by adult cattle during the previous 12 months.
- The grazing area for weaned calves must be free of any drainage or effluent.

The Victorian Department of Primary Industries Johne's disease website is a valuable source of information: http://www.dpi.vic.gov.au/dpi/index.htm and follow the links, Agriculture and Food>Animals and Livestock>Animal Health>Bovine Johne's Disease.

### 2.6.2. South Australia

For many years South Australia (SA) had controlled BJD in known infected herds by a strict regulatory approach. However, this was not engaging all herds and the risk of introducing infected cattle from more heavily infected areas was increasing as herds expanded. In 2004, SA launched a new, voluntary, audited QA program, DairyManaJD, to allow dairy farmers to manage BJD more as a quality issue (Rogers et al, 2006). It is a collaborative program between the government veterinary service, cattle industries, dairy processors and food regulatory authority. Funds have been largely provided by the beef industry, which sees that it is better protected by improved control in the dairy industry. Dairy ManaJD aims to:

- Provide a means by which owners of non-infected dairy herds or herds with a low prevalence of infection, can protect their herd status.
- Reduce the risk of BJD spreading between dairy herds.
- Provide a means by which infected herds can trade lower risk cattle based on history and calf rearing.
- Reduce disease spread within infected herds which will result in an improved herd risk category and reduced contamination of product and the farm environment.
- Assign a meaningful Dairy BJD Assurance Score to all dairy herds (see below).
- Remove the imposition of regulatory controls in favour of an industry audited on-farm program.

The principal elements of the DairyManaJD program are:

- National Livestock Identification Scheme (NLIS) identification of all animals;
- Subsidised testing of the herd.
- A Dairy BJD Assurance Score assigned to the herd, in consultation with an approved veterinarian.
- Declaration of the Dairy BJD Assurance Score on the National Vendor Declaration (NVD) for all animal movements into or out of the dairy herd, or for a land sale, lease or agistment.
- Introduction of replacement breeding cattle with an equal or higher Dairy BJD Assurance Score.
- Implementation of the nationally agreed Three Step Calf Rearing Plan (see below);
- Tracing of high risk animals from infected herds.
- Notification of diagnosis or suspicion of BJD.

By April 2006, approximately 60% of SA's 380 dairy farms had enrolled in the program with only 17 new infected dairy herds detected. A third of SA's herds had Dairy Scores of 7 or higher and about 10% were classified as infected at the time (Scores 1-6) .

## 2.7. Research and communication

Under the banner of the National BJD Strategic Plan, Dairy Australia, the dairy industry's research and development organisation, has initiated several research projects in the past three years as part of its whole chain approach, from farm to product, in managing paratuberculosis. It is also about to launch a major communication and training program to change producer understanding and practices in managing paratuberculosis in the dairy industry.

A year-long survey of bulk raw and pasteurised milk at milk processing factories across Australia in 2004 did not detect any evidence of M paratuberculosis by culture. To reduce testing costs and improve access to herd testing, the industry is also sponsoring research and validation of herd level tests on aggregate samples, such as farm tank milk and mixed faeces collected from the dairy yard faeces, as are used in other countries.

Other research projects that should contribute to assuring and controlling paratuberculosis in dairy herds in future include evaluation of a killed vaccine and validation of pooled faecal culture for cattle.

The communication and training program aims to eventually involve all dairy farmers in paratuberculosis control, especially in the endemically infected areas. Increasing the visibility of industry ownership and support should not only encourage disease prevention, lowering of the incidence of infection on-farm and better risk management in buying cattle, but also largely remove the stigma felt by the owners of herds that are currently officially classified as infected or suspect. Initially the strategy is to create awareness and reasonable understanding of the Dairy Score. Further developments will focus on changing farmer attitudes and having them use the Score in selling and buying replacement cattle. Private veterinarians, dairy factory staff, stock selling agents and other advisers will be included in the program.

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# 3. An Overview of the Voluntary Bovine Johne's Disease Control Program in the United States of America

M.A. Carter[1]

## 3.1. Background

In 1993, the United States Animal Health Association (USAHA) adopted a model Johne's disease (JD) herd certification program (Whipple, 1993). The program was not accepted nationally because of the cost associated with testing all animals above 24 months in a herd and other program issues. In 1997, USAHA's National Johne's Working Group (NJWG) appointed a committee of Federal, State and industry representatives to design a more affordable and flexible program based on sound scientific knowledge. The result was the U.S. Voluntary Johne's Disease Herd Status Program for Cattle (VJDHSP) (Bulaga, 1998). Instead of trying to certify herds free of Johne's disease, the VJDHSP provided minimum requirements for a program to identify herds with low risk for the presence of M. paratuberculosis infection. The VJHSP guidelines were used as a model for States developing Johne's control programs and for the Uniform Program Standards for the Voluntary Bovine Johne's Disease Control Program (VBJDCP), approved by the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) in April of 2002.

## 3.2. Objective

The objective of the VBJDCP is to provide minimal national standards for the certification of herds with low risk of having JD, and to provide an organized approach to controlling the disease at the producer level. The VBJDCP does not preclude the adoption of more stringent rules by any State with regard to activities within its boundaries. However, regulations dealing with interstate movement must conform with Federal regulations.

## 3.3. Structure of program

The VBJDCP is designed as a cooperative program administered by State governments and supported by industry and the Federal Government. The program consists of three basic elements: (1) Education to inform producers about the cost of JD and to provide information about management strategies to prevent, control, and eliminate it; (2) Management to work with producers to establish good management strategies on their farms; and (3) Herd Testing and Classification to help separate test-positive herds from test-negative herds while providing additional information regarding the level of confidence with the low risk status or an estimated prevalence within infected herds. (See Fig. 1)

Most States have adopted the national program as is, but some States (particularly in the northeast United States of America [USA]) have included the VBJDCP as part of a larger quality assurance/cattle health program, providing a broader approach to disease prevention on the farm. This format appears to be the most practical approach if the program is to remain voluntary, particularly if Federal funding continues to decrease. States have been focusing on educating producers and veterinarians to build interest and funds received by States through cooperative agreements with USDA-APHIS-VS have been used to provide incentives for producers to join the program. Incentives include testing cost supplementation covering the veterinary fees for conducting risk assessments and developing herd management plans. Two States have tried presenting small grants to producers. While these grants are greatly appreciated by producers, they place time demands on State administrations to review grant applications.

Confidentiality concerns remain a strong deterrent to joining the program, particularly with the beef industry. As a result, States prefer to put infected herds into the management level of the program without offering the option of the test positive classification. Management herds

[1] United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services

have had a risk assessment completed and a herd management plan developed, that may or may not include infected herds. Within the management level, herds may test but are not required to test. This leaves flexibility to the testing strategies so that producers can choose the strategy that best fits their management.

While the program itself is voluntary, the USA does have regulations in place to prevent known infected domestic livestock from moving interstate. Once an animal has been confirmed positive to an official JD test, (defined as an organism detecting test done in a USDA approved laboratory), these animals are restricted to the State. The exception to this is if the animal is sent to slaughter with an owner/shipper statement identifying the animals as infected. The primary issue in enforcing this regulation is that animals tested because of suspicion of JD have already been culled due to clinical disease or other management reasons before the results come back to the veterinarian or producer. On farms that know the organism is present, testing is usually done by serum or milk enzyme-linked immunosorbent assay (ELISA) and not confirmed by an organism detection method which allows many to slip into the market channels.

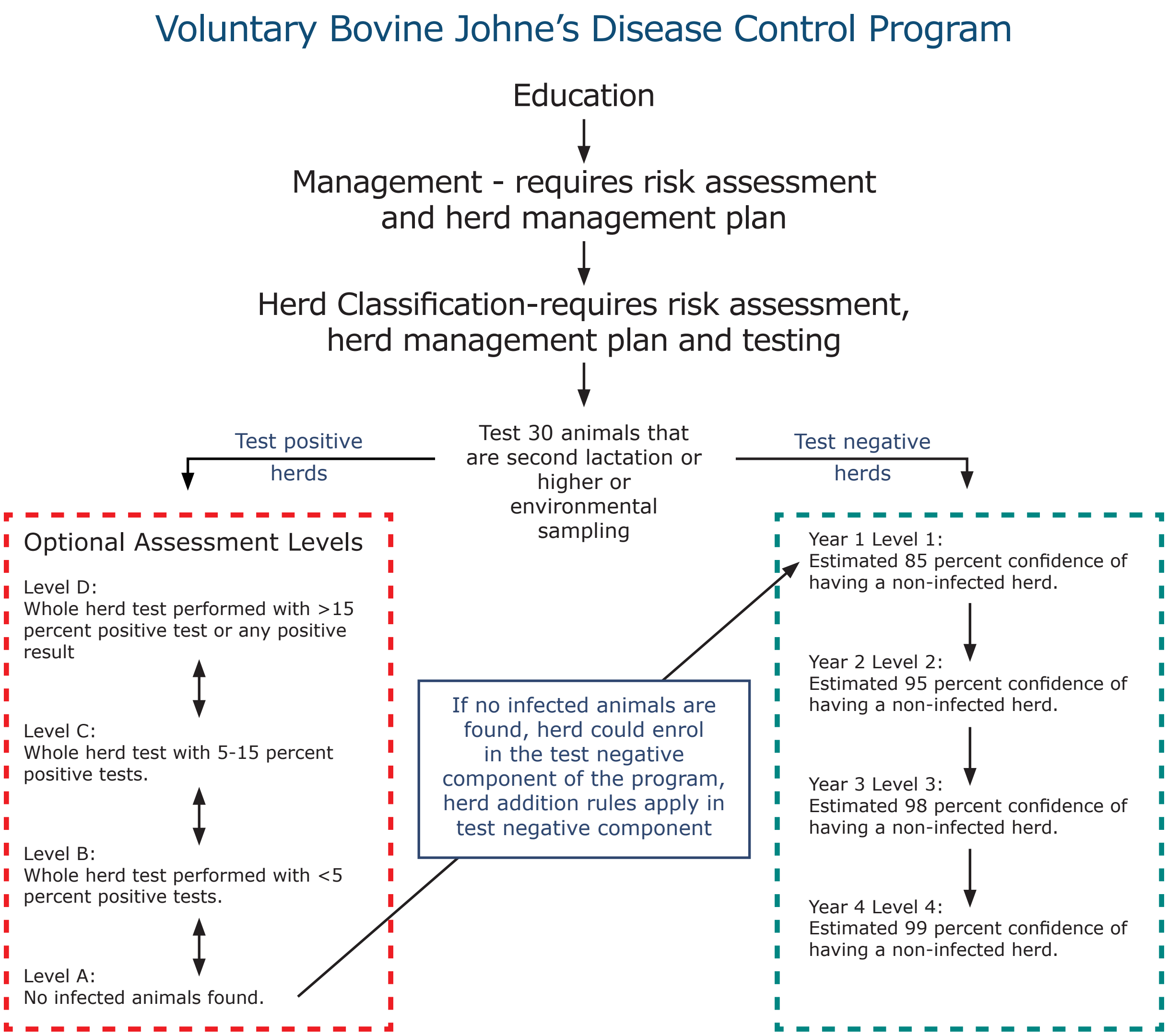


**Figure 1.** An Overview of the Voluntary Bovine Johne's Disease Control Program. (USDA-APHIS, 2006)

## 3.4. Test Strategies

The program level dictates the amount and type of testing the herd owner is required to do in order to remain in the program. Herd owners that are in the education level of the program typically have not done any testing since this is usually the first contact the producer has with the program. Herd owners participating at the management level of the program are not required to test, but as part of a required herd management plan, most herds incorporate some kind of testing. The testing done is meant to be a "best" fit according to the needs and resources of the producer and therefore can be quite flexible. To assist with identifying a best fit, USDA-APHIS-VS supported a project to develop a "Best Test Strategies" document which will be available in late 2006.

Herd owners within the test positive component of the program must include a testing plan approved by the Designated Johne's Coordinators (DJC) USDA-APHIS-VS within their herd management plan. The plan must show what testing will be done and how testing results will be used (cull, management separately, not to bred back, not keep calf, etc.). For herd owners that are applying for the optional B, C classification levels, testing must include all test eligible animals and limits the testing methods to individual faecal samples (culture or PCR) or serum ELISA.

