Georgia Dairy CONFERENCE

SAVANNAH GEORGIA

Milk Quality Management: Turning Diagnostics Into Decisions

Dr. Justine Britten
Udder Health Systems
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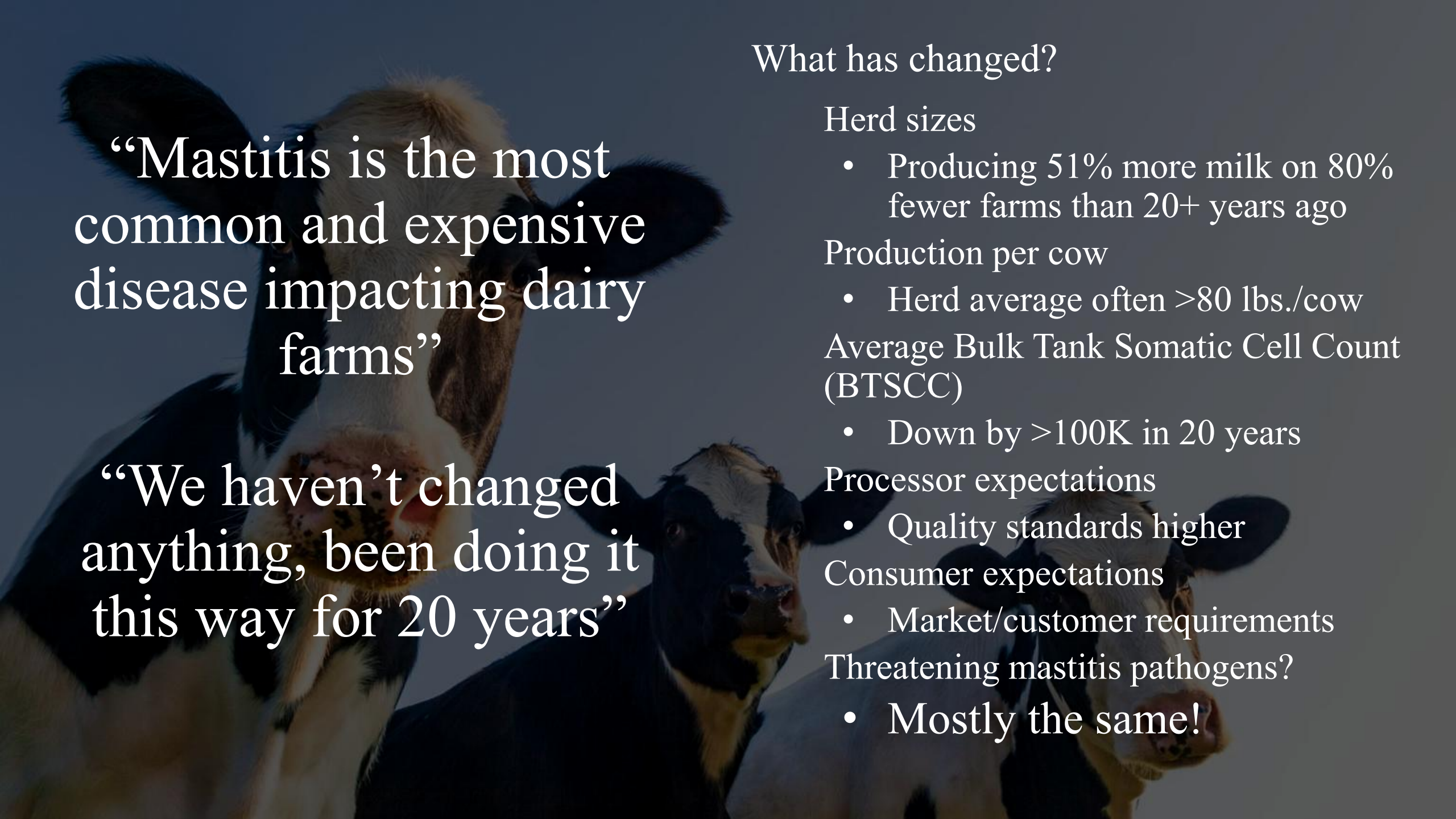


"Mastitis is the most common and expensive disease impacting dairy farms"

"We haven't changed anything, been doing it this way for 20 years"

What has changed?

Herd sizes

- Producing 51% more milk on 80% fewer farms than 20+ years ago

Production per cow

- Herd average often >80 lbs./cow

Average Bulk Tank Somatic Cell Count (BTSCC)

