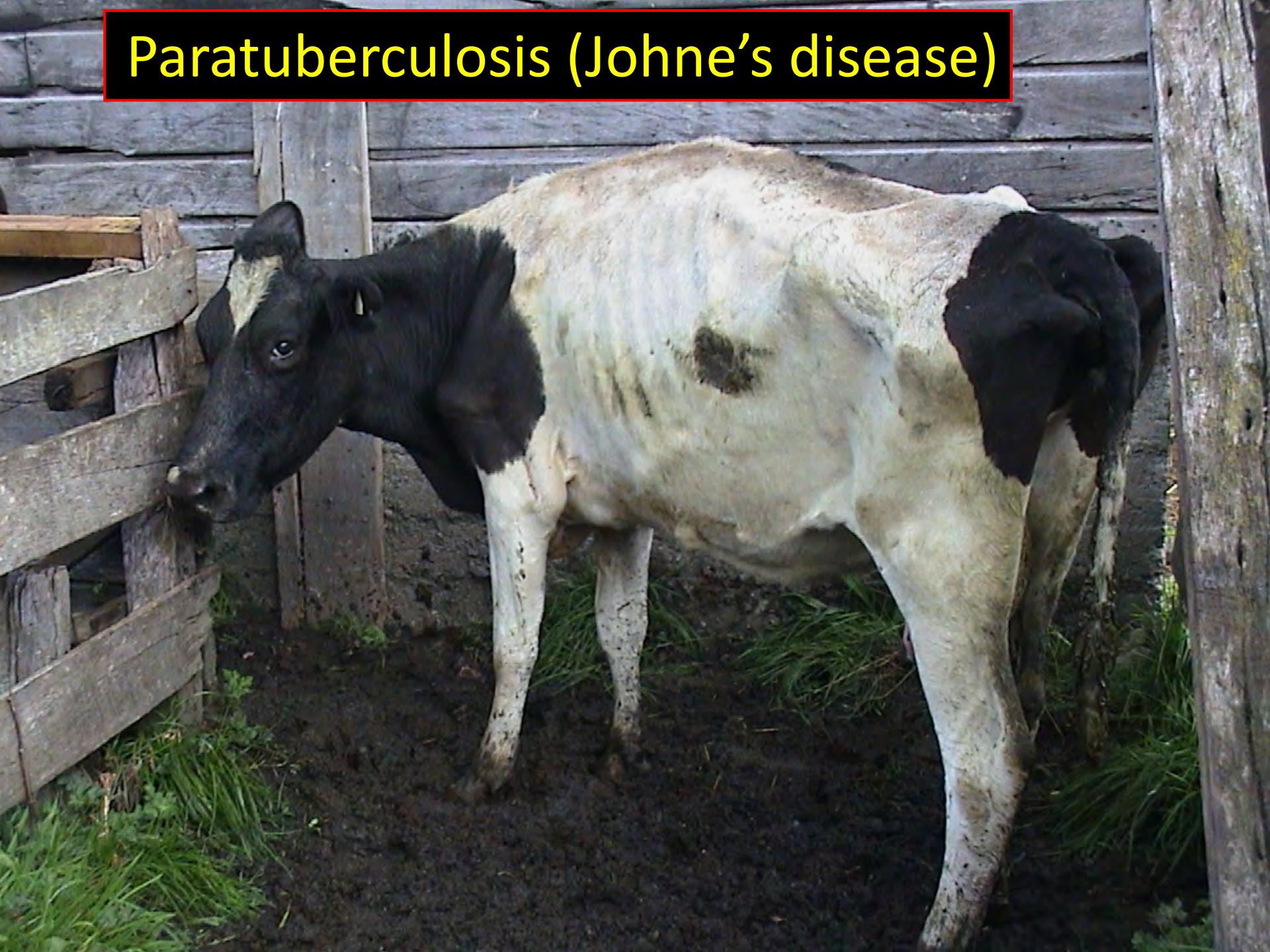




# **Combating Johne's disease using management & genetics**

Michael T. Collins, DVM, PhD  
University of Wisconsin

# Paratuberculosis (Johne's disease)



The cause:

