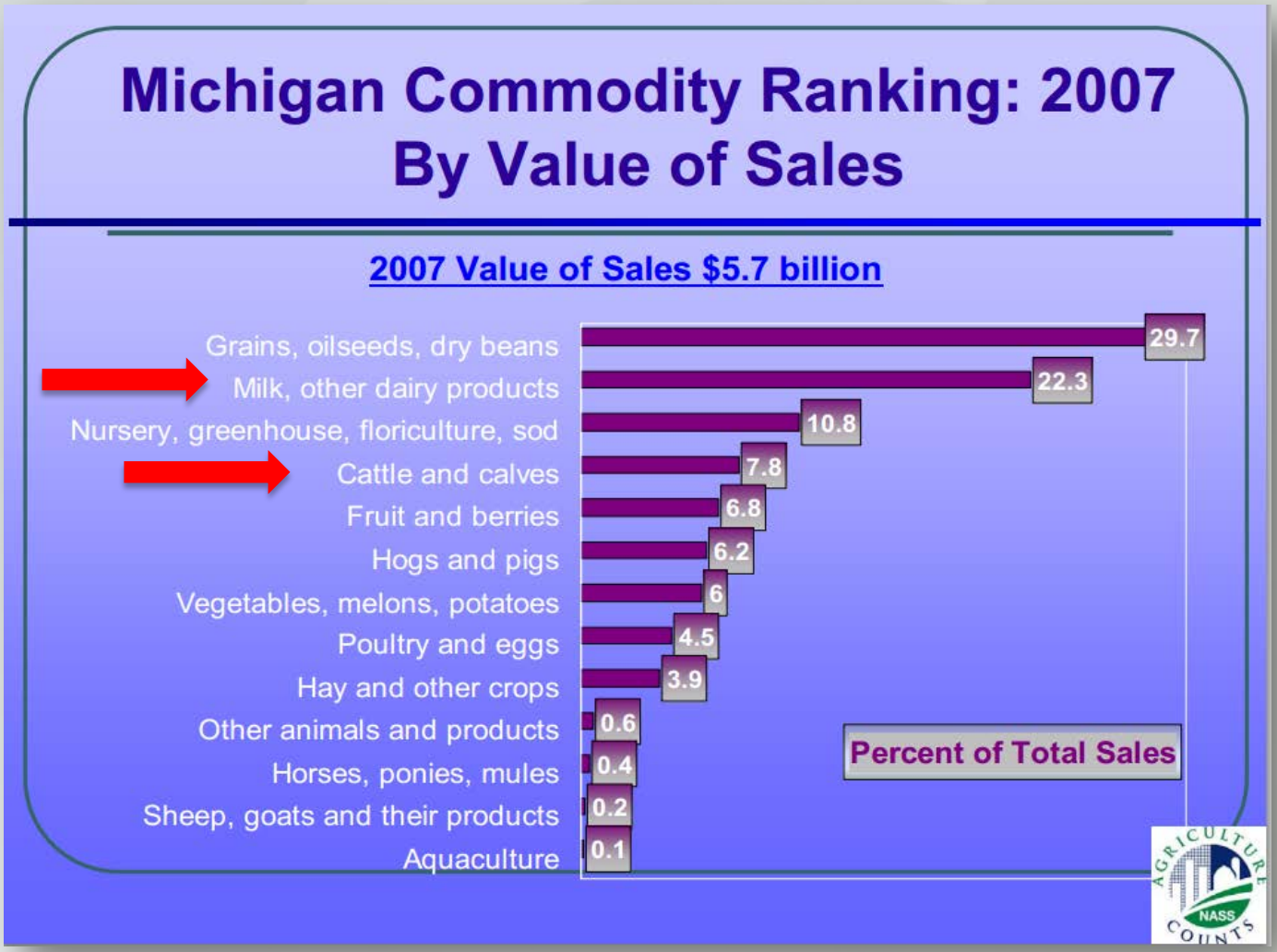
Answering Practical Questions For Michigan Cattle Producers

Bovine Infectious Disease Research

Importance of the Cattle Industry



Applied Research

- Transmission of *Mycobacterium bovis* (bTB)
  - Survival of *Mycobacterium bovis* ensiled feeds
- Michigan Johne's Disease Control Demonstration Project
  - Research✦Teaching✦Outreach

