

Johne's Disease: The ostrich approach just isn't working!

National Holstein Association, June, 2010

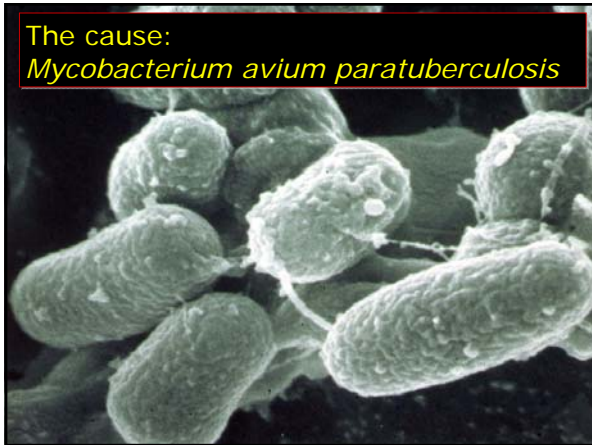
Michael T. Collins, DVM, PhD
Professor of Microbiology
University of Wisconsin-Madison



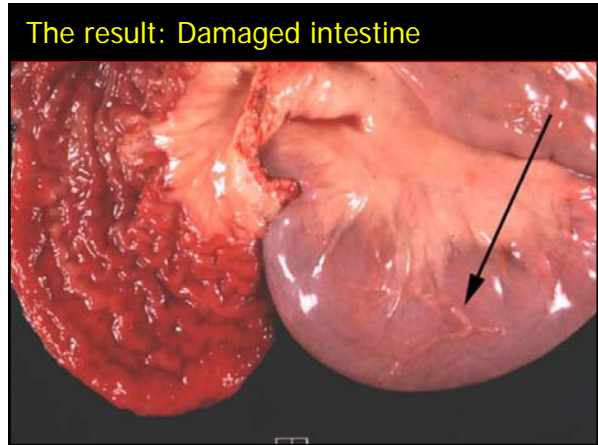
Johne's disease



The cause:
Mycobacterium avium paratuberculosis



The result: Damaged intestine



Clinical Johne's disease

Australian data on 179 herds

Median incubation
period = 5 years

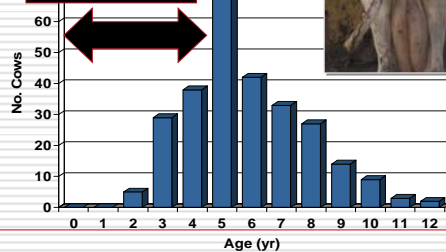
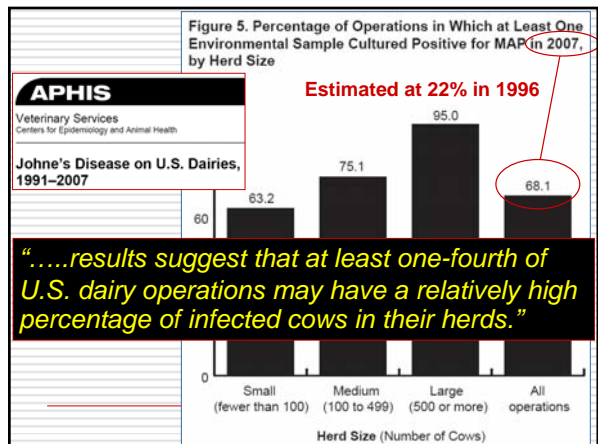
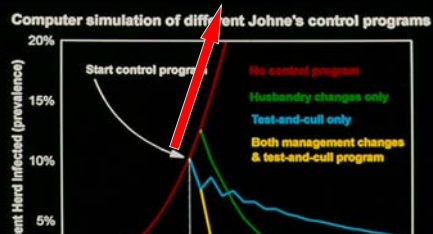


Figure 5. Percentage of Operations in Which at Least One Environmental Sample Cultured Positive for MAP in 2007, by Herd Size



".....results suggest that at least one-fourth of U.S. dairy operations may have a relatively high percentage of infected cows in their herds."

Johne's spreads within herds!