- Down by >100K in 20 years

Processor expectations

- Quality standards higher

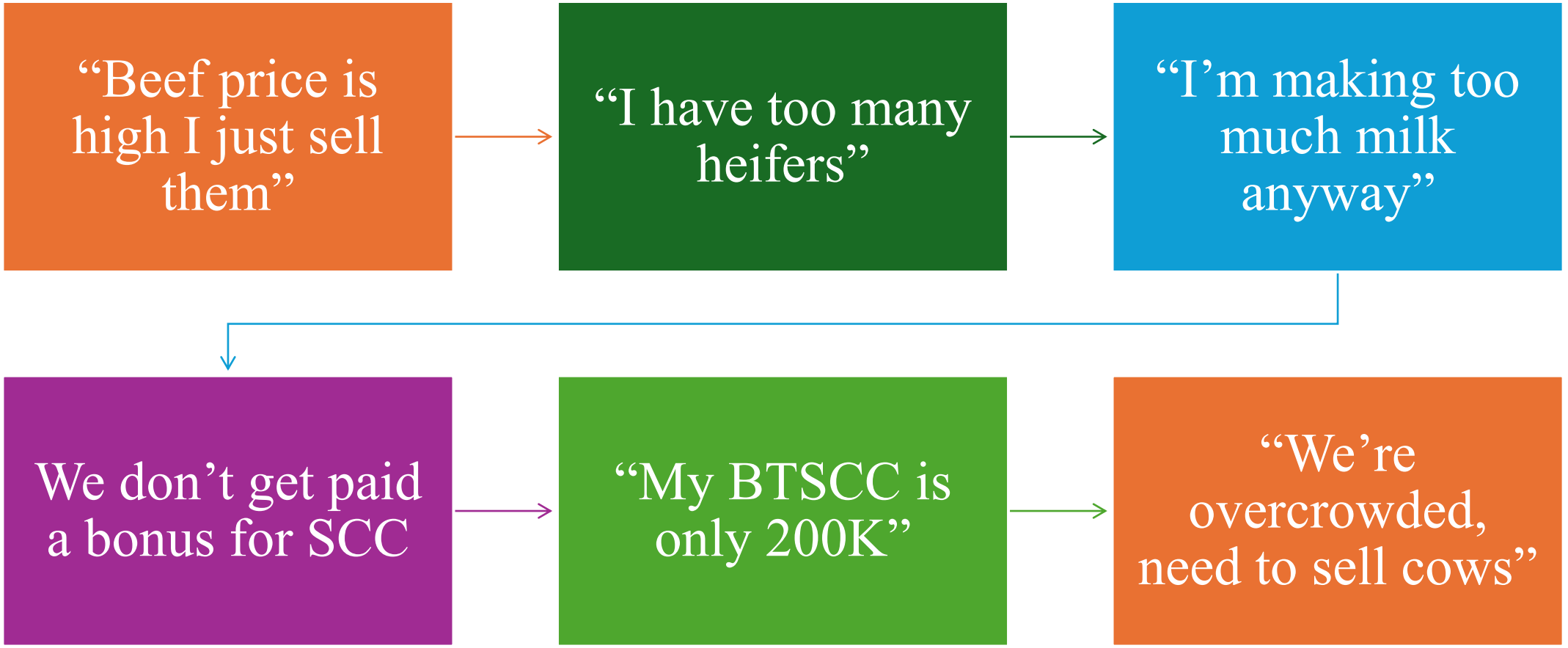
Consumer expectations

- Market/customer requirements

Threatening mastitis pathogens?

- Mostly the same!

So, what's the problem?

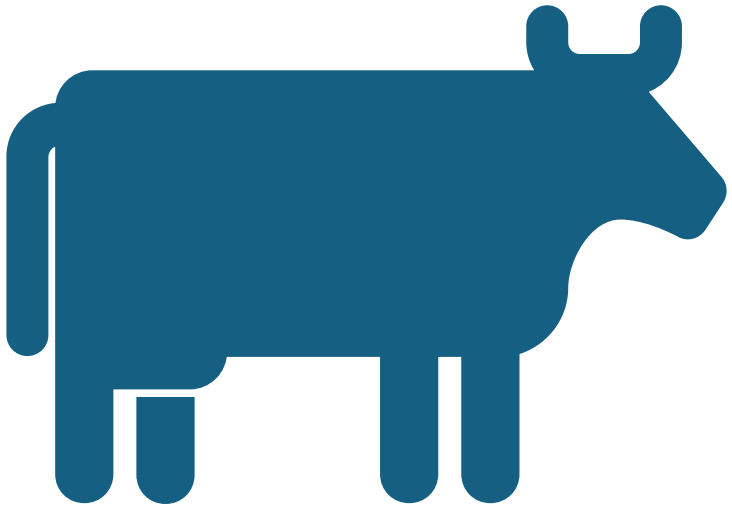


Why Diagnostics Matter

Things I hear the most….

- “I feel like we’re having more mastitis”
- “Seems like there are more Staph cows this month”
- “We’ve never had this many __()___before”
- “But we haven’t changed anything”

Don’t GUESS, use DATA!



Fact: You have an enormous advantage with the dilution effect of a large herd

Fact: This becomes a double-edged sword when disease containment becomes necessary on a large scale

Why do we care?

- Mastitis can and will hide and smolder in your herd
- Contagious mastitis is still a major threat to all herds
- This smolder *will* become a fire *when* enough variables in the equation change
- If you don't have a plan for Contagious Mastitis, it has a plan for you!

Learning Objectives

- Key characteristics of major contagious pathogens
- Real world examples of contagious outbreaks
- Levels of on-farm lab programs
- Advantages and pitfalls of PCR use

Contagious Pathogen Updates

Perspectives and Data from a Milk Quality Lab

Contagious Mastitis Pathogens

Goal: Identify, Control and Prevent

Source: udders, cow to cow transmission

Targets:

- Staph aureus
- Strep ag
- Mycoplasma
- Prototheca

Prototheca

Key Challenges and Solutions

Prototheca

Rising prevalence?

Or are we just getting better at detecting?

Need to make sure we're asking the RIGHT questions!