*Mycobacterium avium paratuberculosis*



# The result: Damaged intestine

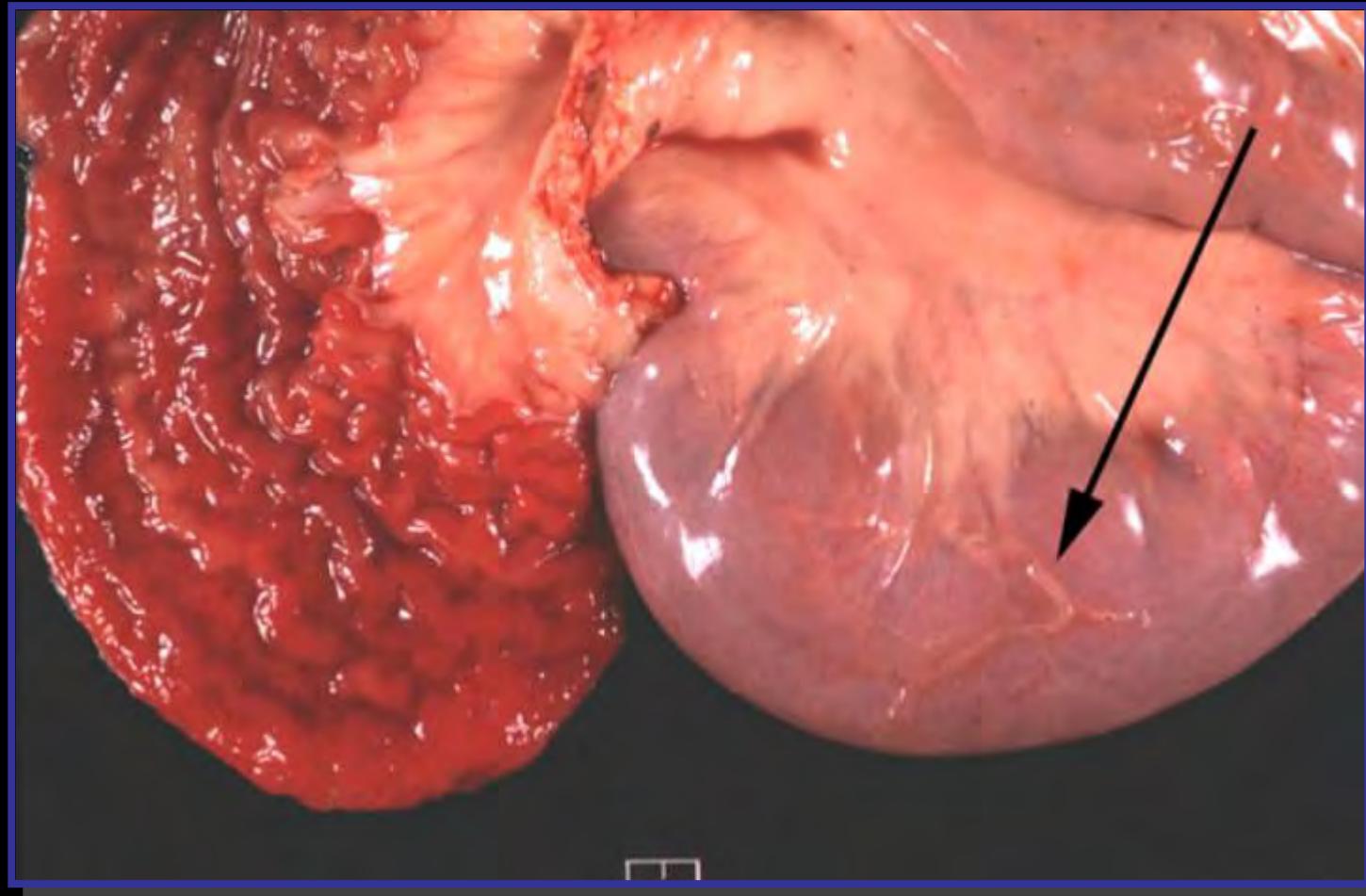


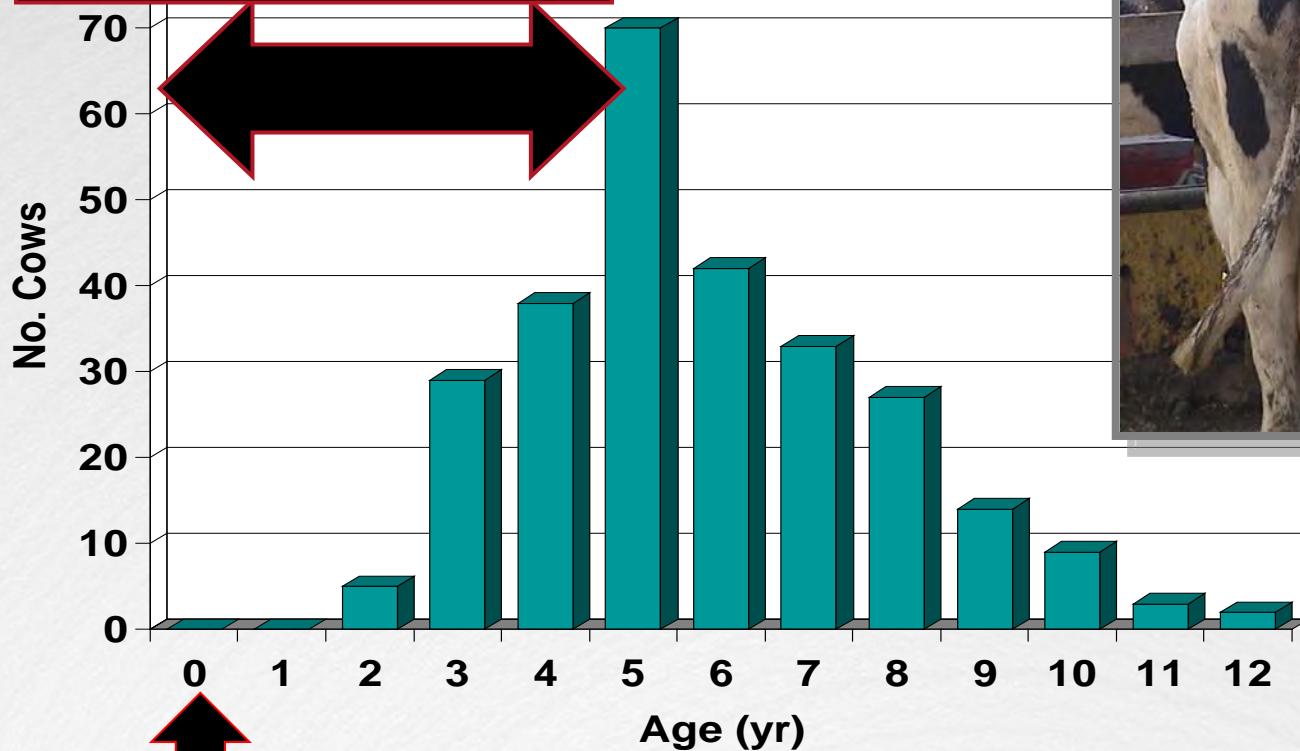
Photo provided by A.J. Cooley



# Clinical Johne's disease

Australian data on 179 herds

Median incubation period = 5 years



Infection



Johne's disease is a global problem.



# Control Program: Principles for all Cattle Breeders

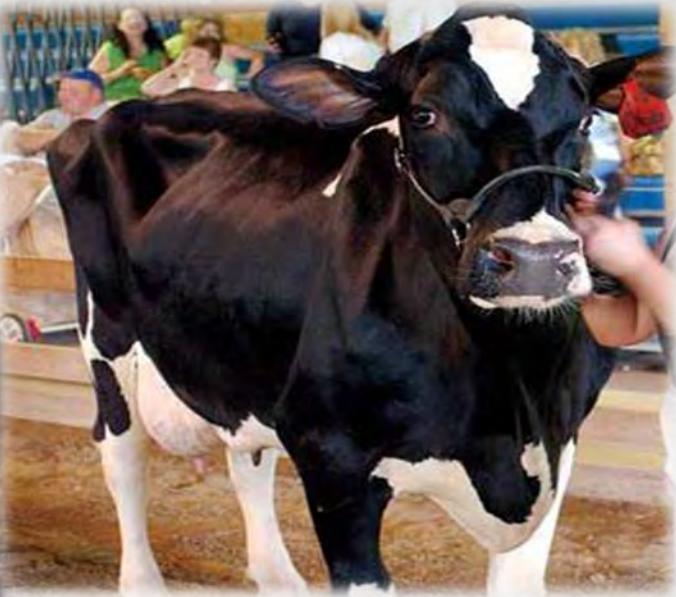


- Eradication is the goal
- The most accurate tests are required
  - Fecal culture & PCR
- Owners are always both sellers and buyers
  - Follow the “Golden Rule”:  
**sell only what you would buy**



# Breeders are Traders

Trading untested cattle from untested herds  
is how herds become MAP-infected





Breeders say:  
**“We MUST trade”**

*I respond:*

# Trade Genes

## Not Germs



# My Advice:

- **Regulate yourself, don't wait for the government to do it.**
  - Improve the health, quality and the image of Holsteins.
- **Phase in testing requirements for your sales.**
  - First, require the animal for sale to be test-negative.
  - Then, require the animal and its dam to be test-negative.
  - Some day, require that animals originate from herds that at least qualify for entry level status in some official program.



