



**A Nuffield Farming Scholarships Trust**

## **Report**

*Award sponsored by*

**The Dartington Cattle Breeding Trust**



### **“Keeping up with the Johne’s” :**

**practical opportunities for the control of  
Johne’s Disease in dairy cattle**

**Charles Harrison**

**July 2013**

**NUFFIELD UK**

# A Nuffield (UK) Farming Scholarships Trust Report



May 2013

*"Leading positive change in agriculture.  
Inspiring passion and potential in people".*

Title	Keeping up with the Johnes: practical opportunities for the control of Johnes Disease in dairy cattle
Scholar	Charles Harrison
Sponsor	The Dartington Cattle Breeding Trust
Objectives of Study Tour	<ul style="list-style-type: none"><li>• To investigate the level of Johnes Disease globally and which countries had effective control programmes in place</li><li>• To establish what methods can be practically used to reduce the level of infection in UK dairy herds</li></ul>
Countries Visited	<ul style="list-style-type: none"><li>• USA: Minnesota, Wisconsin and Illinois</li><li>• Canada</li><li>• Australia</li><li>• China</li><li>• Denmark</li><li>• Ireland</li><li>• The Netherlands</li></ul>
Findings	<ul style="list-style-type: none"><li>• Johnes Disease is here to stay</li><li>• Although it cannot be eradicated, the disease can be controlled effectively on farm by strict management protocols</li><li>• Future national control of Johnes Disease will depend on consumer attitudes and subsequent processor action</li></ul>

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## Disclaimer

The views expressed in this report are entirely my own and do not necessarily represent the views of the Nuffield Farming Scholarships Trust, or my sponsor, or any other sponsoring body



## 1. Introduction

### 1a. Clinical Johne's Disease

Johne's Disease (pronounced Yo-nees) is named after Dr Heinrich Johne, a German veterinary microbiologist who, in 1894, discovered the bacteria in the intestines of an emaciated, unthrifty cow, thought to be suffering from intestinal tuberculosis. When cultured, injected into a guinea pig, and was found not to produce bovine tuberculosis (*Mycobacterium bovis*), he concluded it was an avian subspecies, *Mycobacterium avium* ss paratuberculosis (MAP). From its early beginnings, paratuberculosis, as it is also known, has spread worldwide; wherever there are cattle, Johne's Disease is present. (See chart on next page).

Although my study covers dairy cattle, Johne's is a disease of all ruminants, in both domestic and wild populations. The intensive nature of rearing domestic species has propagated its spread.

Bovine Johne's Disease is a contagious, chronic, wasting disease. It is caused by ingestion of milk, water or feed contaminated with MAP bacteria, which embed themselves into macrophages (defence cells) in the lining of the small intestine (ileum). When triggered to replicate, they cause a thickening of the intestinal wall which hinders absorption of nutrients. As this thickening continues, poorly digested feed is excreted as profuse MAP bacteria-laden diarrhoea. Despite eating and drinking normally, the animal loses weight rapidly, becomes emaciated, and will eventually die, if not euthanised. The fact that the bacteria can infect and lie dormant for 2 to 10 years before being triggered and causing clinical symptoms of the disease is a major issue in its detection and therefore control.

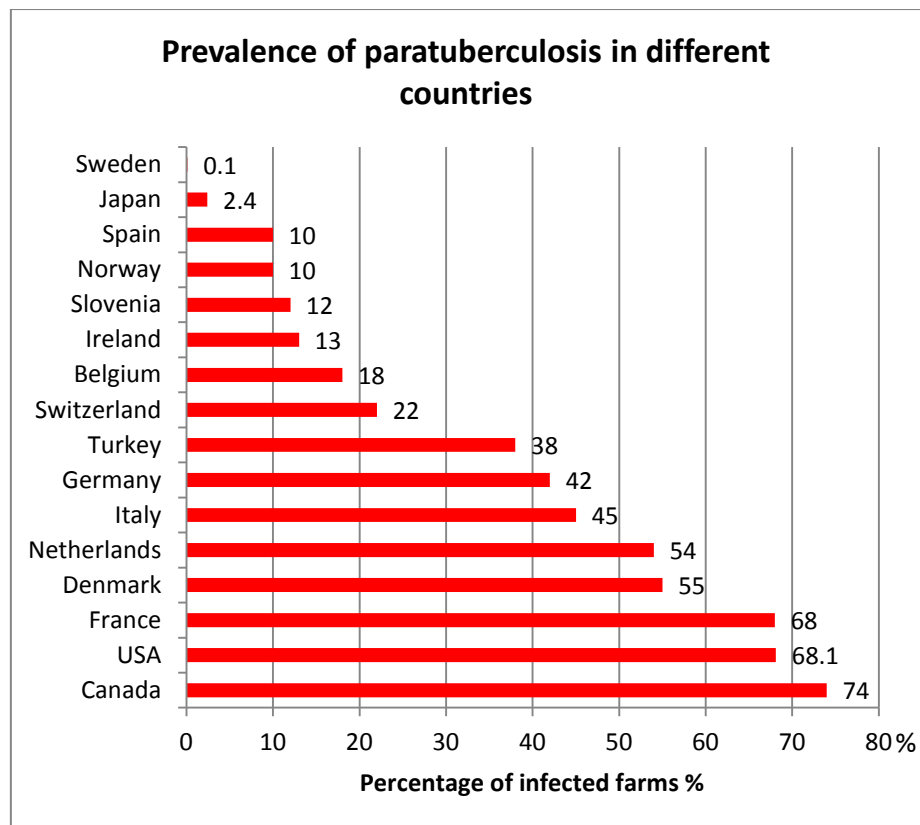
Infection pathways generally follow the ingestion of faecal-contaminated milk, water or feed, by that most susceptible creature, the newborn. Despite evidence that infection can occur (20% chance) across the placenta to an unborn, in a cow with advanced clinical symptoms of the disease, the calf is most susceptible in the first few hours of life. After standing, the calf's next impulse is to suckle, usually travelling up and down the underside of its mother, or any nearby cow, until it locates the udder and eventually the teat. Although the ingestion of colostrum, the first

Although my study covers dairy cattle, Johne's is a disease of all ruminants, in both domestic and wild populations.

milk containing vital antibodies for the calf's naïve immune system, is imperative, the calf's journey to reach the teat is fraught with danger. A cow with clinical Johne's that has had access to the calving area, be it pen, barn or paddock, will have contaminated the area with possibly billions of MAP bacteria through its faeces and thus any cow that lies in those faeces becomes a possible transmitter to its calf.

So the route to control is stopping this cycle of infection through the means of various management strategies, and it is on these that I have based part of my study. The other part of my study has been to discover what has and is being done to control this incurable disease on an international level.





Source E.Momotani 11th ICP.



Johne's Disease sufferer



## 2. Personal Background



Me, Charles Harrison

I am a 2<sup>nd</sup> generation dairy farmer in a family run dairy business. We milk 1200 crossbred cows over three units on a low input system on 2,000 acres of Surrey/Sussex Weald clay. I had known about Nuffield Farming Scholarships from an early age, my uncle having completed his Scholarship in the early 80s on computers in agriculture, and my father tagging along to meetings and eventually becoming secretary of the Nuffield Dairy Group and later an Honorary Nuffield Scholar.

After three fantastic years at Wye College, and two travelling through Australia, New Zealand and Africa, I settled into the family business in 1996. Although the thought of

embarking on a Nuffield Farming Scholarship was always there, before I knew it, I was married with four young children (a tight calving pattern has always been a goal) and priorities changed. It was only acting as chaperone to my ageing father over the last three years that the spark was reignited; that, and a persuasive John Stones.

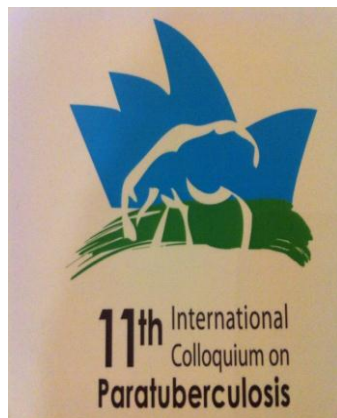
The subject I brandished at my interview was the Merits of Autumn Block Calving. The subject I held three days later was the control of Johne's Disease, my lacking of this control being one of my biggest regrets in the last few years. It seemed our paddock block calving and colostrum pooling had set us up for years of clinical losses to this insidious disease.