Testing strategies for the test negative component are designed around reasonable assumptions that a herd is low risk for the presence of Mycobacterium avium subspecies paratuberculosis (MAP). The test negative component includes 4 levels which approximates 85 percent, 95 percent, 98 percent and 99 percent confidence of having a non-infected herd (USDA-APHIS, 2006). The approved test strategies can be seen in Fig. 2.

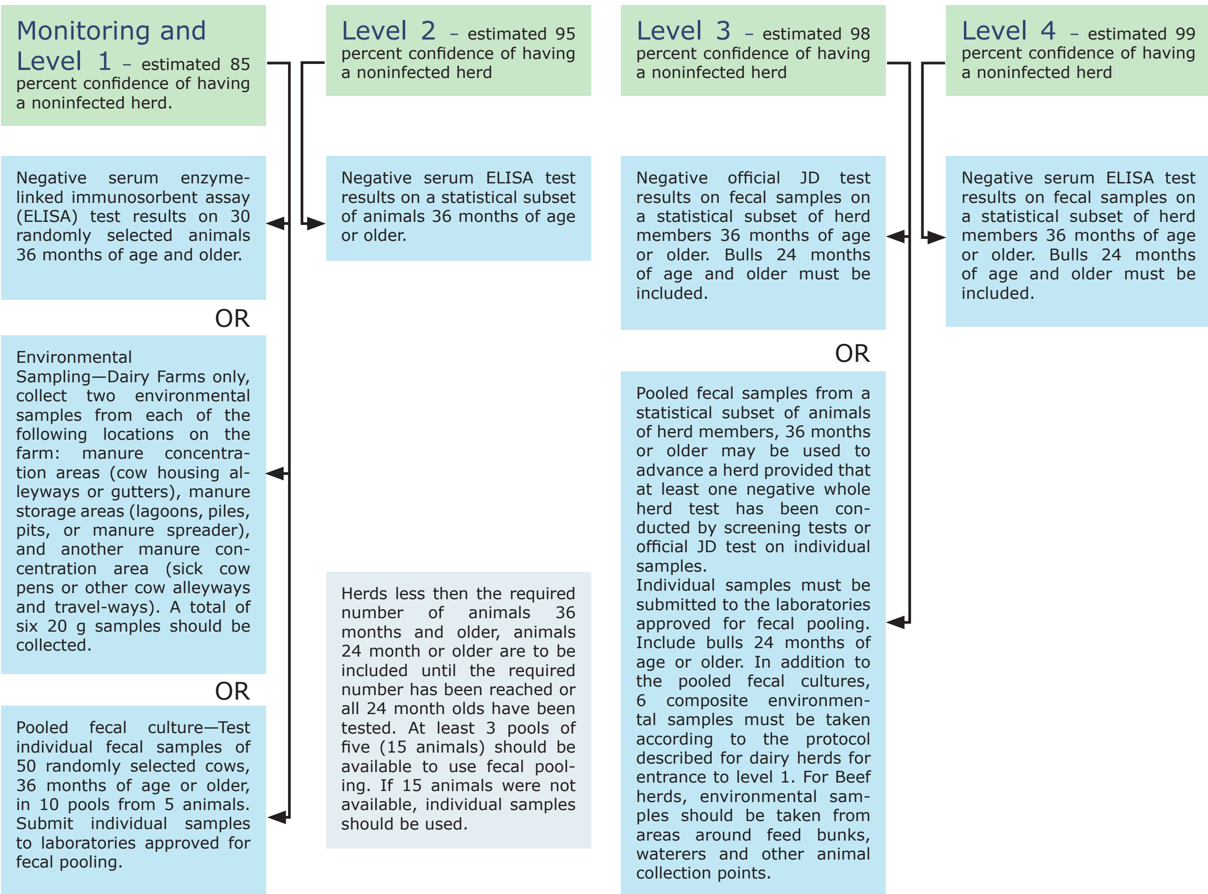


**Figure 2.** Approved test strategies for the Test Negative Component of the Voluntary Bovine Johne's Disease Control Program (USDA-APHIS, 2006)

## 3.5. Communications

One component of the VBJDCP is the creation of the State advisory committee or working group to assist the State Veterinarian and DJCs in establishing and operating a JD program. This committee involves producers, beef and dairy industry representatives, private veterinarians, university and extension personnel, State and Federal regulatory personnel, and others. The creation of this group has been the first step for most States when starting the VBJDCP in their State.

In each State, the DJC is the primary contact for program issues. Their role is to coordinate the control efforts within their State, educate the field staff working on the program within their State, and develop outreach programs for producers and private veterinarians. The national program calls for one coordinator per State. To qualify, a veterinarian must be employed by the Federal or State government or through a University associated with extension activities and complete required training. After a basic training course, DJCs are required to complete a refresher course every other year to keep current with program changes and the latest research. This interaction also provides opportunities to discuss problems that arise and solutions. The DJC updates the national coordinator informally through monthly conference calls, and through formal State quarterly reports through USDA-APHIS-VS electronic data submission systems.

National program updates are provided online at the USDA-APHIS-VS Web site and reported annually at meetings such as the U.S. Animal Health Association – Committee on Johne's Disease – National Johne's Working Group and the National Institutes of Animal Agriculture.

## 3.6. Education of farmer and advisors

In order to provide information for the control of JD, USDA funds three major projects to collect and disseminate the information: 1) National Johne's Demonstration Herd Project, 2) National Johne's Education Initiative, and 3) the Johne's Disease Integrated Project

### 3.6.1. National Johne's Disease Demonstration Project

The National Johne's Disease Demonstration Project was proposed with the objective to develop and validate model strategies for control of JD. The national project officially started in 2003, although several States had initiated their own projects earlier. The plan will support the project for at least five years.

The primary objective of the demonstration herd project is to evaluate the long-term effectiveness and feasibility of management-related disease control measures on JD. However, secondary objectives include: providing information and materials for education and training; evaluating management; testing and monitoring strategies; and creating opportunities to address other research objectives.

The project has identified specific outcomes that each herd in the project are required to measure and submit for analysis. These include the incidence of clinical disease and prevalence of infection in each herd; the amount of culling done based on test results in the absence of clinical disease; and the evaluation and monitoring of disease-transmission risks and on farm management practices.

As of May 2005, the National Johne's Disease Demonstration Project completed its second full year of data collection. Sixteen States are participating with dairy herds and 11 States have beef herds enrolled. Currently, 27 beef herds and 70 dairy herds are enrolled in the project, accounting for approximately 6,400 and 74,000 mature cattle (2 years or older), respectively. Participating beef herds range from 35 to over 700 mature cattle. Participating dairy operations range in size from 70 to over 4,000 lactating cows. The largest percentage of both beef and dairy herds consists of herds with 100 to 499 mature cattle.

### 3.6.2. National Johne's Education Initiative

The National Johne's Education Initiative (NJEI) is a response to needs identified in the National Johne's Disease Control Program Strategic Plan (Hartmann, 2002). The focus is on producers.

The NJEI's goal is to enhance awareness of the disease within the industry resulting in an increase in producer support of and participation in the VBJDCP. Activities that are underway, or in the planning stages include:

- Placement of articles in leading producer publications
- Survey of purchasers or users of Johne's and Beyond CD Rom relative to use and additional needs and update of CD and related Web site based on feedback from the survey
- Translation of several slide sets, or other related materials, to Spanish
- Maintenance of a Web site for the initiative (www.johnesdisease.org)
- Collection of State developed JD information, for a central access point
- Collection of presentations given at various national meetings

### 3.6.3. Johne's Disease Integrated Program

The Johne's Disease Integrated Program (JDIP) is a comprehensive consortium of scientists whose mission is to promote animal biosecurity. This is accomplished by the development and support of projects that are designed specifically to enhance knowledge, promote education, and develop real-world solutions that reduce losses. Its activities are funded primarily through a National Research Institute grant from USDA. The primary benefit is to promote efficiencies through collaborative research and share the intellectual and physical resources that are critical to overall success. A significant goal of JDIP is to reduce time translating basic science research into useful products and procedures.

A key feature of the JDIP project is the development of six Core Resources designed to provide a service function to all members of the JDIP community as well as external stakeholders. Each Core Resource is charged with a specific goal and includes members across disciplines and institutions.

- Core 1 provides consulting services and training programs for JD-related biostatistics and epidemiological study design.
- Core 2 provides services, reagents, and standardized protocols for diagnosis and strain differentiation of MAP.
- Core 3 provides state-of-the-art genomics and proteomics reagents and resources, as well as services and facilities for the production of antibodies and other immunological reagents for MAP and JD research.
- Core 4 develops and provides access to standardized animal models and provides access to state-of-the-art animal facilities for JD research.
- Core 5 develops and implements a strong communications, training, and outreach plan.
- Core 6 is responsible for the oversight of the JDIP program and promotes linkages with public and private stakeholders. http://www.jdip.org

In addition to the Core Resources, four research oriented projects have been developed to meet the needs of the stakeholders.

- Project 1, an Epidemiology and Transmission working group, is looking to aid the understanding of MAP transmission within farm transmission dynamics and on-farm risk assessment of JD.
- Project 2, a working group for Diagnostics and Strain Differentiation, is looking at the development and validation of efficient tests and testing strategies to facilitate control of JD in animal populations.
- Project 3 focuses on MAP Biology and Pathogenesis in those areas specific to the biology of MAP rather than issues that are common to all other pathogenic Mycobacterium subspecies.
- Project 4 relates to MAP Immunology and Vaccine Development through defining the cellular and molecular events associated with the development of an immune response to MAP in neonatal and adult animals.

### 3.6.4. Planned/intended modifications

No significant changes are planned at this time. Possible changes for the future include revising the language for the confidence statements to bring greater awareness to the fact that even test negative herds could potentially be infected, and because the original assumptions used for the confidence calculations need to be adjusted. Other minor changes that are expected are the inclusion of new testing strategies to maintain the confidence of the program while reducing the cost of testing to the producer.

Although a couple states have a Johne's control program for goats in place, development of a national program for sheep and goats remains slow but a draft program is expected some time in 2007.

There has been some effort on the part of the dairy industry to push for expanded testing for interstate movement of cattle but this effort has not gained support at a broad level.

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# 4. Plans for a Paratuberculosis certification and eradication program in Finland

L. Kulkas[1]

## Abstract

Paratuberculosis was an officially controlled disease in Finland for several decades during the 20th century, until the first clinical case was diagnosed in an imported beef animal in December 1992. The disease was fast taken out of the list of diseases to be controlled. Since then paratuberculosis has been diagnosed in five beef herds (between 1992 -2000), but no dairy herds. A Paratuberculosis certification and eradication program is planned during 2006 -2007.

## 4.1. Background

### 4.1.1. Beef herds

Paratuberculosis was an officially controlled disease in Finland for several decades during the 20th century, until the first clinical case, since the beginning of the century, was diagnosed in an imported beef animal in December 1992. The disease was fast taken out of the list of diseases to be controlled. The officials stated that the disease was impossible to control. Since then paratuberculosis has been diagnosed in 5 beef herds (between 1992 -2000), but no dairy herds. Typical for the positive beef herds is that they buy and sell breeding animals. They have also imported beef animals from Western Europe. Almost all the rest of the 2300 beef herds have an unknown status, but the estimate is that about 2 % of the herds are infected, that would be about 40-50 herds. About 120 beef animals are imported from Western Europe per year. The imported animals are tested for paratuberculosis. There are blood samples from beef herds in Finland available after a BVD blood sample collection. These samples will probably be checked with an Elisa test, to evaluate the level of paratuberculosis in the beef herds.

### 4.1.2. Dairy herds

A small screening has been done between 1999 - 2004 in about 80 dairy herds that buy and sell breeding animals. Blood samples from all animals over 2 years have been collected three times and serologically tested (CSL, Idexx and Pourquier). More than 50 % of the herds have had one or more animals seropositive. Fecal samples have been collected from all seropositive animals from about half of the herds two times, but no paratuberculosis bacteria have been found after 6 months incubation. At least 5 other mycobacterial species have been found. Löwenstein- Jensen and Dubois medium have been used as growth mediums. The results have not yet been published.