Survival of *Mycobacterium bovis* during forage ensiling

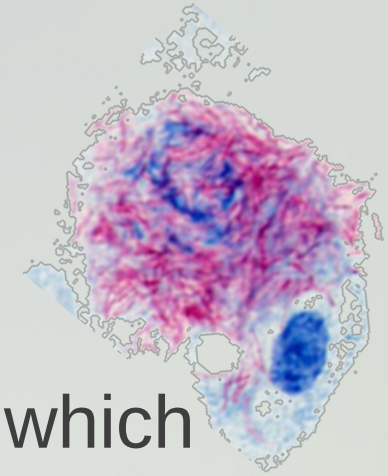
MICHIGAN STATE UNIVERSITY

Department of Agriculture & Rural Development

MMPA MICHIGAN MILK PRODUCERS ASSOCIATION

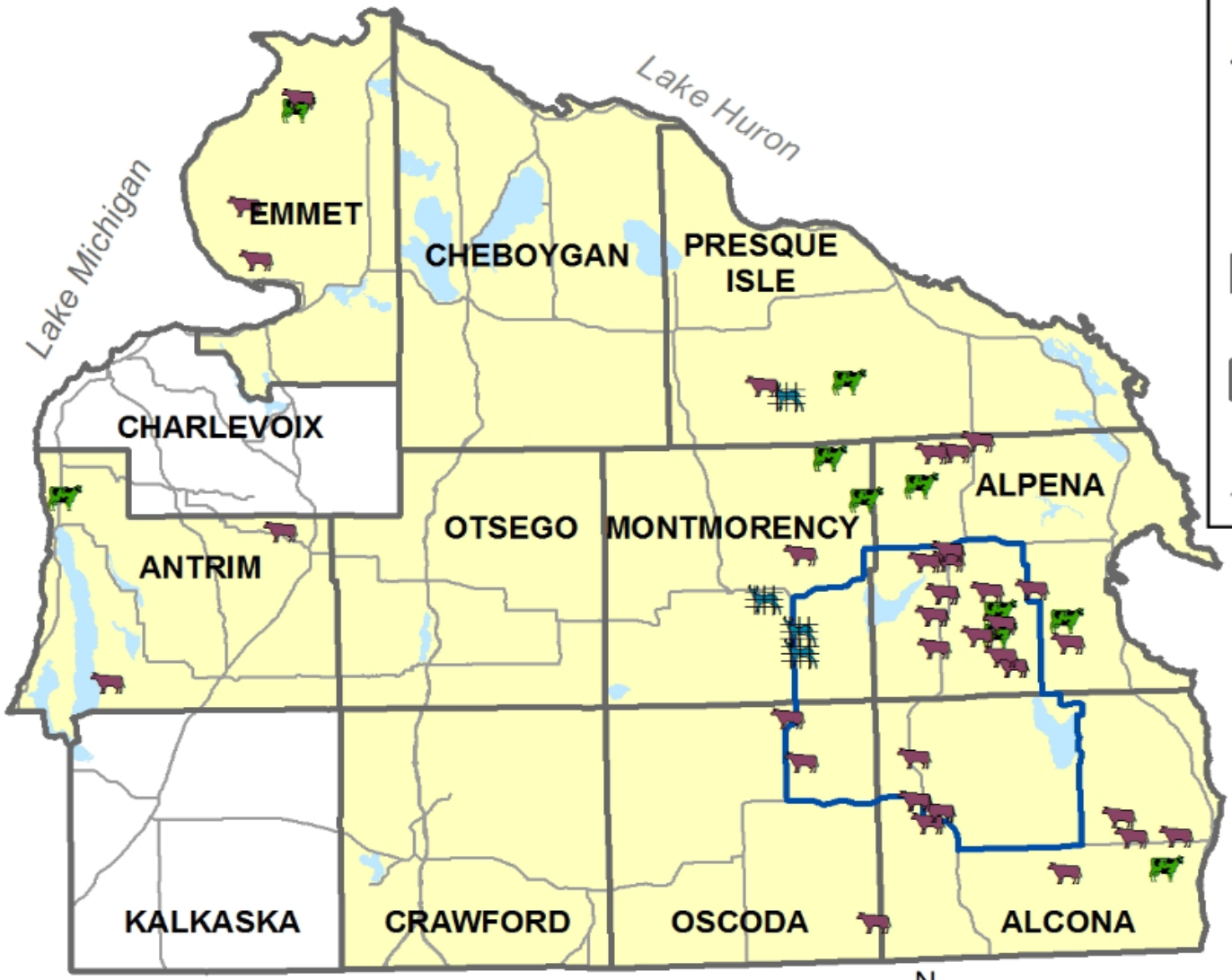
DIAGNOSTIC CENTER FOR POPULATION AND ANIMAL HEALTH

Background



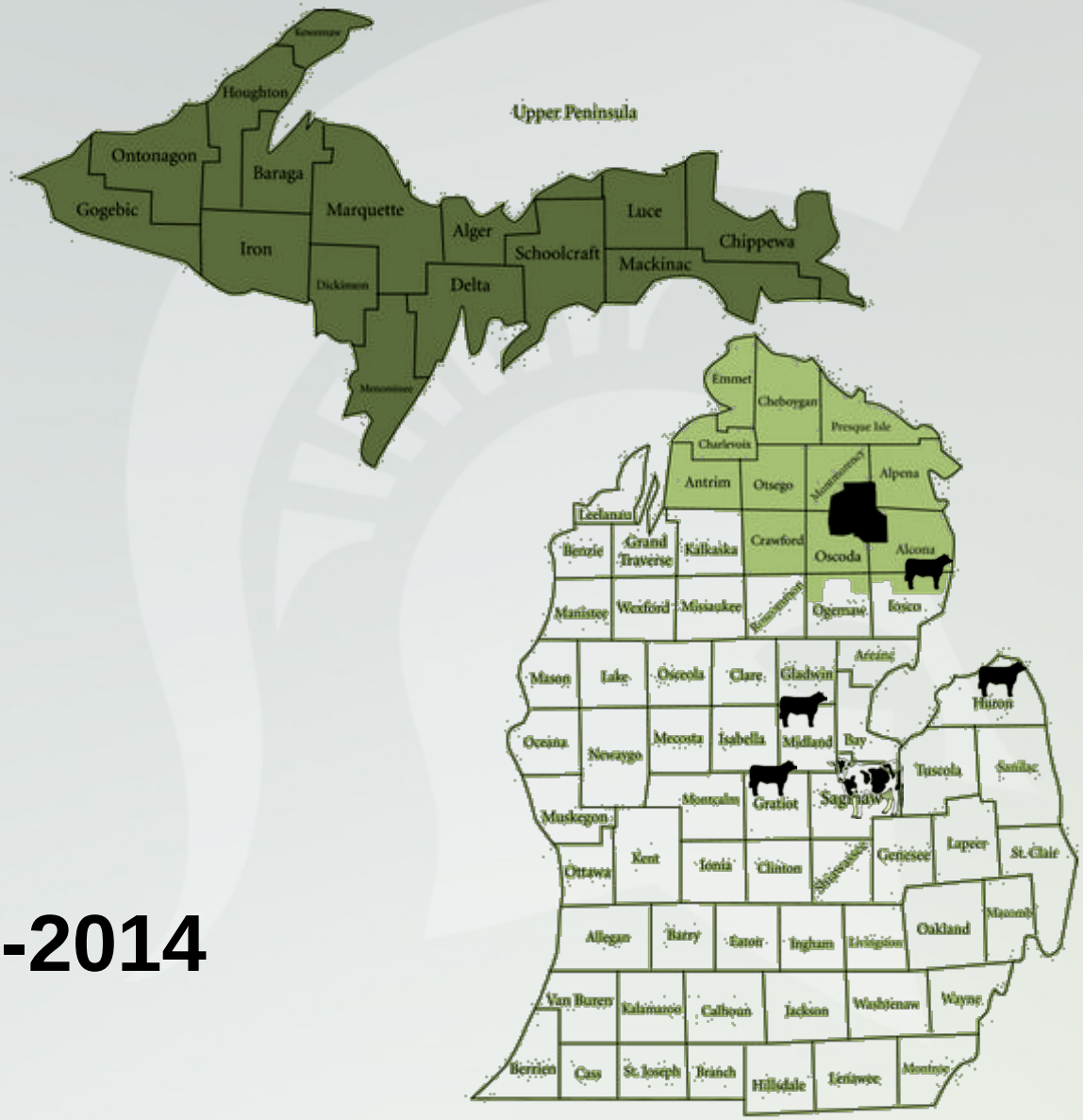
- ***Mycobacterium bovis*** is the bacteria which causes **bovine TB**
- Bovine TB continues to be a problem in NE MI
  - **White tail deer** are likely the primary reservoir
  - Transmission of *M. bovis* from deer to cattle believed to be indirectly thru **contaminated feed, water, environment**
  - Still learning about **transmission risks**

Bovine Tuberculosis Positive Cattle and Captive Cervid Herds 1998 - 2012



Legend	Total
Positive Beef Herd	43
Positive Dairy Herd	12
Positive Captive Deer Herd	4
TB Infected County *(Wildlife or Cattle)*	
DMU 452	
County Boundary	
Lakes	
Highways	

Rev. November 2, 2012


Upper Peninsula
Houghton
Ontonagon
Baraga
Gogebic
Marquette
Iron
Dickinson
Menominee
Alger
Schoolcraft
Delta
Luce
Mackinac
Chippewa
Emmet
Cheboygan
Presque Isle
Charlevoix
Antrim
Otsego
Montmorency
Alpena
Leelanau
Benzie
Grand Traverse
Kalkaska
Crawford
Oscoda
Alcona
Manistee
Wexford
Missaukee
Roscommon
Ogemaw
Iosco
Arenac
Mason
Lake
Osceola
Clare
Gladwin
Huron
Oceana
Newaygo
Mecosta
Isabella
Midland
Bay
Tuscola
Sanilac
Montcalm
Gratiot
Saginaw
Muskegon
Ottawa
Kent
Ionia
Clinton
Shiawassee
Genesee
Lapeer
St. Clair
Allegan
Barry
Eaton
Ingham
Livingston
Oakland
Macomb
Van Buren
Kalamazoo
Calhoun
Jackson
Washtenaw
Wayne
Berrien
Cass
St. Joseph
Branch
Hillsdale
Lenawee
Monroe

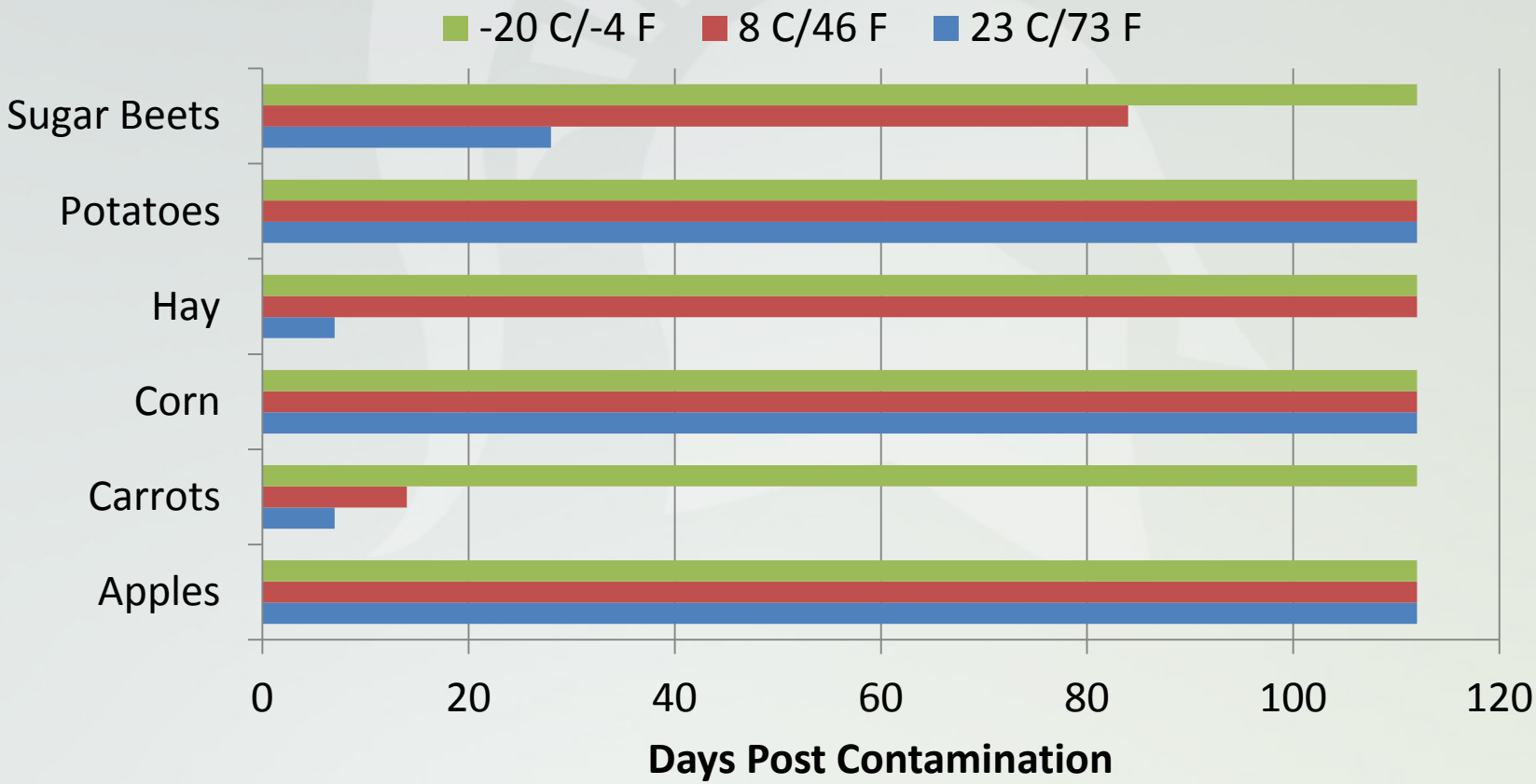
2013-2014

Potential bTB Transmission Reservoirs?

Background

- Under experimental conditions, *M. bovis* can survive on common feeds used to bait deer and feed cattle

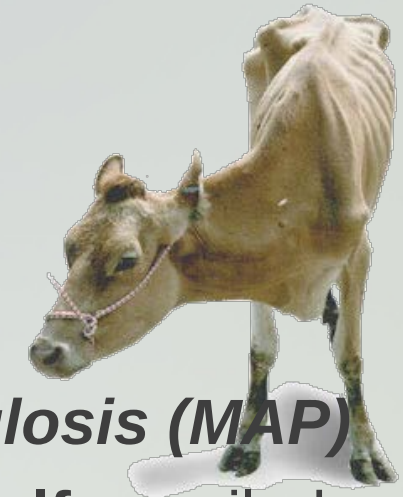
  Palmer and Whipple, Journal of Wildlife Diseases, 42(4), 2006, pp. 853–858



Background

- We do know that some pathogenic bacteria can survive the ensiling process:
  - **Listeria** Pauley and Tham, Acta vet. Scand. 2003; *44:* 73-86
  - **Streptococcus** Petersson-Wolfe *et al.*, J. Dairy Sci, 2011;94 :5027–5032
  - **Enterococci** Petersson-Wolfe *et al.*, J. Dairy Sci.,2011;94 :5027–5032
- Others do not:
  - **STEC *E. coli*** Byrne *et al.,* J. Food Protection, 2002;65:1854–1860
  - **Salmonella** Cook *et al*., J. Applied Microbiology, 2013 ;115:334-45

Background



- ***Mycobacterium avium* subsp. *paratuberculosis (MAP)***
  - *MAP* detected by PCR in **mixed grass/alfalfa** ensiled for **150 days** Cook *et al*., J. Applied Microbiology, 2013 ;115:334-45
  - *MAP* detected by PCR in **grass hay baleage** ensiled for **107 days** Khol et al., Veterinarni Medicina, 55, 2010 (5): 225–232
  - In both cases, *MAP* culture was attempted, but unsuccessful
- **Nothing on *M. bovis***

- **Objective**
  - Determine the survivability of *M. bovis* in feedstuffs that are commonly harvested, ensiled and then fed to cattle in NE MI

- **Specific Aims**
  1. Determine if *M. bovis* can survive ensiling.
  2. Determine if survival of *M. bovis* in ensiled forages decreases over time.
  3. Determine if there are differences between forage ensiled.