<b>On my study tour I visited:</b> <b>Australia (February 2012 and March 2013)</b> <b>China (March 2013)</b> <b>USA (October 2012)</b>	<b>Canada (October 2012)</b> <b>Denmark (May 2012)</b> <b>Ireland (April 2013)</b> <b>The Netherlands (July 2013)</b>
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### 3. Study Tour : Australia

The changes in subject of my study led me into an immediate Google search of Johne's Disease. I was fairly naive about any international work being carried out on Johne's, apart from hearing a Professor from Denmark at a Dairy UK Johne's conference back in 2009, talking about his country's control programme. I came upon an American site, Johne's Disease Integrated Program (JDIP), that boasted a conference every July. This suited me perfectly, with the Nuffield Contemporary Scholars Conference to take place in late February to find what was expected of me, and July being a quiet time with all our cows dry. However, upon further enquiry, I was informed this conference had been amalgamated with the 11<sup>th</sup> International Colloquium on Paratuberculosis (ICP), to be held in 8 days' time in Sydney! So off to Australia I went



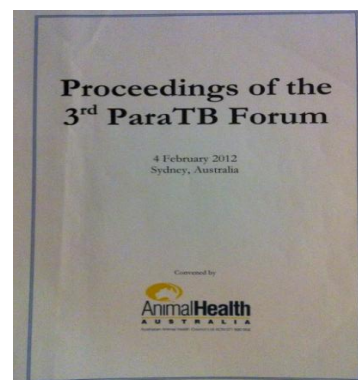
#### 3a. International Colloquium on Paratuberculosis, Sydney

To say I dropped everything to get to Sydney, would be an understatement. I managed to make contact with the British contingent going to the Colloquium, comprising Dick Sibley and Peter Orpin, vets and founders of

[www.myhealthyherd.com](http://www.myhealthyherd.com) and Dr Ed Komorowski of Dairy UK.

The ICP is held every 2 to 3 years under the auspices of the International Association of Paratuberculosis (IAP) and involves sessions on all aspects of Johne's Disease, from its epidemiology to genomics, and international disease control to public health. The 300 delegates were made up of researchers, livestock industry representatives, vets, State and Federal government primary industry officials, and public health authority officials, gathered for the Colloquium in the spacious grounds of the University of Sydney.

I was very fortunate to be allowed to attend the 3<sup>rd</sup> ParaTB forum. The forum, an initiative of the International Dairy Federation in 2006, was set up to monitor the success of existing Johne's control programmes, and enable frank and open discussion of methods used, progress towards objectives and, as in this 3<sup>rd</sup> forum, "Lessons learned: what strategies work, and which have failed?"



#### My bible of Johne's control programmes

Eight countries participated in the forum, giving an outline of their programmes and where they stood with them. I could not have dreamt of a better introduction to Johne's control, networking with the national





programme coordinators and being provided with the proceedings of the forum, which has become my bible. *(See photo on previous page)*

The following days of the Colloquium offered an insight into the depth and breadth of the disease; the challenge of attaining knowledge transfer from scientist to farmer and the realisation that the huge funding put towards research into this disease was on the back of the spectre of a Crohn's Disease link rather than for the good of the farmer. It is generally accepted that although MAP bacteria are found in the majority of Crohn's patients, a causative link cannot be found. Saying that, if there is a one per cent chance of a link, then steps should be taken at all stakeholder levels to minimise the risk through effective control.

### 3b. Dairy Australia, Melbourne

My initial ten day whirlwind trip to Australia plus having to be back in the UK for the Contemporary Scholars Conference, left me no time to organise visits. I returned a year later, with a lot of travelling under my belt, to finish the job. With the majority of Australia's dairying being based in Victoria, I headed there.

I met with Dr Robin Condron and Kathryn Davis of Dairy Australia, to discuss how, as a levy board, they are bringing Johne's education to the farmer. Johne's has always been a notifiable disease in Australia and it is only in the last decade that the mandatory regulation of movement restrictions and compulsory slaughter in infected herds, which forced the disease underground, has been changed to a voluntary management approach. Australia is in the fortunate position of having eradicated major diseases, such as brucellosis, tuberculosis and pleuropneumonia, through establishment of an effective animal health capability.

The positive position of having the disease confined to the south east of the country is tempered with the fact that it is endemic in this area, albeit at a low prevalence. So while some States boast a free (Western Australia) or protected (Queensland, Northern Territories and most of New South Wales and South Australia) status, with an approach of keeping the disease out, areas such as Victoria and Tasmania are dealing with apathy from farmers, who see no particular economic cost to the disease and who are still wary of the "stick" approach used historically by the State governments. The push for control now is coming very much from the dairy industry, which has adopted a precautionary approach to the possibility of a future health risk caused by MAP, which could threaten access to international markets.

The industry has used a three pronged attack, with better communication and training on Johne's control (BJD Aware), using risk based trading systems in a National Dairy BJD Assurance Score (Dairy Score) and better Johne's management through the adoption of recommended measures (3-Step Calf Plan). I must explain that the acronym BJD is used to distinguish Bovine Johne's Disease as Australia suffers greatly from the sheep variant, Ovine Johne's Disease (OJD).

#### BJD Aware

Effective education of farmers and advisors on Johne's and its control is of paramount importance when trying to implement risk assessment and assurance measures. As in many countries, Australia has been hampered by the negative attitudes of some livestock agents and vets, who can exert a wider sphere of influence than that of individual sceptical farmers. Use of communication tools such as media articles, DVDs, the Dairy Australia website and postings has improved understanding within the industry. It is easy



to overestimate interest and level of understanding in Johnne's control when farmers have competing issues to manage, such as a poor milk price and climate.

## Dairy Score



Sale cattle showing Dairy Score  
(Source: Dairy Australia)

The reasoning behind the National BJD Assurance Score was to identify the risk of a dairy herd having or spreading Johnne's, and subsequently help when buying or selling stock. It relies upon farmers being involved in a control program and hygienic calf rearing programs. The score is between 0 and 10, with 0 being non-assessed and scores over 7 being attained as a herd is test negative over a number of years, making it eligible for the Cattle Market Assurance Program (CattleMAP), a further level of management "belt and braces".

Frustration has occurred with farmers engaging in the programme with an infected or suspect status scoring a 1, while those not engaged score 0 and sell cattle under the misleading title of "no known Johnne's", thus stigmatising those who try and do the right thing.

Many do not attempt to join until a number of years of improved calf management have elapsed. Those looking to sell their herd imminently may prefer to do nothing rather

than embark on a yearly endeavour to improve a low score. A 30% uptake does not bode well for the programme as many farmers achieving higher scores of 7 or more, see no financial uplift to sales and indeed see a disadvantage to being limited to only buying from fellow participants with an equal or higher score, or risk having their score reduced.

There was no critical mass of farmers participating to create a tipping point where the question moves from "Why are you involved in a control programme?" to "Why aren't you involved?"

## 3-Step Calf Plan

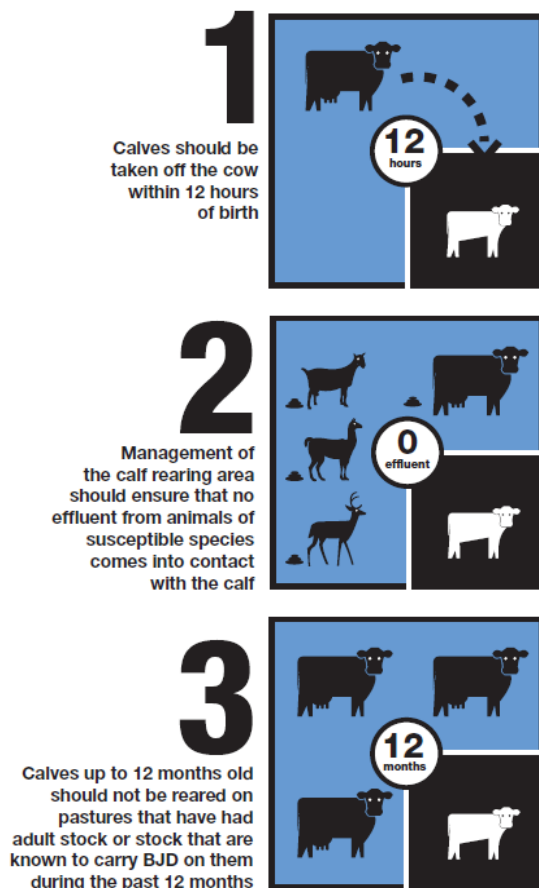
The 3 Step Calf Plan is a simple yet effective industry-led voluntary programme, which contains three essential components in minimising the spread of Johnne's disease. It was developed for inclusion into all on-farm dairy assurance schemes and its implementation contributes to a higher Dairy Score, but many farmers just see it as best practice for rearing youngstock.