There are about 14.000 dairy herds in Finland and the estimate is that about 0.1 % (10-20 herds) could be infected, probably via contacts with beef herds. The import of live dairy animals is relatively small, on average 16 animals/year during the last 8 years. They have all come from Sweden, which is probably free or almost free of paratuberculosis. Before that no live dairy animals were imported during several decades.

### 4.1.3. Other species/animals

No cases of paratuberculosis have been diagnosed in sheep, goats or deer in Finland. Lymph nodes from deer have occasionally been tested.

[1] Valio Ltd., Helsinki, Finland

## 4.2. The plan

The first meeting of a Paratuberculosis working group met in Finland on September 19th, 2006. All concerned sectors were represented: The government, testing laboratory personnel, the meat and milk sector.

### 4.2.1. The Certification Program

The paratuberculosis situation in cattle in Finland is relatively good, but there is not enough knowledge about freedom of the disease on herd level to certify the herds without a certification program with an appropriate testing scheme. A wish was expressed for an evaluation, would it be possible to certify the situation in Finland with a random sampling scheme? This would cost far less than certification of all cattle herds with calving animals. The number of dairy herds will be halved in the next ten years, so there will be about 7000-8000 dairy herds in 2016. The number of beef herds will probably slightly increase during the next 10 years.

The certification program would entail:

1. A voluntary program for at least the first 3-5 years, then eventually an obligatory program.
2. During the first 3 years, approximately 2000 dairy herds and 400 meat herds could perhaps join. The aim is to get those herds that will continue in production for at least 10 (?) years to join.
3. Faeces sampling of the oldest cows (average dairy herd size is 20 cows/herd), yearly for 5 years, with freedom certification level increasing year by year after negative growth results. The sampling interval could then be increased.
4. The producers will have to agree to buy new animals from herds on the same certification level or better and to agree to enter an eradication program, if paratuberculosis is found in the herd.
5. The cost of the certification screening would be shared by the government and the meat and milk sector.
6. The cost of the program direct to the producer is still open. This part will influence the interest to join very much.

### 4.2.2. The Eradication Program

It is expected that about two paratuberculosis positive dairy herds and 8 beef herds will be found during the first 3 years. The eradication program will be flexible, depending on how many positive herds are found.

1. The main part of the eradication costs will be paid by the meat and milk sector (industry).
2. The government should stand behind the main part of the costs for the diagnostics in laboratories. The government should put restrictions on sale of live animals from paratuberculosis positive herds.
3. The herd level eradication program will be "customer" made by specialists. It will entail slaughter of positive animals and their last born calves, calf isolation and feeding regimes, calf and heifer rearing in separate units, possibly on separate farms, according to internationally tested models.
4. A stamping out with full compensation to the farmers could be considered, at least for the dairy herds. It could be the cheapest way in the long run! The positive beef herds are the best breeding herds in Finland, which makes it difficult to apply the stamping out method in them. If an eradication program is too harsh on the producers, they will not join the certification program. There is a delicate balance to be maintained between the aim to free the country of paratuberculosis and the possible wishes of the farmers with positive herds.

## 4.3. The next steps

A group of three representatives from the Ass. for Animal Diseases Prevention, Finnish Food Safety Authority EVIRA and Valio Ltd. will formulate the certification and eradication programs more specifically. The estimation of possible costs is very important. The next meeting of the Paratuberculosis working group will be in November 2006. The programs will later be sent around for comments and sometime next year for approval to involved partners.

# 5. Control programme for paratuberculosis in Denmark

S. S. Nielsen[1,2], Ø.R. Jepsen[2], K. Aagaard[2]

## Abstract

Operation Paratuberculosis is the Danish control programme for paratuberculosis in dairy cattle. The programme is based on The Bang Method used to successfully eradicate bovine tuberculosis. Details about the programme are described herein, including the development of the programme. The programme was initiated in February 2006 and currently comprises of 537 farmers (~10% of all dairy farmers in Denmark). More farmers are expected to join as the programme evolves. The programme focuses on reducing within-herd transmission but when test-strategies have been evaluated, adjustments of the programme to include elements of herd certification or surveillance will be considered. Diagnostic testing is primarily done using an inexpensive milk antibody ELISA, without confirmatory testing. This same test-information may be considered for use in the surveillance or certification schemes. We are aware that there is still room for improving the current programme, but participating farmers and their herd health advisors have shown great enthusiasm about the project.

## 5.1. Introduction

Operation Paratuberculosis, the Danish control programme was launched in February 2006. The reasons for establishing the programme were: a) high paratuberculosis prevalence with approximately 80 to 85% of herds estimated to be infected (Nielsen, unpublished data); b) many farmers experiencing considerable economic problems as a result of Mycobacterium avium subsp. paratuberculosis infections and; c) increased paratuberculosis awareness among farmers.

There are currently no regulatory control on paratuberculosis in Denmark, except; a) farms cannot deliver milk from diseased cows; and b) imperfect goods (including live animals) cannot be traded without full disclosure to the buyer of any faults or defects of the goods. However, since 2002 an infected animal is not considered faulty or defective, due to the high paratuberculosis prevalence, but diseased animals are considered faulty if it can be proven that the seller is responsible for the condition.

Research projects involving farmers, as well as better communication to farmers and exchange of information concerning the high prevalence, and changes in the structure of farming have all contributed to the successful implementation of the programme, which is evident since farmers' participation in the programme is purely voluntary and at the cost to the farmers.

In this paper, the Danish control programme is described in detail.

## 5.2. Aims of the programme

The current programme is a voluntary participation control programme. The aims of the programme are: 1) to provide tools to farmers that wish to control paratuberculosis; and 2) to reduce the overall prevalence of paratuberculosis in Denmark. These aims have been established by the Danish Cattle Federation (DCF) as the representative of the cattle industry without involvement of the veterinary authorities. The long term aim is to eradicate paratuberculosis, with the establishment of successful control strategies, cost-effective surveillance and certification programmes.

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## 5.3. Decision processes

When the Danish government veterinary authorities express no immediate interest in an infectious disease of cattle, the central decision to address the problem is usually carried out by the DCF. The DCF was formed in 2002 and is composed of four organisations: the Danish Dairy Board (the central organisation of the Danish dairy companies), The Danish Farmers' Unions, the Danish Livestock and Meat Board (the trade organisation for the Danish beef and veal sector) and Dansire (the breeding organisation). These organisations are represented in the DCF, and thus represent a broad variety of interests in the cattle sector. Except for a few small private dairy companies that are members of the Danish Dairy Board, the participating entities are all co-operatives.

In 1998, the joint cattle industry (including the members that later formed DCF) and the veterinary research institutions (The Royal Veterinary and Agricultural University, the Danish Institute for Agricultural Sciences and the Danish Institute for Food and Veterinary Research) decided to carry out a research project named "Kongeåprojektet" (Andersen et al., 2000), which involved research, development, evaluation and use of diagnostic tests for paratuberculosis, and studies on risk factors associated with infection. The project was initiated in 1999 and ended in 2003. Follow-up activities to the Kongeåprojekt included further studies on pathogenesis, infection dynamics and intervention, and combined intervention against paratuberculosis and Salmonella Dublin. The reasons for combining paratuberculosis and Salmonella Dublin were: a) intervention against the two focuses on calving management; b) a national surveillance programme on Salmonella Dublin was initiated in 2002; and c) a desire to use the focus on Salmonella Dublin for simultaneous focus on paratuberculosis.

Based on the results from the two project periods, and a growing number of professional publications in farmers' magazines, there was an increasing desire from farmers to have tools and laboratory tests available for paratuberculosis. On an annual tour by the DCF board to farmers' meetings in September-October 2005, farmers were asked their opinions on the initiation of a paratuberculosis control programme. At the 11 meetings with approximately 600 to 800 participants, all but one response was positive. The most prevailing comment was: "Why wasn't this initiated earlier". Therefore, in November 2005, the DCF board decided to launch Operation Paratuberculosis, as a voluntary control programme.

## 5.4. Programme management and steering committee

The programme is managed by a central coordinator, employed by the DCF. The programme also includes a steering committee, consisting of members from DCF and external members (Table 1).

**Table 1.** Composition of steering committee in Operation Paratuberculosis, their roles and origin

| Group | Role and origin |
|---|---|
| 5 herd health advisors | 2 animal scientists operating as locally as herd health advisors<br>2 veterinary practitioners operating as locally as herd health advisors<br>1 veterinary consultant operating as locally as herd health advisor |
| 1 laboratory representative | Steins Laboratory that perform the laboratory tests |
| 1 RYK*-coordinator | 1 coordinator representing the 4 RYK centres |
| 1 veterinary chief | Responsible for political issues and coordination with other programmes |
| 1 programme manager | Coordination of Operation Paratuberculosis |
| 2 communication persons | Coordination of communication and writing of professional publications |
| 1 Cattle Database representative | Data management and extraction of results in useful formats for management of paratuberculosis on a herd level |
| 1 scientist | Programme designer and responsible for assuring that facts and programme contents are consistent |

*) RYK is the recording and milk yield control scheme.

Among the external members, 5 herd health advisors have the role of providing input from farmers' advisors. All samples of the programme are collected via the milk recording scheme, which is managed by four recording and milk yield control centres (RYK). All samples are transferred to one laboratory for testing. Logistics concerning sampling and laboratory testing is coordinated with inclusion of members from RYK and the testing laboratory. Test results are sent to the central Danish Cattle Database, and RYK can extract the results to compile management lists, which can be used by farmers and herd health advisors. These lists can also be accessed online directly by farmers and herd health advisors. The lists are described in detail in the following section.

## 5.5. Structure and content of the control programme

The programme includes regular herd testing of all lactating cows, establishment of aims, risk assessment, risk management and risk communication. Testing is coordinated by DCF and the remaining tasks should preferably be conducted by the farmers in cooperation with the local herd health advisor (see section 8).

The control programme is based on the same features as was used for the eradication of bovine tuberculosis, commonly known as "the Bang Method" (Bang, 1908; 1928). The idea behind the Bang Method is that an imperfect test can be used for diagnosis, but care should be practiced in the decisions made based on the test result, because not all cattle with a positive test result will be diseased, either due to false positive reactions, infections that never result in evident disease or other causes. However, test-positive animals are in general a greater risk for transmission of the pathogen than are negative animals. Therefore, all positive test animals should be managed so that the risk of transmission is eliminated or reduced. Culling of some positive animals may be a decision that is used under certain circumstances, e.g. low prevalence, further diagnostic evidence, clinical disease etc. But culling should never be the universal decision, even though some farmers find this decision the easiest and most convenient, especially at the beginning of a control plan.

| Dansk Kvæg | | ParaTB Milk feeding list |
|---|---|---|
| Herd with 230 cows | Herd ID xxxxx<br>Test date: 15.02.06 | Printed 23.08.06 15.38 Page 1<br>Den Kgl. Veterinær- og Landbohø<br>35 28 20 79 135 |

Based on milk antibody test i Herd xxxxx tested 15.02.06

Risk = High: milk should not be used for feeding of heifer calves; High hygiene around calving

| Animal ID | ELISA (15.02.06) | Previous (04.01.06) | Clv.no. | Exp. calving | Milk yield drop | Inf.-group |
|---|---|---|---|---|---|---|
| -00929 | 0.9 | 0.1 | 6 | | Likely | 2 # |
| -00940 | 0.3 | 0.7 | 4 | 09.10.06 | Very likely | 9 * |
| -00941 | 1.0 | 1.2 | 5 | 28.09.06 | Very likely | 9 * |
| -00958 | 0.5 | 1.0 | 5 | 10.03.07 | Very likely | 9 * |
| -00965 | 0.7 | 0.0 | 5 | | Likely | 2 # |
| -00982 | 0.8 | 0.8 | 4 | 18.09.06 | Very likely | 9 * |
| -00984 | 0.6 | 0.6 | 3 | 23.11.06 | Very likely | 9 * |
| -00991 | 0.5 (04.01.06) | - | 5 | 17.03.07 | Likely | 2 # |
| -00994 | 0.1 | 0.3 | 3 | 26.09.06 | Possible | 5 |
| -01001 | 0.9 | 0.9 | 4 | | Very likely | 9 * |
| -01001 | 0.9 | 0.8 | 3 | 16.10.06? | Very likely | 9 * |
| -01013 | 0.4 | 0.4 | 3 | | Very likely | 9 * |
| -01035 | 0.5 | 0.6 | 3 | | Very likely | 9 * |

**Figure 1.** Extract of a management list used for management of calving and milk feeding, based on test results in a herd regularly tested with a milk antibody ELISA. Only a part of the High-Risk cows are shown, and none of the Low-Risk cows are shown.