	Prototheca (+)	# Of Bulk Tanks	% Positive
2008	2	541	0.4
2009	5	488	1
Jan-April 2010	4	404	1
May-Dec. 2010	130	579	22
2011	157	474	33
2012	119	483	25
2019	158	612	26
2020	154	675	23
2021	153	570	27
2022	161	535	30
2023	134	498	27

Eradication Challenges

Low SCC: Very poor indicator of infection

Subclinical

Underestimating cow to cow transmission

Under detection – Culture protocols may miss, **why**?

- Non-selective agar
- Slow growth
- Low shedding
- Pooling

Prototheca in the Environment

Environmental Sources – Relevant but KEY reservoir is the cow

- It WILL be in bedding if in the cows!

Water sources

- Variable but less likely
- Flush water often problematic

	Bedding	Water	Towel
None Detected	374	142	16
Prototheca Spp.	274	19	2
Totals	648	161	18
%	42%	12%	11%

Prototheca in the Cows

Reason Sampled	Total Positives	Blood Agar Positive	Prototheca Agar Positive	Total Samples	% Prevalence
Fresh	644	33	611	13771	5%
Clinical or High SCC	952	339	613	16632	6%
Herd Culture	185	0	185	4843	4%
Hosp. Out/Dry-Off	62	0	62	2013	3%
Retest	45	1	44	506	9%
Unknown Reason	364	100	264	5232	7%

UHS Cow cultures – Blood Agar: 186,438 (2015-2020)

- 251 Prototheca isolates identified – 0.14%

UHS Cow Cultures – Prototheca Agar: 106,219 (2015-2020)

- 2,676 Prototheca isolates – 2.5%

Mastitis Species = *Prototheca bovis*

Prototheca Detection Frequency

	2022	2023	2024	2025	2026
Test Positive	52	55	13	4	0
Tests Total	58	98	71	212	4
Percent Positive	89.7%	56.1%	18.3%	1.9%	0.0%

When do you go further?

Is it in the bulk tank?

- Should trigger investigation

Is the bulk tank SCC elevated?

- Often not a good indicator

Are there clinical cases?

- Cow to cow transmission IS a concern!

Outcome

String Samples – July ‘23

14 Total pens

Cultured all for Staph aureus & Prototheca

10/14 Pos. for one or both

Kept Chasing….

~600+ samples (Herd)

Began Fresh screening

Sampled Ind. Cows

~1200 total samples

69 Staph aureus cows

11 Prototheca cows

Clean Tank – June ‘24

Took 1 year of strings, mass sampling events and fresh screening to finally eradicate

Repeated Strings

2 Pens Pos. – Prototheca

7 Pens Pos. – Staph aureus

Another example….

4000 cow dairy; milking on 80 stall rotary, new startup 2021

Culture program: (University VDL)