I feel it is very effective in its message and simple graphical representation. Many programmes fall down in having too many messages for the farmer to absorb and consequently the easiest and not necessarily the most effective measures are adopted.

**Step 1** involves the prompt removal of susceptible newborn calves from the dam within 12 hours, to minimise exposure to a potentially contaminated environment.

**Step 2** is to ensure the calf does not come into contact with faecal effluent from potentially infectious species (eg. cattle, llamas, alpacas, goats or deer). Keeping the calf area clear of this material also reduces the risk to other infections such as *Salmonella* and *E.Coli*.

See diagram on next page.



The 3-Step Calf Plan. Source : Dairy Australia

**Step 3** aims to keep calves off pastures grazed by adult cattle or other infectious species until they are at least 12 months of age, when they are less susceptible to infection. The MAP bacteria are known to survive in soil for up to a year, so isolated youngstock grazing on high ground (to avoid infected runoff) is recommended.

### The Johne's Disease Calf Accreditation Program (JDCAP)

This programme, introduced by the Victorian State government's Department of Primary Industries in the late 1990s, is a more stringent and detailed form of the 3 Step Plan. Accreditation additionally requires the property to be subject to inspections by an approved vet, using clean water for drinking/calf milk replacer preparation and, if not using milk replacer, feeding milk from low-risk cows. Although it does not guarantee

Johne's-free calves, the certificate of compliance shows control measures have been taken. The \$250 cost of the annual audit is paid by the farmer to the approved vet, and then claimed back from the DPI once a completed audit form has been lodged.

### 3c. South Gippsland, Victoria

I returned to Australia at the end of my travels to gain the "Nuffield experience", immersing myself amongst the free thinkers of South Gippsland. I was very fortunate to stay with 2011 Scholar Roma Britnell and husband Glen and visited their two units - amid 38° heat and bushfires to the north - as well as meeting up with their vet, Steve Jagoe, who gave me a good insight to the Victorian Test and Control Program (TCP). This voluntary programme, introduced in 1996, initially aimed to contain the spread of Johne's by annual whole herd blood testing, culling test-positives (with compensation) and strictly ensuring no adult manure came into contact with the calf rearing area.

It evolved in 2003 to TCP2, which centred on enhanced cattle trading opportunities and the JDCAP was introduced. In 2010, TCP3 was introduced which made enrolment of JDCAP mandatory, and limited testing to animals 4 years and older, while ensuring test-positive cows were sent solely to slaughter within 30 days and clinical animals did not enter the food chain. Offspring of test-positive animals are deemed as high risk and managed appropriately.

As with many programmes, the removal of subsidised testing and compensation for culls saw a fall-off in farmer participation, from a high of 600 Victorian herds (14%). Despite this a test and cull operation from one end, with calf management at the other, provides a great pincer movement against the disease, as



long as Johne's is not then "brought in on the back of a truck".

Travelling east, Dr Peter Younis of the Timboon Vet Group was kind enough to take me on farm for a JDCAP audit and explained all the measures needed to concur with the programme. There was a concern that the lack of financial incentive to remove Johne's because of its few clinical cases and the higher profile of other diseases such as BVD and Salmonella, was going to cause a further reduction in participation.

I met with 2010 Scholar Graeme Nicholls, who gave me an insight in his involvement with JDCAP and frustration with the regulation in the mid 1990s, and how he waited until the entire herd had been through JDCAP before becoming involved. He highlighted the issue of watercourses flowing through infected properties and causing possible infection.

Fellow 2012 Scholar Damien Murphy was able to show me the increased management of double fencing calf paddocks to reduce possible adult contamination, and reiterated farmer uncertainty of the efficacy of the tests available, as well as providing a bed for the night!

Pedigree breeders have the most to gain from accreditation and the hope of receiving the benefits of free status. They also have the most to lose if any animals sold come back as positive and the word gets round to potential customers. Scholar Paul Mumford has a pedigree Jersey herd and gave me an insight into the complexities of achieving a low incidence status for stock sales. Stud breeders very much know to ask the question on disease status rather than leave it to "Buyer beware". Working out an individual cow's score has numerous permutations depending on herd history, and how many

years the herd has been attached to a programme.

Nuffield stalwarts, Max and Barb Jelbart, provided me with a fantastic base and their history of Johne's management control since the mid-80s. It was great also to meet up with Brits Gwyn and Lorraine Jones who were visiting friends and family.

Phill Poulton, a Leongotha vet, gave me an insight into the challenges that Dairy Australia are having in motivating farmers to participate in control programmes and also his pet subject of acupuncture and the downer cow!

### 3d. Queensland

I have included Queensland as I was very fortunate to be able to attend the Dairy Innovators' Forum, just north of Brisbane. Despite the promise of the Sunshine Coast, torrential rain dominated, especially during the pre-forum farm tours which visited three young, forward-thinking dairy operations. The conference covered a range of disciplines, including business management with Calvin Moody, a US dairy farmer with 6,000 cows and Tasmanian Grant Archer, 2012 Australian Dairy Farmer of the Year and Dairy Business of the Year winner. Nuffield Scholars Paul Lambert and Robert Nichols presented their studies on opportunities for large scale dairies, and renewable energy as an alternative income, respectively. Both were fascinating papers. By nature of the conference's title, all the dairy operators present were forward thinkers and there was a very positive buzz to the proceedings.

It is interesting that wherever you go in the world everyone is dealing with the same problems; milk price being topical at the time.

My next stop was China.





## 4. My Study Tour : China

I visited China to try and discover what impact Johne's disease might have on this rapidly expanding market, both in the importation of livestock and attitude to dairy products. The fact that my visit to a 4,000 cow unit was cancelled due to an outbreak of foot and mouth spoke volumes.

I was wondering how the importation of large numbers of young cattle from Australia and New Zealand, with little Johne's status background, might fare in the challenging environment of some Chinese dairy units. A meeting with Agricornp Alta's Robert Watson, based in Beijing, importing semen into a number of large dairy organisations, confirmed that Johne's is "not even on the radar" when it comes to priority herd health

issues. The level of fire fighting on management and nutritional issues would keep it that way for some time.

I found it very difficult to talk to anybody about dairy product safety, understandably after the melamine scandal, but there seemed to be general acceptance that product that was not Chinese in origin was more widely trusted. Levels of supply and demand had a great bearing on how many hoops they expected importing processors to jump through.

I was very grateful for the hospitality provided for by IDEXX in Beijing.

My next visit was to the USA.





## 5. My Study Tour : USA

In 1996, USDA studies show that MAP was present on around 22% of US dairy farms. By 2007, this had jumped to 68% and, on herds of 500+, 95% are said to be infected. In the last decade, \$160 million has been spent on Johne's research which has now virtually come to an end. Like Australia, the US had a quarantine approach to Johne's in the 1970s with infected herds put on a blacklist. Re-engaging wary farmers into voluntary programmes has been a challenge. As important dairying states, Minnesota and Wisconsin are at the forefront of Johne's education and control programmes.

My trip to the US was based loosely around the networking opportunity of the ParaTB forum in Sydney, where I had met Professor Scott Wells of the University of Minnesota and Professor Mike Collins of University of Wisconsin, and godfather of Johne's control.

### 5a. Minnesota



Me, Scott Wells and Linda Glaser

My first stop was the beautiful campus of the University of Minnesota, where I met with Scott Wells, the Division Head of Veterinary Public Health, and Linda Glaser, from the Minnesota Board of Animal Health. Scott

became involved in Johne's at the university in the late 90s, as funding was on the increase, and proof that control procedures were actually doing any good was deemed necessary. So, in 1999, eleven "stable" dairy units were enrolled as demonstration herds to show the effects of best practice. With increased funding, Risk Assessment Management Programs (RAMP) were introduced, starting at 25 pages, but eventually condensed down to two. Scott and his team set out to evaluate the effectiveness of critical control points in Johne's management strategies. This covered maternity pen management, offsite heifer rearing, colostrum management, milk feeding programmes, management of adult dairy cattle and finally vaccination. Due to the long incubation and inconsistency in expression of the disease, trials to find the efficacy of different management policies are fraught with frustration. Long term trials are expensive and the fact that the average lifespan of a US dairy cow is 2-2 ½ lactations does not help. Although final results are still pending on a number of trials, current observations show all these practices have a critical part to play in Johne's control.