Forages Used

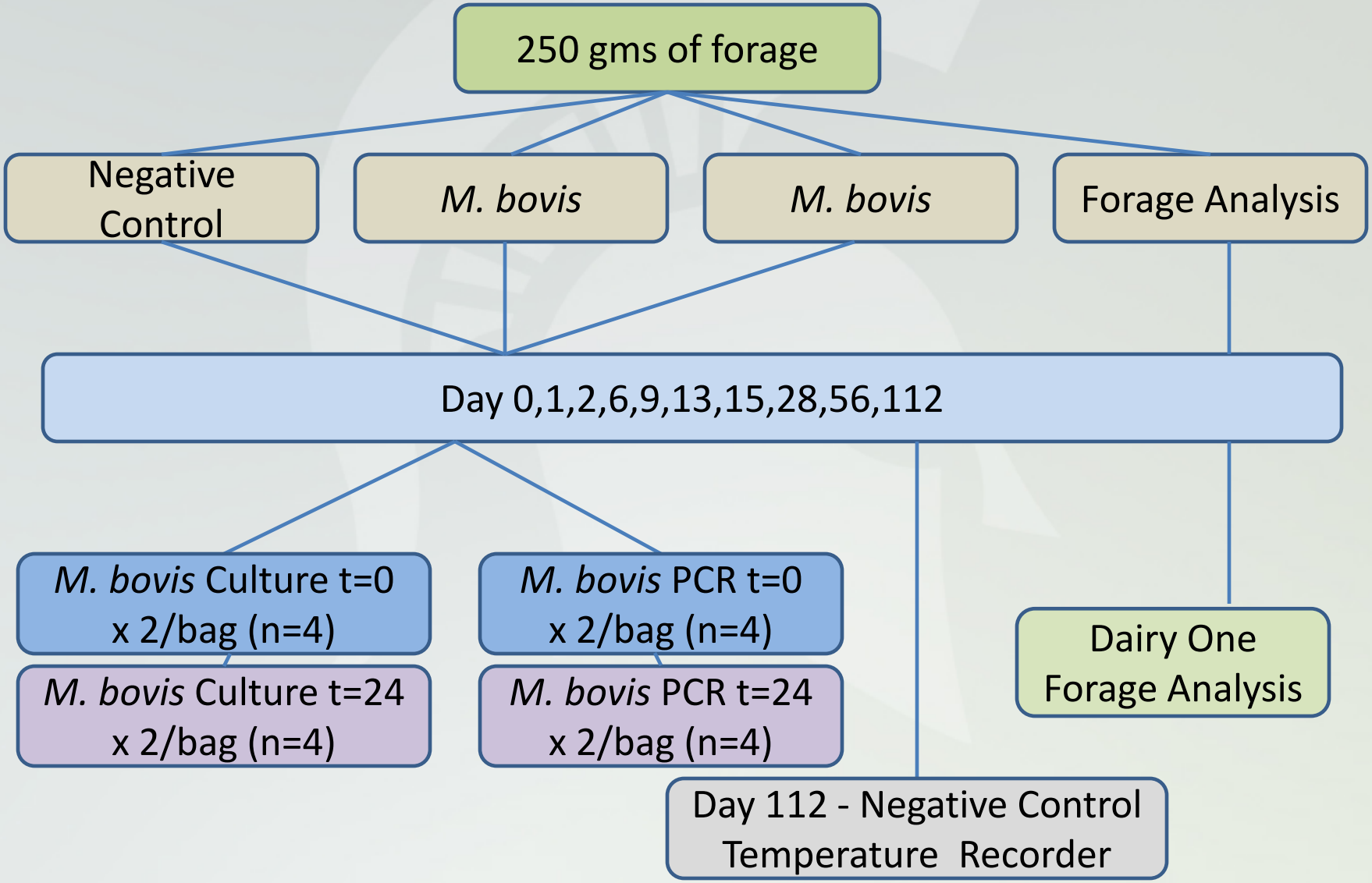
- Forages commonly ensiled in NE Michigan
  - **Alfalfa**
    - 35% DM
  - **Mixed grass**
    - 60% DM
    - 40% DM
  - **Corn**
    - 32%DM

