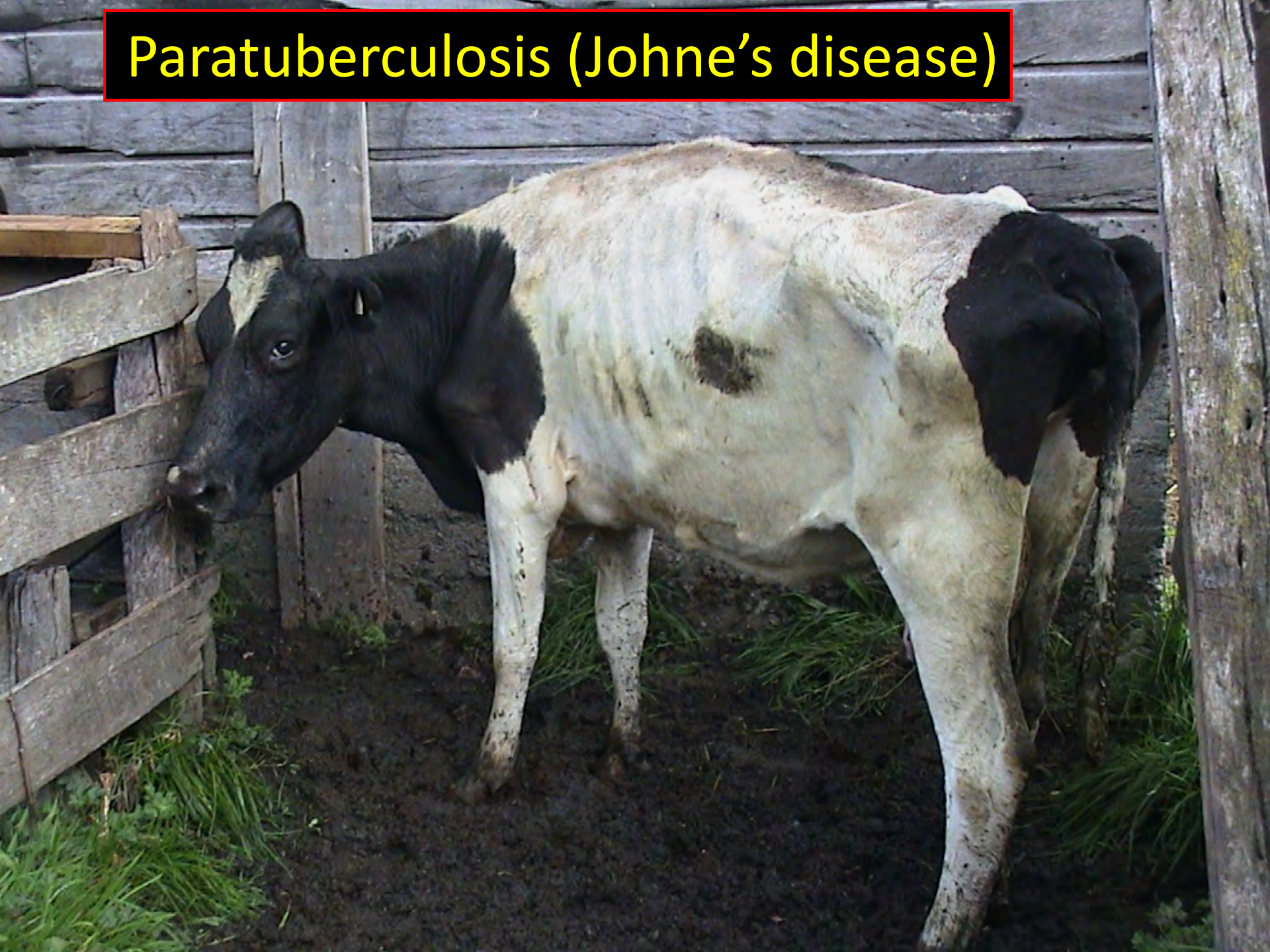




Combating Johne's disease using management & genetics

Michael T. Collins, DVM, PhD
University of Wisconsin

Paratuberculosis (Johne's disease)



The cause:

Mycobacterium avium paratuberculosis



The result: Damaged intestine

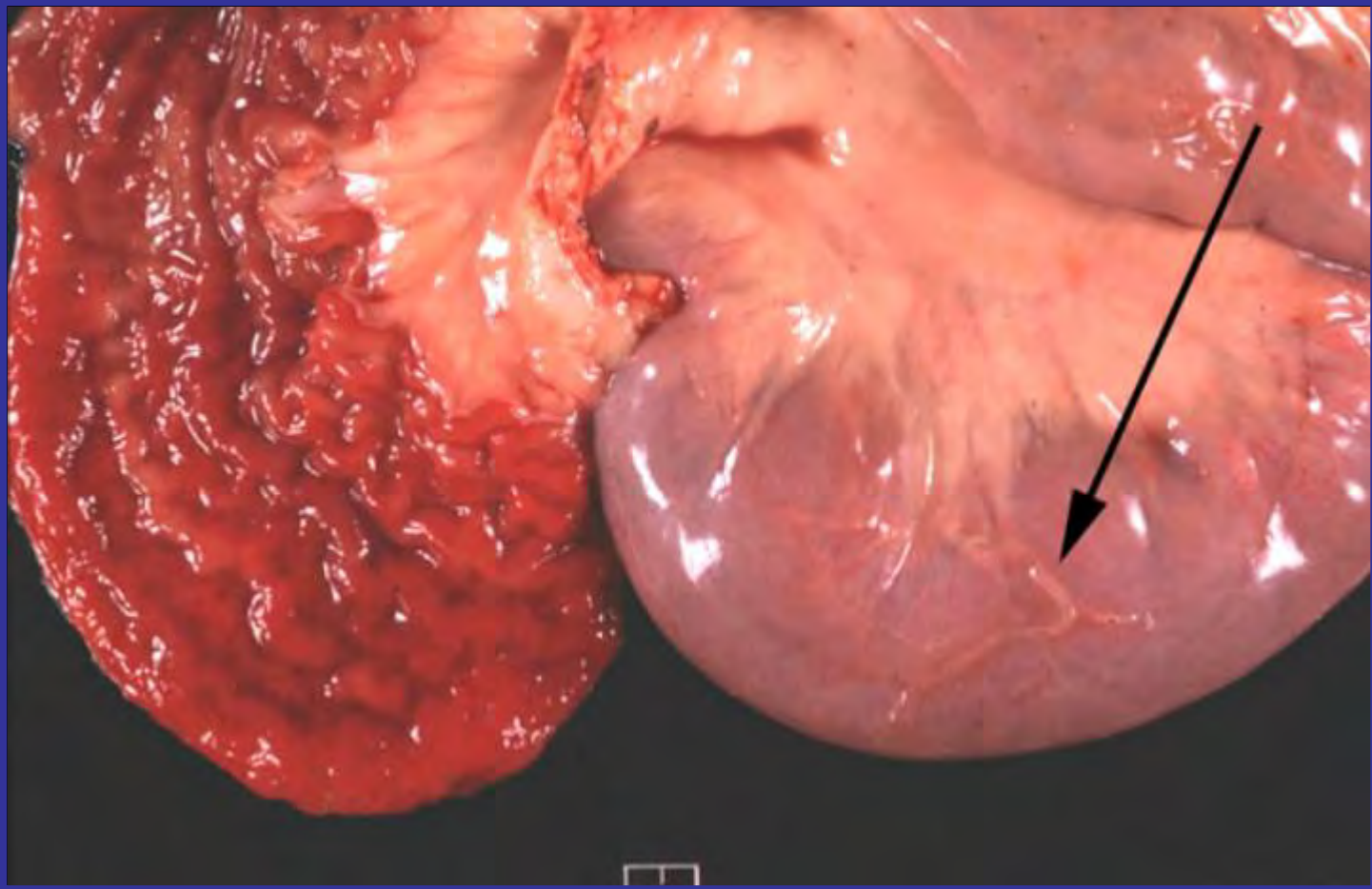
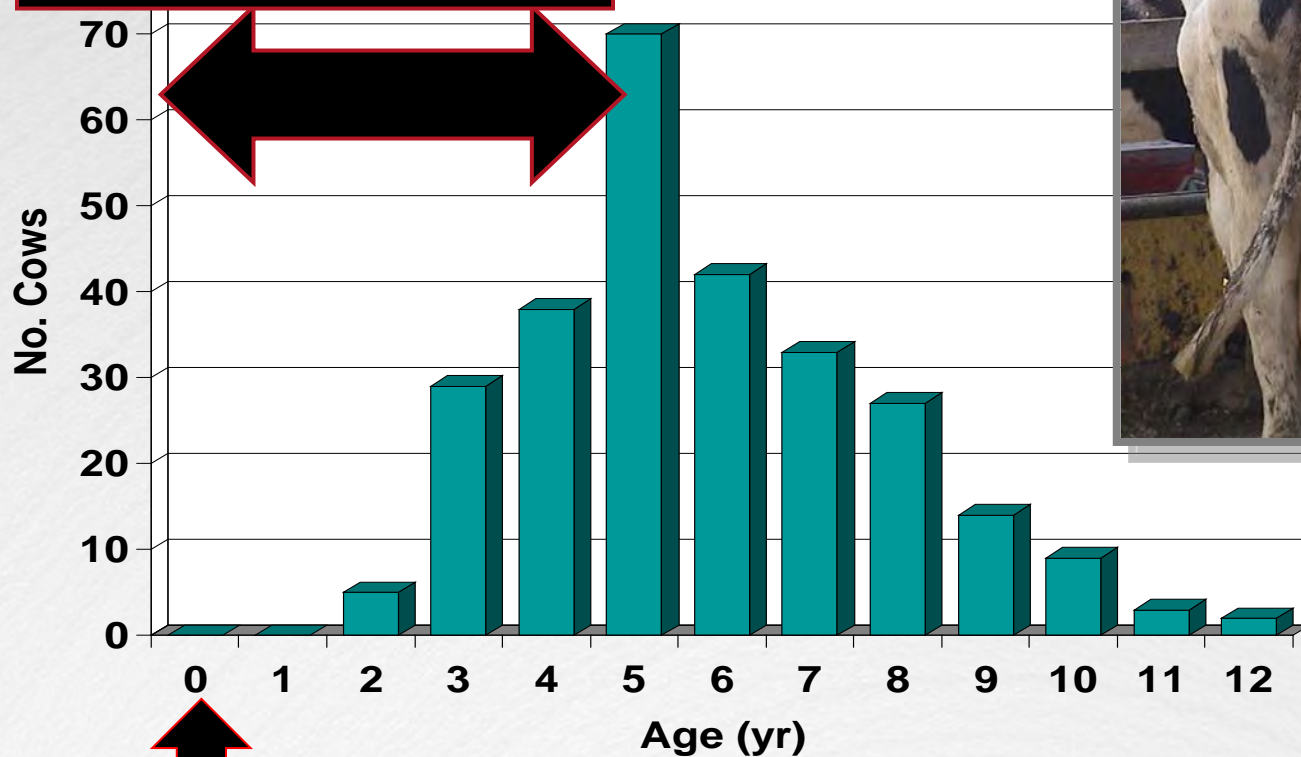