- All fresh cows and heifers
- All mastitis cows

40% of fresh cultures positive for Prototheca

- Began late January 2025

December 2024 Bulk Tank SCC = Avg. 150K

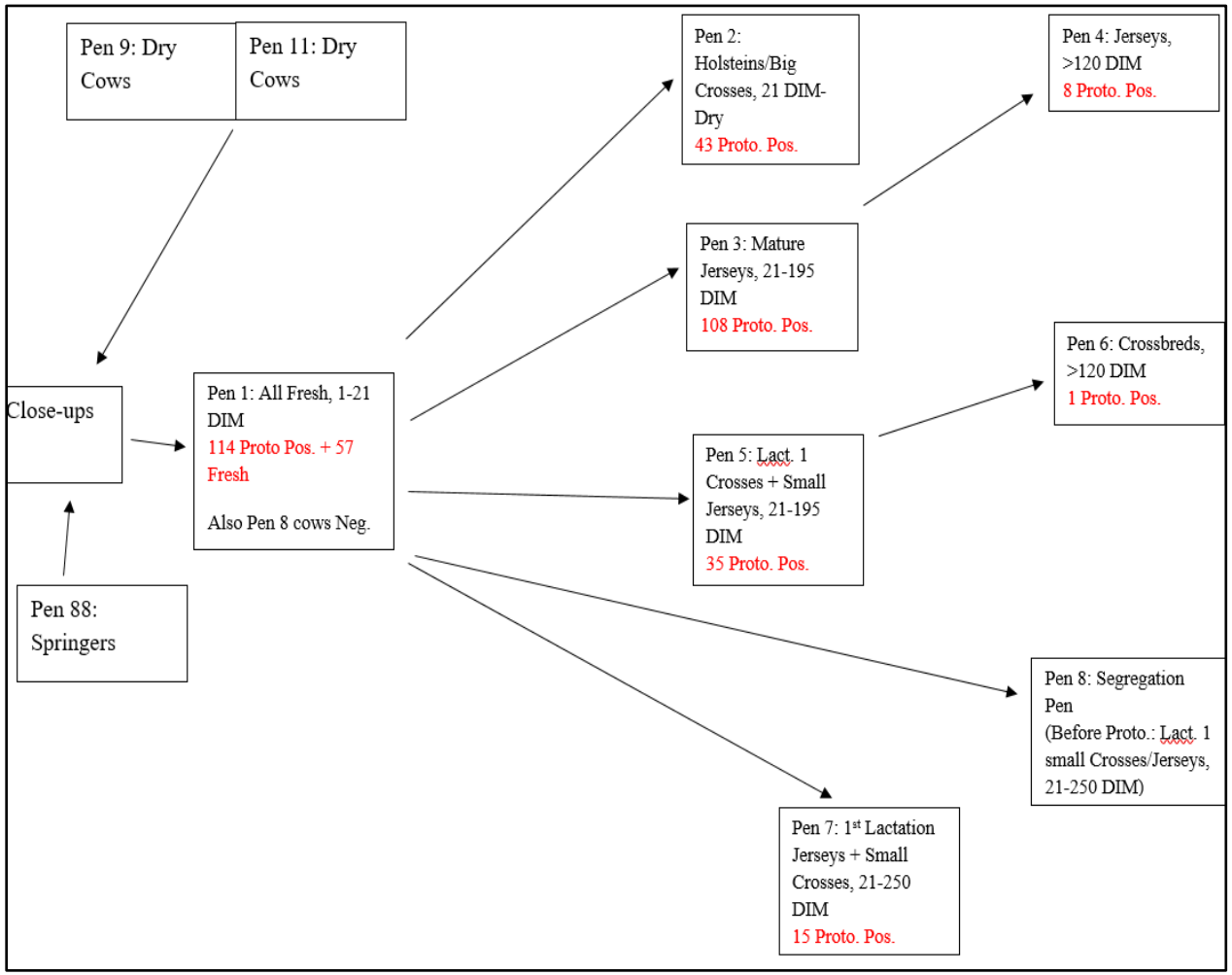
March 2025 Bulk Tank SCC = Avg. 300K

What would YOU do?

Herd Summary Report For 2025

POSITIVES

Month	Streptococcus agalactiae (1)	Staphylococcus aureus (3*)	Prototheca (15)	Mycoplasma (18)	Totals
January	-	-	-	-	0
February	-	-	-	-	0
March	-	125	416	-	541
April	-	17	65	22	104
May	-	21	105	4	130
June	-	7	10	3	20
July	-	23	5	1	29
August	-	17	3	1	21
September	-	24	9	-	33
October	-	3	3	-	6
November	-	5	9	-	14
December	-	10	21	-	31
Total Positives	**0**	**252**	**646**	**31**	**929**
Total Tests	**8736**	**8736**	**10581**	**7967**	



Outcome

Take Home

- Segregate or eradicate; MUST contain the problem!
  - Focus on cow to cow transmission
  - High quality germicides and backflush
- Aggressive approach has been most successful in my experience
  - Ensure “clean” pens are truly clean!
- Every contagious has a tipping point!

Staph aureus & Strep ag

Are they back?

Is Staph aureus still a problem?

<u>The #1 pathogen I am dealing with in large herds</u>

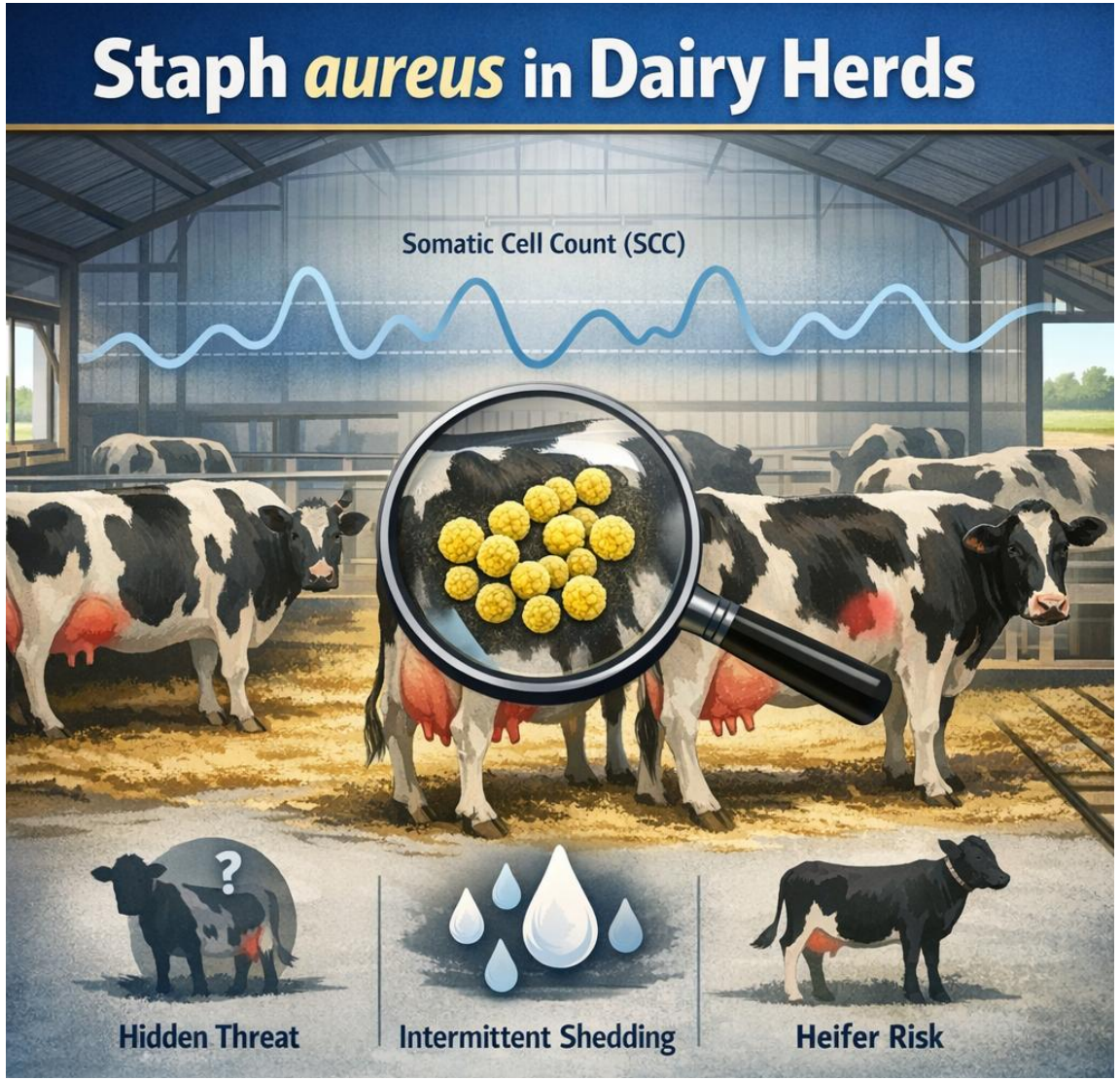
WHY???