The modifications made to the Bang Method for the control of paratuberculosis is as follows: herd managers are advised to test their herds 4 times per year using a relatively inexpensive and sensitive milk antibody ELISA. Many positive test-results are seen with this test, because of our focus on sensitivity rather than specificity. The results comprise of some cows that are infectious, some with an infection that has yet to progress to disease, some cows that may transiently acquire Map from the contaminated environment and some which may be false-positives. Irrespective of the reasons for the test-positivity, all test-positive are considered to be potential transmitters of the pathogen. However, they are only recommended for culling if: a) they have repeatedly high test-levels; b) "clinical information" is present e.g. unexpected drop in milk yield, diarrhoea or other clinical features indicative of disease due to MAP infection; or c) there are very few test-positive in the herd. Confirmatory testing is generally not recommended.

Test-negative are also referred to as "Green cows", meaning that on the test-date they are not infectious and therefore considered to be low-risk cows. Green cows, especially the elder ones, would make good candidates for production of colostrum for a colostrum bank. Green cows may calve with other green cows, and the hygiene level can be lower than that of high-risk cows.

Test-positives are considered to be high-risk cows. They are subdivided into: "Red cows" and "Yellow cows". Red cows are recommended to not calve again, but given the specific test-results and the prevalence, this can be subjected to further differentiation in a specific herd. Yellow cows can calve again, but preferably in a calving area separated from the calving area of Green cows. The calving area for Yellow cows should be single pens, and each calving pen should be thoroughly cleaned after each calving. Neither Red nor Yellow cows should provide any milk (colostrum, milk from cows with high somatic cell count, and bulk tank milk) for feeding of calves. All cows are categorised into risk groups, which can be used for management of milk feeding and calving. An example of a management list of high risk cows is shown in Figure 1. In addition to the division of all cows into risk groups, these lists can also be used to roughly estimate total milk production loss for a herd (Fig. 2).

| | | 1st Parity cows | 2nd parity cows | > 2nd parity cows | Total |
|---|---|---|---|---|---|
| Avg. kg. ECM | | 8243 | 7488 | 5562 | |
| No. of cows | Inf.group | | | | |
| | 0 | 39 | 19 | 18 | 76 |
| | 2 | 1 | 14 | 11 | 26 |
| | 9 | 2 | 11 | 39 | 52 |
| Annual production loss | | 2968 | 20592 | 30591 | 54151 |
| | Inf.group | | | | |
| Percent cows | 2+9 | 7 | 57 | 74 | 51 |

**Figure 2.** Milk production loss in the herd is estimated based on the potential production among cows of infection group 0 and the no. of cows in infection groups 2 and 9. It is a rough estimate and is based on a percent-wise reduction compared to what is expected in an age-group. In this herd with 230 cows, the older cows do not seem to produce much milk, but this could be an artefact.

## 5.6. Diagnostic testing

Most testing is done using a milk antibody ELISA (Nielsen, 2002; Nielsen et al., 2002) on milk yield control samples. There is no recommendation to do confirmatory testing with faecal culture, but some farmers may choose do so. To date, none have done it in the programme. However, it is recommended that decisions should always be done on a minimum of two test results, especially when the decision is culling.

The test used is optimised to be as sensitive as possible. Unspecific reactions are of less importance, because not all reactions lead to culling of test-positives. The primary aim of testing is to detect infectious animals as soon as possible, whereas testing to detect infection is not an aim related to decisions of the individual animal. The ELISA has been shown to be able to detect almost all infected cattle, that shed bacteria (Nielsen and Ersbøll, in press), although the age-span of testing positive is from 2 to 11 years of age. However, with frequent testing and the test scheme should be able to detect most animals at the time they are infectious (Nielsen and Toft, 2006a).

Based on the repeated testing, cows are divided into 6 infection groups: 0 (repeated negative, minimum 2 samples); 1 (negative, but only one test result); 2 (positive on last sample and negative on previous tests); 3 (last four tests negative, but with one previous positive result); 5 (last result negative, but more positive results have occurred previously) and 9 (last two or more results positive). Cows with positive reactions are all considered to be high risk animals and potentially infectious, but only cows of groups 2 and 9 have been shown to have reduced milk production. It is important to emphasise to farmers and advisors, that they should interpret the result relative to the infection stage, and 3 conditions are generally considered: Infected (inf. groups 2, 3, 5 and 9), Infectious (inf. groups 2, 3, 5 and 9, but with most weight on 2 and 9), and Affected (inf. groups 2 and 9 (Nielsen and Toft, 2006b). Production losses can be summarised from the frequency of cows of infection groups 2 and 9, compared to the expected production (Nielsen et al., 2006b).

The test-frequency that is currently recommended is 4 times per year so that at least 3 tests per cow will be obtained however, this test-frequency needs to be further evaluated wth regard to new available information i.e. suggestions that cows aged between 2 to 4 years should be tested more frequently, whereas older cows could be tested less frequently (Nielsen and Ersbøll, in press).

## 5.7. Herd classification

There is currently no test scheme used for herd classification. The current prevailing idea is to estimate the probability of freedom of MAP infection (PFree) among cows based on annual ELISA testing, without confirmatory testing. The resulting PFree along with a calculated True Prevalence are based on the test-prevalence, and are corrected for the imperfection of the test. This approach has proven to be cheaper and more efficient than using confirmatory testing (Sergeant and Nielsen, unpublished data). Microbiological testing of environmental samples and bulk tank milk samples using PCR are also being considered as possible strategies for herd classification, but still requires further evaluation.

## 5.8. Education of advisors

The general level of knowledge about paratuberculosis among herd health advisors was quite variable prior to the establishment of the programme. Some herd health advisors were able to establish herd health plans which lead to successful reduction of paratuberculosis to a level where the infection no longer gave problems, while others would often state, that there are no effective schemes that can be used. In the latter herds, the solution would simply be culling of severely affected animals with no preventive measures established. In some instances, vaccination was used as an additional tool to management procedures aiming at reducing transmission.

A similar situation was observed with Salmonella Dublin, of which 25% of Danish dairy herds are antibody positive based on bulk tank milk samples (results from the surveillance programme in 2002) (Nielsen et al., 2003a). Observed reduction in prevalences in some regions compared to other regions having the same initial prevalence (Nielsen et al., 2006), combined with information from local advisors stating that they saw no incentives to control Salmonella Dublin, lead to the establishment of courses in preventive management of Salmonella Dublin and paratuberculosis. The primary course material consisted of a manual for advisors (Nielsen and Nielsen, 2005), which is based on a similar manual from the USA (Rossiter et al., 1999), but with modifications in the setup, the use of different risk scores and including both paratuberculosis and Salmonella Dublin. Our primary aims for using the manual are to: a) provide a tool to advisors to have a systematic approach to the infection; b) provide farmers with information to establish their own goals about the control of paratuberculosis on their farms; c) do a systematic risk assessment together with the farmer, so both parties will learn about the infection in the process; and d) create a management plan, which addresses the aims and the risks of transmission. Also included in the manual is information about various topics pertaining to the two infections. The manual is available (in Danish) at: www.paratuberkulose.dk.

An estimated 200 to 400 veterinarians provide cattle services regularly, and of these, 50-75% are estimated to provide some herd health services. Approximately a 100 animal scientists are estimated to provide cattle advisory services, including feed planning and to some extent, herd health advice.

Five two-day courses were offered in 2004, but 2 were cancelled due to few participants enrolled for the course. In 2005 and 2006, three more courses were added to the programme, which offered combined Salmonella and Paratuberculosis intervention strategies. Approximately 112 herd health advisors (of which 2/3 being practicing veterinarians) have participated in the courses to date. In Sept. 2006, an additional course focusing on interpretation of diagnostic tests for paratuberculosis, and use of management lists based on test results was offered. This course was a follow-up to previous courses, which was attended by 24 participants, of which a half had participated in at least one of the previous courses. Additional follow-up courses will be provided based on demand.

In addition to courses, meetings and seminars have been arranged locally by groups of veterinary practitioners, with the aim of discussing intervention strategies against paratuberculosis. From 1999 to 2006, there appears to have been an increase in paratuberculosis discussions among herd health
advisors, though this may to some extent be driven by farmers' demands to their advisors rather than local advisors seeking new advisory tasks.

## 5.9. Information to and communication with farmers

Initially, there was no information and communication strategy. This was resolved in 2006 with the initiation of the programme. It was recognised that providing information was not sufficient, but constructive discussions with farmers and advisors should also be in place. This communication should primarily be via local advisors, but meetings have also been held with active participation of farmers.

Information to farmers has been published in farmers' magazines with increasing intensity since 1999. In 2006, a new web-site was launched: www.paratuberkulose.dk, where farmers and advisors can obtain the up to date information about the infection and its management. The advisors manual (mentioned in section 8) was also sent to all dairy farmers in February 2006. In 2006, a DVD was produced containing information about the infection, and information on how to manage it. This will be sent to all dairy farmers in November 2006. The process of involving farmers and advisors are still ongoing and may need to be revised to keep farmers in the programme.

## 5.10. Funding

The programme is paid by the farmers through testing. There is no public funding for the programme, except for the production of the DVD and research projects, which have been co-funded by the DCF and various other government research programmes.

## 5.11. Participitation in operation paratuberculosis

Operation Paratuberculosis was launched in February 2006 with an application deadline in March 2006. Only herds that applied could participate, to assure that logistics for sample collection and laboratory analyses would be sufficient. In this first round, 537 of approximately 5200 Danish dairy herds joined the programme. The next application deadline will be in October 2006, with hopefully more farmers joining the programme. Farmers' attitudes to the programme have been surprisingly positive, even though the time frame for effective control and eradication has been predicted up to 6 to 8 years in a given herd. The participating herds consist of approximately

125 cows, whereas the average herd size in 2006 was approximately 100 cows. Whether the farmers will remain in the programme, and how it will develop further, is currently not known.

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# 6. Current surveillance and control program on paratuberculosis in Japan

S. Kobayashi[1], T. Tsutsui[1], T. Yamamoto[1], A. Nishiguchi[1]


## Abstract

This paper introduces the paratuberculosis active surveillance and control program and related issues in Japan.

After the first detection in 1959, the number of bovine paratuberculosis cases increased in the mid-1980s, with an annual incidence of more than 200 by 1996. Although the disease was one of the notifiable diseases at that time, it was designated as a subject of the nationwide active surveillance by the amendment of Domestic Animal Infectious Disease Control Law (the Law) in 1997.

All the targeted types of cattle, which are designated by each prefectural government (mainly dairy cattle, and beef cattle to some extent), have to be tested at least once in every five years. All the detected cattle diagnosed with the approved testing methods are compulsorily culled with compensation. Each farm, where the cases are detected, is placed under monitoring with repeated testing for a certain period. Simultaneously, some control measures recommended by the Law and related regulations are taken in order to prevent the spread of the disease within each herd.

Most of prefectures developed their own practical guidelines for controlling paratuberculosis in the light of the Law and related regulations established by the Japanese government. Therefore, the details of their guidelines differ by prefecture. The trend of incidence after the active surveillance started is not favorable at the moment. Recent incidence and control strategies are now being reviewed by the Johne’s Disease Advisory Committee.


## 6.1. Introduction - background of bovine paratuberculosis in Japan

The first case of bovine paratuberculosis in Japan was detected pathologically in a dairy cow at a breeding center. This animal was imported in 1955 and died in 1959 with severe clinical signs (Yokomizo, 1999). During 1980s the number of cases had increased gradually and more than 200 cases were detected every year in the mid-1990s based on the application of serological diagnostic methods (Statistics on Animal Hygiene, MAFF, 2005). Since 1971 paratuberculosis had been designated as one of the notifiable diseases in Japan and its passive surveillance had been in operation. However, because of the increase of cases, it has been also subjected to nationwide active surveillance by the amendment of the Domestic Animal Infectious Disease Control Law (the Law) in 1997.