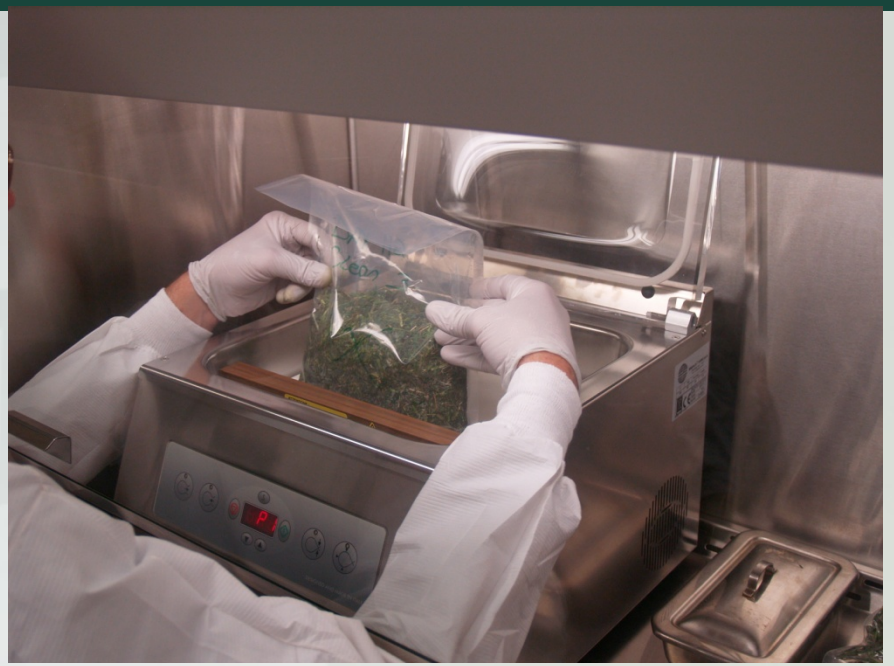
Alfalfa

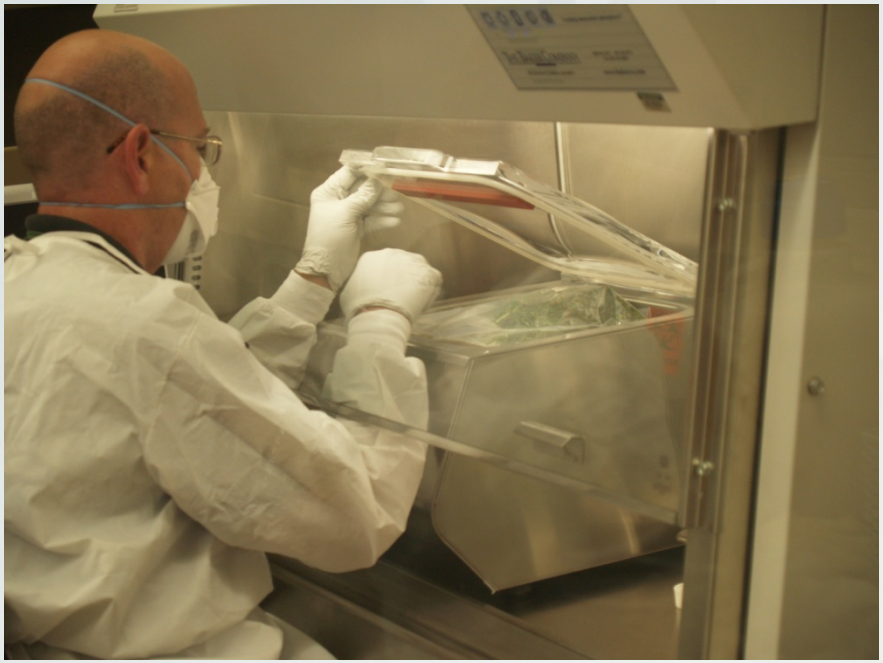
Mixed Grass

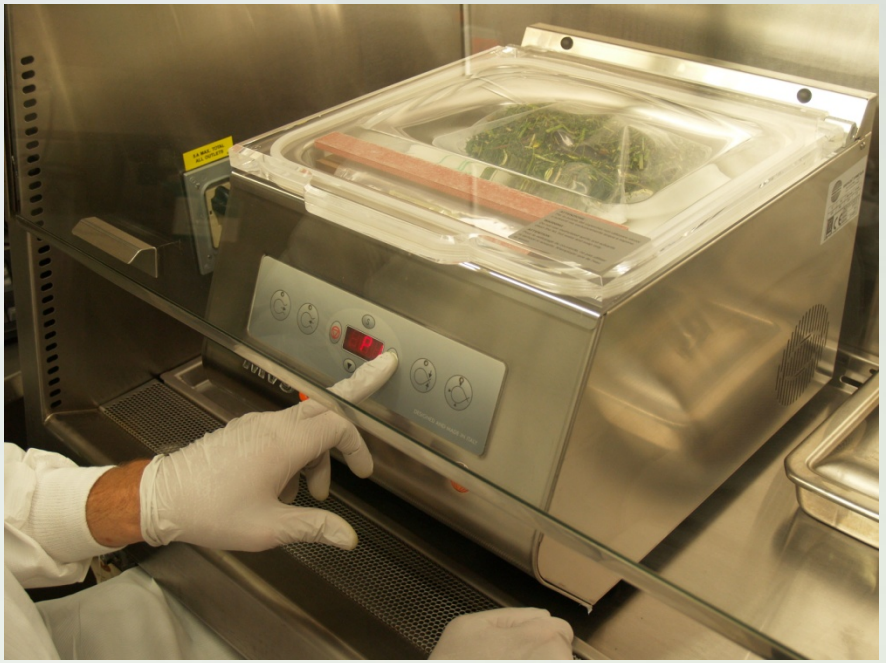
Corn

Design


250 gms of forage
Negative Control
M. bovis
M. bovis
Forage Analysis
Day 0,1,2,6,9,13,15,28,56,112
M. bovis Culture t=0 x 2/bag (n=4)
M. bovis PCR t=0 x 2/bag (n=4)
M. bovis Culture t=24 x 2/bag (n=4)
M. bovis PCR t=24 x 2/bag (n=4)
Dairy One Forage Analysis
Day 112 - Negative Control Temperature Recorder