Haven’t we learned anything about Staph aureus in the last 50 years???

Historical: High SCC cows/tank, clinical mastitis, exponential increase

Actual:

- Smolders and hides in herd
- SCC is a lagging indicator
- Low clinical mastitis rate
- Production relatively unaffected
- Slow progression
- Intermittent shedding
- Higher heifer prevalence



Cow and Tank SCC Impacts

Not all S. aureus cows will have an elevated SCC!

- SCC will increase over time as udder health declines and infection progresses
- Both number of infected animals **and/or** severity of infections can drive SCC

How many infected animals does it take for a tank to go positive?

- Many factors: size of the herd, size of the tank/silo, number of high shedders vs low shedders, number of animals infected, laboratory method/protocol

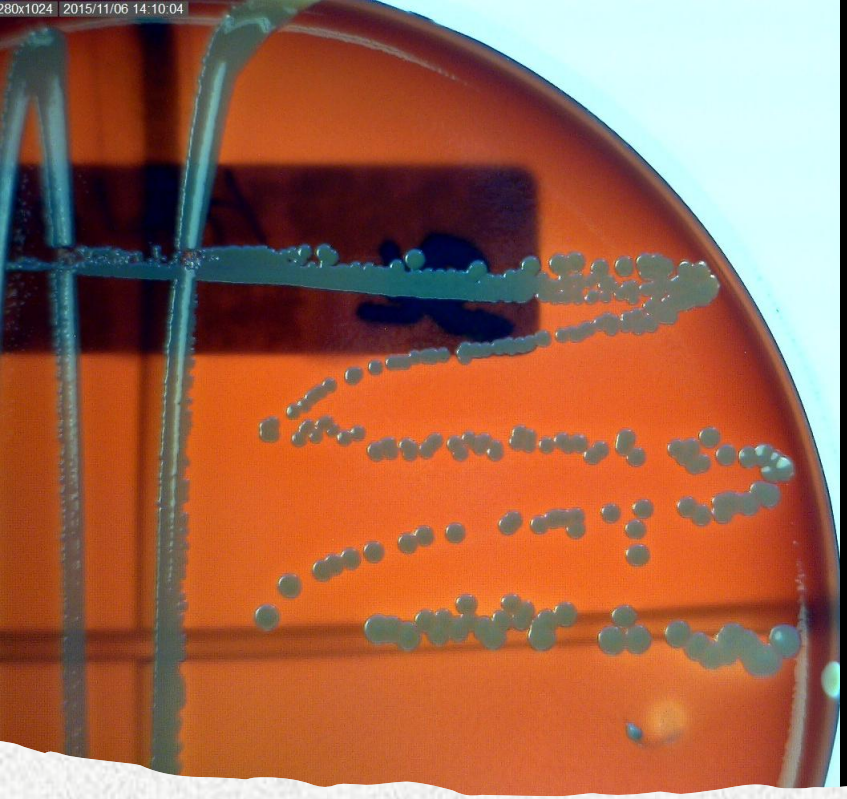
Relationship between culture status of tank and infection status in the herd is moderate at best!