Every detected cattle are compulsorily culled and farms detected must be placed under the monitoring program for a certain period. These control measures are currently applied to control the trend of the number of cases downward.

## 6.2. Cattle distribution and animal disease control system

In Japan there are around 1.2 million adult dairy cattle and 1.7 million beef cattle, respectively. The distributions vary regionally, that is; almost half the number of the dairy cattle are distributed in the Northern Island; beef breeds, mainly Japanese Black, distributes in the Western part of the country and dairy breed for beef including male Holsteins and crossbreeds are also distributed in the Northern Island reflecting the large number of dairies (Fig. 1 and 2).

In order to control animal diseases, each of 47 prefectural governments operates some Livestock Hygiene Service Centers (approximately 190 centers nationwide in 2005). A total of 2,100 veterinarians are located in these centers all over Japan. Control of animal infectious disease is administered on the basis of the Law and related regulations. The number

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of bovine notifiable diseases designated in this Law is 37, including paratuberculosis. Any veterinarians who suspect these diseases are obliged to report to the Ministry of Agriculture, Forestry and Fisheries (MAFF) via prefectural governments. When the disease is confirmed, appropriate control measures are then taken by the veterinary officials with the cooperation of farmers. In addition to this passive surveillance, currently paratuberculosis, brucellosis, tuberculosis and bovine spongiform encephalopathy are subjects to active surveillance as bovine diseases.

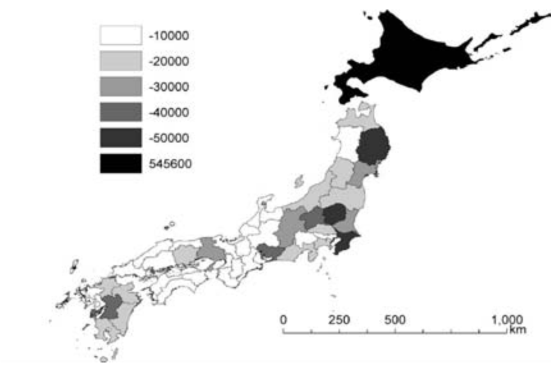


**Figure 1.** Distribution of dairy cattle in Japan (2004)

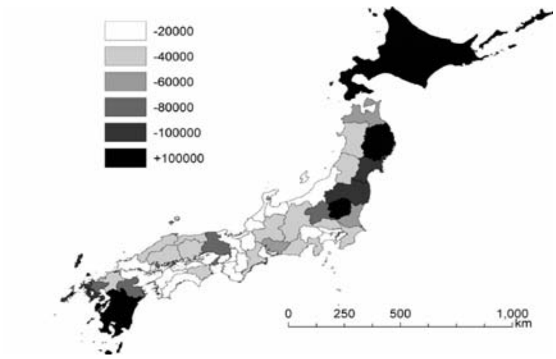


**Figure 2.** Distribution of beef cattle in Japan (2004)

## 6.3. Paratuberculosis control program

The framework of paratuberculosis control program is described in Fig. 3. Types of cattle for the paratuberculosis active surveillance are decided by each prefecture in the name of the governor. Each prefecture selects more than one of type of animal, including milking cows, breeding bulls, cattle raised with cattle that are subjected to the surveillance and beef cattle. Practically all the prefectures target dairy cows for active surveillance, however, some prefectures have not tested beef cattle. The approved diagnostic methods of positive criteria for paratuberculosis are; 1) positive results of two sequential ELISAs with interval of more than two weeks, 2) isolation of Mycobacterium avium subsp. paratuberculosis (MAP) by bacteriological culture, 3) microscopic confirmation of MAP in fecal samples from animals with clinical signs, 4) positive results of both ELISA and intradermal Johnin test and 5) positive results of both of intradermal Johnin test and complement fixation test. More than one combination of these tests is to be conducted to every targeted animal at least once in every five years. When positive results are confirmed, all the positive cattle are culled. Then the detected farms are compensated by four fifths of the market price of cattle by the Japanese government.

For the detected farms, a monitoring with repeated testing is administered. These repeated tests are performed until all the animals are found negative for a couple of times with certain months of interval. Therefore, it normally takes some years for the detected herds to finalize the monitoring period.

Simultaneously, detected farms perform some control measures recommended by the Law and related regulations in order to prevent the spread of the disease within the herds. It includes the immediate isolation of infected animals out of herds prior to slaughter, disinfection of the stall and cowsheds and the appropriate composting of manure. It also recommends to feed calves with hygienic or artificial colostrum apart from the potentially infected adults to prevent the horizontal infections. In case it is difficult for the farm to carry out these control measures, voluntary culling would be another option, which is partly compensated. In addition, the importance of the confirmation of cattle with disease-free certification is emphasized when the farm introduces new animals from the contaminated area.

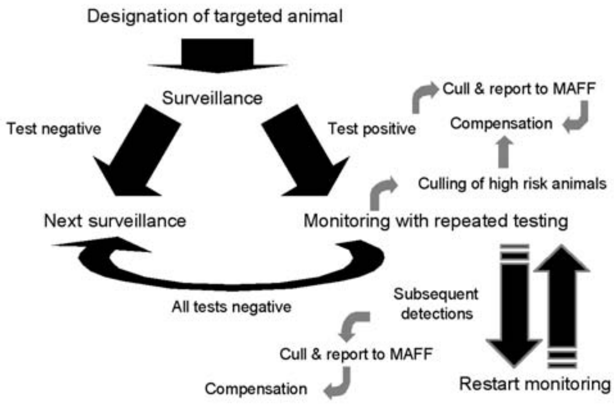


**Figure 3.** Framework of Japanese paratuberculosis control program

Currently, most prefectures conduct the control program following their own guidelines, which are enacted on the basis of the principle described above. However, the detail of each guideline varies among prefectures, which is including interval of surveillance, duration of the monitoring period, interval and frequency of repeated testing in monitoring period, diagnostic methods applied and so on.

## 6.4. Trend in incidence of paratuberculosis

The trend in incidence of bovine paratuberculosis in 1981 – 2006 was described in Fig. 4 (Statistics on Animal Hygiene, MAFF, 2005; note that incidence between January and June 2006 was obtained from the web site of MAFF). A steep increase in the number of cattle tested was observed in 1998 and 1999. Then it decreased subsequently, but began increasing again in 2003 (data not shown). The number of cattle detected doubled in 1997 immediately after the start of the surveillance. After that it was stable at approximately 700-800 per year, but reached more than 1,100 in 2004. Although a decrease was observed in 2005, the incidence by June 2006 already reached to half of the total incidence in the previous year.

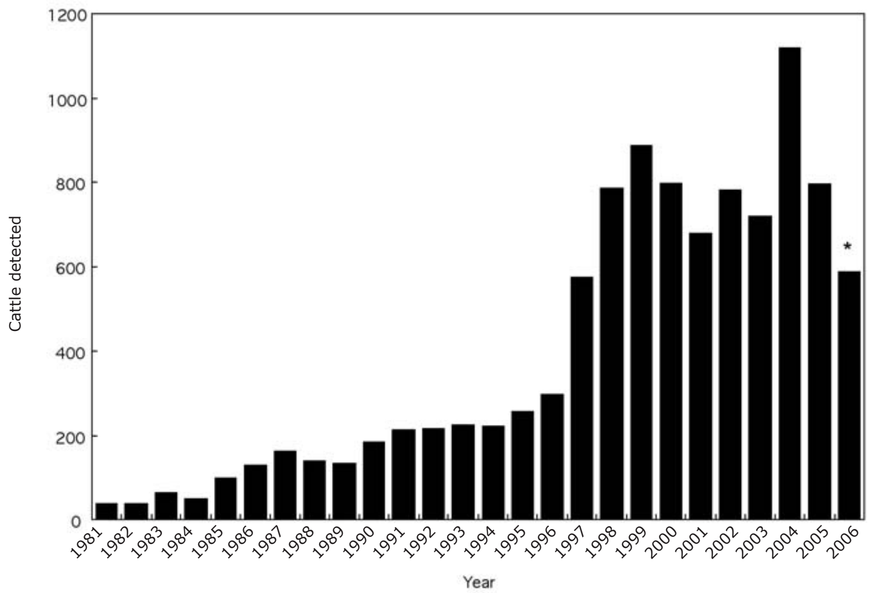


**Figure 4.** Incidence of bovine paratuberculosis: 1981-2005
(*Note that data of 2006 is Jan. - Jun.)

## 6.5. Johne's disease advisory committee

Since 2005 MAFF has organized the Johne's Disease Advisory Committee in order to review the national epidemiological feature of paratuberculosis incidence more precisely and discuss the more effective control measures. Members include not only the experts working on paratuberculosis but also the veterinary officials from the prefectures who apply the program. They have been discussing and reviewing a control plan of this disease.

## 6.6. Conclusion

As the active surveillance is conducted at least once in every five years, each prefecture will finalize its 2nd round for all the targeted animals in the end of 2006. At this point of time, further review of the epidemiological features of this disease and the current program are necessary.

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# 7. Johne's Disease Control In New Zealand

L. Burton[1]

## 7.1. Overview

The New Zealand dairy industry is a major part of the pastoral farming industry primarily comprised of dairy and beef cattle, sheep and deer. The best estimates available currently estimate the annual cost in New Zealand for dairy farmers to be between $3.8 million and $31.7 million annually.

Substantial contact between species occurs particularly with dairy young stock often being grazed on properties also grazed by beef cattle and sheep. Similar overlaps also exist with deer. As a consequence a pan-industry approach covering these species is being undertaken to develop new and or improved control measures for all three species. This has resulted in the establishment of a Johne's research consortium, which will undertake research and provide future control measures. It is considered that the currently available control measures do not provide for New Zealand's pastoral grazing industries sufficient certainty of success at acceptable cost for them to be implemented for control of the disease as part of a national control programme. Instead the animal industries will undertake further research in a structured 7 year programme with expected expenditure of $NZ17 million.

The objective is: to effect a substantial reduction of herd/flock and within herd/flock prevalence of Johne's at least cost to farm production operations, and a reduction in human exposure to Mycobacterium paratuberculosis from animals or products from these industries.

## 7.2. Background

Johne's disease is a chronic, infectious disease caused by Mycobacterium paratuberculosis that affects cattle, sheep goats and farmed deer. The disease causes weight loss and death of adult animals and is a worldwide problem in all advanced agricultural countries with significant cattle and sheep industries. In New Zealand, it is widespread in dairy cattle and sheep and is rapidly spreading in farmed deer. Currently available control methods for all hosts in a New Zealand based pastoral grazing system are considered inefficient and/or unsatisfactory.

The disease can be diagnosed by immune-based diagnostic tests, bacterial culture or post-mortem histopathology. Extensive investigations in cattle and sheep have shown that the specificity of immunological tests is compromised by the very close antigenic relationship between M. paratuberculosis and other ubiquitous microbes such as Mycobacterium avium. None of the available tests readily detects subclinically infected animals and they have proved unsuitable in test and cull programmes for sheep and cattle.

Johne's disease in farmed deer, but not sheep and cattle, may involve serious outbreaks in yearlings with pathology that is sometimes indistinguishable from bovine tuberculosis. The unique aspects of Johne's disease in deer have created an urgent demand by farmers for tests that are being developed and evaluated for this species. These tests will be essential for defining the unique aspects of Johne's disease in deer and in conjunction with vaccination may have a role in the control of the disease.

While diagnostic tests may have a role in Johne's control strategies for other hosts especially cattle, this is outside the scope of this Programme. For all livestock hosts, an additional complication for control based solely on a classical test and slaughter approach is the presence of potential wildlife reservoirs of infection recently identified by the isolation of M. paratuberculosis from rabbits in Scotland and ferrets in New Zealand.

The use of vaccines for the control of Johne's disease has been investigated over many years in numerous countries but currently is not a popular control method within New Zealand. The vaccines that have been most extensively used consist of whole bacteria (killed or live) mixed with oil adjuvants and administered by subcutaneous injection. Such vaccines produce large

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and often unacceptable lesions at the injection site and sensitise animals to react to immune-based tests for bovine tuberculosis.