# Selecting for Genetic Resistance

Might be possible –  
But it's not the total solution



## Whole-Genome association analysis of susceptibility to paratuberculosis in holstein cattle

B. W. Kirkpatrick\*,†, X. Shi\*, G. E. Shook† and M. T. Collins‡

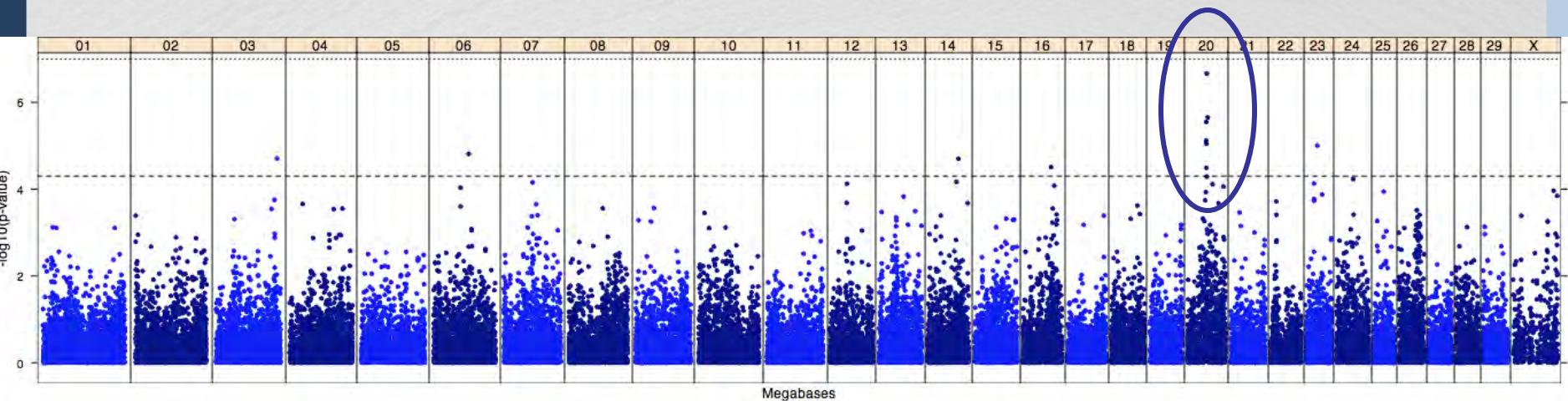
\*Department of Animal Sciences, University of Wisconsin-Madison, Madison, WI 53706, USA. †Department of Dairy Science, University of Wisconsin-Madison, Madison, WI 53706, USA. ‡Department of Pathobiological Science, School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI 53706, USA.





# Combined Association Test

## 10,000 Holsteins x 50,000 SNPs



Cochran-Mantel-Haenszel Test with Population 1 as a fifth group



# Commercial dairy herds

## Question #1: Is the herd infected?

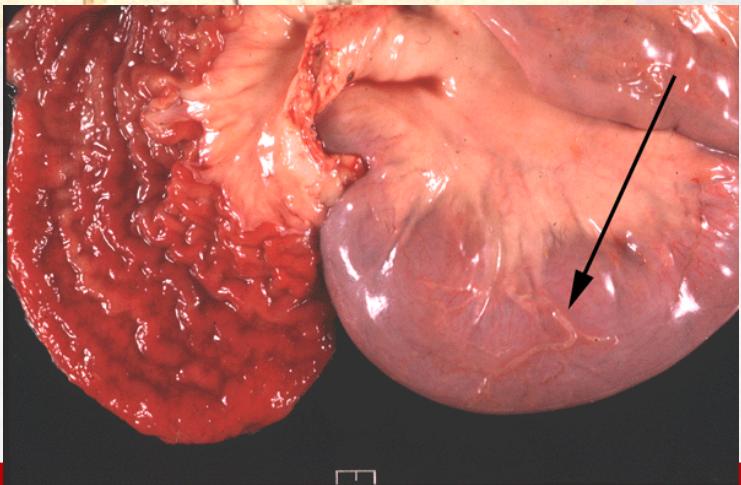


### Probably infected if:

- ✓ Clinical cases of JD seen
- ✓ Many cattle are purchased
- ✓ Cattle imported from high-prevalence countries
- ✓ Large herd (>500 head)