Photo provided by A.J. Cooley

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



ANIMAL GENETICS

Immunogenetics, Molecular Genetics
and Functional Genomics



doi: 10.1111/j.1365-2052.2010.02097.x

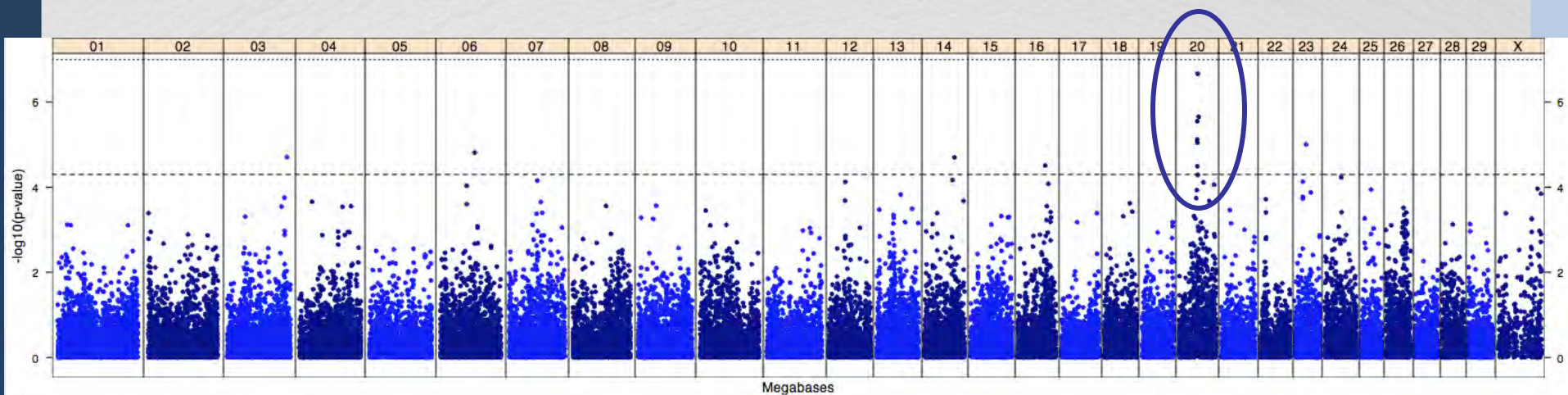
Whole-Genome association analysis of susceptibility to paratuberculosis in holstein cattle

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

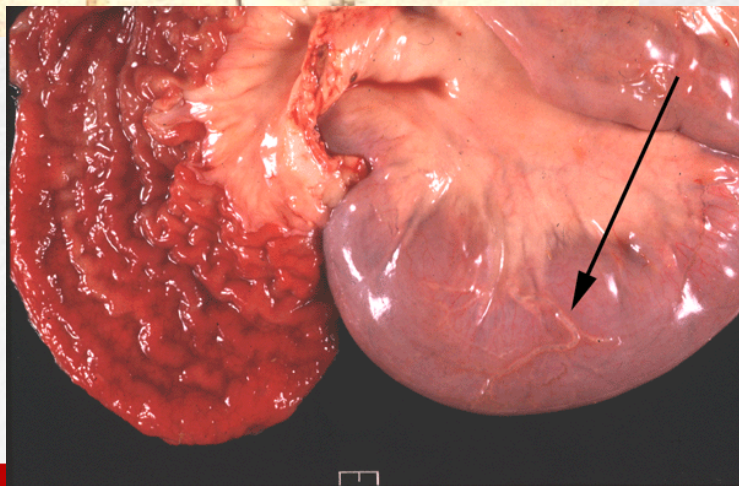
Question #1: Is the herd infected?

Probably infected if:

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



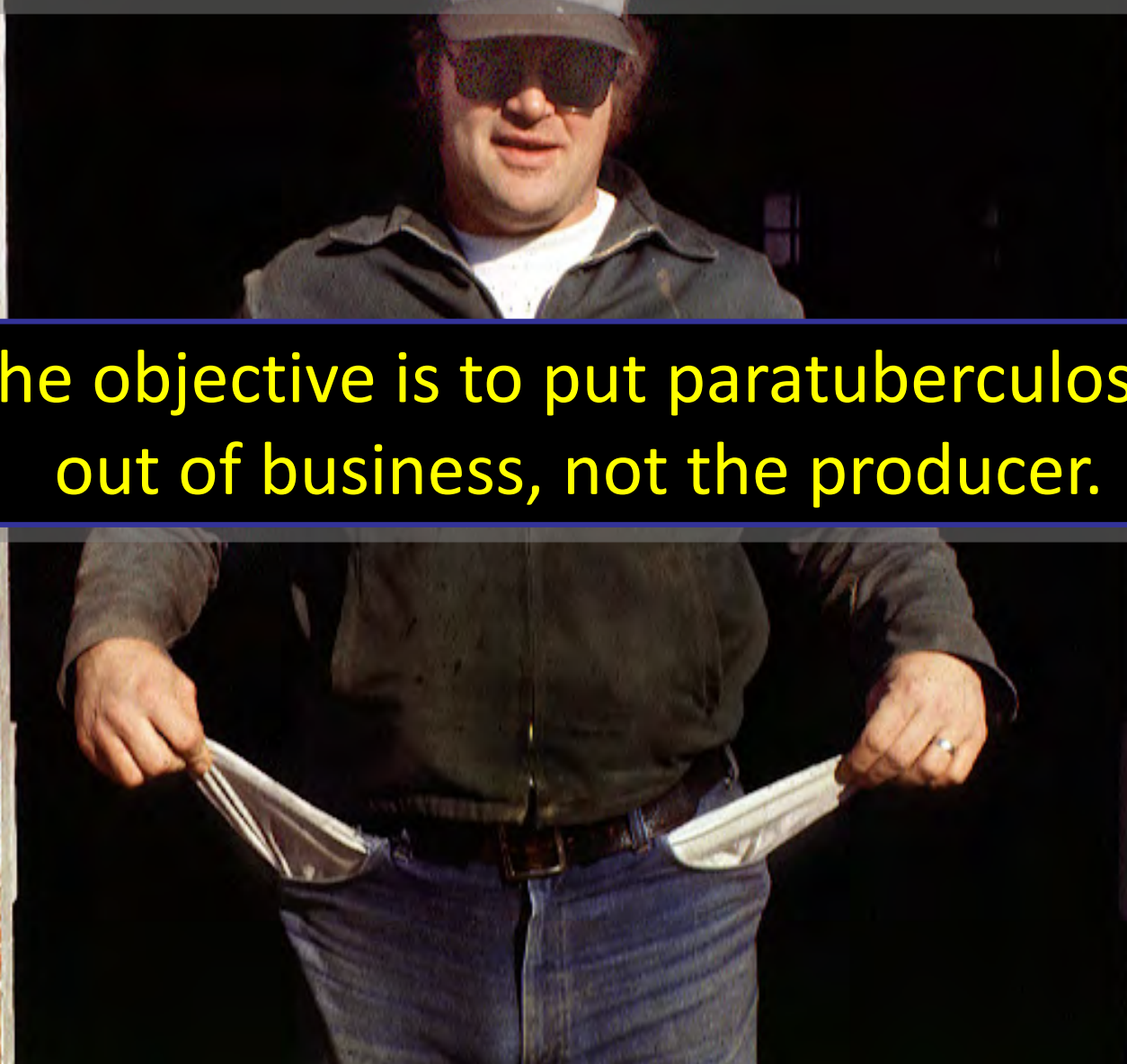
Confirm if the herd is infected



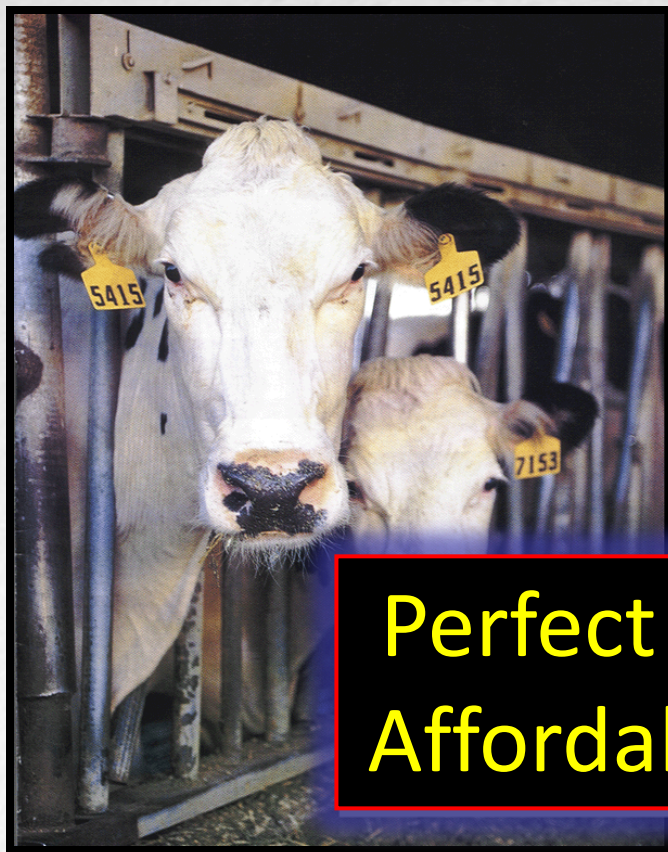
- **Test cull cows**
 - Fecal culture or PCR
- **Necropsy culls**
 - Histopathology & microbiology
- **Environmental fecal samples**
 - 6 sites/dairy
 - Culture or PCR

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

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.





United States
Department of
Agriculture
Animal and
Plant Health
Inspection
Service