While in Minnesota, I was kindly ferried about by Linda Glaser, who took me to meet a number of State field vets and farmers. Jeff Smith, based in the South East of the State, around Zumbrota, was a local vet for 28 years and was pleased to take on the disease management role of a State vet. As farmers were not paying for his time, he found them much more willing to talk and communicate their concerns on disease issues. After the years of persecution involved with Johne's and the State, Jeff used the statement "I'm from the Government, I'm here to help you!"



as an icebreaker to newly involved farmers. He feels he is in a great position to help farmers and make a difference. His hospitality, in providing a bed for the night, use of his homemade pizza oven and inclusion in a fund raising concert for a local theatre, was greatly appreciated.



DHIA Zumbrota Laboratory, Minnesota

Zumbrota is also home to one of Minnesota's two Dairy Herd Improvement Association (DHIA) milk testing labs. Since 2008, milk ELISA has been available, and as government funding for the blood ELISA has ceased, this method has been taken up. Of the 136,000 samples taken per month, 2000 are tested for Johne's. The tests are a screening mechanism for farmers, and Muril Niebuhr, who heads the lab, says in four years the number of positives has reduced from 5% to 3 ½ %. For those farmers looking to source lower risk replacements, in contrast to the old blacklist, there is Johne's Test Negative list. Bruce Dokkebakken at the Buffalo DHIA lab told me of the slow introduction of the milk test as university researchers were at first sceptical, as were some vets, who saw it as a threat to one of their income streams of blood testing. As in the UK, they are looking to use their data to put an economic cost to Johne's, and also to look at a possible heritability of genetic tolerance to Johne's Disease, carried out by the Agricultural Research Service in Washington.

I was fortunate to visit Gar-Lin Dairy, a 1,650 cow operation, while they hosted 3,000 locals at the annual Rochesterfest County "Breakfast on the Farm" event. Dana Allen-Tully had 32 full-time and 14 part-time employees on a fully housed three-times-a-day milking system. The benefits of a large labour force and strict protocols allowed for efficient "snatch" calving and colostrum pasteurisation. Interestingly further expansion was limited by local pollution zoning laws.

## 5b. Wisconsin

My trip to Wisconsin was based around the university in Madison, home of Professor Mike Collins, the leading proponent for Johne's control in the US. Mike does a very good job in providing a reality check between researchers and farmers; that regarding practical costs of testing - "the idea is to put the *disease* out of business, not the producer". He believes the only way there will be progress on Johne's is if there is a financial benefit to farmers through a payment to control, rather than a perceived saving in cost borne out by reduced clinical cases. Another route for progress was whether there would be a push by international food companies to source product from test-negative herds to mitigate any perceived health risk from MAP in emotive products such as infant formula. Mike felt that Johne's Disease was not even in the top ten of concerns held by dairy farmers, evidenced by poor control programme participation.

To show producers what was achievable on commercial farms Mike headed the "Healthy Cows – Proven Practices" demonstration herd project, where 9 farms went through testing and supervised application of recognised management protocols for 7 years. The huge commitment by all collaborators yielded a



reduction of ELISA positive 1<sup>st</sup> lactation animals from 10% to 3%. This information was published as a Hoard's Dairyman supplement with practical and affordable applications of control on various production systems. Using examples of farmers who were really suffering with the disease in their herds and overcame it, provided a valuable educational tool in that "if they can do it, you can do it". By agreeing to stand up and be counted the participating producers helped remove any stigma attached and moved the agenda forward.



Source "Hoard's Dairyman

I went on a road trip with Mike, visiting a number of the participating farms, and was able to see the commitment and attention to detail that these farmers held. The Ripp brothers, running 900 cows, completely redesigned their calf rearing system with a massive attention to detail on calf hygiene, with detailed records on colostrum quality (refractometers) and individual calf intakes as well as scrupulous biosecurity and hygiene. The resulting reduction of calf mortality from 10% to 3%, complemented their Johne's level now running at 0.9% test positives for the herd.

The problem of "sale barns" was emphasised as nearly all cattle are being marketed in this auction system where highest bidder wins.



Troy Ripp and Professor Mike Collins

Advice was, if it is necessary to restock, use certified herds or failing that, small herds which have not bought in stock and are going out for valid (i.e. not disease) reasons.



Hoard's Dairyman August 1971

I was also lucky to visit Steve Calvert, of Hoard's Dairyman for the last 44 years, to discuss the role the magazine takes in educating farmers. The magazine has a history of championing disease control, with successful campaigns against tuberculosis and brucellosis. Hoard's have their own dairy farm of 500 Jerseys and Guernseys, where animals have historically been vaccinated for Johne's, but now use milk ELISA, so any developments on control are readily printed. Steve feels farmers have a duty of care to their animals and this should be put to the public.





While in Chicago I met briefly with Ken Olsen who runs the Johne's Disease Integrated Program (JDIP), which is a consortium of scientists from over 80 universities "all committed to finding solutions to better diagnose, treat, prevent and control Johne's

Disease". He told me of the challenges now facing the research community with drastically reduced funding.

I then crossed over the border to Canada to see the situation there.





## 6. My Study Tour : Canada

In 2009, the Canadian Johne's Disease Initiative (CJDI) was introduced, to coordinate the nine provincial Johne's control programmes across Canada. Funded by Dairy Farmers of Canada and the Canadian Cattleman's Association, it recognised the large amount of cross provincial movement of cattle and the need for education, and development of control and research programmes throughout the provinces. Apart from Quebec, which initiated a programme in 2007, the rest of the provincial initiatives have only been active since 2010-2011, all with a three to four year duration and voluntary in nature.

Canada shows one of the highest prevalence's of Johne's Disease in the world, with an estimated 74% of farms infected. Despite this, within-herd prevalence is relatively low.

### 6a. Canadian MAP Researchers Meeting, Banff

While at the ICP in Sydney, I managed to corner Professor Herman Barkeema, from the Department of Production Animal Health at the University of Calgary, Alberta, and asked if there were any national Johne's events I might attend. If I made out I was one of his students, he said, I might be able to attend the next MAP researchers' meeting, which is what I did. The fact that the meeting was in Banff, among the Rockies, was an added

bonus. As the name suggests, the meeting brought together all those working on Johne's research as well as an update on the control programmes.

Canada shows one of the highest prevalence's of Johne's Disease in the world

Education is a central theme for the provincial programmes, from magazine and journal articles to presentations at meetings and conferences. Anything that keeps the message fresh in the farmer's mind is used.

The Animal Health Risk Assessment Management Plan (RAMP) is similar to that of other countries, where the producer and his vet go through a questionnaire assessing calving, calf rearing and hygiene protocols promoting high health status of cow and calf, as well as top quality milk. On completion of the RAMP, a management plan can be created to further reduce the likelihood of MAP infection, with a maximum of three changes to be strictly implemented.

### 6b. Ontario.



Johne's Education & Management Assistance Program



Educational literature (Source: Alberta Johne's initiative)



As one of the major dairying provinces in Canada, I travelled to Ontario to see farmers involved in Johne's control and speak to Dr Ann Godkin, from the Ontario Ministry of Agriculture, who oversees the Johne's Education and Management Assistance Program. Despite a 70% uptake in the programme they wanted to know why the remaining farmers did not participate. When surveyed the reasons given included the fear of having to dispose of "good" cows, thinking they did not have a Johne's problem, not participating in **any** voluntary programmes or that they were selling the herd within the next two years.

This was the first time I had seen a scheme to get infected animals out of the human food chain, and made me think it was possibly the shape of things to come.

As well as education and a RAMP, Ontario offered optional testing of the entire milking herd funded once, and \$500 for each high-positive cow permanently removed and disposed of by deadstock, compost or burial. This was the first time I had seen a scheme to get infected animals out of the human food chain, and made me think it was possibly the shape of things to come.

Dairy farmers in Ontario seemed very happy with their lot. A high milk price on the back of

a tight quota system saw them investing heavily in infrastructure, to give them modern, well-run units. All the ones I met saw the benefits of Johne's control and found added benefits of reducing other diseases in their youngstock at the same time.

Dr Dave Kelton from the University of Guelph developed the Ontario Johne's Program, and one of his postgraduate students, Steve Roche, was looking at farmer participation via discussion groups. Using the concept of Australian "Farmer Focus" groups, a veterinary facilitator would head groups of 10-15 farmers on each other's farms talking about disease control among other things. The key to success was in the facilitator providing a topic around Johne's control, prevention or general calf health, and allowing the farmers to thrash out a solution, rather than dictating a course of action. I went out to Navan to see an excellent facilitator, vet Dr Dave Douglas on Focus Farm member, Nick Dessaint's farm. It was a fairly revolutionary concept to get farmers speaking about Johne's Disease openly.