Oil-based vaccines are very unlikely to be acceptable for widespread use in cattle and farmed deer in New Zealand because of their interference with testing for tuberculosis. These vaccines often induce good levels of protection against the development of clinical disease but do not prevent animals from becoming infected and being a source of infection for other herd / flock mates. Recognition of the suboptimal levels of protection has prompted the recommendation that management changes designed to reduce the level of exposure to infection form an integral part of control schemes using vaccination.

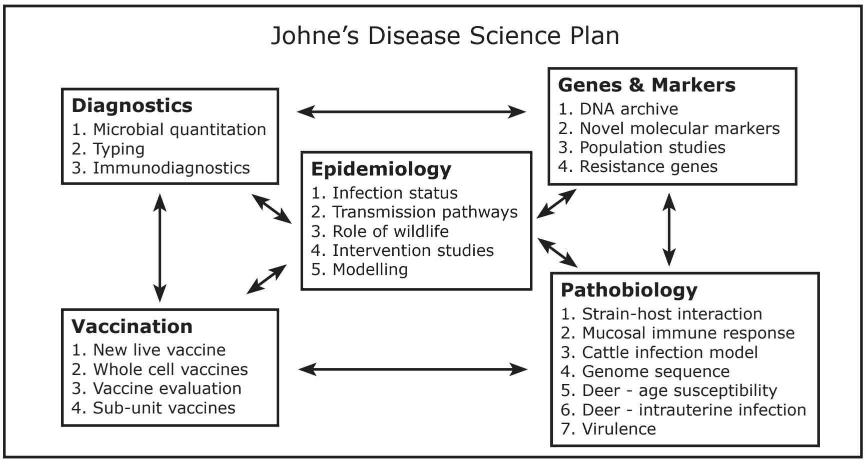
Breeding for resistance has only relatively recently been applied to Johne's disease in susceptible domestic livestock populations but with the rapid advances in molecular biology the possibility of genetically defined resistant animals has improved dramatically. These changes in technology now allow research to undertaken with a greatly improved likelihood of success being achieved.

The goal is to develop cost-effective means for the control of Johne's disease in New Zealand. The key areas requiring investigation:

- the quantification of food product contamination with M. paratuberculosis to identify target populations or subpopulations for control measures to be applied.
- the risk posed by source animal populations by determination of prevalence of the disease in these populations.
- the development of new vaccines and their optimal use.
- the development of improved diagnostics.
- an improved understanding of the complex interactions between the host, M. paratuberculosis and the environment.
- targeted management strategies for farmed livestock.
- discovery of the gene(s) conferring resistance to the development of clinical disease

Over the last decade, there has been a growing international awareness of the problems in ruminant livestock industries caused by Johne's disease. Initially, these problems were centred on the lack of cost-effective measures to control the disease. More recently, attention has increasingly been directed at the possibility that M. paratuberculosis may also be a human pathogen and the cause of Crohn's disease. This has been heightened by the recent publication in the Lancet showing live M. paratuberculosis present in the circulatory system of Crohn's patients. This does not demonstrate causation but certainly heightens public concern regarding this as being more probable. While there is no conclusive evidence to support this contention increasingly food retailers and consumers are showing concern about the presence of this animal pathogen in food products. It is likely that if this continues the precautionary principle may will be applied by purchasers or importing countries.

## 7.3. The future - the science plan




The following provides background details relating to each of the science objectives

## 7.3.1. Objective 1. Epidemiology

To identify cost-effective management procedures for reducing production losses caused by Johne's disease, through better understanding of the relative importance of the various sources and transmission pathways for the infection of domestic livestock species with M. paratuberculosis resulting Johne's disease. This will include comparing effectiveness of options such as vaccination, test-and-cull, or wildlife control by:

- Providing better understanding of the relative importance of the routes and rates of transmission of M. paratuberculosis between herds and species. This knowledge will be crucial in determining whether individual herds and flocks can be managed independently, or whether freedom from Johne's disease can only be achieved by integrated management across properties.
- Determining which management tools and strategies are likely to be most effective in reducing the economic losses and market-access risks posed by Johne's disease. This will be achieved by a combination of empirical field-testing of control options at the whole-property scale, and by the construction, validation, and use of bioeconomic models to predict longer-term outcomes for individual farms, and at landscape or regional management strategies.

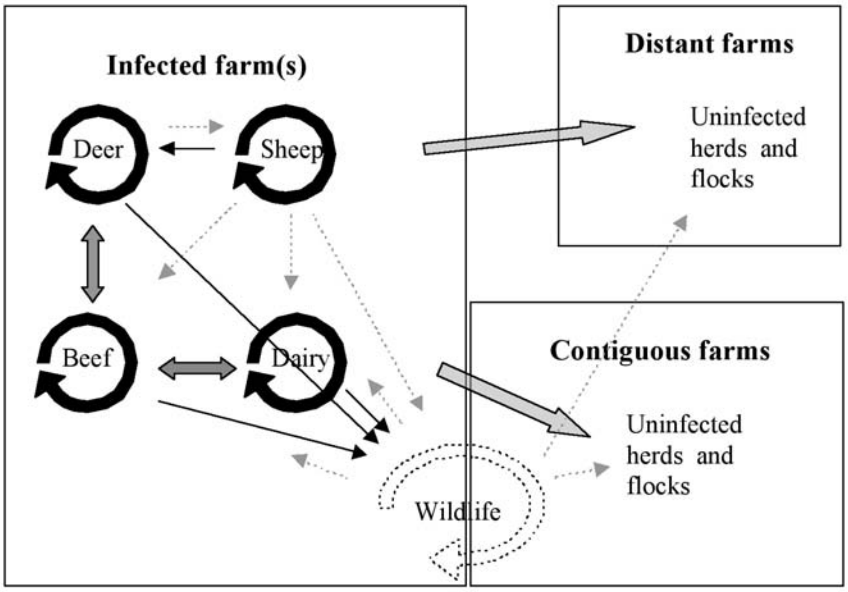



**Figure 1.** Potential routes for the transmission of M. paratuberculosis in New Zealand. The circular arrows represent independent intra-species maintained of infection, both known (black filled) and potential (dashed unfilled), while the straight arrows represent inter-species transmission with the larger and more solidly filled arrows representing the best-known and/or important pathways.

Currently available evidence and modelling of economic losses in New Zealand suggests that overall production losses are moderate with only a small number of dairy, beef, and sheep farms experiencing substantial loss through premature culling of clinically affected animals. Sub-clinical production limiting effects of Johne's disease are considered to be relatively low. However, the actual losses cannot be reliably estimated because the true incidence of substantial clinical loss is not known with any precision for dairy, beef, and sheep farms. In contrast, Johne's disease has been ranked the most serious disease by deer farmers, associated with large loss of growing stock by both mortality and ill-thrift. The goals of management will therefore differ widely between species, and also between herds within livestock species. For example, demonstration of freedom from M. paratuberculosis infection may be crucial for stud farms, whereas for heavily infected dairy herds, the goal may be to reduce the incidence of Johne's disease rather than to achieve freedom from infection per se.

The five key components are:

1. Determining the most important sources of infection and pathways for the transmission of M. paratuberculosis within herds, and between herds and species.
2. Determining mechanisms of infection and the pattern and impacts of subsequent disease progression.
3. Determining the role of wildlife in the maintenance and spread of M. paratuberculosis in livestock.
4. Comparison of the field efficacy of the most promising tools for reducing the incidence of M. paratuberculosis infection and/or Johne's disease.
5. Modelling of the dynamics of infection and the efficacy of disease control.

### 7.3.2. Objective 2. Diagnostics

There are three distinct diagnostic approaches available to advance our understanding of M. paratuberculosis infection and contribute to its control or eradication in cattle, deer and sheep. The mix of these will differ for individual host species. Diagnosis should be considered in the broader context of discrimination and classification rather than being restricted to monitoring disease per se.

1. Microbial culture: Develop more specific, sensitive tests that would allow for more accurate quantification of M. paratuberculosis in vivo or in vitro. Consider investment in in vitro methodologies to better characterize differences in the phenotype of 'bovine' vs. 'ovine' strains of M. paratuberculosis. More discrete typing and improved culture techniques will contribute to all the other objectives.
2. Molecular strain typing: Develop molecular probes capable of differentiating between strains and biotypes of M. paratuberculosis at a considerably more sophisticated level than is currently available using RFLP methodology. Strain typing will be fundamental for the Epidemiological and Herd control Objective. This technology will allow for individual strain typing of M. paratuberculosis from wildlife reservoirs.
3. Immunodiagnostics: Develop an array of cellular and antibody based immunoassays capable of distinguishing between - exposure, protection, infection, disease and host susceptibility (or resistance) following M. paratuberculosis challenge or vaccination. This will be essential to understand basic pathobiological mechanisms involved in natural or experimental infection. It will be necessary to determine how M. paratuberculosis specific antigens could contribute to more specific and sensitive diagnostic tests and identify protective immunogens for the development of new candidate vaccines. Immunodiagnostics will contribute to more cost-effective selection of candidate vaccines with superior efficacy.

### 7.3.3. Objective 3. Vaccines

The aim is to produce a new vaccine(s) that is safe, fully characterised, acceptable to farmers, meat processors, consumers and the general public, and produces high levels of protection against infection and / or development of clinical disease due to M. paratuberculosis. The use of new vaccine(s) will be expected to markedly reduce the level of clinical disease in susceptible animal populations and therefore reduce the risk of contamination of food products and the environment with M. paratuberculosis. Vaccination has the potential to be a cost-effective method for controlling Johne's disease in New Zealand. This was the conclusion of a New Zealand study (Brett, 1998) which is supported by overseas experience, especially for the control of Johne's disease in sheep. There are reports in the literature that question the value of Johne's vaccines for the control of the disease in cattle. These deficiencies will be one focus of this objective.

Key areas of research will be:

1. Evaluation of currently available vaccines
2. Development of new vaccines. This will cover both live and sub-unit vaccines.
3. The evaluation of new vaccines in model systems

### 7.3.4. Objective 4. Animal Resistance – Gene Discovery

To identify and validate a series of genetic markers that can be used to select Johne's resistant sires or screen commercial populations to identify resistant breeding stock.
One of the most cost effective means of protecting pastoral species from the impact of diseases on farm is the development of improved genetics to effect an increased level of resistance across an entire population through centralised selective breeding technologies. Gene discovery or identification of associated markers is a technically demanding process. Initially this objective will deliver a comprehensive DNA and tissue archive, which will for the base resource for all the research. A series of experiments will be initiated to find and validate genes and markers for resistance to Johne's diseases in deer, sheep and dairy cattle. This project will combine the best current technologies for diagnosis and measurement of pathology in diseased animals with new development from the diagnostics and pathobiology objectives to generate phenotypes for detailed mapping studies. These mapping studies will deliver the validated genes and marker targets that will ultimately be used in the selection of resistant sires and dams.

1. DNA and tissue archive of Johne's infected ruminants.
2. Novel molecular markers for identifying resistant phenotype.
3. Expression studies to identify candidate genes for Johne's disease.
4. Mapping studies to identify and validate genes for Johne's resistance.

### 7.3.5. Objective 5. Pathobiology of Johne's disease

To provide understanding of selected aspects of the complex interactions between the host, infectious organism and environment and to develop methods that will enable the successful accomplishment of other objectives.

An understanding of the pathobiology of Johne's disease underpins many of the outcomes required for improving disease control, including better diagnostic tests, better vaccines, breeding for disease resistance, and herd management. Host/pathogen interactions determine what type of immune response is associated with disease, and knowledge of this assists in the development of improved diagnostic tests. Understanding the type of immune response associated with protection against disease helps define the requirements for vaccination (acquired immunity) and also markers for breeding for resistance (innate and acquired immunity). Information on interactions between strains of M. paratuberculosis, different hosts, and environmental factors, contributes to an understanding of the epidemiology of paratuberculosis, and helps to identify herd management practices for disease control. A clear understanding of Johne's disease lags well behind that of many other infectious diseases affecting human and animals. This is particularly evident in comparison to tuberculosis, which is also caused by a slow growing mycobacterium species. Johne's disease resembles tuberculosis in some immunological and pathological features, but it is more poorly understood and has inferior control tools, partly because the research is less advanced and partly because M. paratuberculosis is a sub-species of the M. avium complex which is ubiquitous in the environment and cross-reacts with many tests. Not only are basic aspects of paratuberculosis such as epidemiology, mode of infection, host-pathogen interaction, strain virulence, and immunology poorly understood, but scientific tools available for controlling this disease such as diagnostic tests and vaccines are inadequate for the purpose. Many attempts to improve control methods empirically have been made and have met with only limited success. There is now a general consensus that better control methods will most likely arise from results of further basic study of the disease, or from directed work that combines both empirical and basic approaches. While the actual development of new and improved methods for controlling paratuberculosis is the subject of the other objectives, this objective is directed at basic and applied approaches that will develop understandings and tools to enable the other objectives to be successful. Thus, the two distinguishing features of this objective are its strong focus on achieving outputs that contribute to success of other objectives of the Consortium and its broad scope encompassing both basic and applied research.