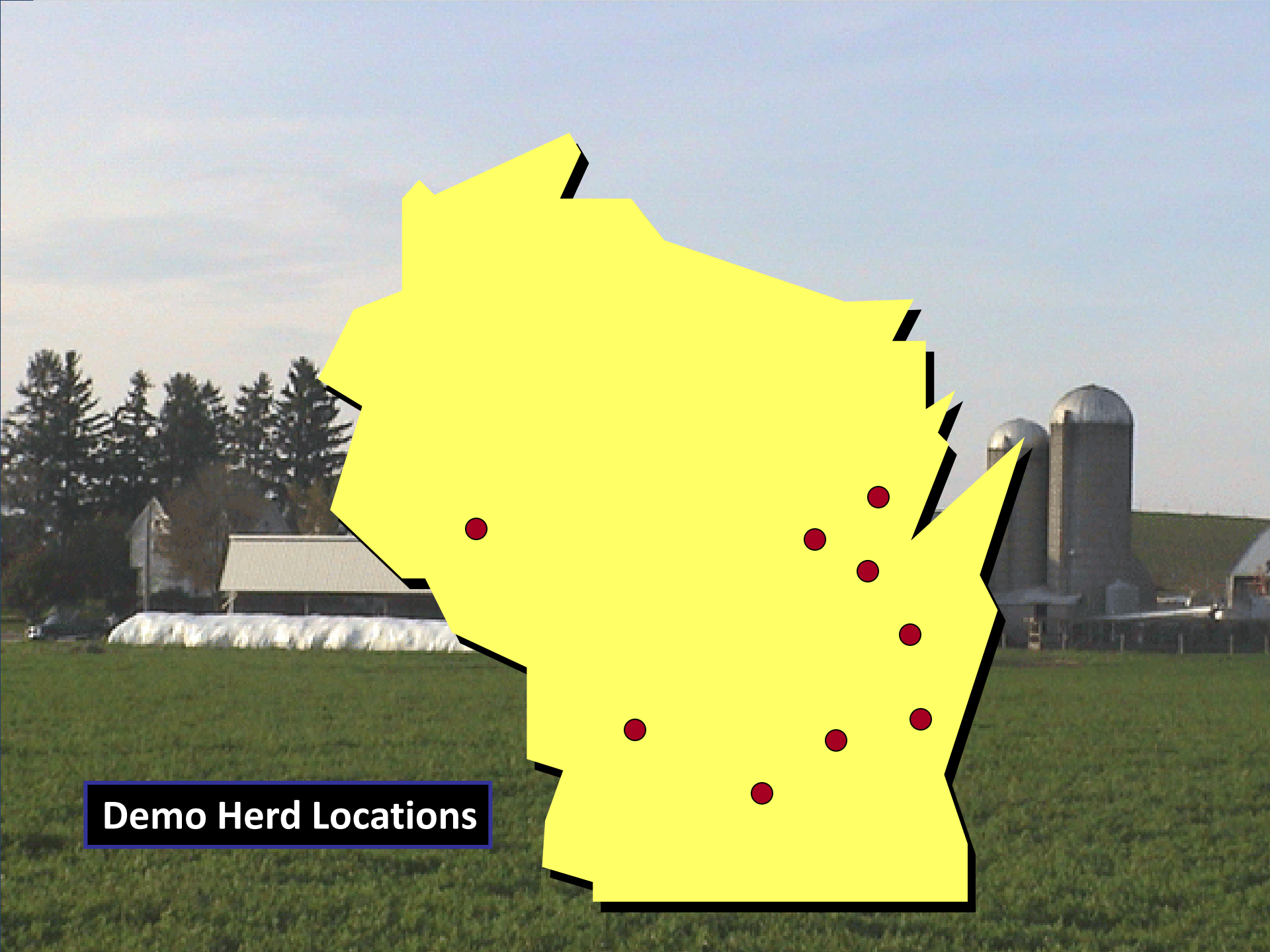
Veterinary
Services

National
Animal Health
Monitoring
System

October 2006

National Johne's Disease Demonstration Herd Project





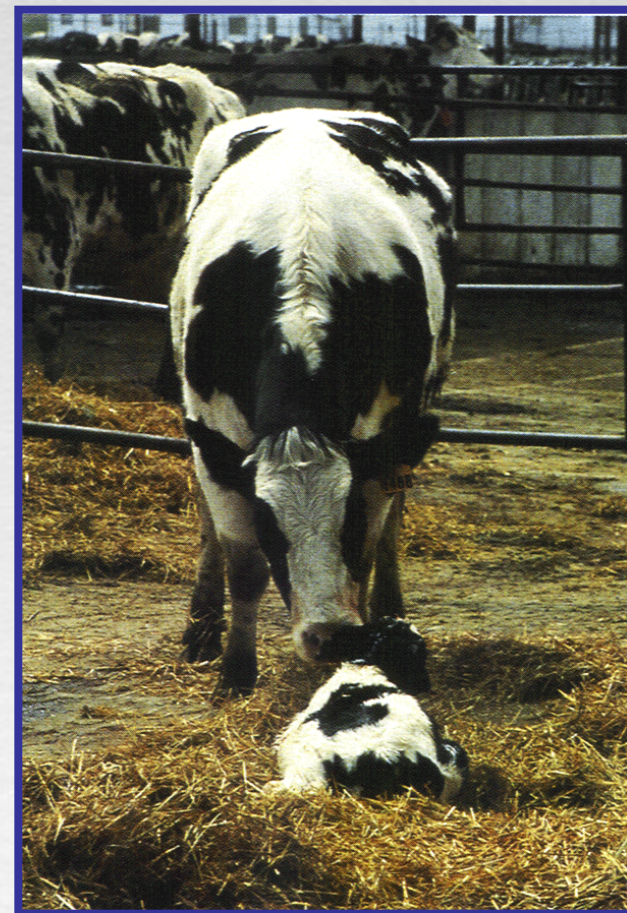
Demo Herd Locations

Initial test-positive prevalence (ELISA test) 9.8% to 20.9%



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 dairy herd's future – the next generation of milk cows. Minimizing death and disease losses in the calf herd can save hundreds of dollars per replacement animal raised. Some farms battle