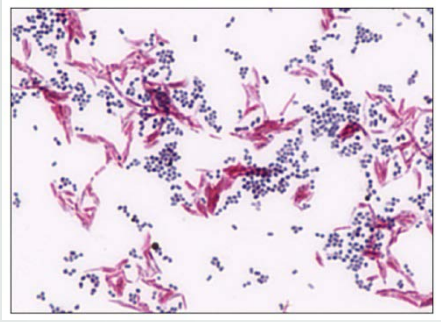



Day 2
T10

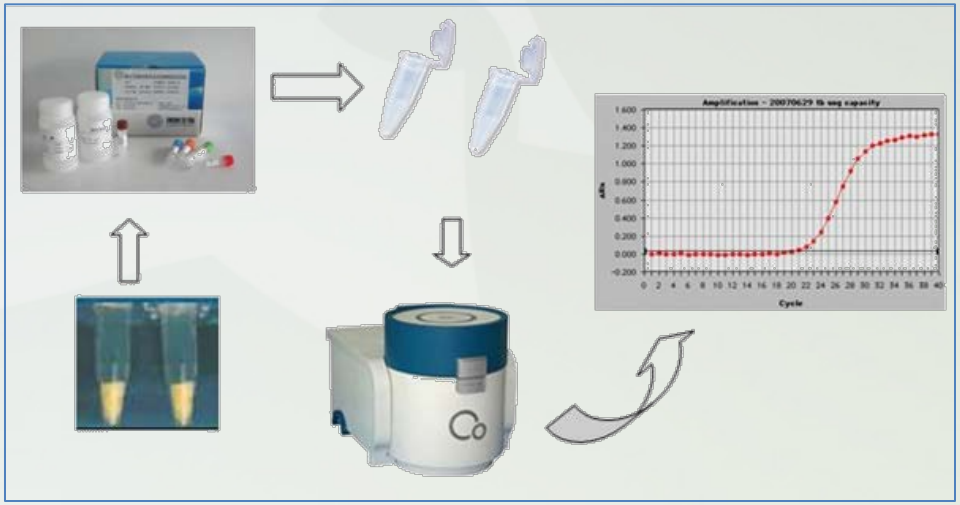

WARNING
RADIOACTIVE MATERIALS
WARNING

Liquid Culture
BACTEC

Conventional Solid Agar Culture

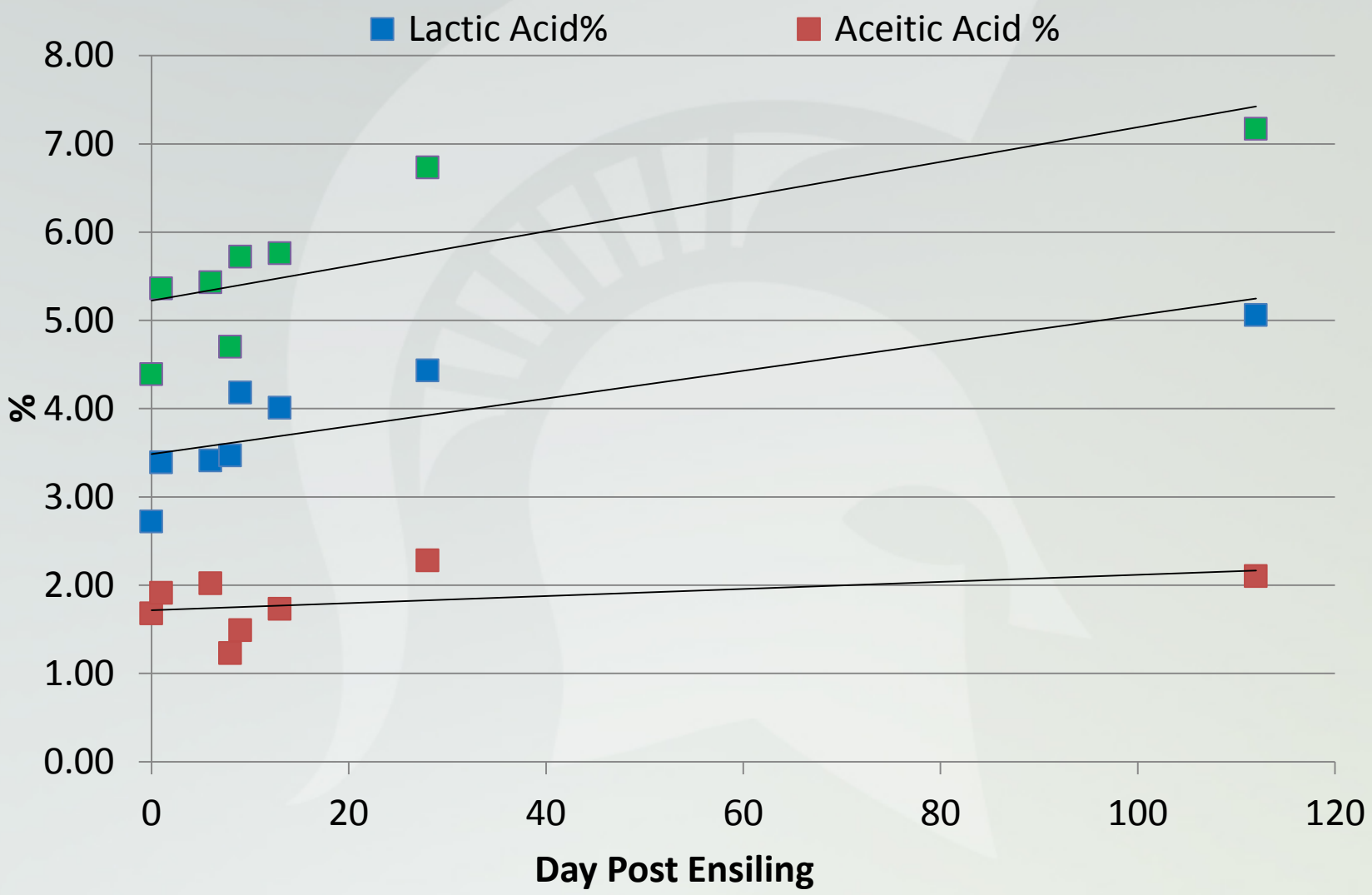


Acid Fast Stain

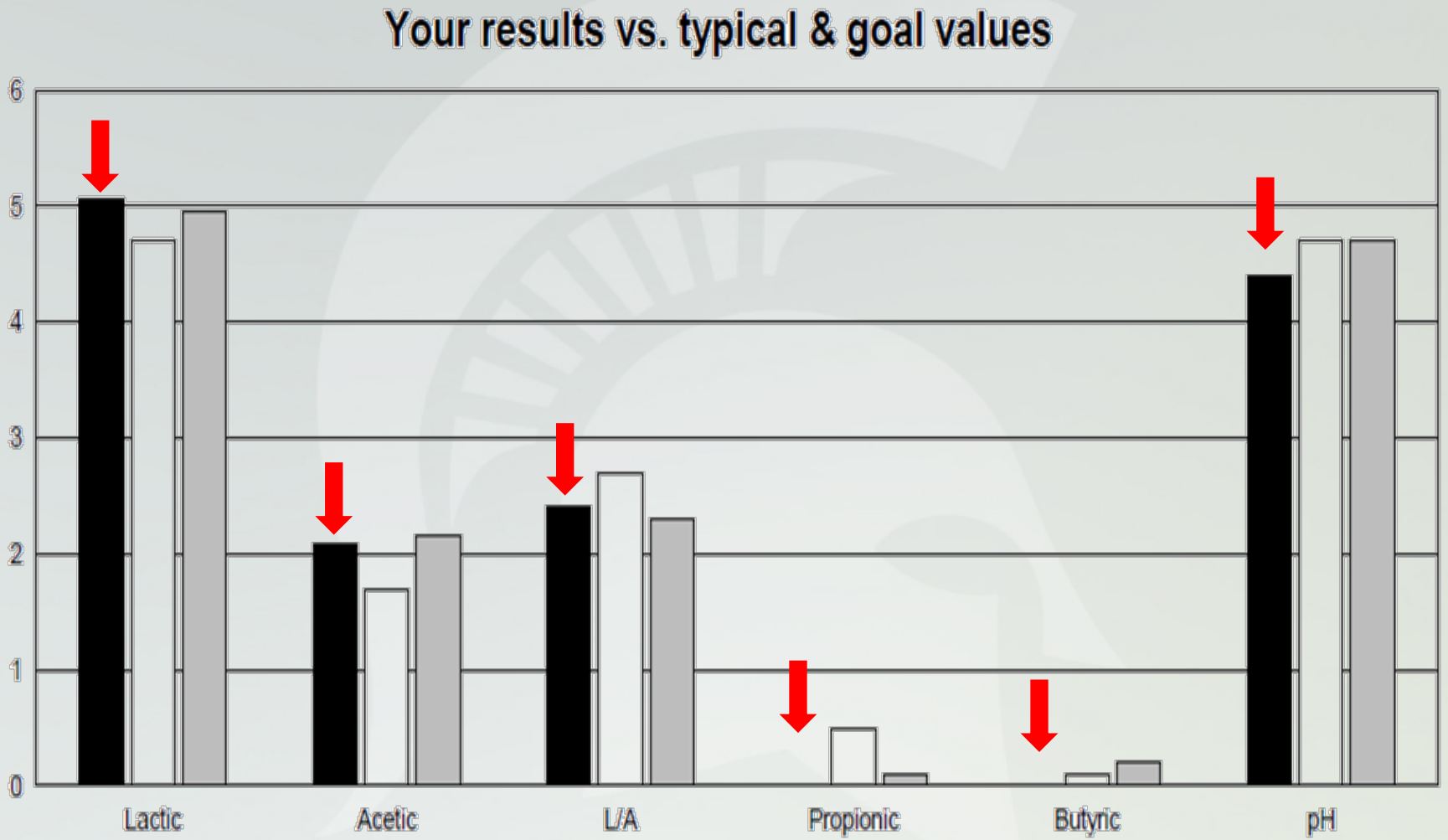


Real Time PCR

Alfalfa - Acid Concentration



Alfalfa Profile



Black = Test Sample **White = Goal** **Grey = Typical**

Culture Results

Alfalfa	
Day	Culture Result
0	POS
1	POS
2	POS
6	NEG
9	NEG
13	NEG
15	NEG
28	NEG
56	NEG
112	NEG

Grass (60% dry matter)	
Day	Culture Result
0	POS
1	POS
2	POS
6	POS
9	POS
13	POS
15	?? +
28	??+
56	NEG
112	NEG

Corn	
Day	Culture Result
0	POS
1	POS
2	POS
6	Neg
9	NEG
13	NEG
15	NEG
28	NEG
56	NEG
112	NEG

Alfalfa PCR Results

Day	Result
0	POS
1	POS
2	POS
6	POS
9	POS
13	POS
15	POS
28	POS
56	POS
112	POS

Summary to Date

- Model for making silage in laboratory system
- We can successfully inoculate and recover *M. bovis* from forages
- Culturable *M. bovis* recoverable at least 2 weeks.
  - Low risk
- Detectable *M. bovis* DNA for length of study
  - Dormant?
  - Infectious?
  - Risk?

PRELIMINARY

Plans For This Summer

- Is the DNA detected from live organism?
- If so, what would it take to become infectious and therefore a threat to cattle?

Research Team

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Jessica Plastow, MSU Diagnostic Center for Population and Animal Health

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Michigan Johne's Disease Control Demonstration Project

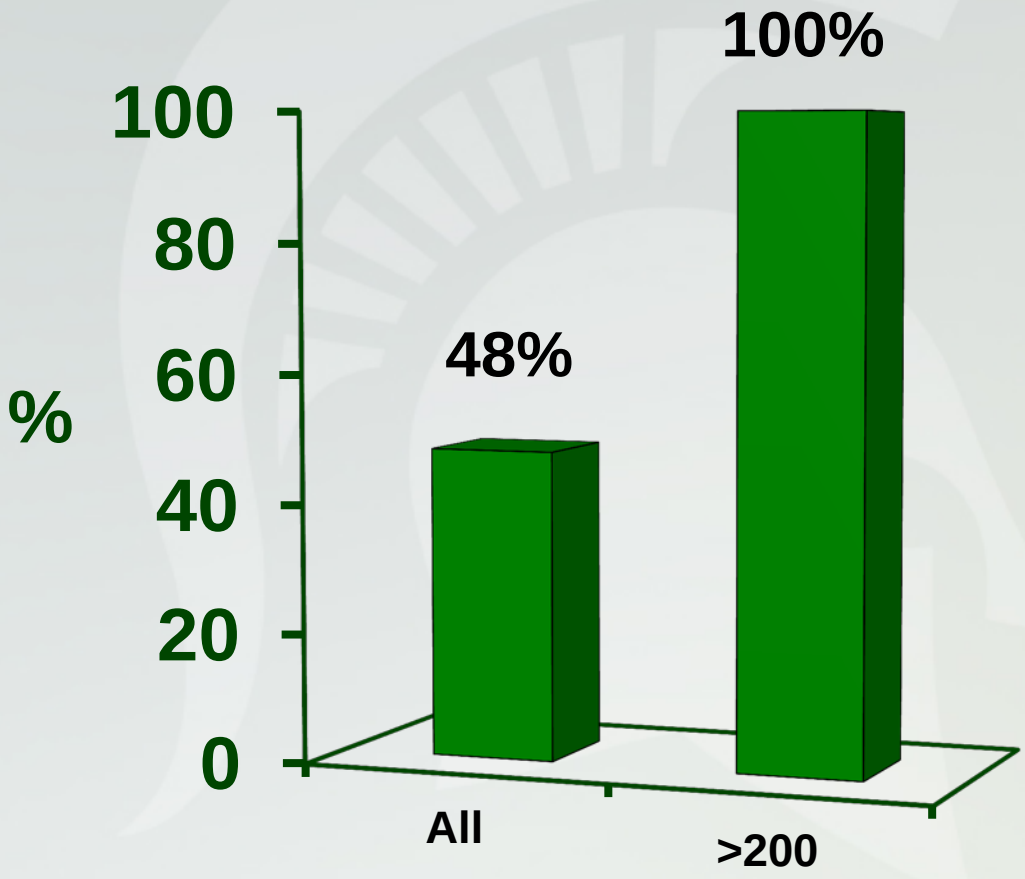
College of VETERINARY MEDICINE
Michigan State University

Michigan Department of AGRICULTURE

USDA UNITED STATES DEPARTMENT OF AGRICULTURE

Johne's Disease – Chronic Diarrhea and Weight Loss

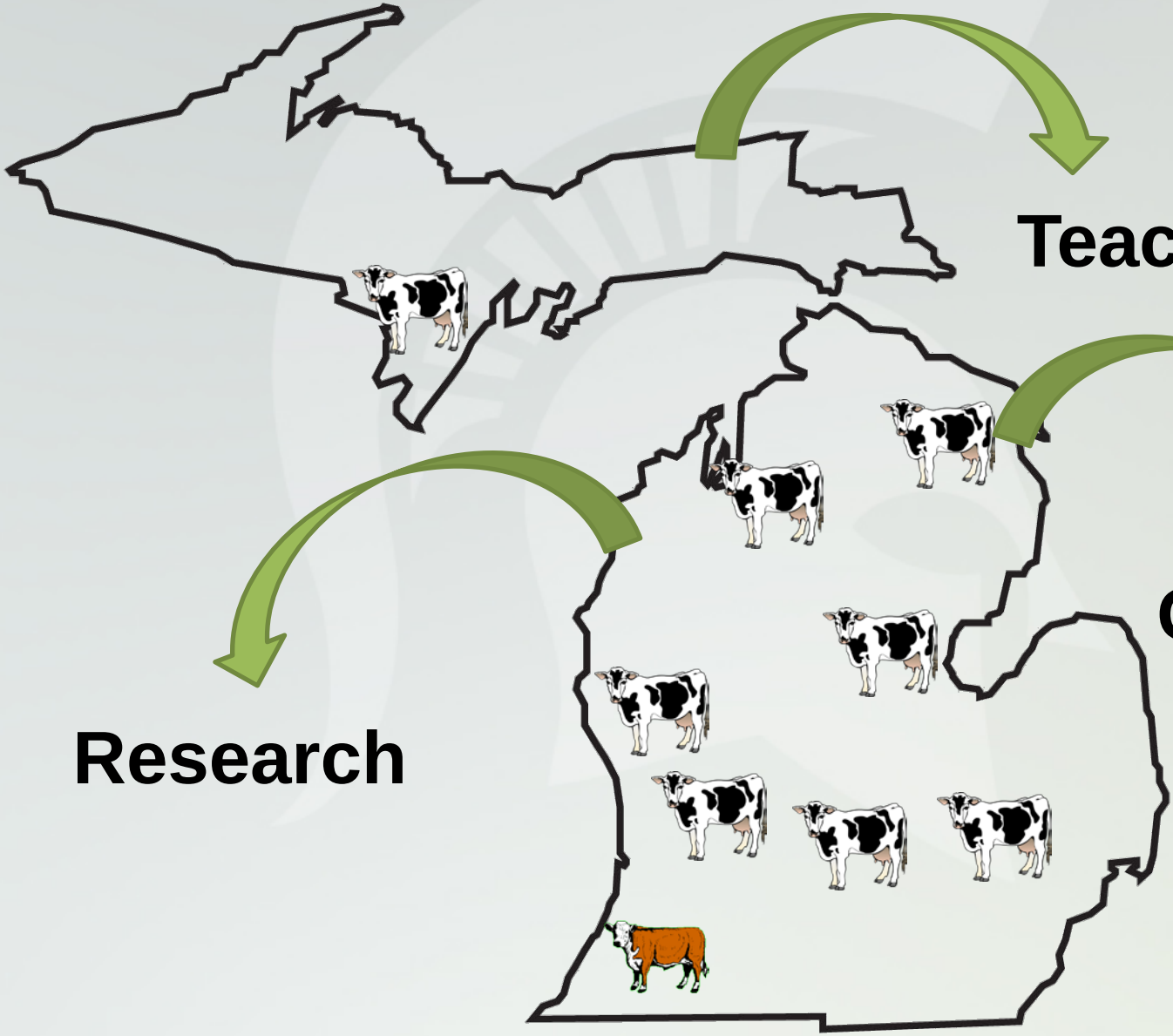
Johne's Disease
Infected Dairy Herds In Michigan