1. Experimental infection models:
2. Investigation of immune responses at mucosal sites:

3. In vitro models of infection:
4. Studies on host/pathogen/environmental factors:

## 7.4. Conclusion

The New Zealand dairy industry has decided not to implement any control measures at farm level until a much improved level of understanding of the epidemiology has been obtained. Additional to the epidemiological studies will be a major focus on developing new methods of control as current methods are not considered economic or capable of delivering significant benefit to farmers. Based on clinical cases it would appear that the prevalence is reducing rather than increasing for reasons that are not understood. Clinical cases rarely exceed 1% of herd size on an annual basis. If current trends continue the primary reason for adopting on farm control measures will be for "food safety" and market access reasons.

# 8. The View of a Food Company

M. Noll, J. Vignal[1]

Nestlé factories are currently sourcing fresh milk from over 300'000 farm suppliers in 32 countries, while the number of Nestlé factories buying milk derivatives such as raw materials and ingredients is even bigger. Nestlé is buying milk from farmers in countries with a large-scale professional dairy farming sector (e.g. France, US) as well as in countries with a small-scaled dairy farming sector (e.g. India, China).

Nestlé's milk collection chain for its dairy factory in Heilongjiang Province in China for example collects fresh milk from over 20,000 small-scale farmers. A complex and well-organized collection structure including over 70 collection centres is needed to ensure that the fresh milk arrives at the factory in good quality.

The dairy sector needs to pay more attention to cattle diseases and to take all reasonable control measures. The industry and the consumers clearly want to buy dairy products that have been manufactured from the milk of healthy cows.

In this context, Paratuberculosis represents a major concern for the dairy sector:

- It is reported that the incidence of this disease is increasing in many countries.
- The causing agent of Paratuberculosis, MAP, has been suspected to play a role in the development of the human Crohn's disease, though no connection has ever been proven.
- Infected cattle are not easy to identify during the early stages of the disease, while their milk may already contain MAP.
- Though pasteurisation reduces viable MAP in milk products by log 3-6, some studies have shown that small numbers of microorganisms may survive.
- Due to the difficulty to detect and to control Paratuberculosis, there are no mandatory control measures by authorities or by the industry.

To conclude, Paratuberculosis is a problem without good immediate solution but with a certain potential to damage the good image of dairy products.

For a dairy company, Paratuberculosis creates the following risks:

- Risks of damaging the image of milk and of losing consumer confidence when milk from infected animals enters the food chain
- Supply risks: high incidence of Paratuberculosis on farms increases production costs.
- Distribution risks: trade restrictions relating to Paratuberculosis are possible in future.

A number of on-farm practices are available that can limit the spread of Paratuberculosis. However some of these measures may be costly and restrictive, so that it is difficult for dairy farmers to implement them.

Current testing and culling programs are expensive and not very effective. Therefore, it is not advisable to impose them.

For the same reasons, the official authorities have not established mandatory programs so far; there are only recommendations and voluntary programs.

To conclude, dairy industry, farmers and official authorities should discuss and find appropriate solutions, i.e. a suitable combination of on-farm measures with testing and culling programs.

Wherever possible, Nestlé has implemented Farm Assurance Manuals to ensure best practices at farm level. Farm Assurance Manuals include mandatory requirements and recommendations covering a wide range of practices from animal feeding, milking hygiene, cleaning, , effluent management, record keeping, to animal welfare and animal health. Most requirements and recommendations in the Farm Assurance Manuals are based on the **IDF / FAO Guide to Good Dairy Farming Practices.** Today the Farm Assurance Manuals include general recommendations on disease prevention, bio security, quarantine and veterinary treatments, but do not include any of the specific measures to prevent Paratuberculosis. In future the Nestlé Farm

1) Nestec Ltd, avenue H. Nestlé, 55, CH 1800 Vevey, Switzerland

Assurance Manuals will also recommend on-farm measures for the control of Paratuberculosis.

Besides, Nestlé has an ongoing project together with participants from the Swiss Federal Veterinary Office and from a specialized consulting company (SAFOSO) to develop procedures to better manage the risk of animal diseases in Nestlé's supply chains. These procedures will be implemented in pilot supply chains with the objectives to avoid supply chain disruptions and to ensure supply of safe raw materials derived from healthy animals.

This project is going through the following steps:

- Describe major risks in the supply chain of dairy raw materials
- Define procedures to manage identified risks
- Adapt risk description and procedures to a pilot supply chain
- Implement standard procedures and train Nestlé staff in pilot supply chain
- Use standard procedures as guidelines for Nestlé factories and supplier audits and for education of suppliers

The food industry alone is powerless to fight animal diseases. The collaboration of all stakeholders is needed to achieve substantial results. Appropriate measures need to be supported and taken by authorities, farmers and industry.

# 9. Review of International Communication and Training Programs for Johne's Disease (paratuberculosis) in Dairy Cattle

D.J. Kennedy[1], A.M. Padula[2]

## 9.1. Background

Many countries around the world are active in the management of Johne's disease (paratuberculosis) in dairy cattle through a range of strategies, many of which include educational programs. Communication and training can be major factors underpinning successful management of bovine Johne's disease (BJD) but programs need to be evaluated within the context of the aims and regulatory environment of the respective control programs.

The Australian dairy industry is taking a lead role in developing a national communication and training program on BJD for all sectors of the industry. This review was undertaken as part of the process to facilitate the development of the Australian program.

The goal of the Australian communication program is to deliver information and training to support the implementation of BJD risk reduction measures, such as hygienic calf rearing, and introduce new tools for risk based trading. This is in accordance with the goals of the national approach to BJD in Australia which are to: (i) minimise contamination of farms and farm products by M. paratuberculosis; (ii) protect non-infected herds whilst minimising disruption to trade; and (iii) minimise the social, economic and trade impact of BJD at herd, regional and national levels.

The aim of this study was to understand the context and implementation of BJD communication and training programs from those countries active in the management of BJD.

## 9.2. Survey approach

Seventeen countries, that were known to be operating or developing either a national or a significant regional approach to managing BJD in dairy cattle, were invited by email to participate in a survey of their communication and training programs. Fifteen countries responded and fourteen provided information on their programs. A standard questionnaire formed the basis for the information received from participants. The countries that responded were: Canada, Czech Republic, Denmark, France, Ireland, Israel, Italy, Japan, Mexico, The Netherlands, Norway, Spain, Sweden, United Kingdom and USA. The survey results were tabulated and qualitatively assessed.

## 9.3. Education within difering program regulatory environments

To analyse the results, the communication and training programs were categorised by the regulatory environment in which they operated within. These were defined into one of the following three categories:

### 9.3.1. National Regulatory Control of Johne's Disease

Four countries that responded implemented strong regulatory programs for BJD: Japan, Sweden, Norway, and the Czech Republic. These have a heavy focus on surveillance and eradication in known infected herds. Broader communication is not a major component of these programs.

In Japan, communication and training programs for veterinarians are carried out at the national level by the National Institute of Animal Health in co-operation with the Animal Health Division of Ministry of the Agriculture, Forestry and Fisheries of Japan. Training focuses on educating veterinarians on the regulatory policies and use of diagnostic tests, with practical instruction on testing and evaluating herds. Residential courses of up to one week in length

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are run each year for veterinarians who are working in the prefecture livestock hygiene service centres or diagnostic service centres, with some courses run for managers. Courses comprise lectures and/or practical sessions. In addition to these short training courses, the national institute runs a six-month course in laboratory methods, research and practical work for young veterinary staff from the prefectures. Institute staff also frequently presents seminars in the prefectures livestock hygiene service centre hosted by the local veterinary association.

Sweden has no specific communication program, although there is occasional publicity in farmers' magazines and the dairy industry remains informed about the situation.

The Czech Republic has published articles with photos and examples of successful and unsuccessful control programs on different farms. Other strategies used included making dairy associations aware of the potentially high direct and indirect economic losses in dairy cattle, declaring BJD to be a zoonosis in 2005, developing certification programs for "safety milk and milk products" to eliminate or reduce the number of living and dead M paratuberculosis in milk and milk products and publicising bad management methods such as feeding mixed colostrum and milk to the young animals and grazing young animals with older ones.

## 9.3.2. Voluntary Regional Programs for Johne's Disease

Voluntary regional programs are coordinated in the Basque Country of northern Spain and in northern Italy.

In the Basque Country, the regional administration works closely with the farmer and the veterinary practitioner involved in the herd. Most communication is by personal contact and meetings with the participating farmers and veterinarians and this personal contact is considered to be an important aspect. Herds in which BJD has not been diagnosed are not involved.

In Northern Italy, the Università degli Studi di Milano – Dipartimento Patologia Animale - Malattie Infettive has been running a control program for three years with the aims of reducing clinical disease and the prevalence of infection by inhibiting transmission of infection to calves. Communication is directed at cattle producers and veterinarians with the key messages including that BJD is costly, that some countries have requirements for trade and that BJD can be controlled without imposing costly and time consuming measures. A brochure is used to promote understanding of the epidemiology and that individual control programs can be developed that are relatively inexpensive and easy to apply. The estimated annual losses due to JD are also presented to overcome the misconception that the only losses are due to clinical disease. Personal contact with farmers is considered important to the success of the program, to clarify issues and doubts. The veterinarians report activities and progress monthly to the university and this regular reporting has helped farmers feel that they are active participants in the program and responsible for the result. In the absence of clinical disease, farmers could be discouraged to continue the program if they do not perceive that they are making progress.

## 9.3.3. Voluntary National Programs for Johne's Disease

These programs are aimed at broader audiences than the regulated and regional programs and reported more significant communication and training activities. In Denmark, France, Israel and the Netherlands the programs are coordinated by the dairy industry or farmer organisations. In the USA, the federal government has taken a lead role in coordinating and funding activities with various other organizations, especially the States and universities. In Mexico, a university is taking the lead. Coordinated national programs are in advanced stages of development in Canada and Ireland.

The Canadian approach is to develop a national standard that is proposed to be delivered by the provinces as a voluntary program with industry and government involvement. It is anticipated that the communication program will evolve with the program implementation and the focus will vary in different areas depending on the level of uptake and the impact of the disease.

In Ireland, the government has encouraged stakeholders and their representative organisations to work together to promote and establish herd health programs, that would include JD management as one component. The government has agreed to provide some financial support towards training veterinary practitioners and laboratory testing costs in the initial stages. Discussions are currently underway between stakeholders with a view to formalising the program structures and funding.

In France, two programs have operated in several Departments (regions) by farmer organizations, Groupement de Defense Sanitaire (GDS), for up to a decade. One type of program is on-farm control in infected herds and the second is a market assurance program. These have recently become national programs, but are still managed by the GDS in the Departments.

The American communication and training program has three components that are linked and funded to varying extents by the US Department of Agriculture. The three education programs are the National Johne's Education Initiative, University of Wisconsin Online Continuing Education, and the Designated Johne's Disease Coordinator Training.

The various programs have been designed to deal with BJD in differing environments in each country and with a range of objectives. Three countries are aiming to become or remain free of BJD and, in those planning to manage the disease, there are a range of objectives addressing issues from the national level to the farm level. None of the programs have been operating for longer than five years and most of them for considerably shorter periods and that evaluations have not been undertaken on most of them. However they have some common features.