continually against disease and death in their calves, while other farms 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
- Calorie
- 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

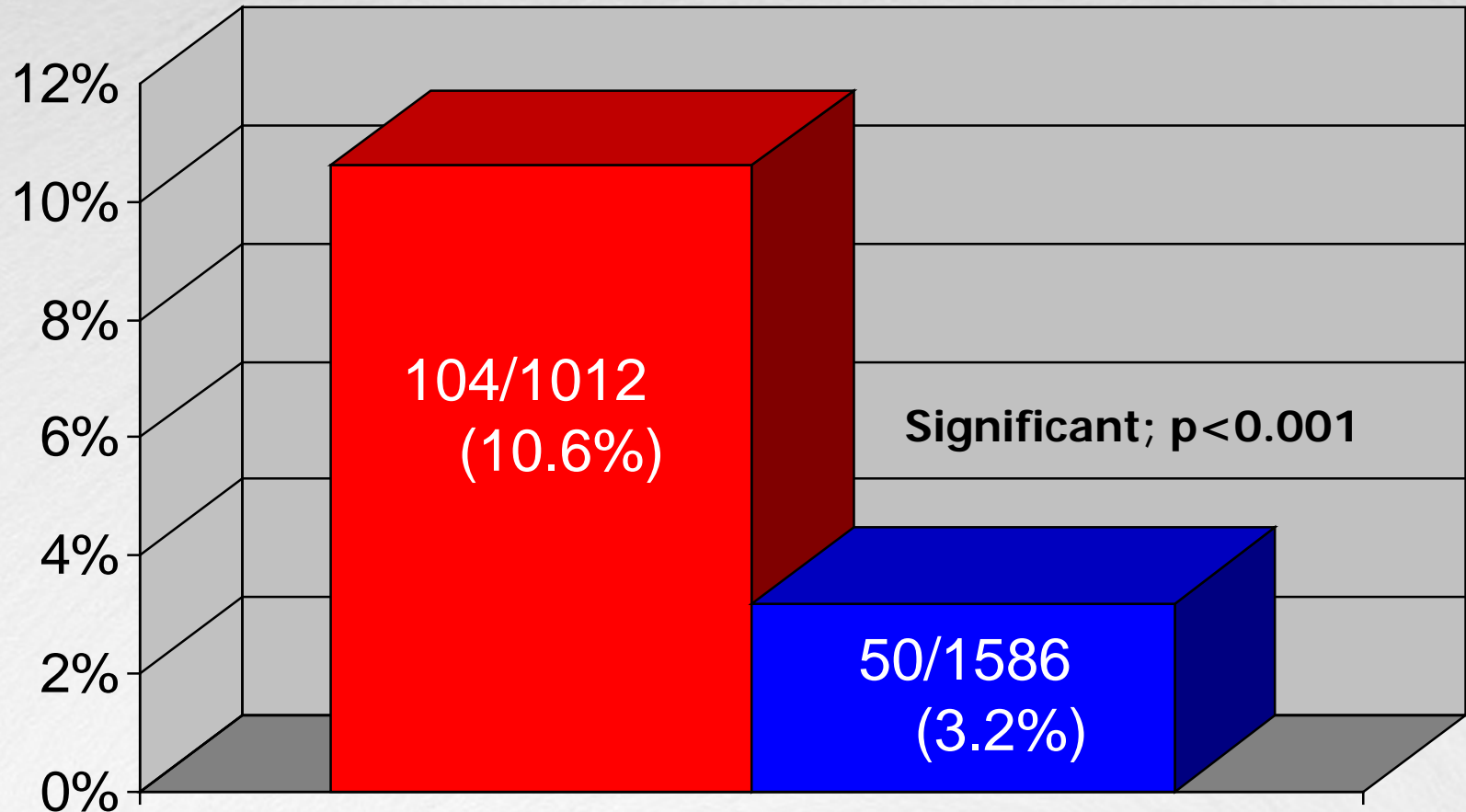
- Likely to go clinical next lactation
- Likely not to complete a full lactation
- Decreased production next lactation
- Decreased lifetime production
- Likely carrying an infected fetus if Pregnant
- Heavy shedders = highly infectious
- Will contaminate maternity pen causing more infected heifers.