Positive Environmental Sample

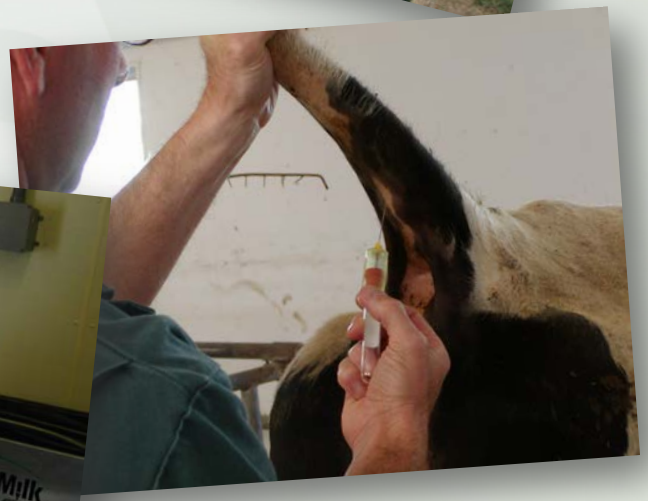
Blair, 2006

Demonstration Farm Locations



Michigan Johne's Disease Control Demonstration Project

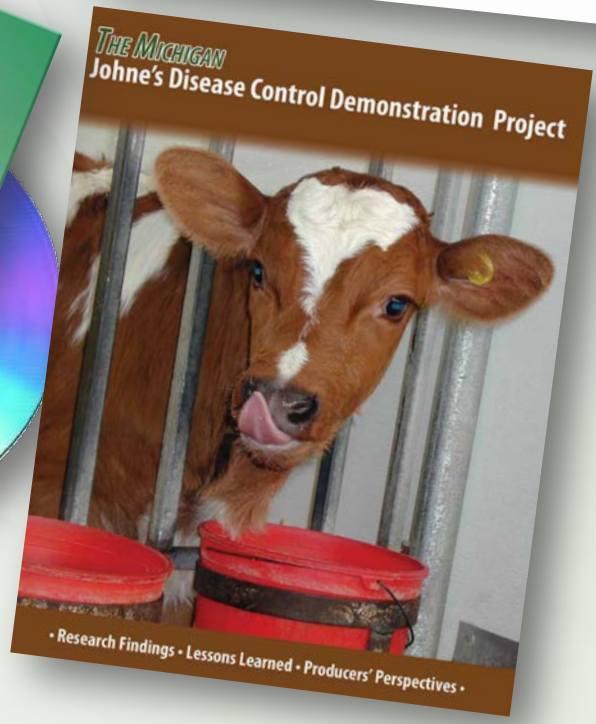

BetterMilk

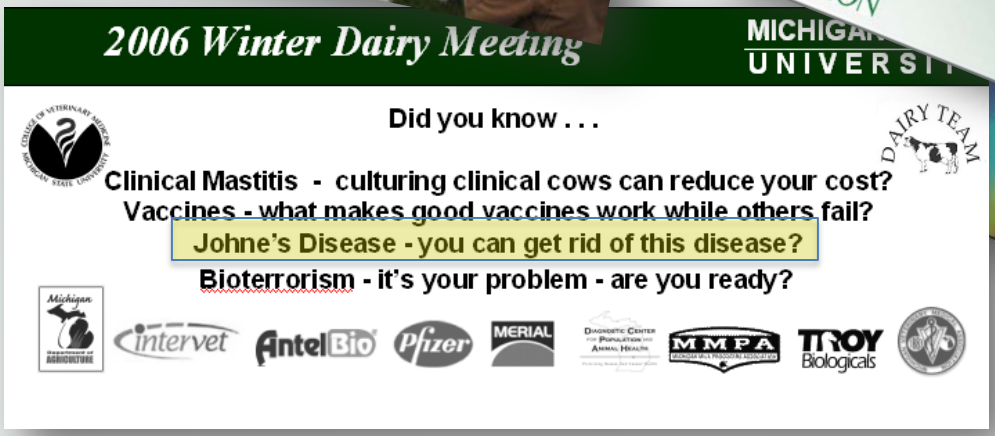


Research Outputs

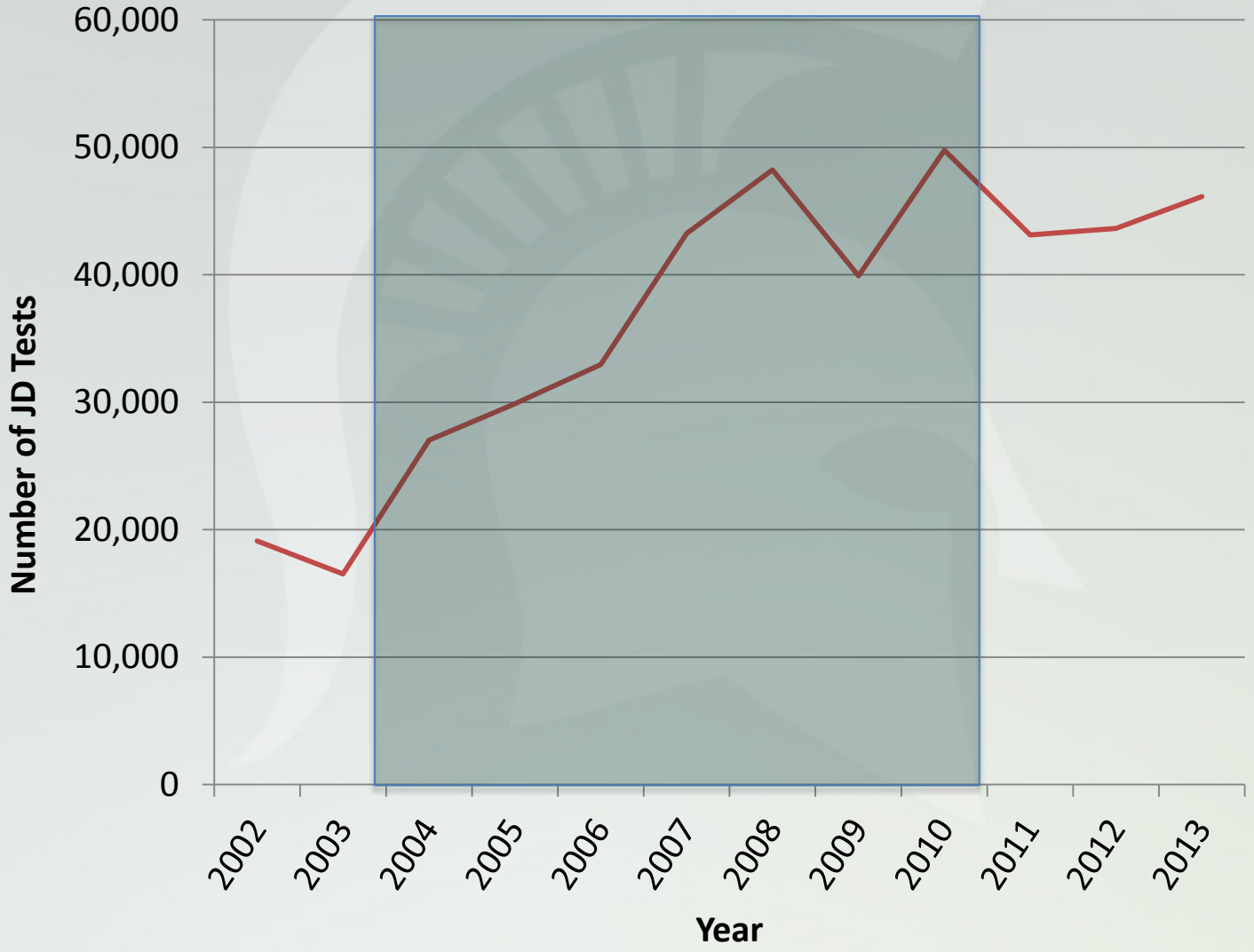
- Developed and demonstrated a target environmental herd screening tool ➔ JD Herd Prevalence (Pillars 2009)
- Documented shedding and risk of shedding MAP in young calves in JD infected herds (Bolton 2010)
- Association between farm transmission risk factor and likelihood of being infected with MAP (Pillars 2011)
- Environmental distribution of MAP over time (Pillars 2009)
- Economics of JD control program (Pillars 2009)
- Productivity and longevity of MAP infected cows (Pillars 2011)
- Biosensor developed for detecting MAP antibodies (Okafor 2008)