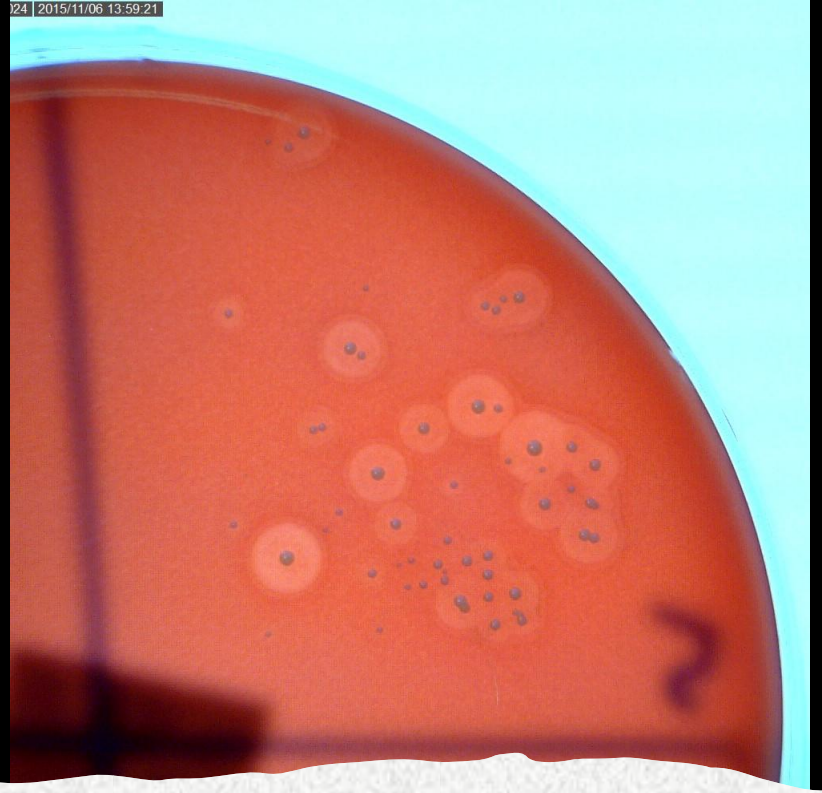
Staph aureus Culture Sensitivity

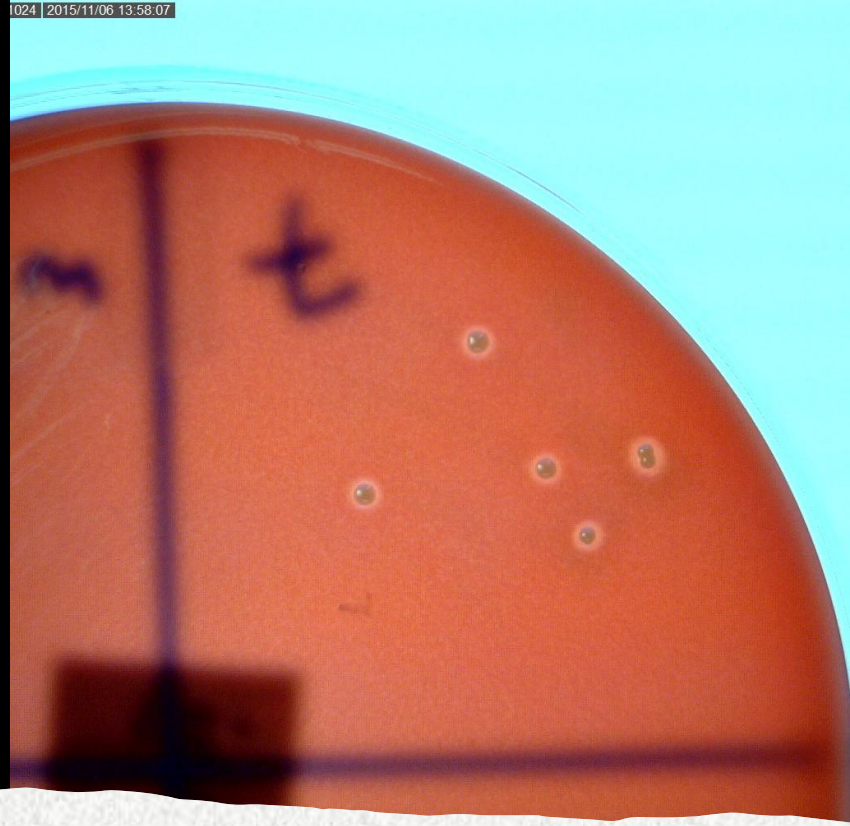
- Detection Range: 30-95%* (!)
- Sampling strategy will significantly impact
  - Composite
  - Quarter
  - Consecutive samples
  - Pooling
  - Volume

Cow ID	Result 1	Result 2	Result 3	Result 4	Result 5
3032	+	+	-	+	-
2575	+	-	+	N/A	N/A
2342	-	-	-	+	+
2259	+	-	+	N/A	N/A
3433	+	+	+	-	-

*Kenneth L. Buelow, William J. Goodger, Michael T. Collins, Murray K. Clayton, Kenneth V. Nordlund, Chester B. Thomas. A model to determine sampling strategies and milk inoculum volume for detection of intramammary Staphylococcus aureus infections in dairy cattle by bacteriological culture, Preventive Veterinary Medicine, Volume 25, Issues 3–4, 1996, Pages 343-355.







Staph aureus Variations

Culture limitations:

- Variable hemolysis → "Classic" Beta not reliable!
- Variable coagulase (rare)

These are all Staph aureus!

How many are we missing?

UHS Staph Study

Staph Aureus Research Project - Data Overview

Total Records

Total Records:	2016	RESEARCH:	1961	400:	55

Staph. aureus Biochemical Groups

Coag+ Beta+	164	66.9%	Coag+ Beta-	72	29.4%
Coag- Beta+	2	0.8%	Coag- Beta-	5	2.0%

Records by Lab (Not Including 400s)

Bellingham (1):	185	9.4%	Meridian (2):	1776	90.6%
Jerome (3):	0	0.0%	Layton (4):	0	0.0%

MALDI Results

Staph aureus (MALDI):	245	12.5%
Staph chromogenes (MALDI):	1213	61.9%
Staph haemolyticus (MALDI):	101	5.2%
Staph simulans (MALDI):	45	2.3%
Staph sciuri (MALDI):	29	1.5%
NRI:	93	4.7%
All Others:	234	11.9%
All Non-Blank Results:	1960	
Non-aureus Staph:	1565	79.8%

PCR Results

Staph aureus (PCR):	245	12.5%
ND (PCR):	1714	87.5%
Total Results:	1959	

Staph aureus in Heifers

Fresh Heifers

- Prevalence at calving may be high
- Some risk of “false” positive exists
- Reference range: 2-15%

When is it considered a problem?