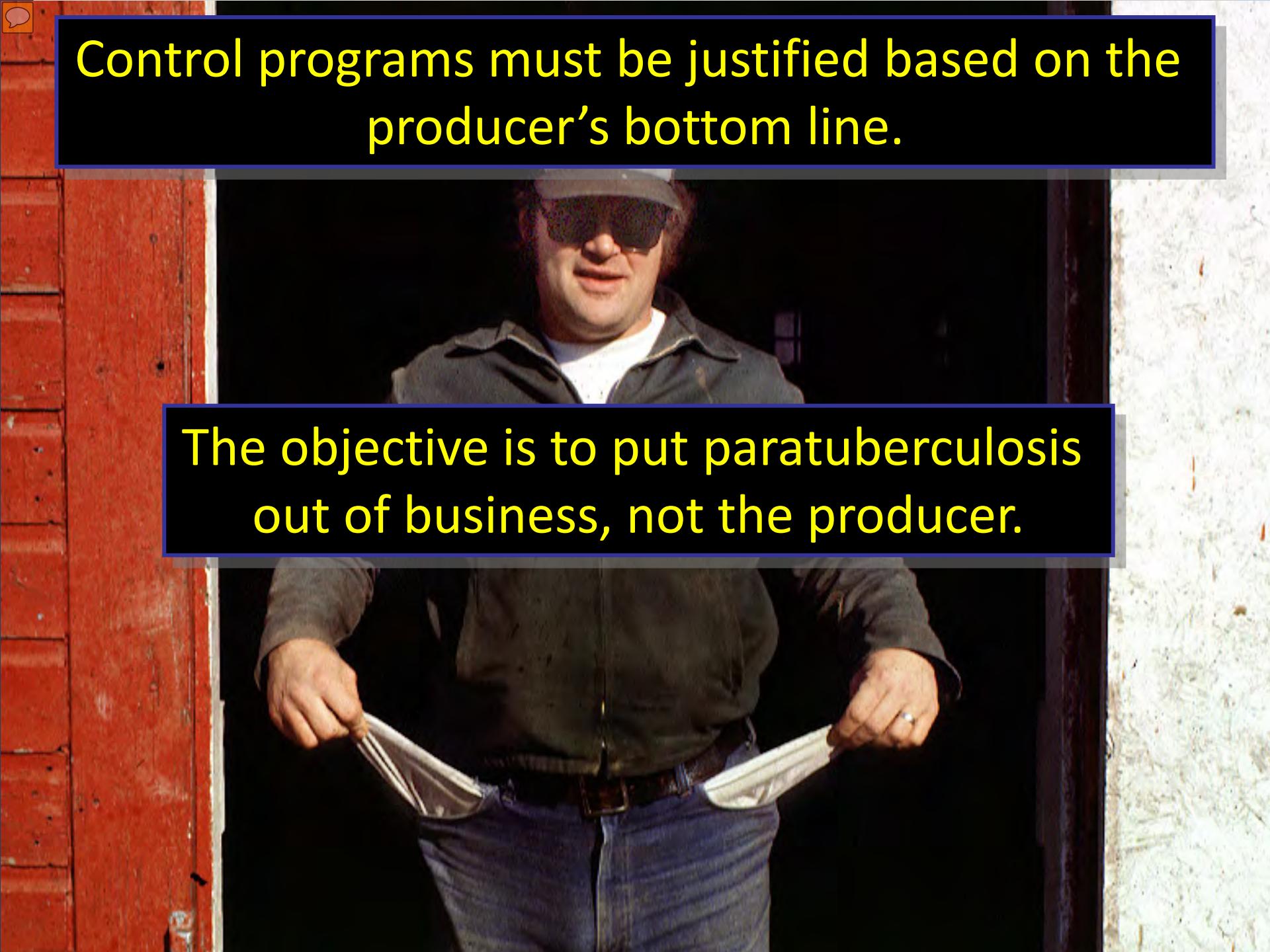


# Confirm if the herd is infected



- **Test cull cows**
  - Fecal culture or PCR
- **Necropsy culls**
  - Histopathology & microbiology
- **Environmental fecal samples**
  - 6 sites/dairy
  - Culture or PCR

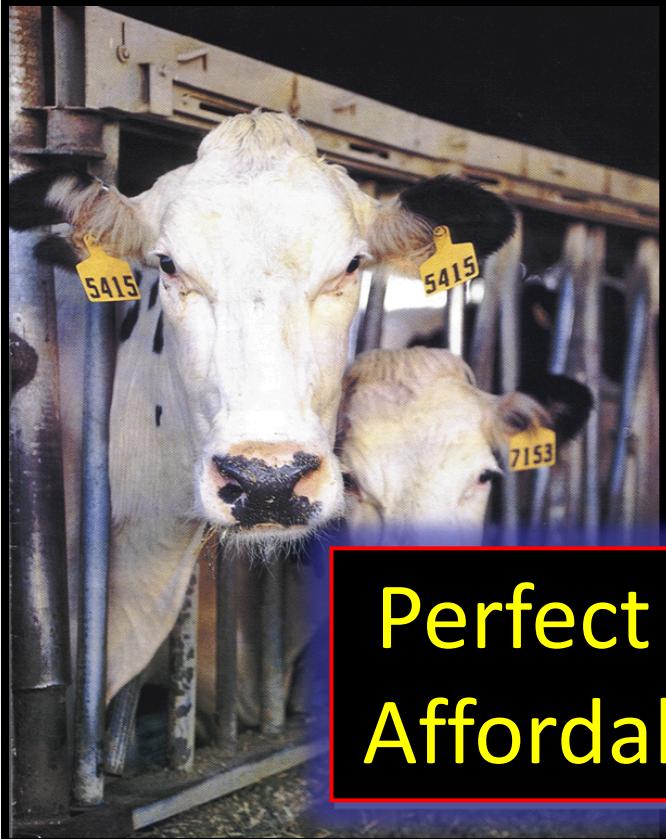
Control programs must be justified based on the producer's bottom line.

A photograph of a man from the waist up, standing in a doorway. He is wearing a dark zip-up jacket over a white t-shirt and blue jeans. He is looking directly at the camera with a neutral expression. His hands are held out at waist level, palms facing forward, revealing that his pockets are completely empty. The background shows a red brick wall on the left and a white textured wall on the right.

The objective is to put paratuberculosis  
out of business, not the producer.



# Field Trial on JD Control Using Low-Cost Diagnostic Tests



Interrupt transmission from the  
**MOST** infectious to the  
**MOST** susceptible  
**MOST** of the time  
("most" refers to probabilities)

Perfect tests are not affordable.  
Affordable tests are not perfect.





## National Johne's Disease Demonstration Herd Project

United States  
Department of  
Agriculture

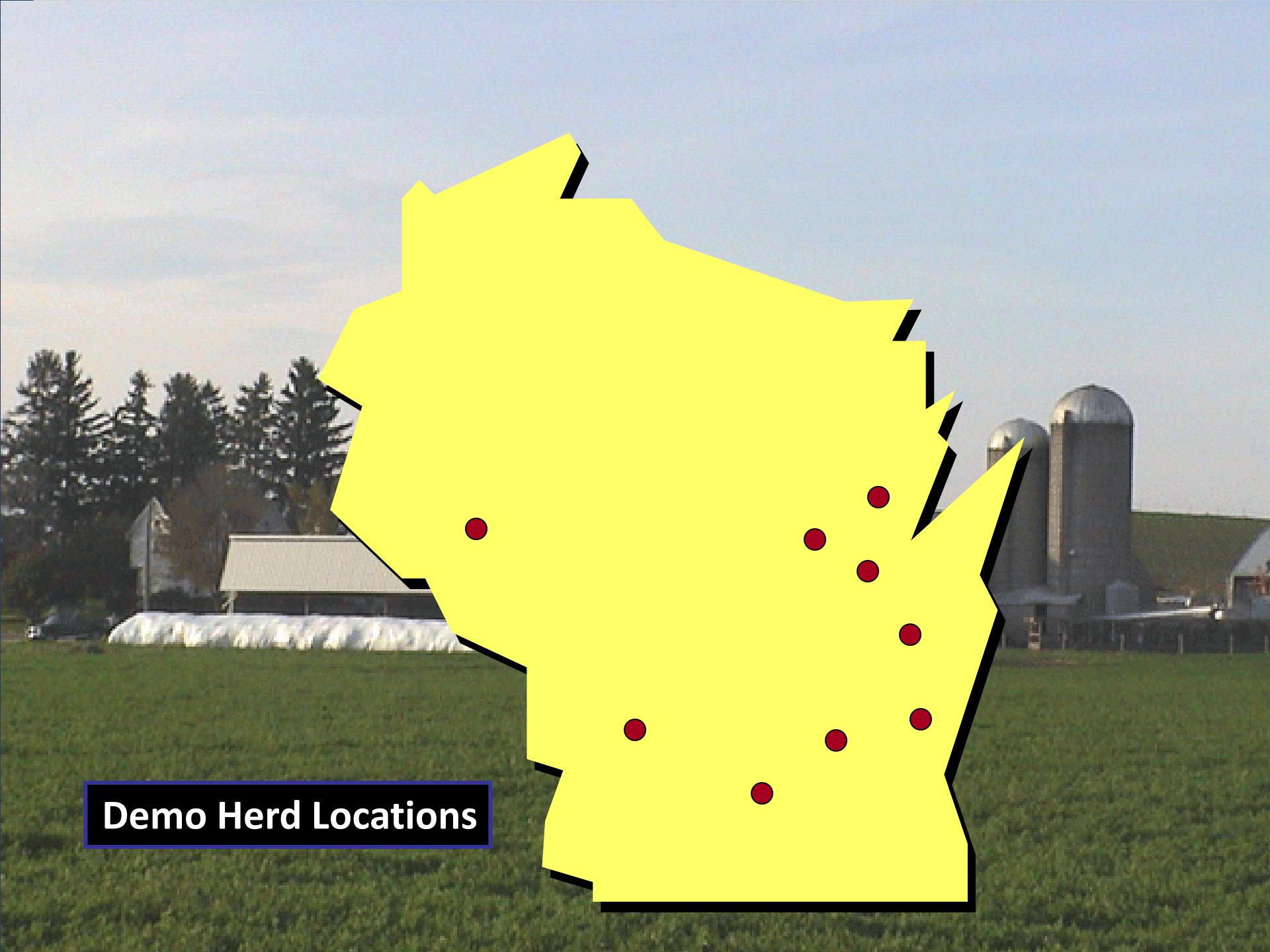
Agricul-  
tural and  
Plant Health  
Inspection  
Service