Take home message:
You have choices what to do, but you must **do SOMETHING!**

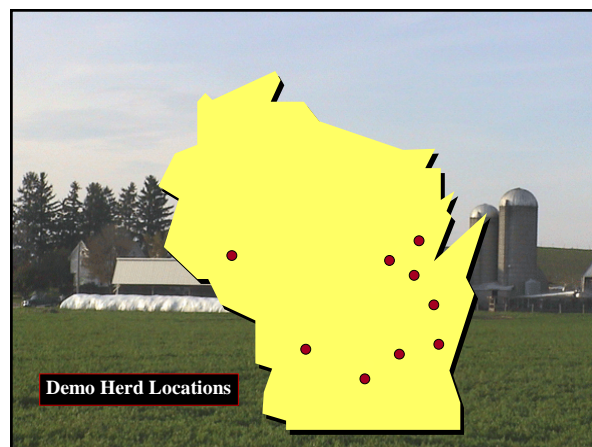
Johne's decreases milk production

Production Parameter	ELISA Result		
	Negative, Low-positive Positive	High (Strong) Positive	
ME305 MILK	21,327 lb ^a	18,631 lb ^b	-2,696 lb
DAYS IN MILK	344 ^a	290 ^b	-54 DIM

Row values with different subscripts are significantly different $p < 0.05$

Lombard et al. JAVMA Dec 15, 2005

Control Programs Work



Demo Herd Locations

ELISA-pos prevalence at the start
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

Project 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. high quality 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.

Step #2: Test-and-Manage



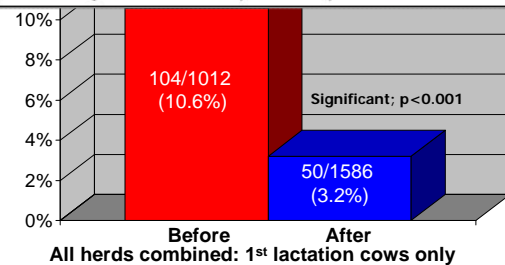
- ✓ **Test** all cows once in each lactation.
- ✓ **Label** ELISA-positive or "suspect" cows.
- ✓ **Only** use colostrum from ELISA-neg cows.
- ✓ Use **separate maternity pen** for ELISA-negative cows.

Quantitative ELISA Based Management Decisions

S/P	Interp.	Action
< 0.10	Negative	Keep for another lactation
0.10 – 0.25	Suspect	Keep – but do NOT use colostrum
0.25 - 0.40	Low pos	Keep – unless other reasons to cull
0.40 – 1.00	Positive	Cull – unless good reasons to keep
> 1.00	High pos	Cull at dry-off: mandatory
Do not use colostrum or milk from ANY suspect or positive!		

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



Study conclusions:

- The program was successful
 - Decreased test-positives
 - Stopped clinical cases of Johne's
 - Satisfied dairy producers
- Some herds controlled Johne's faster than others
 - Prevalence was key: start sooner rather than later
- The veterinarian is critical to use diagnostics effectively and keep the program on track.


Hoard's Dairyman April 10, 2009

HEALTHY COWS HEALTHY INDUSTRY



Not all Johne's cows are thin.

IDEXX ELISA S/P = 2.0 = Strong-positive




CSU study: 12 of 21 (57%) cull dairy cows confirmed MAP-infected had no clinical evidence of Johne's disease.
 Antognoli et al. Veterinary Microbiology 127:300, 2008

Reasons to Cull ELISA Strong-Positive Cows


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

Objective of Testing



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.




Match test to purpose

Special Report

Consensus recommendations on diagnostic testing for the detection of paratuberculosis in cattle in the United States

Michael T. Collins, DVM, PhD, DACVM; Ian A. Gardner, BVSc, MSc, PhD;
 Franklyn B. Garry, DVM, MS, DACVM; Allen J. Rossel, DVM, MS, DACVM;
 Scott J. Wells, DVM, PhD, DACVPM



Funded by USDA-APHIS-VS Cooperative Agreement #05-9100-0996-GR

Milk ELISAs




- ❑ Commercial ELISA kits are being licensed for use on milk.
- ❑ Milk quality labs are offering testing.
- ❑ The cost of milk ELISAs to producers will decline.