Steve also looked at how farmers preferred to take in and give out information through a Visual, Aural/Auditory, Read/Write and Kinesthetic (VARK) Test to establish a suitable learning style for future educational material. Farmers were "multimodal" i.e used all of the above methods.

Denmark was next on my travels.



## 7. : My Study Tour : Denmark

Professor Soren Nielsen, of the University of Copenhagen, is well known to all in the field of Johne's control, especially in the UK, where he has been instrumental in helping to develop a programme based on Danish experiences.

Unlike Australia and the US, Denmark has never had mandatory control measures implemented by government. Since 2002, the Danish Cattle Federation, run by farmers, has decided which policies for government to legislate on for the good of all. As 93% of Denmark's 3,900 dairy herds milk-record, through a single company, RVK, there was an easy transition to milk ELISAs when the voluntary control programme was introduced in 2006. The programme reached 29% of farms and 40% of cows, using a "traffic light" system to divide cows into risk groups. "Red" high-positive cows are highly infectious showing a decrease in milk yield, "yellow" are infectious but no effect on milk yield, but could turn "red," and "green" are classed as non-infectious with normal milk yield. While green cows can be used to provide a colostrum bank, yellow cows' colostrum should be discarded in conjunction with improved calving hygiene, and red cows are recommended to be culled pre calving.



Source: Knowledge centre for Agriculture

The focus is very much on "within-herd" control, where the only "between-herd" control recommendation was not to purchase

replacements. In 2011 a certification scheme was introduced on a scale of 1 to 10: one showing a herd to be low risk, test-negative and no purchased stock, while a 10 score indicated an untested herd.

### 7a. Knowledge Center for Agriculture, Skejby

I met Kasper Krogh of the Danish Cattle Association, at the Knowledge Center for Agriculture, where he gave me an overview of disease control in Denmark. The cooperative attitude of Danish farmers has helped in the formation of a massive database of animal data which statisticians at the Knowledge Center have analysed and used to provide farmers with management tools. Denmark has a good history of disease eradication, including brucellosis, TB, IBR and Bluetongue, with BVD imminent. With this background I was surprised there was not more enthusiasm within the industry, especially as two thirds of dairy products are exported. Development was further hampered by removal of funding for research just as the voluntary programme began in 2006, and by 2011 the funding for the programme was provided by participating farmers through a herd fee of €50/year.

As with all farmers, the Danes wanted to see a quick fix to this disease, for which there is none. The diligence required for continuous risk management is a daunting task for many farmers, but good communication and encouragement between farmers, herd health advisors and programme managers is helpful. Despite decreased funding, Kasper has excellent web based resources which are regularly updated to keep producers engaged.





### 7a.i. Lene Trier

Lene, a vet and practice owner in the Esbjerg district of Denmark, has been heavily involved in farmer participation of the Danish Johne's control programme. With Soren Nielsen and Kaspar Krogh, she developed the use of farm meetings to educate producers in reducing the transmission of Johne's.



Lene Trier

Her most successful advocate of this approach was Thise Dairies. Thise is an organic co-op of 83 farmers, who collectively decided to eradicate Johne's as a way of increasing herd health and reducing the risk of antibiotics in their products. A cow with Johne's has a reduced immunity to other diseases, such as mastitis and lameness, which often require veterinary treatment. Every farm designed a control programme and eight groups of farmers were designated geographically.

They meet twice a year, with a producer giving a tour of his farm and outlining his management strategy for reducing MAP transmission. The other farmers give feedback and suggest alternatives and, as in the Canadian Focus Farms, the facilitator does not provide a readymade solution, but summarises the advice given, asks the farmer what changes he will make and when, updates the group with new information and above all provides encouragement.

**As they say, "Give a farmer a problem and he will find a solution; give him a solution and he will find a problem."**

A Thise representative is also present to provide some continuity to the strategy. After a meeting at Arla's head office in Aarhus, I was surprised they had not been similarly proactive, rather than relying on voluntary uptake of the national programme.

Whilst travelling to a number of farms with Lene, I was amazed at the tight regulation on all veterinary products and the vet's duty to administer it. As the number of farmers and vet practices continue to decrease and become more geographically isolated there is a move to relax some of the regulations on animal welfare grounds. **It made me shudder to think if we had had to deal with this situation in the UK.**



## 8. My Study Tour : Ireland

Although a notifiable disease since 1955, Johne's Disease levels in Ireland increased rapidly with the opening of borders within the Single European Market in 1992. In the following 12 years 85,000 cattle were imported, mainly from Denmark, the Netherlands, France and Germany. In 2005 it was estimated that 20% of Irish dairy farms were infected with Johne's Disease.

Ireland has bided its time in becoming involved in a national Johne's control programme, looking at the effectiveness of different strategies around the world. Where Ireland's position differs from that of many other countries is that it is a net dairy exporter of two thirds of its products, and one of these products, namely infant formula, accounts for over 15% of global production. Even a perceived link to Crohn's disease, could cause a major issue in their international markets in regards to Johne's status.

### 8a. Animal Health Ireland, Dublin.



Animal Health Ireland (AHI) was formed in 2009, as a call to arms over non-regulated cattle diseases in Ireland. While the government has full control over the likes of TB, BSE and foot and mouth disease, there was no structure to deal with management diseases such as BVD, mastitis, Johne's and IBR. It is a public/private partnership relying on the Department of Agriculture to match-fund industry's input. The budget currently runs at €1 million.

BVD eradication has been cited as the first goal, with mandatory ear tagging of calves

with DNA sampling tags. The fact there is only one official tag manufacturer is a great bonus. BVD has been chosen primarily as it is an easy win over time with culling of persistently infected (PI) animals. Once farmers see a benefit they will hopefully give backing to Johne's control as the next campaign, although hopefully with realistic expectations. Those in industry, especially the dairy processors, are keen to see Johne's pushed to the front as soon as possible, as BVD control is very much seen as a win for the farmer through reduced wastage but of no benefit to the processor, whereas a low Johne's risk product has market potential, and inversely a high Johne's risk product gives vulnerability. Time is of the essence in starting a voluntary programme, before the removal of milk quotas in 2015 and the expected rapid expansion in cow numbers. Although it is recognised there is little possibility of nipping the disease in the bud, the education phase wants to be fully absorbed before expansion, and there is an emphasis on primarily protecting herds that test negative for Johne's.

As well as speaking to Joe O'Flaherty, CEO of Animal Health Ireland, and Simon More, Chair of the Technical Working Group on Johne's, I was also able to meet David Graham, Programme Manager for AHI, and Sam Straine, David's equivalent at Animal Health and Welfare Northern Ireland. With large numbers of cross-border cattle movements, coordination and cooperation within disease control programmes between Northern Ireland and the Republic of Ireland is seen as of paramount importance. Any control programme introduced into the UK would



have to work on the same cross border principle.

### 8b. Carbery, Cork



Carbery, Co. Cork

No one in Ireland would disagree that it is the processor Carbery that is pushing the hardest for Johne's control in Ireland. Carbery produce high value ingredients, including infant formulas that are exported worldwide. Certain countries have asked at what level Johne's control has been implemented on supplying farms and, when no answer could be given, the company introduced its own limited programme. Other processors have stood in line behind Carbery to push AHI in implementing a national programme. SJohn O'Brien, a supplying farmer and on the Carbery farmers' board, has been the most vociferous advocate in raising awareness of the issues, and can see the upcoming expansion - after the end of quotas in 2015 -

as a potential problem if farmers are not on board.



John O'Brien

John has found it frustrating that some stakeholders, such as farmers' unions, have not been more proactive, looking only at short term cost to the farmer rather than a possible win for the industry. The future success of Johne's control in Ireland lies with the

The future success of Johne's control in Ireland lies with the commitment of the processors.

commitment of the processors. If this is strong there is a possible domino effect of similar product based processors from other countries seeing a market advantage of low MAP milk, and pushing the agenda onwards.



## 9. My Study Tour : The Netherlands

The Netherlands has attempted to control Johne's in one way or another since the 1920s, through vaccination, voluntary and compulsory measures. Recognition by farmers of the export market taking 60% of their product and how crucial it is to protect this has led them down a path of more stringent control.