Veterinary  
Services

National  
Animal Health  
Monitoring  
System

October 2005





**Demo Herd Locations**

# Initial test-positive prevalence (ELISA test)

## 9.8% to 20.9%



All: fairly well-managed with low risk assessment scores



Smallest: 80 in stanchions



Typical: 200-400 in freestalls



Largest: 1400 in freestalls



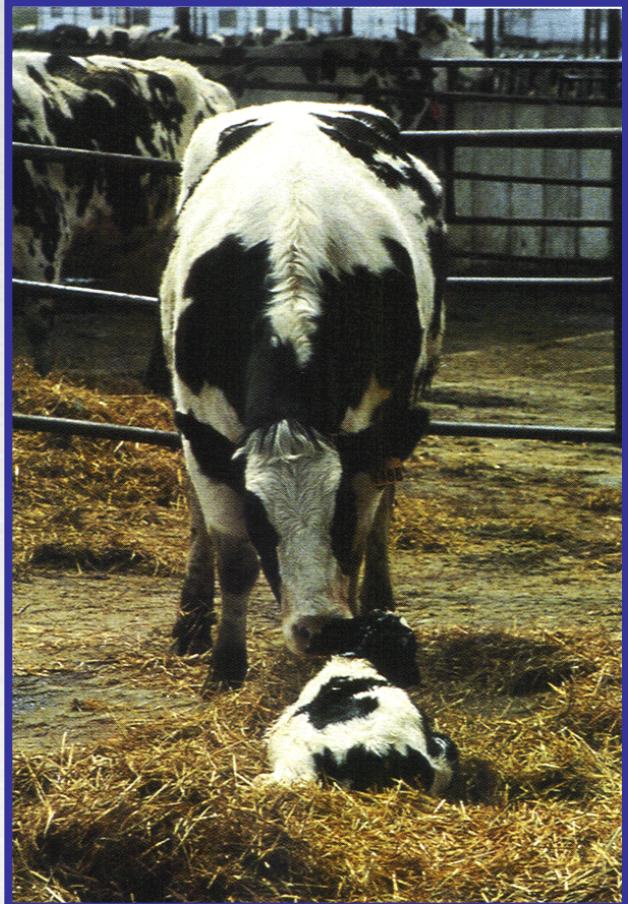
# Control Program: Simple, Affordable, Two-Steps

## ✓ Step #1: Hygiene

- Stop new infections: focus on heifer rearing.

## ✓ Step #2: Testing

- **Label** high risk cattle.
  - Segregated calving area
  - Do not use as colostrum donors
- Cull only the most heavily infected cows – those not likely to survive another lactation.





# Step #1: Just Four Things to Do

## 1. Prompt calf removal from cow.

While still wet; before standing to nurse.

## 2. Feed 4 qt. **CLEAN** colostrum in <6hr.

One cow to one calf: from test-negative cow.

## 3. Feed pasteurized milk until weaning.

Milk replacer or on-farm pasteurizer.

## 4. Hygienic rearing system.

Feed and water free from manure contamination.

### Raising Calves...



### The 5 C's of a Healthy Start

Your guide to creating a healthier herd and a healthier income through good calf management.

Raising healthy calves is a challenging and rewarding job. Calf raisers are responsible for the health and well-being of their replacement milk cows. Minimizing death and disease losses in the calf herd can save hundreds of dollars per replacement animal raised. Some terms are common, others are against disease and death in the calves, while others have no problems. What are the keys to a successful calf program? What does it take to raise healthy calves?

The five C's of a healthy start are:

- Colostrum
- Calories
- Cleanliness
- Comfort
- Consistency

## Step #2: Test-and-Manage

- ✓ **Test** all cows once in each lactation.
- ✓ **Label** positive or “suspect” cows.
- ✓ **Only** use colostrum from negative cows.
- ✓ Use **separate maternity pen** for negative cows.