Most of the countries with endemic BJD are aiming to reduce the prevalence and economic impacts of the disease and see it primarily as an animal health program. Only Canada, the Czech Republic and the Netherlands specifically mentioned the issues of contamination of milk or potential links with Crohn's disease. These may however be unstated drivers in other programs' aiming to reduce prevalence.

Comments about the difficulties with test and cull approaches, and reducing BJD prevalence through improving biosecurity and risk assessment and management, is consistent with the Australian approach. The success of the Irish plan to incorporate these messages for BJD control in a broader herd health package will be worth monitoring. A similar approach is also being undertaken in Norway for goats.

## 9.4. Target audiences

Survey respondents identified three general categories of target audiences to whom they wished to deliver messages.

### 9.4.1. Farmers

To engage producers, the voluntary programs are attempting to promote what benefits should accrue to them from their investments, such as "healthier cattle" and reducing the (often hidden) economic impact of BJD. Personal contact is the main method of communication in the regulatory and regional programs that are focused on infected herds but the broad national programs are largely using traditional direct mail bulletins and newsletters as well as awareness articles in farmer magazines.

In addition to traditional approaches, novel strategies have also been employed by some countries. In Ireland, experienced farmers are being used to educate others. In the Netherlands, they widely distributed their farmer checklist and manual and, in the USA, a producer learning website has recently been established. The Americans value the accessibility of the web and its ability to deliver consistent information that can be easily updated to their very large dairy industry that is distributed widely over many jurisdictions. They however recognise the difficulty that some rural users still have in accessing web sites at reasonable speeds.

The key messages for producers were varied, including: farmers must manage their own herd biosecurity, BJD is a costly disease with many costs hidden, BJD can be controlled, managing herd health is a good investment, preventative measures are worth implementing, current tests are not ideal but useful for identifying infected herds and risk analysis and planning is important for any herd. These messages were delivered by a range of methods, including: direct mailings, newsletters, personal advice, articles in newspapers, various booklets and other technical publications, face-to-face group meetings, and websites.

### 9.4.2. Veterinarians

Veterinarians play a central role in both educating farmers and requiring education themselves about national programs and technical issues associated with BJD.

The communication and training goal of the voluntary programs is to improve veterinarians' technical knowledge and understanding of the epidemiology of the infection and the use of diagnostic tests. This appears to be directed at improving herd biosecurity and risk assessment. In Denmark and Israel, veterinarians are being encouraged to not only be technical resources but also the "champions" for BJD management.

In most countries the principal approaches to training veterinarians has been through courses, seminars, workshops and hands on learning. The advantage of this approach is that these provide the opportunity to discuss and resolve issues. The Netherlands and USA both noted the importance of giving consistent information and again the web is the mainstay of veterinary education on JD in the USA at the national level.

The key messages for veterinarians were varied and included: need to understand the disease its epidemiology and diagnostic tests in detail, and that reducing the prevalence is a long term process for which preventive measures should be implemented. Delivery of these messages took place using on-farm experiential learning, seminars, direct mailings, training programs, personal communications, conferences, internet based training and risk assessment training.

### 9.4.3. Stakeholder communications

As expected in coordinated national programs, a large number of organisations need to be engaged. Communication to industry, government and other stakeholders generally aims to increase awareness and support for the respective programs through written communication and direct personal contact and meetings. One form of communication noted was the lobbying of various funding bodies for support of national and state programs.

The key messages for industry, government and other stakeholders were centred on the economic impact of BJD, growing need for herd health programs in the industry and adopting a whole-of-chain approach to management. Delivery mechanisms reported included meetings, newsletters, websites and personal communication.

## 9.5. Evaluation of communication and training

Most international programs for BJD management are in their early stages, with limited data on their impact to date. In the survey, this was reported in various forms such as face-to-face discussions with people who had completed training programs. Questionnaires were also been used to obtain feedback from farmers on the effectiveness of the communications and training in the form of their general knowledge of BJD and the program. The managers of the USDA National Animal Health Monitoring System (NAHMS) have assessed the changes to management practices, in a Follow-Up study, from the 2002 NAHMS survey. The study examined the risk reduction measures that dairy farmers have applied between the 1996 and 2002 studies. Their results show that of 27 herds evaluated, across a range of risk management practices, 12 did make at least one management change between the two studies. Notably this was primarily in the earlier separation of calves from their dams.[1]

There is a subtle difference between the goals of a BJD management program and their measures of success, and the goals of a BJD communication and training program. Although the two need to be very much in alignment. For example, reducing the prevalence of the disease is not a direct goal of the communication and training program, rather, this a goal of the overall program; but is facilitated by good communication and training. Measures such as the number of farmers enrolled in a program may be useful for assessing national and regional programs but provide little information as to the understanding those farmers that have enrolled have of the 'bigger picture' and disease control or that of industry stakeholders.

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[1] APHIS Veterinary Services, Centres for Epidemiology and Animal Health, Info Sheet, Aug 2005, http://www.aphis.usda.g ov/vs/ceah/ncahs/nahms /dairy/index.htm

## 9.6. Lessons learned from other countries

Although most of the voluntary management programs are still in their early stages, their results thus far have been attributed to a range of factors. Among these, the two factors are notable: firstly, the sharing of information and experiences among producers and veterinarians; and secondly, making farmers aware of the financial losses they could experience due to BJD.

Factors reported that contributed to unsatisfactory results in management programs were quite varied and included: lack of industry leadership at a national level, inconsistencies in policy, too much paperwork, slow internet access in rural areas, fear of penalties for infected herds, and, lack of market premiums for assured cattle. Communication clearly has a strong role to play to maintain industry leadership at a national level.

Among the lessons learnt, there is a recurring theme that farmers must be involved and take ownership if the programs are to succeed. Understandably this depends very much on their being able to see the benefits to themselves of managing BJD. France noted that it is also important not to give farmers false expectations of what can be achieved and at what speed. In particular, clearing their herds of infection requires care and patience.

The USA noted using the advantages of the web to communicate consistent and up to date messages was an important aspect of their national program, especially in an environment where the national industry does not have the structure and means for dissemination across their numerous and scattered stakeholders.

There are several recurring themes that have been described above but there are also many differences among the countries. Only Israel and the Netherlands reported having undertaken formal evaluations of their programs and these were of the broader program rather than the communication and training aspects.

## 9.7. Australian program

The Australian dairy industry and government animal health authorities are actively working towards achieving a less regulated approach to the management of BJD in Australia. A key part of this strategy is the implementation of a voluntary, risk based trading system for dairy cattle – the National Dairy BJD Assurance Score[1]. To support the implementation of this new system, a national communication and training strategy has been developed. A project manager has been employed to facilitate the development of the program with key stakeholders. All sectors of the dairy industry need to be informed about the new approach to BJD management.

The vision for the dairy industry is to have all dairy farmers implement measures to reduce the risk of BJD spread, and that these measures are recognised and valued by other farmers. Australia is in a very favourable situation in that there are geographical areas of the country that are free of BJD or it is only present at very low prevalence. The disease is however endemic in south eastern Australia where the theme of the communication program is to create a positive environment for managing BJD. Key messages have been developed for each industry sector with the initial approach aimed at raising awareness of the new risk based trading system.

## 9.8. Conclusion

Communication and training programs have an important role to play in facilitating the management of BJD across all levels, from farmers to national stakeholders. To achieve a clear, consistent and national program all stakeholders must be in alignment. Without a process to achieve communication among stakeholders, the development of national initiatives and programs is difficult. Veterinarians are generally perceived as the most important people to educate and be trained to the highest level. However there are many other individuals and groups that influence farmer decision making that also need to be included in any communication and training program.

[1] More information is available at www.dairy.com.au/bjd

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## 10. Participants in the first ParaTB Forum

| Name | Country |
|---|---|
| David Kennedy | Australia |
| Robin Condron | Australia |
| Roland Bossuyt | Belgium |
| Réjean Bouchard | Canada |
| Arshnee Moodley | Denmark |
| Karsten Aagaard | Denmark |
| Søren Saxmose Nielsen | Denmark |
| Laura Kulkas | Finland |
| Choreh Farrokh | France |
| Shahriar Dabirian | Iran |
| Sota Kobayashi | Japan |
| Toshiyuki Tsutsui | Japan |
| Lindsay Burton | New Zealand |
| Kerstin Plym-Forshell | Norway |
| Andrea Holmstrøm | Sweden |
| Jean Vignal | Switzerland |
| Brian Lindsay | United Kingdom |
| Ed Komorowski | United Kingdom |
| Michael Carter | USA |

PROCEEDINGS OF THE 1ST PARA TB FORUM

**ABSTRACT**

Paratuberculosis is an infectious disease that has emerged to become one of the leading causes of economic loss to the dairy cattle and small ruminant industries. The first IDF ParaTB Forum held in Shanghai, China, in October 2006, provided a platform for

- presentations of national /regional control or eradication programs on paratuberculosis in dairy herds (goals, type of program, methods and mechanisms involved);
- feed-back on programs that are established or under establishment;
- analyses on how well the program is pursuing the goals set.

The programme of the meeting included presentations of programs in 6 countries, a contribution of a review of communication and training programs, and the view of a dairy processing company.
Representatives of 14 countries and a multinational dairy food processor participated in the meeting.

*Keywords: analysis, cell, dairy herds, e. coli, import, Johne's disease, mastitis, mycobacterium paratuberculosis, paratuberculosis, pasteurization, risk, somatic*

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- All tables/figures included in final document to be sent also in separate Word, Excel or PowerPoint files, in colour format. Pictures to be sent in tif or eps format (resolution 300 DPI)
- All files to be named with author's surname plus title of paper/tables/figures.

### References

- References in the document to be numbered and placed between square brackets.
- Reference lists at the end of the document to contain the following:
  * Names and initials of all authors;
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  * If the publication is a journal, title of journal (abbreviated according to 'Bibliographic Guide for Editors and Authors', published by The American Chemical Society, Washington, DC), and volume number;
  * If the publication is a book, names of the publishers, city or town, and the names and initials of the editors;
  * If the publication is a thesis, name of the university and city or town;
  * Page number or number of pages, and date.

Example: 1 Singh, H. & Creamer, L.K. Aggregation & dissociation of milk protein complexes in heated reconstituted skim milks. J. Food Sci. 56:238-246 (1991).

Example: 2 Walstra, P. The role of proteins in the stabilization of emulsions. In: G.O. Phillips, D.J. Wedlock & P.A. William (Editors), Gums & Stabilizers in the Food Industry - 4. IRL Press, Oxford (1988).

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## ANNEX 1 **IDF CONVENTIONS ON SPELLING AND EDITING**

In the case of native English speakers the author's national conventions (British, American etc.) are respected for spelling, grammar etc. but errors will be corrected and explanation given where confusion might arise, for example, in the case of units with differing values (gallon) or words with significantly different meanings (billion).

“........ Usually double quotes and not single quotes
? !........ Half-space before and after question marks, and exclamation marks
± ........ Half-space before and after
micr<u>oo</u>rganisms........ Without a hyphen
Infra-red ........ With a hyphen
et al......... Not underlined nor italic
e.g., i.e.,... ........ Spelled out in English - for example, that is
lit<u>re</u>........ Not liter unless the author is American
ml, mg,... ........ Space between number and ml, mg,...
skimmilk ........ One word if adjective, two words if substantive
sulfuric, sulfite, sulfate........ Not sulphuric, sulphite, sulphate (as agreed by IUPAC)
AOAC <u>International</u> ........ Not AOAC<u>I</u>
progra<u>mme</u> ........ Not program unless a) author is American or b) computer program
milk and milk product ........ rather than “milk and dairy product” - Normally some latitude can be allowed in non scientific texts
-ize, -ization ........ Not -ise, -isation with a few exceptions
Decimal comma........ in Standards (only) in both languages (as agreed by ISO)
No space between figure and % - i.e. 6%, etc.
Milkfat........ One word
USA, UK, GB........ No stops
Figure ........ To be written out in full
1000-9000 ........ No comma
10 000, etc. ........ No comma, but space
hours........ ø h
second ........ ø s
litre ........ ø l
<u>t</u>he Netherlands
Where two or more authors are involved with a text, both names are given on one line, followed by their affiliations, as footnotes
for example A.A. Uthar[1] & B. Prof[2]
[1] University of .......
[2] Danish Dairy Board .....
IDF does not spell out international organizations

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