Extension Outputs





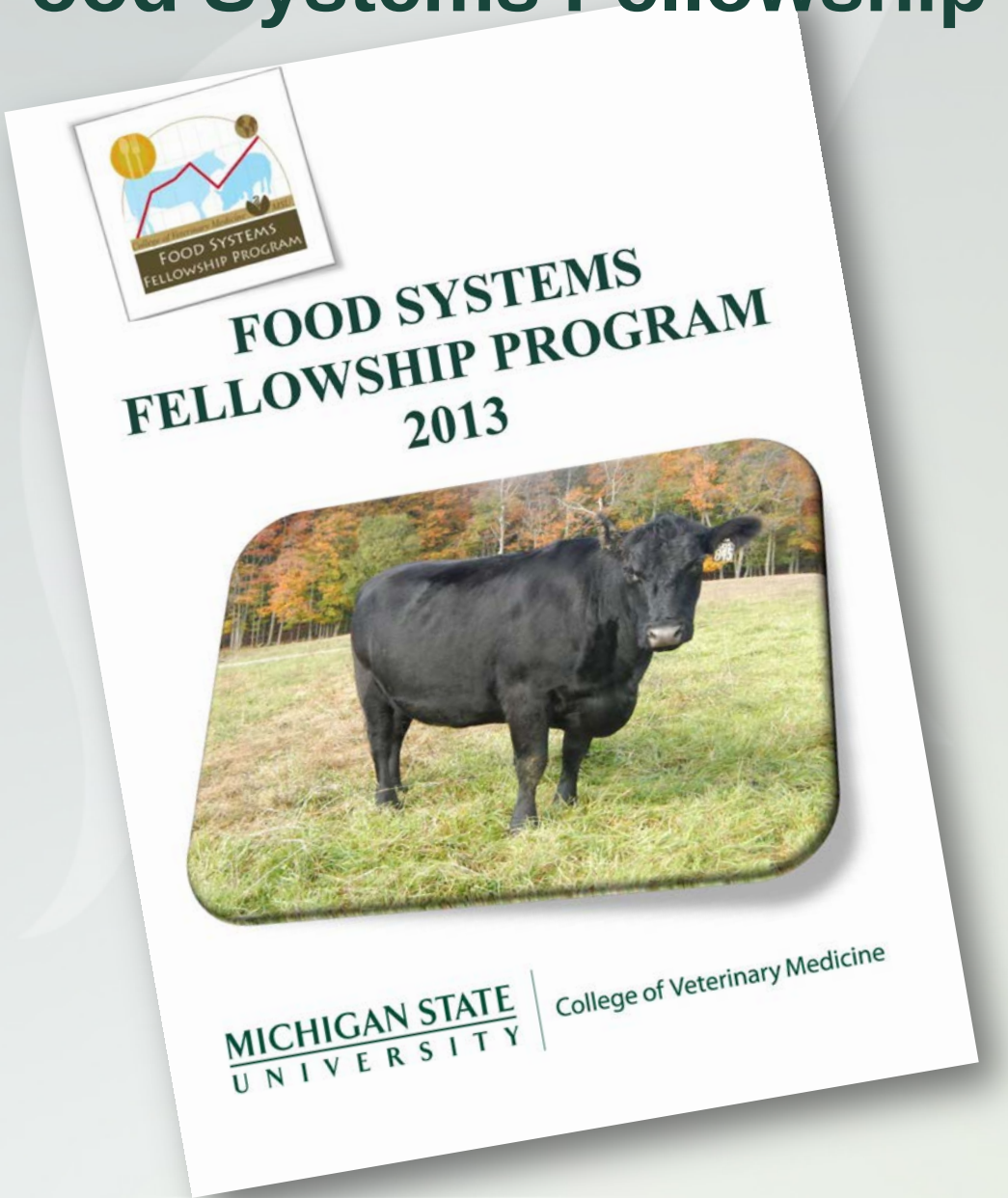
-Impact-
Testing as Proxy For Control Programs



Other Bovine Infectious Disease Work at CVM

- **Shiga Toxin Producing E. coli**
  - Manning (MMG), Bartlett, Grooms, Rust (ANS) Cousins (ANS)
- **Bovine Leukosis Virus**
  - Bartlett, Norby, Erskine, Sordillo, Contreras, Cousins (ANS), Swenson, Grooms
- **Mycobacterial diseases**
  - Grooms, Kaneene, Cousins (ANS), Abramovitch (MMG)
- **Bovine Viral Diarrhea Virus**
  - *UP BVDV Eradication Project*
  - Grooms, Bolin

Summer Food Systems Fellowship Program



MICHIGAN STATE
UNIVERSITY

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Michigan Upper Peninsula
Bovine Viral Diarrhea Virus Eradication Project

Partnering In Animal Health - BVDV Eradication Project

College of VETERINARY MEDICINE
Michigan State University

MICHIGAN STATE UNIVERSITY EXTENSION

Pfizer

Pfizer Animal Health

Objective

To demonstrate the application of a regional BVDV eradication/control program in the US

BVDV Overview

Mucosal Disease

Thrombocytopenia

Acute Death

Acute Infection

Immunosuppression

Respiratory Disease

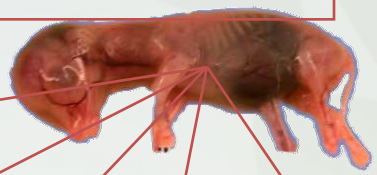
Reservoir of Infection

Acute Diarrhea

Fetal Infection

Subclinical Infection

Congenital Infection's



Abortions

Congenital Defects

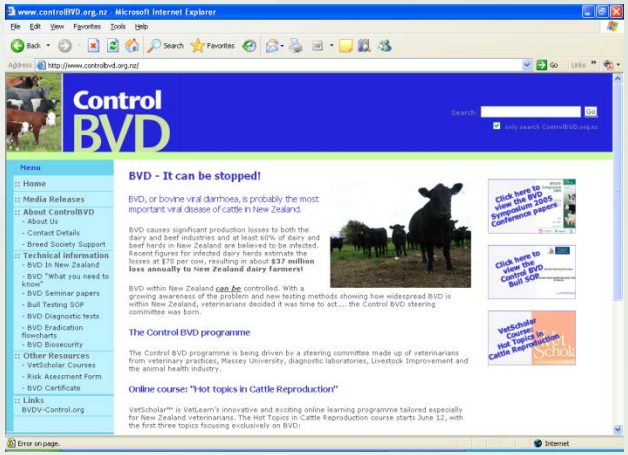
Persistent Infection

Normal

"Weak Calf" Syndrome

Why Such A Big Deal?

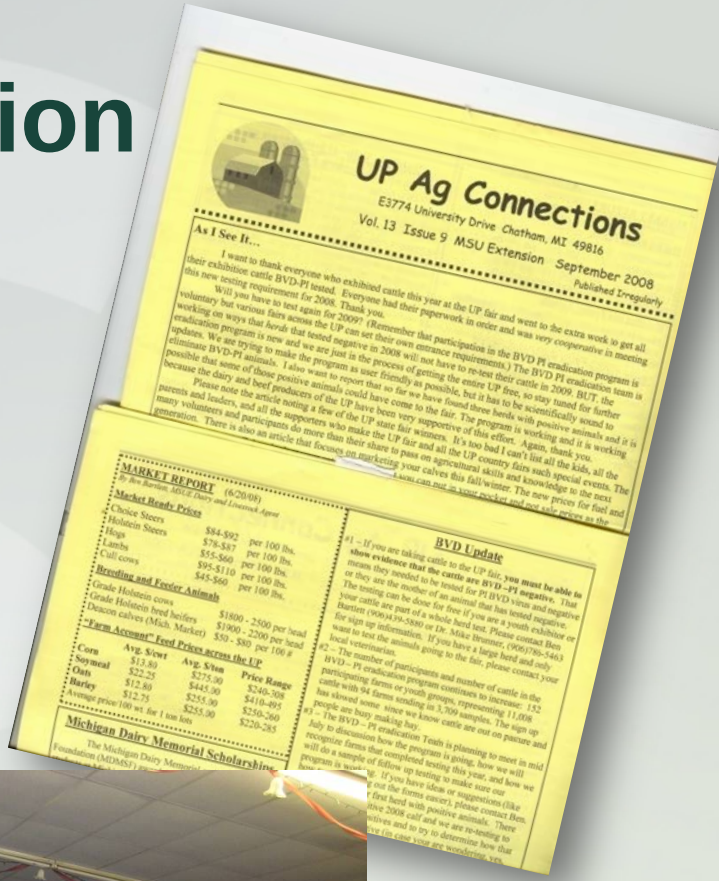
- Significant Animal Health Challenge
  - Morbidity/Mortality/Performance
- Economic Losses
  - All sectors of the cattle industry
- Many countries moving to becoming BVDV free
  - EU
  - New Zealand



Overview of Program Components

- BVDV Education
- Planned Herd BVDV Control Program
  - Eliminate PI BVDV cattle, if present, from herds (biocontainment)
  - Implement plans to keep BVDV from spreading to other herds (biosecurity).
  - Use a comprehensive BVDV vaccination protocol to minimize risk if BVDV exposure occurs
- Surveillance for Presence of BVDV in the UP

BVDV Education



UP Ag Connections

E3774 University Drive Chatham, MI 49816

Vol. 13 Issue 9 MSU Extension September 2008

Published Irregularly

As I See It...

I want to thank everyone who exhibited cattle this year at the UP fair and went to the extra work to get all their exhibition cattle BVD-PI tested. Everyone had their paperwork in order and was very cooperative in meeting this new testing requirement for 2008. Thank you.

Will you have to test again for 2009? (Remember that participation in the BVD PI eradication program is voluntary but various fairs across the UP can set their own entrance requirements.) The BVD PI eradication team is working on ways that herds that tested negative in 2008 will not have to re-test their cattle in 2009. BUT, the eradication program is new and we are just in the process of getting the entire UP free, so stay tuned for further updates. We are trying to make the program as user friendly as possible, but it has to be scientifically sound to eliminate BVD-PI animals. I also want to report that so far we have found three herds with positive animals and it is possible that some of those positive animals could have come to the fair. The program is working and it is working because the dairy and beef producers of the UP have been very supportive of this effort. Again, thank you.