## **Reasons to Cull Strong-Positive Cows**

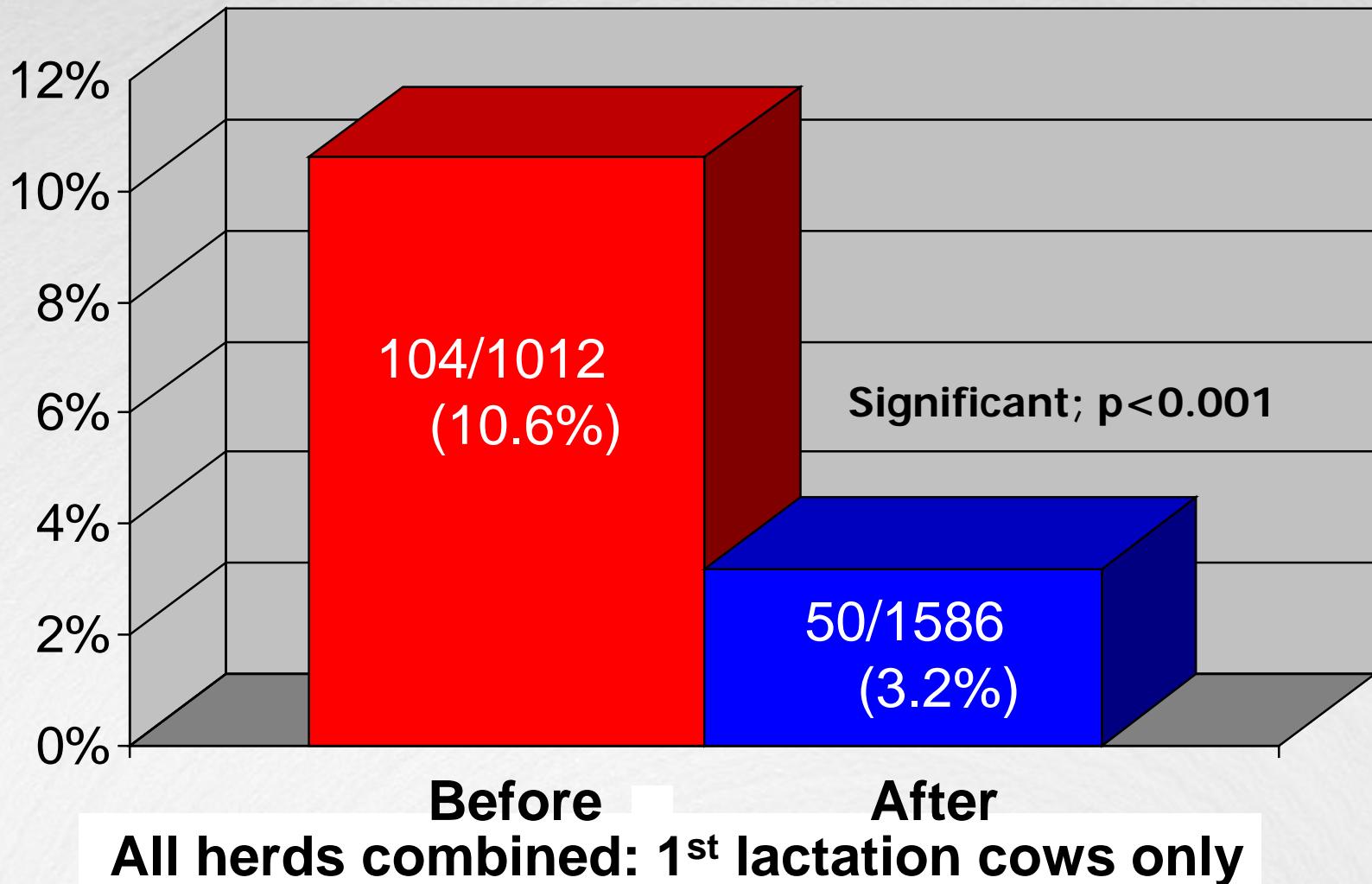
- Likely to go clinical next lactation
- Likely not to complete a full lactation
- Decreased production next lactation
- Decreased lifetime production
- Likely carrying an infected fetus if Pregnant
- Heavy shedders = highly infectious
- Will contaminate maternity pen causing more infected heifers.



# Before & After Control Program

Percent positive

As of January 1, 2007





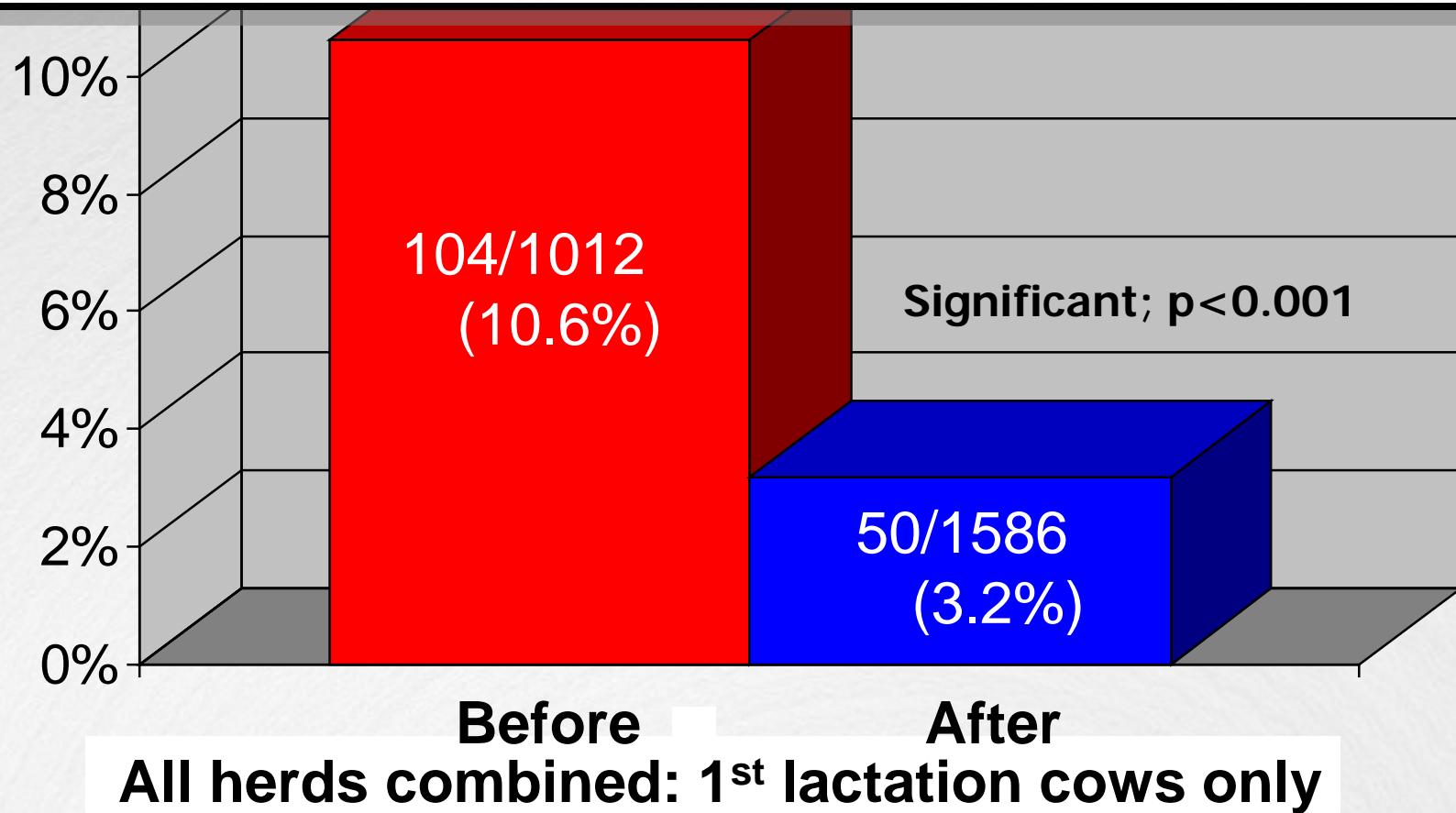
J. Dairy Sci. 93:1638–1643  
doi:10.3168/jds.2009-2664

© American Dairy Science Association®, 2010.