### 9a. GD Animal Health Services, Deventer



Dr Maarten Weber and me  
sharing the lighter side of Johne's control

I travelled to Deventer to meet Dr Maarten Weber who was first involved in the national paratuberculosis voluntary programme in 1998. There was an estimated clinical prevalence in 20% of herds and a view to prevent infection in MAP free herds and assist infected herds with certified status levels. A mere 5-10% participation led to a more formal approach in 2006 with the Milk Quality Assurance Programme (MQAP) initiated through the dairy processing industry. Initial annual testing was free and voluntary, resulting in a 95% uptake, and this provided

herds with a simplified status level of "A", "B" or "C".

"A" herds were those with a consecutive negative result, "B" herds were test positive, but with all test positive cows culled, and "C" herds being test-positive and test-positives not culled. In 2010 testing became mandatory on an annual basis for "B" and "C" herds, and biennial testing for "A" herds. This went a step further in 2011 when all herds had to reach the "B" status. Although advice for calf management is given to farmers both by GD and vets, there is an expectation that "B" and "C" farms will buy replacements from "A" herds, and not source from abroad. Those herds with a high incidence of clinical cases are given special dispensation to reach achievable levels in an economical time frame. It is yet to be seen whether annual testing is sufficiently robust to catch all high-positives both before they calve or before they are sold. Where the aim is to achieve an acceptable level of MAP in bulk milk and to then achieve zero levels post pasteurisation, the scheme goes much further than many voluntary programmes in other countries.

### 9b. ZLTO Dairy Division, National Farmers Organisation



Since 2006 there have been many stakeholders involved in the coordination and communication of a more rigorous approach to Johne's control in the Netherlands. The Dutch ministry of agriculture plus the dairy processing industry as well as farmer organisations have come together to roll out a MAP reduction programme. Toon van Hoof of





the Dutch farmers' organisation ZLTO, has had great influence in the current process.

Visiting him in Asten in the south east of the country, he explained that having 85% of the milk picked up by one company, namely Friesland Campina, helped enormously. All Dutch dairy farmers realise the importance and vulnerability of the export trade, which takes 60% of their product. I thought the move from voluntary to mandatory testing would have caused uproar from a nation of farmers already creaking under the

burgeoning weight of regulation and bureaucracy. Good communication and the realisation of doing the right thing seem to have curtailed this. Animal health issues were brought to the fore in the Netherlands when a regional outbreak of Q fever (*Cloxiella*) in dairy goats caused the infection of 2,500 people and more than 20 deaths between 2007-9.

My travels were now over and I returned to the UK.





## 10. The situation in the UK

Estimated infection levels on UK dairy farms range from 35 to 70%. From my time at the ICP in Sydney, it was apparent that the UK was coming from behind in Johne's control. Despite the sterling work of Peter Orpin and Dick Sibley of [www.myhealthyherd.com](http://www.myhealthyherd.com), a web-based risk assessment programme, in educating over 2,000 farmers, there is no centralised control programme in place. With no government intervention, as seen in other national programmes, it is left to the processors to rise to the challenge. They have done this to a limited degree with producers' meetings and "30 cow tests" but, as with all campaigns, it is continued engagement that is the difficulty, with vets as well as farmers.

The availability of milk ELISA testing since 2008 has allowed affected and concerned farmers to take some control of their destiny in identifying infected cattle, but it is only fairly recently that the bio-security of the calf has come to the fore. Coordination through Dairy UK's Johne's Action Group has produced an excellent conference, and a structure for stakeholders to discuss future collaborations,

but there needs to be a continued drive to keep the agenda moving forward.

The overshadowing effect TB has on the farmer's psyche has allowed Johne's and other diseases such as BVD and IBR to slip in under the radar.

There is no doubt bovine TB has played a huge part in Johne's disease levels in the UK. The overshadowing effect TB has on the farmer's psyche has allowed Johne's and other diseases such as BVD and IBR to slip in under the radar. Throughout my travels international disease specialists cannot believe we have allowed ourselves to get to the position we have. TB has not been the only antagonist. BSE and Foot and Mouth disease have all played their part, triggering huge restocking levels, from both within the country and international imports, thus ensuring a uniform pooling of Johne's infection.





## 11. Control Measures for Johne's Disease

Control measures have been internationally recognised as a combination of testing, culling, decontaminated feeding and watering, quarantine of heifer rearing areas, and scrutinising the source of non-home grown replacements. All measures require 100% commitment by the staff involved, over a period of 8–10 years, so written protocols annually reviewed by vet and staff are vital.

### 11a. Testing: “If you don't measure it, you can't manage it!”



Milk ELISA testing

Before you test for Johne's Disease you must consider what you are trying to achieve. Are you specifically trying to identify positive animals, or whether you have the disease at all? How much financial and physical resource are you willing to put toward testing? Historically many of the world's control programmes have provided initially free or heavily subsidised screening, with engagement falling away as eventually the cost of testing is put back on the farmer.

Testing for Johne's Disease is problematic as those tests available are only effective in diagnosing clinically infected animals. Sub-clinical animals, although showing no outward

signs of the disease, can still intermittently shed the MAP organism.

There are three common ways to test for Johne's disease, these being

- faecal culture
- faecal PCR
- milk or blood ELISA

**11a.i. Faecal culture:** This is seen as the gold standard in Johne's testing, using an individual or pooled sample to screen for the presence of the MAP bacteria. The problem arises in the length of time it takes to get a result. This notoriously slow growing bacterium can take between 10 and 16 weeks to culture.

**11a.ii. Faecal PCR:** the Polymerase Chain Reaction test involves the detection of MAP DNA in a faecal sample. This test is often used in programmes where a negative result needs to be confirmed, usually from a sample taken from the slurry store. Results are obtained much more quickly.

**11a.iii. Blood or milk ELISA:** The Enzyme Linked Immunosorbent Assay tests for antibodies produced by the animal, in response to a MAP infection. Although not as accurate as the previous two tests, it is practically the most useful. While a blood test would usually involve a vet visit, milk ELISA testing can utilise milk recording samples; the only extra work involved being a tick in the “Test for Johne's” box on the recording sheet. No-one suggests a culling decision should ever be made on just one milk test but, over a number of tests, a status is formed. A 30-cow test



has been used in the UK, choosing those older cows more likely to be infected than younger cohorts. Although positive results show high likelihood of infection, negative results should not be treated as the all clear, as only a representative sample has been taken (unless of course you have a herd of precisely 30 cows!). The danger with a negative result from a sample of the herd is the detachment from any future Johne's testing. The nature of the disease is that it can always be sitting in the background, amongst younger herd members or bought in stock.

On blood and milk ELISA, testing the whole herd is preferable, and imperative if any signs of Johne's have been seen.

On blood and milk ELISA, testing the whole herd is preferable, and imperative if any signs of Johne's have been seen. The results are only as accurate as the people taking the test; a wrongly labelled sample could lead to a high genetic merit animal being rejected for providing herd replacements.

#### **11a.iv Timing and frequency of tests:**

Assuming you have Johne's at a certain level, it is essential that the timing and frequency of the test is of maximum benefit. If you are limited to testing animals twice yearly, the most beneficial times would be pre-breeding, to allow a medium or high titre animal to be put to a non-dairy sire; and pre-drying off, where an animal has moved from a low to high titre since the last test. This is less complicated in a block calving scenario

where results from the whole herd can be attained at once.

Those unfortunate enough to have frequent TB testing should try to test with a long an interval as possible since the last TB test, preferably 4 to 8 weeks after, as the tuberculin can affect results. It is also recommended not to test within 5 days of calving, as again colostrum can skew results.

Accuracy of the tests is often cited as an issue. As Mike Collins said, "A perfect test is not affordable and an affordable test is not perfect". Accuracy is measured by sensitivity (Se) and specificity (Sp). Sensitivity is the test's ability to correctly classify truly diseased animals as "test positives". Specificity is the test's ability to correctly classify truly non-diseased animals as "test negatives". While faecal culture and ELISA tests are nearly 100% specific (i.e. identify all test-negatives) they have only 45-50% sensitivity (i.e. catch only half the test-positives).

Obviously the more tests that are carried out, the clearer the picture of the individual's disease level, with many herds opting for quarterly testing. This comes at a financial cost, and it is necessary that results are acted upon. The fact that the infection occurs in "waves" also frustrates farmers, in that an animal tests high-positive, then tests low for a number of tests. Different stressors such as calving and poor nutrition may also have a bearing on this, but generally a high test is a high test! It is important to remember other diseases have been eradicated with tests much poorer than those available for Johne's.