Before & After Control Program



Percent positive

As of January 1, 2007



Before **After**
All herds combined: 1st lactation cows only



J. Dairy Sci. 93:1638–1643

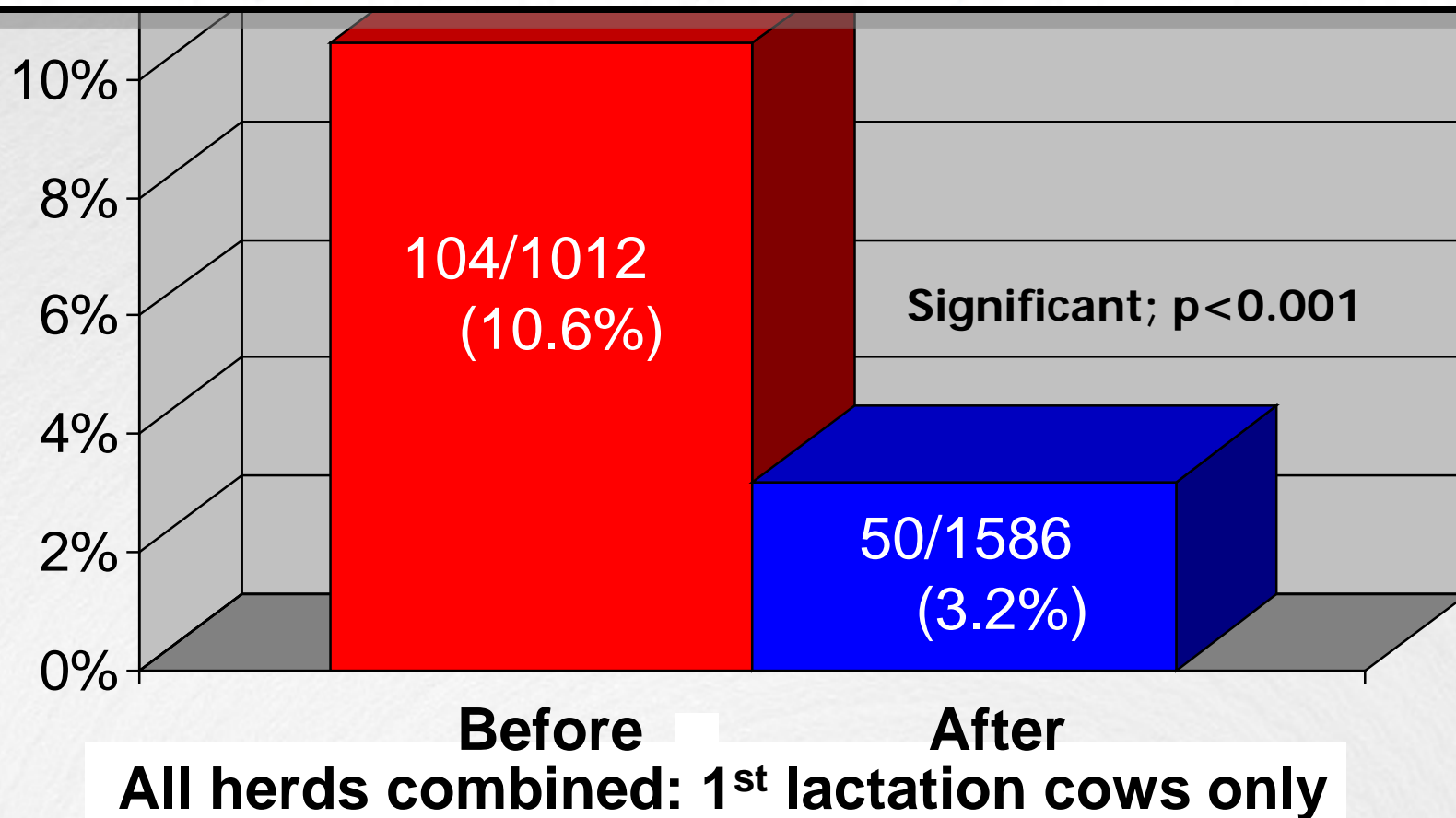
doi:10.3168/jds.2009-2664

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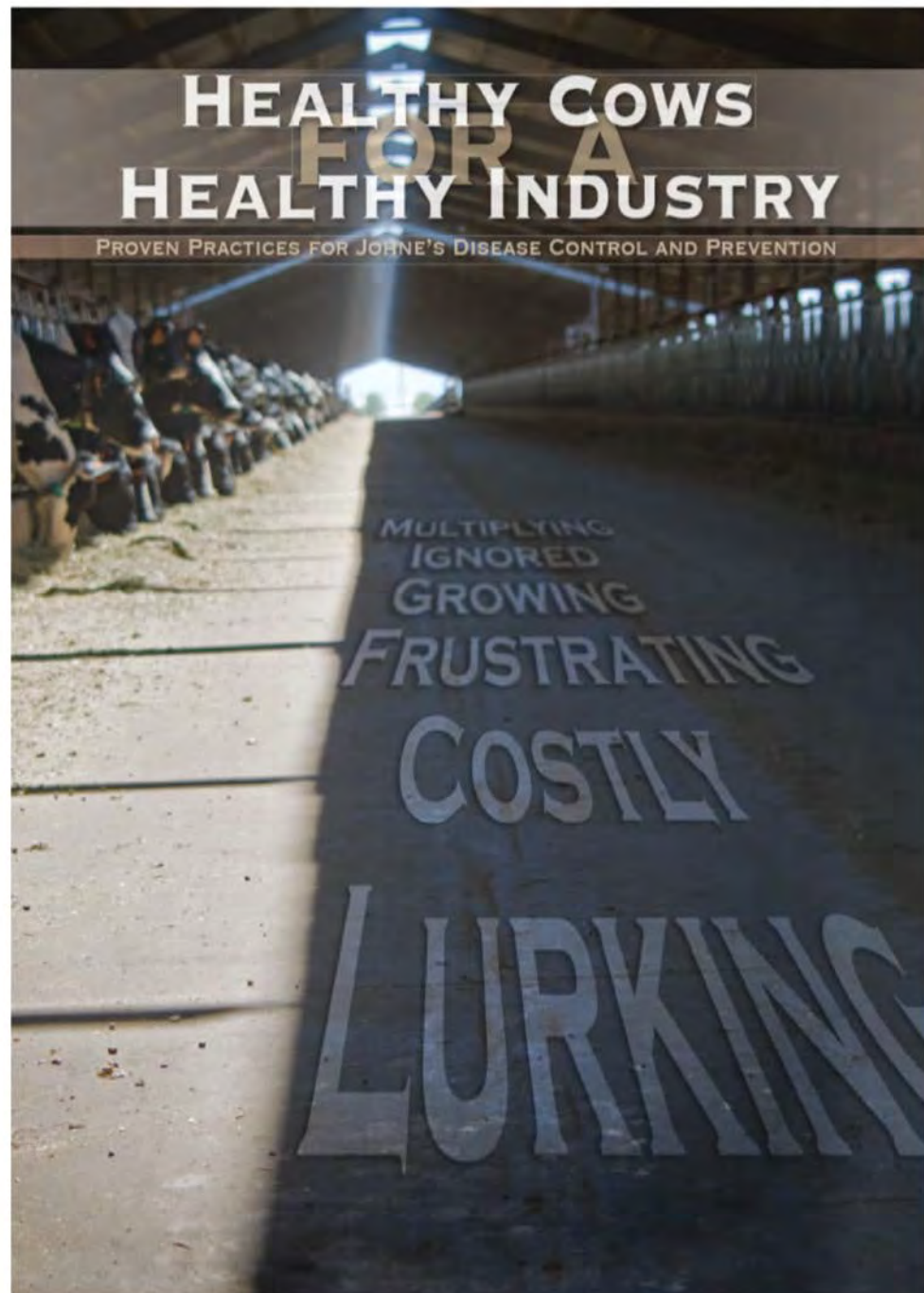
Successful control of Johne's disease in nine dairy herds: Results of a six-year field trial