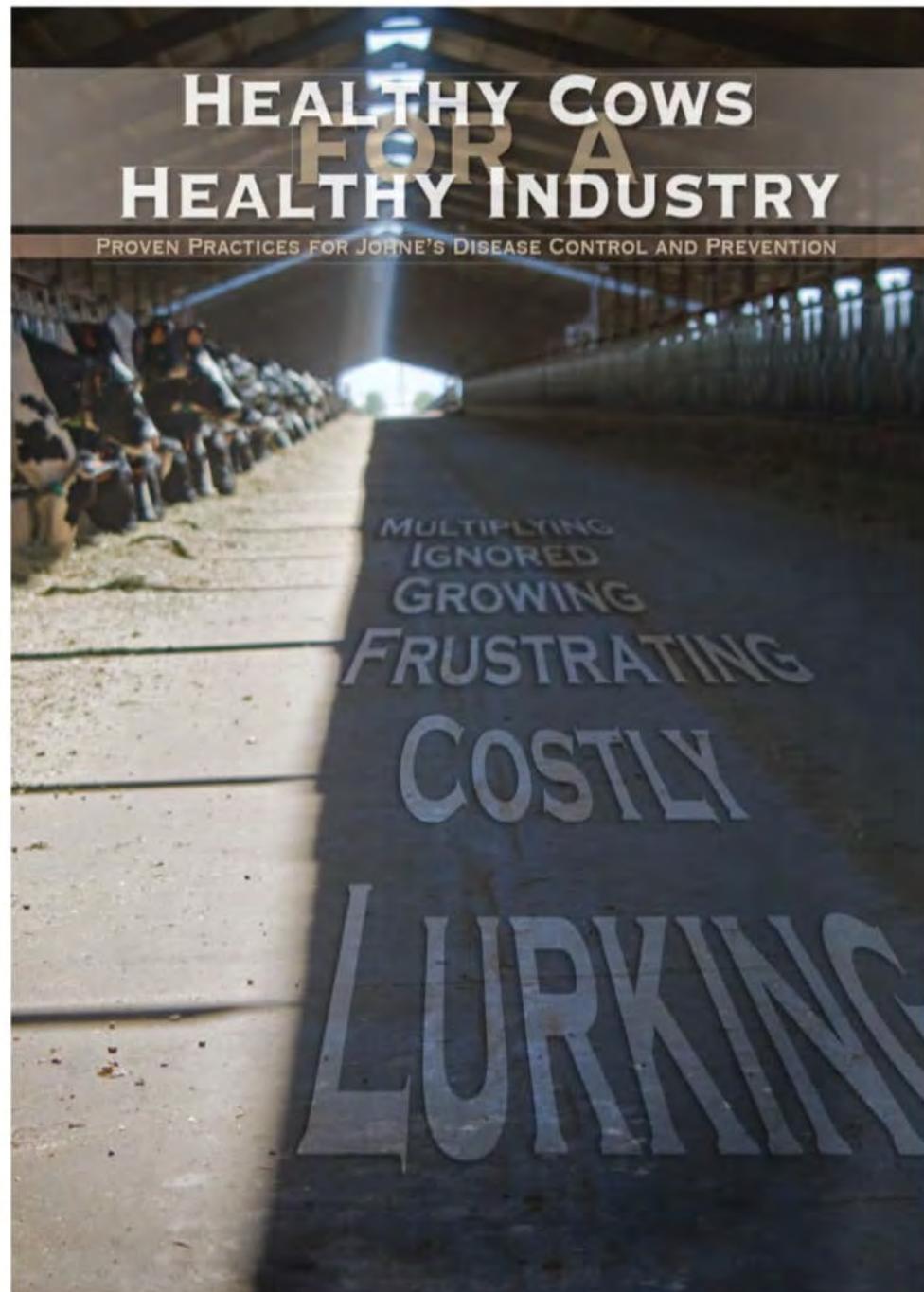
## Successful control of Johne's disease in nine dairy herds: Results of a six-year field trial

M. T. Collins,<sup>1</sup> V. Eggleston, and E. J. B. Manning

Department of Pathobiological Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, Madison 53706-1102



Each of the nine  
producers tells their  
own success story.



Building infrastructure to improve dairy cattle health plus protect export and local markets.



**What Different Countries Are Doing**



# Dutch ParaTB Program

## “Milk Quality Assurance Program”

started January 2008

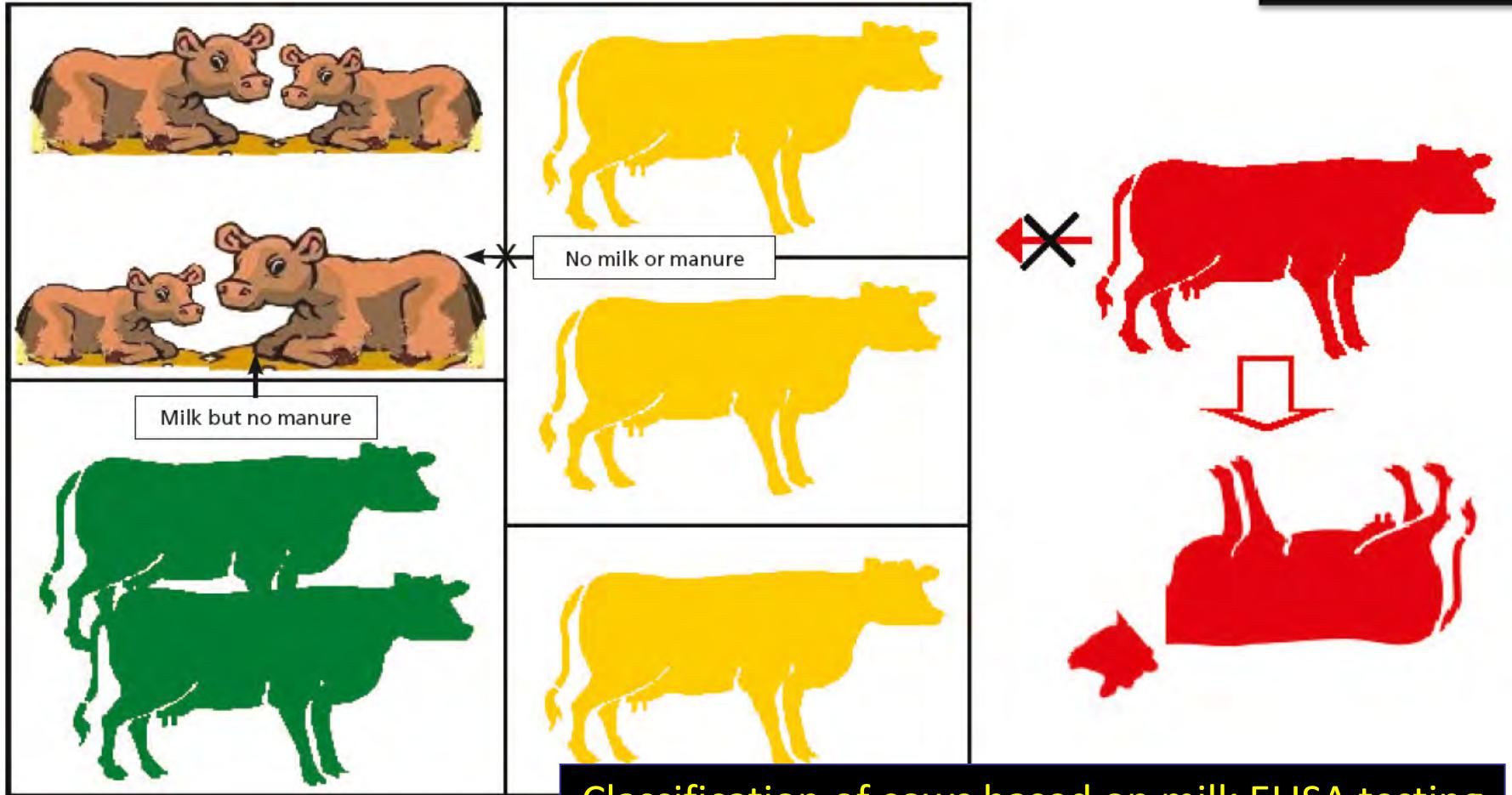
- Classify all herds by serum or milk ELISA:
  - Status **A** herds: test-negative
  - Status **B** herds: test-positive but positive cows culled
  - Status **C** herds: test-positive cows remain in herd
- Dairy processor pays 100% testing costs
  - If herds use PTB preventive management practices
- In 2010 all Dutch dairy herds must participate
- By 2011 all herds delivering milk must be status A or B