### 11a.v Identification:

Once a Johne's carrier has been found, she needs to be easily recognised, especially in the parlour. Different methods include large red ear tags, leg bands, tail tapes or freeze brand with a "J". Personally we use tail tapes and leg bands, as an ear tag cannot easily be seen from the pit, and a brand takes too long to come through. General recommendations are that offspring from an infected dam should also be identified in a similar way as potentially infected, through colostrum or trans-placental infection (uncommon).

Many control programmes band animal records into different groups using colours - "the traffic light system" - for management purposes, red being positive animals, amber for inconclusive animals and green for negative animals.

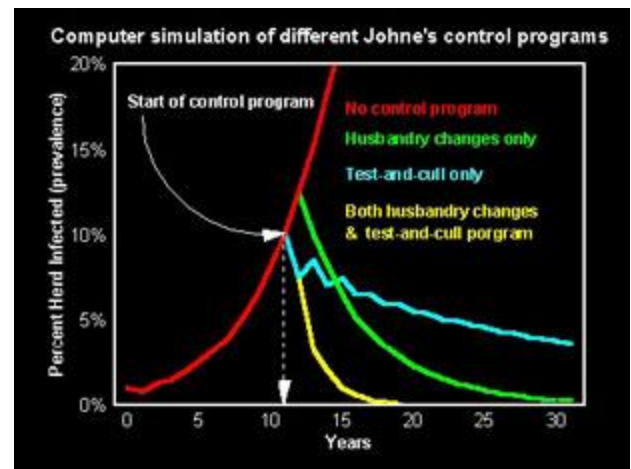
### 11a.vi Decisions, decisions

It is when you have all the data in front of you that a decision must be made. The course of action taken by a producer with 1% of the herd infected, and with no clinical cases, may differ greatly from someone with 10% infection and heifers showing clinical Johne's. It depends very much on what the farmer's aspirations are regarding disease. Has he nailed BVD and IBR and is looking for the next disease to conquer, or is he struggling with TB, and Johne's control is about to be put in the "too hard" box?

## 11b. Culling

"Test and Cull" has long been a method in trying to curb the excesses of Johne's but, unless combined with other effective control measures, it will normally fail. Herds with a very low incidence of Johne's may be more effective with a culling policy, especially if the

culprit is recently bought in, and the culling immediate.



Effect of different control programmes  
(Source: Johne's Information Center)

Red line = no control programme  
Green line = Husbandry changes only  
Blue line = Test and cull only  
Yellow line = Both husbandry changes and test-and-cull programme

Without testing, infected cows will eventually cull themselves, either through poor yield, higher mastitis incidence, infertility, lameness or the clinical effects of the disease. But it is the degree of shedding of the bacteria before this occurs that is the issue. A favourite cow will invariably be diagnosed and it depends on the farmer's sentiment on how many tests are needed to confirm the inevitable.

Once the decision to cull has been made the farmer faces another moral dilemma of which route the animal takes. In an ideal world the cow would go to the knacker or for incineration; usually the route is through the abattoir and into the food chain. Government vets see no problem with this as the disease is concentrated in the alimentary canal and thus discarded, but the public may have a different opinion. Unfortunately a number of infected animals will be sold into a market, and onto unsuspecting farms, to infect their possibly



naive herds. One can only imagine how many positively diagnosed cows were sold internationally, when many Western European countries started their control programmes.

### 11c. Calving Area



Calving area hygiene

As previously mentioned, the key to stopping the spread of Johne's on farm is stopping contaminated faecal matter from entering the calf's mouth. The earliest opportunity for the calf to become infected, apart from *in utero*, is as it hits the deck after calving. A calf being born onto an area covered in dung from previous occupants, possibly Johne's shedders, gives it a high chance of ingesting faecal matter as it searches for a teat, sucking as it goes on the surrounding walls, floor and other parts of the calving area. The mother, lying down to calve, could also pick up MAP-rich muck on her flanks and udder.

So advice is to firstly keep known infected animals away from the calving area, and definitely do not use the calving area as a sick bay, as a clinical Johne's case invariably looks unthrifty. Clean and keep clean with frequent new bedding.

Johne's-positive cows, if kept in the herd, will need to calve somewhere. If inside, this should be in a separate pen with solid sides. In Denmark I saw two calving pens, separated by a five bar gate, one for normal cows the

other for Johne's cows. As if to prove a point, one cow standing next to the gate lifted her tail and squirted muck through the bars, thus contaminating the next door pen!

Farms calving outside, like my own operation, face similar challenges. A larger area is normally available which is a benefit but is the calving paddock (or pad) static or rotated? Is the area free draining or does it become a bog in inclement weather?

All these issues need to be addressed to reduce possible contamination. The earliest opportunity to do this, obviously, is at birth. Those wonderfully dedicated farmers, committed to halting the disease, will "snatch" calve. Before the calf has a chance to suckle it is placed in a tub or bath, which the mother can reach into to lick the calf dry but the calf is unable to stand and suckle, thus removing the possibility of the calf ingesting faecal matter off the flanks or udder of the dam. The calf is then removed, fed good quality uncontaminated colostrum and housed away from any source of adult manure. The reality on many farms varies

Those wonderfully dedicated farmers, committed to halting the disease, will "snatch" calve.

from this example to no form of calf bio-security whatsoever. Again the level attained depends on farmer aspiration and economic practicalities of labour availability to reach these desired goals. It would be hoped most calves could be picked up within twelve hours of birth but the reality on many farms is within twenty four hours.

### 11d. Feeding and Water

#### Colostrum Management



Although direct faecal ingestion is seen as the highest risk to infection, colostrum comes a close second, due to the ease with which it can become contaminated. Ideally, each calf should be fed its dam's colostrum or that of a known negatively-tested, older cow. It is imperative that the colostrum is collected hygienically, ensuring any faecal contamination is removed from the teats, and that it is stored in a closed container that dung cannot

Pooling of colostrum has and does spread MAP bacteria effectively to calves, especially if it is stored and added to on a daily basis.

splash into. Pooling of colostrum has and does spread MAP bacteria effectively to calves, especially if it is stored and added to on a daily basis. Again, feeding waste milk has its dangers. Your guard may be up with fresh calves, dumping colostrum from infected animals, but antibiotic-treated positive animals may slip through the biosecurity net, if waste milk is fed.



Pasteurise at 60°C for 60 minutes.

In infected herds many farmers look to feed milk powder or pasteurise waste milk and colostrum. Work carried out by Dr Sandra Godden at the University of Minnesota, has

shown pasteurisation at 60°C for 60 minutes is very effective in reducing MAP levels as well as other pathogens, such as E. Coli and Salmonella, while leaving immunoglobulins intact and active. One hundred percent of MAP bacteria are not killed even in commercial pasteurisation, so all known positive-dam colostrum should still be discarded. Attention to detail is essential with all these management practices, so that correct temperatures are adhered to and corners are not cut.



Keep water uncontaminated

In conjunction to milk feeding, calves will have access to water and hard feed which must not be contaminated. It is imperative those reared outside do not drink from watercourses downstream from other, possibly infected, stock.

### 11e. Heifer Rearing:

The calf is at most risk in the first year of life, so as calves go out to graze care must be taken not to put them in contact with sources of infection. Calves should have designated areas to graze which have not had adult cattle on them for at least 12 months, as MAP bacteria have been found to survive over a year in slurry and soil. Whether the amounts constitute an infective dose, is difficult to determine.



Water courses running through youngstock areas are another possible source of infection, especially if downstream from adult cattle or a neighbouring farm. Having youngstock paddocks on high ground removes the risk of them coming into contact with any sort of runoff.

Best practice for separating calves from adult cattle is putting a secondary fence a metre in from the original boundary fence to ensure any dunging from the adult cattle does not enter the calf paddock. Where youngstock are agisted off-farm, the history of the paddocks and neighbouring areas should be investigated.

The previously mentioned Australian JDCAP and 3 Step Calf Plan cover this succinctly.

### **11f. Replacements: Buyer Beware!**

However much work and effort that is put in to Johne's control on farm, it can be for nothing if the disease is bought in from outside. The lack of an official accreditation programme in the UK makes buying-in stock a game of Russian roulette. Given the history of

Given the history of cattle disease in the UK, with BSE, foot & mouth and TB, there has been a lot of rapid depopulation and repopulation in the cattle dense areas of Britain.

cattle disease in the UK, with BSE, foot & mouth and TB, there has been a lot of rapid depopulation and repopulation in the cattle dense areas of Britain, silently spreading the disease countrywide. A move towards larger herd sizes and the technically-demanding Holstein have also increased demand for

replacements. The fact that the replacement of choice is an in-calf heifer makes the job even harder, as the disease is rarely detectable in stock under two years of age.