Please note the article noting a few of the UP state fair winners. It's too bad I can't list all the kids, all the parents and leaders, and all the supporters who make the UP fair and all the UP country fairs such special events. The many volunteers and participants do more than their share to pass on agricultural skills and knowledge to the next generation. There is also an article that focuses on marketing your calves this fall/winter. The new prices for fuel and

MARKET REPORT (6/20/08)

Market Ready Prices

Choice Steers		
Holstein Steers	$84-$92	per 100 lbs.
Hogs	$78-$87	per 100 lbs.
Lambs	$55-$60	per 100 lbs.
Cull cows	$95-$110	per 100 lbs.
Breeding and Feeder Animals	$45-$60	per 100 lbs.
Grade Holstein cows		
Grade Holstein bred heifers	$1800 - 2500 per head	
Deacon calves (Mich. Market)	$1900 - 2200 per head	
	$50 - $80 per 100 #	

"Farm Account" Feed Prices across the UP

	Avg. $/cwt	Avg. $/ton	Price Range
Corn	$13.80	$276.00	$240-308
Soymeal	$22.25	$445.00	$410-495
Oats	$12.80	$255.00	$250-260
Barley	$12.75	$255.00	$220-285

Average price/100 wt. for 1 ton lots

Michigan Dairy Memorial Scholarship

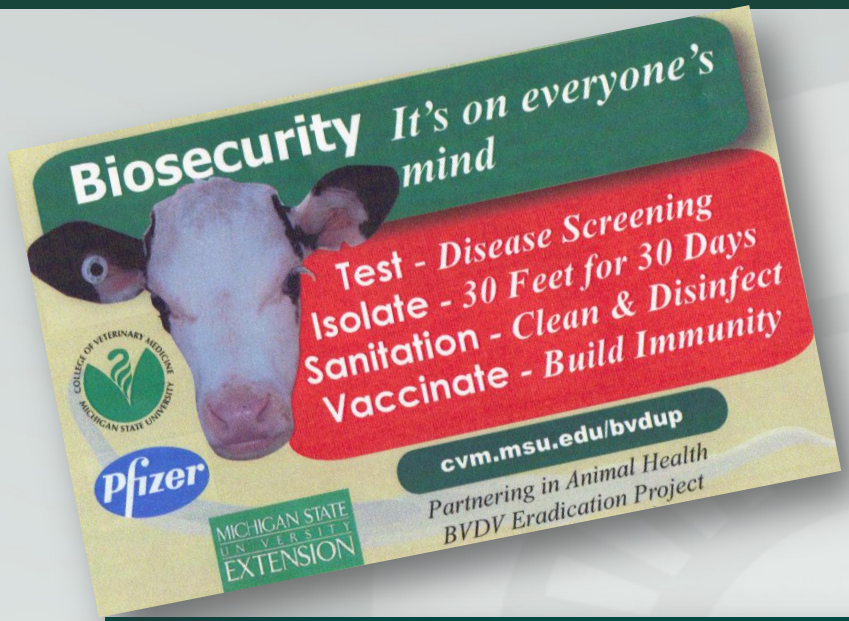
The Michigan Dairy Memorial Foundation (MDMSF)

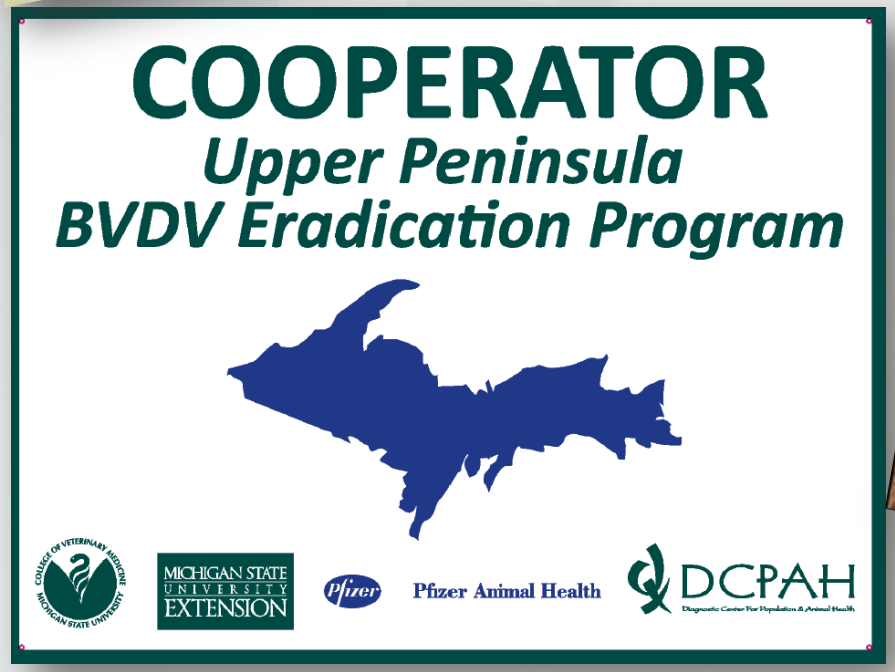
BVD Update

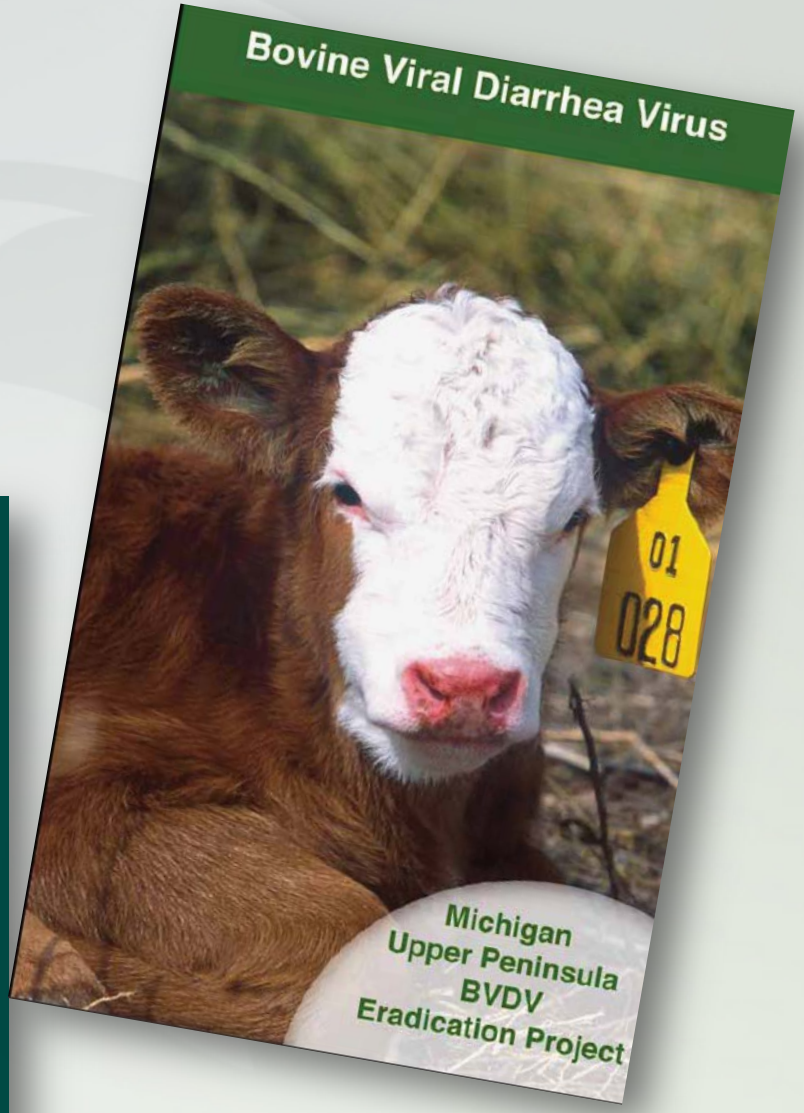
#1 – If you are taking cattle to the UP fair, **you must be able to show evidence that the cattle are BVD –PI negative.** That means they needed to be tested for PI BVD virus and negative or they are the mother of an animal that has tested negative. The testing can be done for free if you are a youth exhibitor or your cattle are part of a whole herd test. Please contact Ben Bartlett (906)439-5880 or Dr. Mike Brunner, (906)786-5463 for sign up information. If you have a large herd and only want to test the animals going to the fair, please contact your local veterinarian.

#2 – The number of participants and number of cattle in the BVD – PI eradication program continues to increase. 182 participating farms or youth groups, representing 11,008 cattle with 94 farms sending in 3,709 samples. The sign up has slowed some since we know cattle are out on pasture and people are busy making hay.

#3 – The BVD – PI eradication Team is planning to meet in mid July to discuss how the program is going, how we will recognize farms that completed testing this year, and how we will do a sample of follow up testing this year, and how we


Biosecurity It's on everyone's mind
Test - Disease Screening
Isolate - 30 Feet for 30 Days
Sanitation - Clean & Disinfect
Vaccinate - Build Immunity
cvm.msu.edu/bvdup
Partnering in Animal Health
BVDV Eradication Project
Pfizer
MICHIGAN STATE UNIVERSITY EXTENSION


COOPERATOR
Upper Peninsula
BVDV Eradication Program
MICHIGAN STATE UNIVERSITY EXTENSION
Pfizer
Pfizer Animal Health
DCPAH


Bovine Viral Diarrhea Virus
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028
Michigan
Upper Peninsula
BVDV
Eradication Project

Summary of Results Over 4 yrs

- Total Cattle Farms in UP = 495
- Total Farms Participating = 294 (59%)
  - Number of Farms w/ BVDV Positive Cattle = 9

- Total Cattle in UP = ~49,000 (NASS 2010)
- Number of Cattle in Program = 26,148 (53%)
  - Number of positive cattle = 24 out of 17,917 samples submitted (0.13%)

Industry Impacts

- Tremendous Excitement
- Industry Cooperation
- BVDV Free Livestock Exhibits
- Marketing of BVDV Free Cattle
- New Appreciation For Biosecurity
- New Focus Comprehensive Disease Control
  - Biocontainment + Biosecurity + Vaccination

Partnerships

- Producers and Cattle Industry
- Michigan State University
  - College of Veterinary Medicine
  - MSU Extension
  - DCPAH
- Pfizer Animal Health
- USDA APHIS VS
- Michigan Department of Agriculture AID