# Danish: Risk-Based Control “Operation Paratuberculosis”

Started in 2006

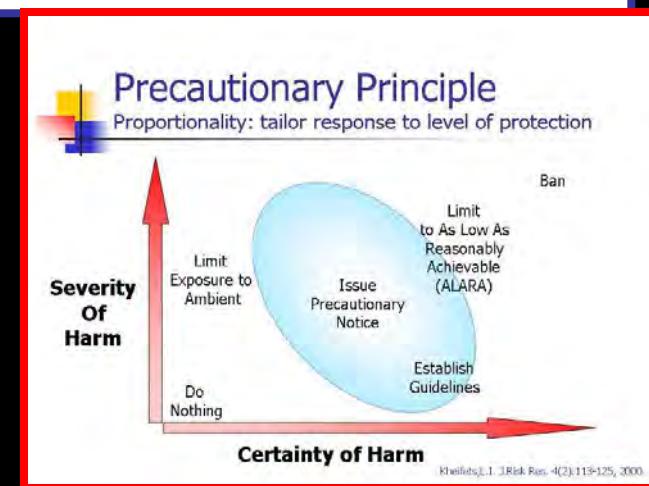




TRUST IN ANIMALS &  
FOOD SAFETY

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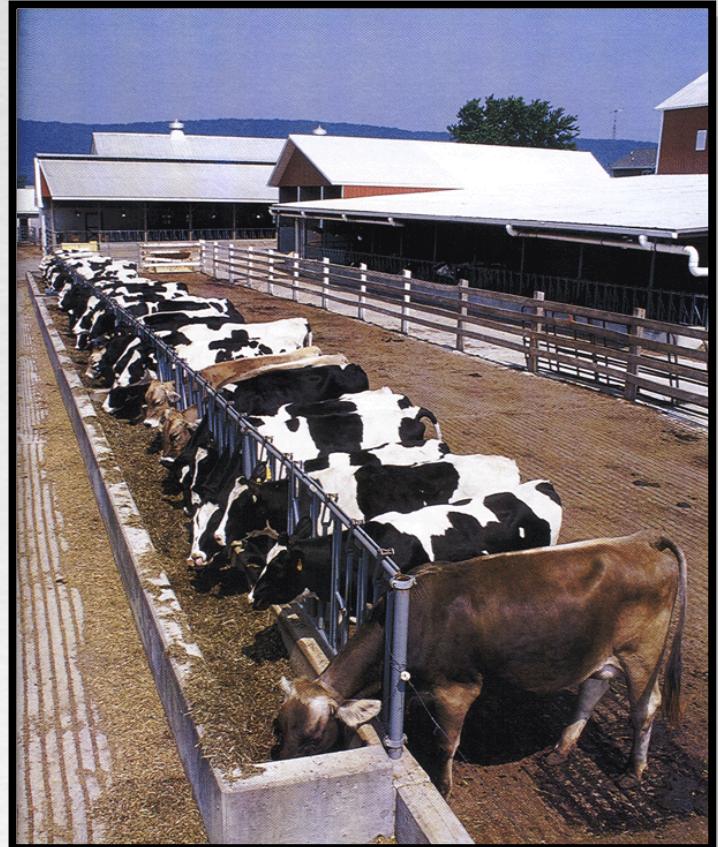
TAFS recommends MAP control at the farm, national, and international level to limit MAP contamination of foods based on the precautionary principle by sourcing raw milk and meat from **test-negative herds.**





# The Farm is the Critical Control Point

- Improves the quality of the raw product.
  - Potentially eliminates the need to change processing.
- Added bonus:
  - Improves health and welfare of the animal.
  - Improves the efficiency and profitability of the dairy.



**Simple concept:**  
**Healthy food comes from healthy animals.**

**Simple fact:**  
**Animals with paratuberculosis are not healthy.**

**Producers and their veterinarians have the knowledge and the tools to deliver raw products with low risk of *MAP* contamination.**



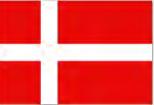
# Summary Advice:

1. Confirm if your herd is infected.
  - ❖ If not, be sure it stays that way.
2. Make four management changes to limit JD spread
3. Start a testing program
  - ❖ Milk ELISA or serum ELISA for commercial herds
  - ❖ Fecal culture or PCR for breeders
4. Act consistently on test results; **trust the tests!**
  - ❖ Cull high-positives before they calve
  - ❖ Label and manage low to medium-positives
5. Prepare to supply milk from test-negative cows



# Countries Capable of Delivering Milk from Test-Negative Herds

 Sweden

 Denmark

 Netherlands

 Canada

 Australia

 USA

 Japan

 Your country?



# One World – One Food Safety Standard