- >10% is high and concerning
- >15-20% is very high
- Goal: <5%
- What can YOU control?
  - Sample collection, fly control, pasteurization

Treatment Outcomes

- Moderate to poor prognosis (~50-60%)
  - How defining cures?
  - Common: single negative culture, 2 weeks post treatment
  - Better: 3 negative cultures, at least 2 weeks apart

Five Pillars of Control

Teat dipping

- Products: 1% Iodine
  - Avoid cheaper germicides
- Coverage: robots, spray, walkovers, foam present some risk!

Backflush

- Iodine or chlorine
- Manual backflush→ Excellent tool if used consistently!

Dry treating

- Blanket antibiotic treatment
- Selective treatment or DCT Alternatives Risky

Identify, segregate or sell

- Quarantine pen
- Permanent ID and visible tag
- Can't manage what you can't see

Zero Tolerance

- Maintain a Negative Bulk Tank
- All Staph cows are sold

Strep ag…Should you worry?

- Very low prevalence but NOT zero
- Will “hide” in large herds – Frequently no consequence
- Organic herds at higher risk
- Herds with Selective DCT or no DCT at higher risk
- May smolder vs explosive outbreak; many variable
- False Positives are a significant Risk!
  - Strep uberis (common)
  - Others exist
- Confirmatory testing must be mandatory for Strep ag!
  - PCR
  - Maldi-ToF

Case Study

- 2000 cow dairy; Holstein, Montbeliarde, VikingRed crosses
- Milking 3x on a 60-stall rotary:
  - Premilking: Future Cow & attach
  - Postmilking: Walkover sprayer
  - No wiping or stripping steps
  - No backflush
- January 2025: Raw count = Avg. >25K, lost bonus
- Bulk Tank SCC: Avg. >200-250K, lost bonus
- February 2025 → Ready to take action

Mistakes were Made….

- Bulk tank positive for 3 years before action taken
- Walkover sprayer broke in April→ limited post dip application for 2 weeks
- Not all positive cows were sorted initially
- Selective dry treatment (maybe stopped altogether?)
- “Minimal” culture program
  - No fresh animals
  - 3-8 clinical samples/week
- No mastitis detection in milking procedure

Outbreak Timeline

Feb. 2025 – Cultured entire herd
- 599 Positive Strep ag
- 258 Staph aureus

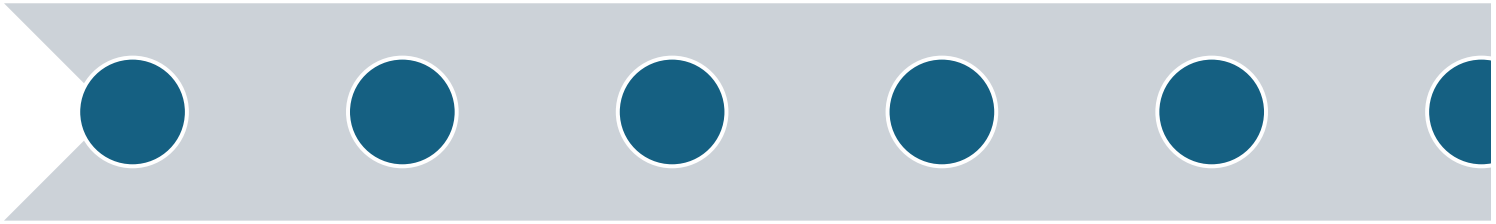
March 2025 – Began sampling fresh cows

April 2025 – Resampled fresh pen; >70% Strep ag, 30% Staph aureus

May 2025 – Began sampling fresh/breeding pens weekly

June-August – Strategically sampled pens, sorted, treated and resampled

July 2(Implem backflus medicate



Herd Summary Report For 20

POSITIVES

Month	Streptococcus agalactiae (1)	Staphylococcus aureus (3*)	Prototh
January	84	29	
February	626	263	
March	21	29	
April	173	83	
May	99	434	
June	73	206	
July	14	116	
August	10	28	
September	2	18	
October	2	21	
November	1	16	
December	3	12	
Total Positives	**1108**	**1255**	

A Word about Streps….

Very challenging to resolve on large dairies!

- *Strep dysgalactiae*
- *Strep uberis*
- *Lactococcus garviae*
- *Lactococcus lactis*
- *Enterococcus species*
- *And more*

Need to know:

- Culture accuracy is moderate at best → Maldi-ToF is King
- "Contagious like" – Bacterial load often high

HOW does knowing the species change management decisions?

Takeaways

- Germicides and backflush are your friends!
  - Manual backflush with medicated drop hose
- High bacterial loads on milking surfaces provide transmission opportunity
- Many infections will be subclinical
- Reduced antibiotic use allows opportunity
- High bacterial loads in bedding → Manure solids/recycled bedding WILL be a challenge!
  - Dryer is better
  - Killed with high heat is best
- Don't ignore chronic high SCC cows

On-Farm Lab Programs

Friend or Foe?