With the earlier adoption of control programmes in the rest of Europe during the mid-nineties, one would like to hope that positively-tested animals did not find themselves heading to our shores.

Traditionally, the only question asked re disease was TB status, with BVD and IBR an afterthought and Johne's left out altogether. With the introduction of the Herd Health Plan for Farm Assurance accreditation schemes, Johne's has been bought back into the frame.

The selling of possibly diseased stock is a very emotive subject. I myself was mortified to discover some heifers we had sold had tested later in life as Johne's-positive. Many farmers may sell stock, never having seen a case of Johne's on their farms, with the disease only triggered by the stresses of the move to new premises, management and subsequent calving.

Those most potentially affected must be the pedigree breeders, where stock sales make up a large proportion of income and reputation is everything. It is perhaps this group who has most to gain from a robust control and accreditation programme. There will always be farmers with an ostrich mentality, who would rather not know their status, and hence not have to make that difficult decision of having to declare their hand.

The responsibility that markets and cattle brokers should take in highlighting Johne's Disease is a thorny subject. Many believe that they should ask potential sellers to disclose disease status and encourage potential buyers to ask the question, despite the jeopardy it could put on a potential sale; but turkeys do not vote for Christmas. The markets may reply





they have enough trouble getting farmers to use their services without putting obstacles in the way, however ethically correct they may be.

### 11g. Vaccination

Where vaccination is seen as the silver bullet in many disease control programmes, such as BVD, this is not the case for Johne's Disease.

Where vaccination is seen as the silver bullet in many disease control programmes, such as BVD, this is not the case for Johne's Disease.

The use of Guidair™ vaccine, licensed and effective for Ovine Johne's Disease, is of limited use for cattle. While the vaccine delays the shedding of bacteria in vaccinated animals, it does not stop the animal contracting the disease in the first place. The major downside to its use is its interference with the test results of another mycobacterial disease, Bovine Tuberculosis; Johne's Disease being caused by *Mycobacterium Avium* Paratuberculosis (MAP) while bTB caused by *Mycobacterium bovis*. The presence of Johne's Disease or its vaccine is said to reduce the sensitivity of the tuberculin test, hence its use is actively discouraged. The other problem entailed is that a vaccinated herd will show positive results for all tests for Johne's, making it impossible to monitor future prevalence of infection. The development of a new cattle specific killed vaccine, Silirum™, is still being trialled, but many of the same issues will apply. The future application of a gene marker to a vaccine which enables it to be easily distinguished from the antibody

response of the actual disease may well be developed for bTB, and later for MAP.

### 11h. Waste Management



Hazards of spreading possibly infected slurry

Slurry and its fractions have now become a resource to many farmers, as artificial fertiliser costs have risen steadily over time. As faecal contamination is seen as the main route of infection the concern is how long MAP survives in this medium under varying worldwide climatic conditions. Many in the southern hemisphere believe the high levels of ultra violet light do much to kill the bacteria on paddocks in dung pats. Spread out of the back of a tanker over a “splash plate” gives the highest level of risk, with possible contamination of water troughs and pasture. Direct injection provides a lower risk option by putting the MAP out of direct reach of the cattle.

Another possible risk is the use of separated solids as a bedding medium which is also becoming popular as an alternative to straw or sawdust. This risk must be gauged against the level of Johne's in the herd and the extent MAP has infected the local environment. Those relatively free of the disease should conversely not import slurry of unknown origin.



## 12. Discussion

Johne's Disease is here to stay. Only a major change to consumer attitude followed instantly by processor attitude and ultimately farmer action will curb the rise in this disease.

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To say it is the sword of Damocles hanging over the dairy industry, as I did back in my Nuffield interview, is perhaps a little melodramatic but, after eighteen months of travel, I still feel desperate about this disease. Despite a great insight into the machinations of control programme design, execution, and in some instances failure, I have found it frustrating (or should it be hopeful) not being

able to meet more grass roots farmers really suffering with the disease. By the nature of the enthusiastic people I have met, the links in the chain from scientist to government

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coordinator to vet has led me to farmers who have already engaged and are reaping the rewards. Putting a financial cost to the disease may make producers think, but in some cases only standing on the precipice of financial ruin will force an action, even if that action is to put up a "For Sale" sign. Before that happens, I hope to spread the word and make sure everyone is "keeping up with the Johne's".



## 13. Conclusions:

- Johne's Disease will not be eradicated in the UK, but lowering the prevalence is achievable.
- National voluntary control programs have lacked widespread participation. Farmers are generally motivated by money to engage in control programmes but disengage when this incentive is removed. A successful programme seems to rely on “carrot” and “stick” principles with collaboration between farmers, government and industry. The “stick” may come in the form of compulsory testing by the processors, at the customer's behest.
- All control measures that keep MAP infected faecal matter out of a calf from 0 to 12 months of age will drastically reduce the risk of Johne's infection.
- Don't buy in or sell infected stock; an untested herd should be considered infected.
- Staff must fully buy in to the chosen protocols; one cut corner can lead to failure.

## 14. Recommendations

- Farmers must be proactive in the debate on Johne's Disease control, before the agenda is dictated to them. Education must be ongoing with a unified message. The calf is the key.
- Any control programme embarked upon must get it right the first time. All Herd Health Plans should provide a protocol for Johne's control.
- On an individual basis, the control measures discussed work. If you have Johne's do your utmost to remove it, including testing, culling, calf hygiene and source clean replacements.
- Involve your vet and staff in your vision and realise 100% commitment from them.
- If you don't think you have Johne's in your herd, test and test again and keep it out with a passion.



## 15. After My Study Tour

Every period of travel I embarked on seemed to coincide with a major event in the UK Johne's calendar, be it meetings of the Johne's Action Group or the Johne's Conference in Worcester.

Now the travel is over, my first priority is to get my own house in order.

I am implementing a stricter policy of control on our own farms to tighten the noose on this terrible disease. I have joined the Johne's Action Group and hope to remove the stigma that still exists regarding Johne's.

I am aware that many of the battered and bruised dairy businesses of the UK do not want another challenge put to them, but this disease won't go away and with apathy will flourish.

The death of my father in March 2013 has left a larger gap than I imagined in my business life; where is a good mentor when you need one? I am keen to follow the Nuffield code and transfer any knowledge back to farmers, hopefully to ensure they are "keeping up with the Johne's"!







## 16. Executive Summary

Johne's Disease or paratuberculosis is a contagious, chronic, wasting disease of all ruminants, from rhinos to reindeer. It is at its most destructive within the domesticated production species of cattle and sheep. The insidious nature of the disease infects that most susceptible of creatures, the newborn. By ingestion of MAP (*Mycobacterium avium* subsp. *paratuberculosis*) bacteria-laden faecal matter on teats, in colostrum, and later in feed or water, the bacteria incubate completely undetectable until the cow matures. Proliferation of billions of these slow growing bacteria in the small intestine causes a thickening of the gut wall halting absorption of nutrients and in cattle causing diarrhoea, emaciation and eventual death. There is no cure and in many countries the disease is endemic. The spectre of a link with Crohn's Disease in humans still lingers after millions of dollars have been invested in research to find a causative link between these similar diseases.

I am a second generation dairy farmer in a family business running 1,200 cows in three herds and 800 youngstock over 2,000 acres in south east England. Our block calving system, pooling of colostrum and naivety has led to a rapid increase in incidences over the last five years. Frustration at the vagueness associated with the practical control of Johne's in my business led me on a worldwide journey to see how others perceive the disease and what measures have been put in

place over the last 50 years to control it, or not. The biennial 11<sup>th</sup> International Colloquium on Paratuberculosis in Sydney provided me with the springboard into the world of Johne's control programmes from Australia, USA and Canada to Denmark, Ireland and the Netherlands. Historical mandatory testing and quarantine in many countries sent the disease underground, so the approach was changed to voluntary funded programmes, pushing education, risk assessment management programmes, and practical control measures to the now-wary farmer.

Despite disappointing participation at national levels, numerous individual farmers have embarked on the 8-10 year journey to be rid of Johne's, thankfully some with great success. A combination of testing and culling highly positive cows with immediate "snatch" calving, stomach tubing with "clean" colostrum, and excluding **any** adult faecal material from the calf's environment for the first 12 months of life reduces likelihood of infection dramatically. Ensuring only home bred replacements, or those from test-negative herds, combined with 100% committed staff and protocols, will deliver success. My goal apart from beating the disease is to provide another route for knowledge transfer about Johne's Disease to the battered and beleaguered British dairy farmer.

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