M. T. Collins,¹ 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

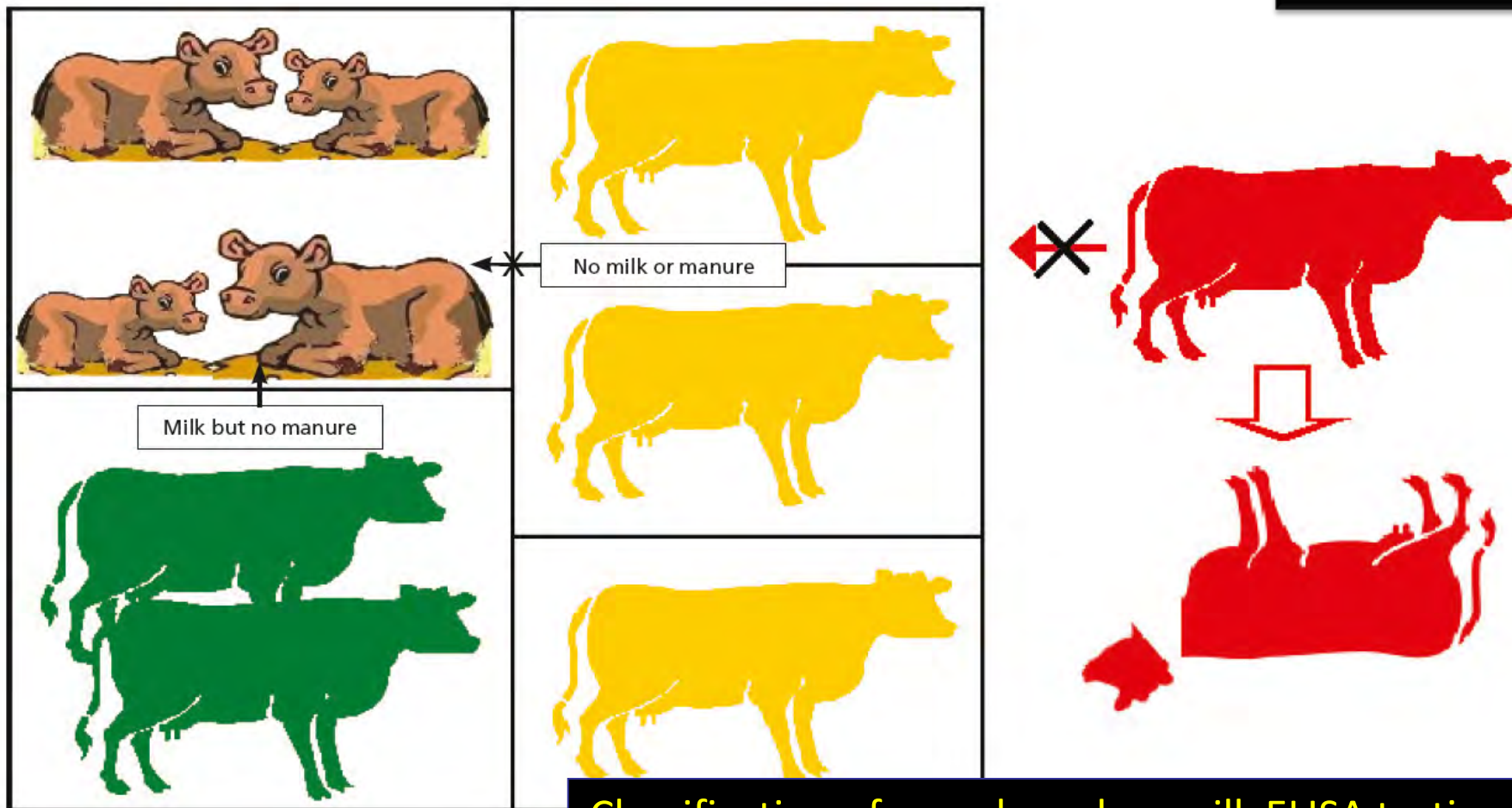


- Classify all herds by serum or milk ELISA:
 - Status **A** herds: test-negative
 - Status **B** herds: test-positive but positive cows culled
 - Status **C** herds: test-positive cows remain in herd
- Dairy processor pays 100% testing costs
 - If herds use PTB preventive management practices
- In 2010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



Classification of cows based on milk ELISA testing



TRUST IN ANIMALS &
FOOD SAFETY

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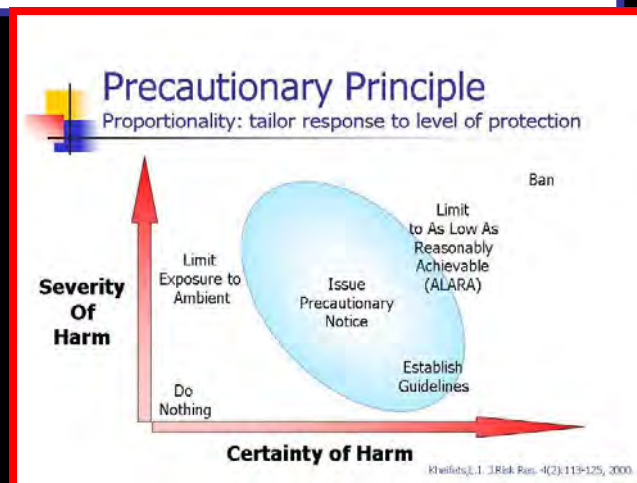
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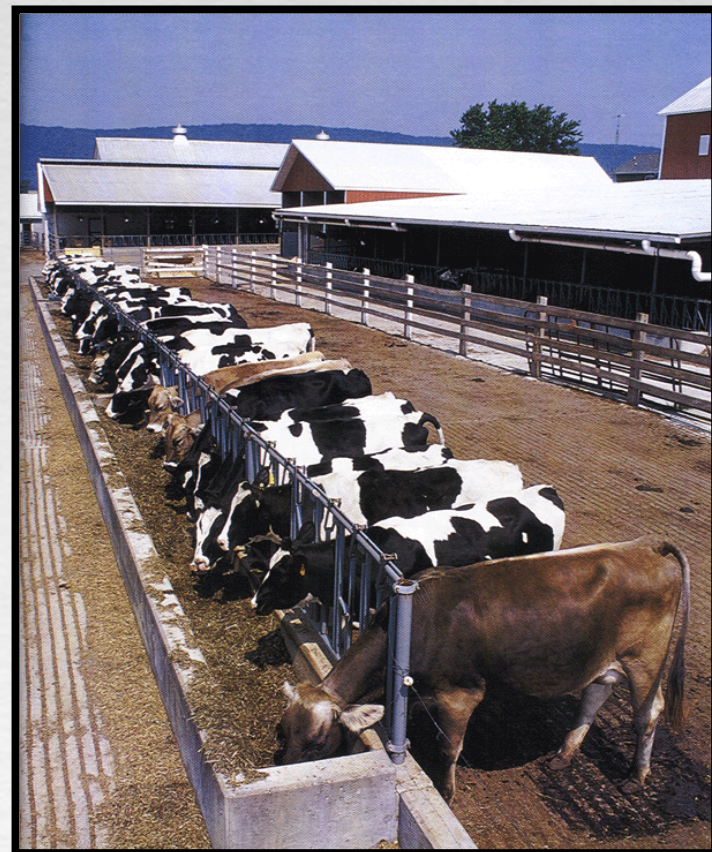


TAFS recommends MAP control at the farm, national, and international level to limit MAP contamination of foods based on the precautionary principle by sourcing raw milk and meat from test-negative herds.



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



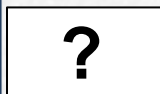
Australia



USA



Japan



Your country?



One World – One Food Safety Standard