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



What Other Countries Are Doing


North 1000.com




Dutch ParaTB Program

"Milk Quality Assurance Program"
started January 2008

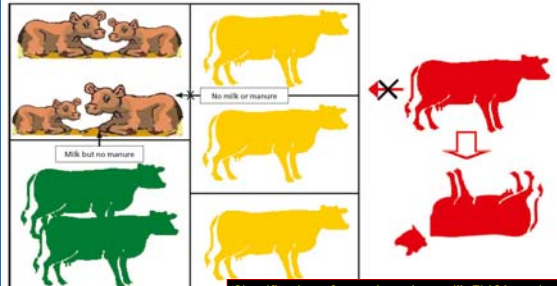
- Classify all herds by serum or milk ELISA:
 - Status **A** herds: test-negative
 - Status **B** herds: test-positive but pos cows culled
 - Status **C** herds: test-positive cows remain in herd
- Dairy processor pays 100% testing costs
 - If herds use pTB preventive management practices
- In 2010 all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






Danish: Risk-Based Control

"Operation Paratuberculosis"



Classification of cows based on milk ELISA testing



TAFS

INTERNATIONAL FORUM FOR
TRANSMISSIBLE ANIMAL DISEASES & FOOD SAFETY

Recommendations published for MAP control at the farm, national, and international level as well as risk-based controls to limit MAP contamination of foods.

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.



We Have the Tools – Time to Use Them

Place multiple hurdles between MAP source and calves or consumers

- Prevent infection of herds
- Limit infection spread on farms
- Test herds and cull positive cattle
- Collect meat and milk hygienically
- Pasteurize all dairy products

Food safety: "teat to tongue" or "moo to you"

Five Reasons to Control Johne's

- JD is a production limiting disease
- JD is an infectious disease (spreading)
- JD tests for are accurate and affordable
- JD control improves overall herd health
- A scientifically sound program is feasible, timely, and the "right thing to do".

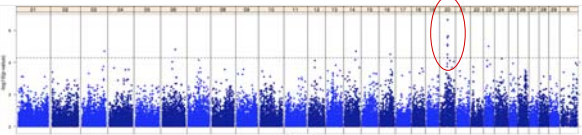
Whole Genome Association Study for Holstein Susceptibility to *MAP* Infection

Brian W. Kirkpatrick, Xianwei Shi,
Michael T. Collins, & George E. Shook

University of Wisconsin - Madison



Combined Association Test 10,000 Holsteins x 50,000 SNPs



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

Results of Logistic Regression Analysis **18 potential markers**

SNP	Chromosome	Megabases	P-value
BTA-114108-no-rs	BTA1	26.1	1.70×10^{-6}
BTB-01112664	BTA2	19.39	1.40×10^{-4}
ARS-BFGL-NGS-118058	BTA2	23.36	3.74×10^{-4}
BTB-01278461	BTA4	85.43	1.88×10^{-7}
BTA-72108-no-rs	BTA4	108.78	2.06×10^{-4}
BTB-00261837	BTA6	66.68	1.72×10^{-8}
Hapmap41410-BTA-104176	BTA7	63.04	9.18×10^{-7}
ARS-BFGL-NGS-32966	BTA9	38.39	5.88×10^{-5}
Hapmap57166-rs29020401	BTA13	34.1	2.42×10^{-5}
ARS-BFGL-NGS-32123	BTA15	43.28	1.65×10^{-4}
ARS-BFGL-NGS-55380	BTA16	22.06	1.47×10^{-7}
BTA-116871-no-rs	BTA17	28.19	1.66×10^{-10}
UA-IFASA-8974	BTA20	31.97	6.82×10^{-8}
Hapmap54042-ss46526396	BTA22	12.41	7.60×10^{-8}
Hapmap51130-BTA-105627	BTA23	32.11	4.73×10^{-4}
ARS-BFGL-NGS-115504	BTA25	21.17	7.56×10^{-11}
BTA-100341-no-rs	BTA26	34.88	9.56×10^{-8}
ARS-BFGL-NGS-109845	BTA29	19.5	5.03×10^{-6}

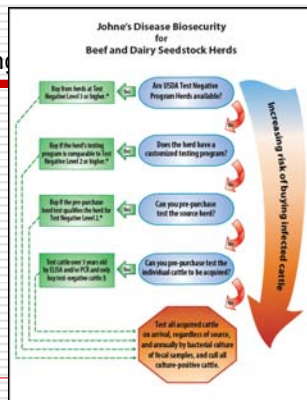
If your herds is JD-free, don't buy it!



Biosecurity: Pre-purchase testing

"Pick your risk":


Decision making chart
allowing herd owner multiple
options and associated risks
of buying *MAP*-infected cattle.



You say: "We MUST trade"

I respond:





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My advice to the National Holstein Association:

- ☐ **Regulate yourself, don't wait for "big brother" to do it.**
 - Improve the quality and the image of Holsteins
- ☐ **Phase in testing requirements for NHA-sanctioned 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 are at least level 1 in the U.S. Johne's Program