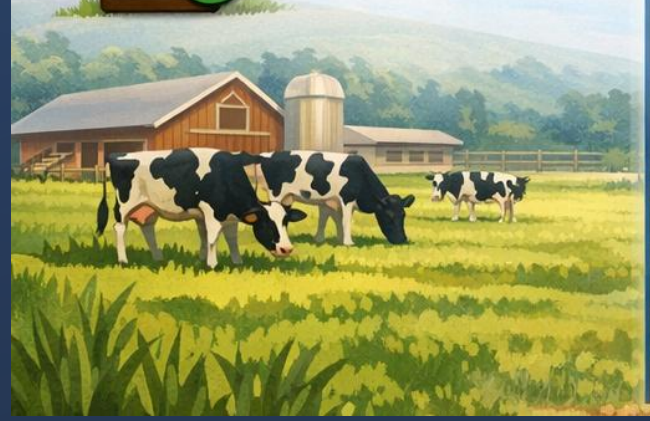
On-Farm Labs in Dairy Management

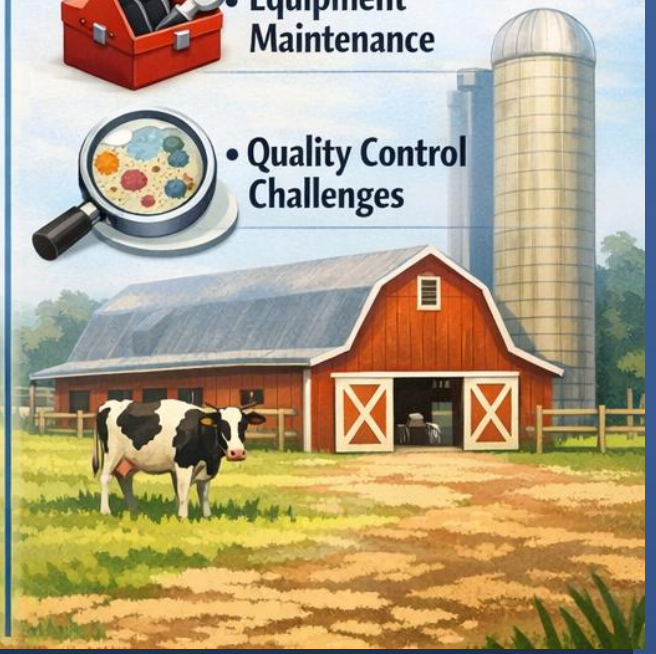
Advantages

- Faster Turnaround Time
- Cost Savings
- Convenience
- Immediate Decision-Making

Disadvantages

- Need for Specialized Training
- Risk of Misidentification
- Equipment Maintenance
- Quality Control Challenges





Scope of Service

- Contagious Mastitis Organisms
- Environmental Organisms
- Rare/low prevalence organisms
- Speciation
- Environmental testing
  - Water
  - Teat dips
  - Towels
  - Bedding

Organism	TNT	Level 1	Level 2	Level 3
Gram Positive	•			
Gram Negative	•			
Strep agalactiae		•	•	•
Strep non-ag		•		
Staph aureus		•	•	•
Staph spp		•	•	•
Mycoplasma		•	•	•
Coliform		•		
Bacillus		•	•	•
E coli			•	•
E-strep			•	
Strep spp			•	
Klebsiella pneumonia			•	•
Pseudomonas			•	•
Trueperella pyogenes			•	•
Strep uberis				•
Strep dysgalactiae				•
Serratia				•
Pseudomonas aeruginosa				•
Pasteurella				•
Proteus				•
Yeast				•
Corynebacterium bovis				•
Prototheca				•

Expanded On-Farm Testing

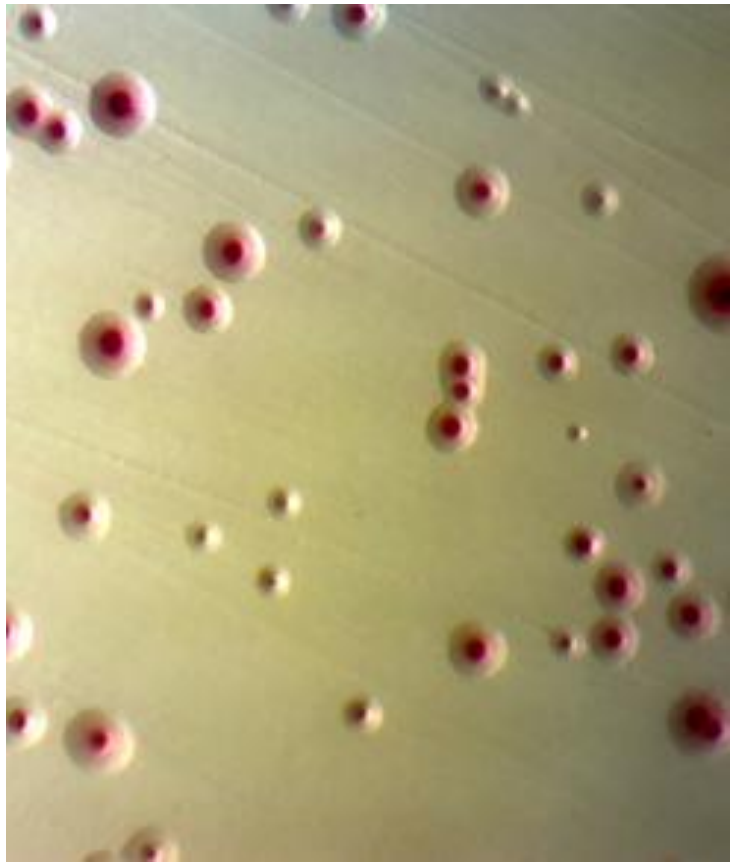
Options

- Beyond the Bi-/Tri-plate
- Contagious: Staph aureus, Prototheca
- Mycoplasma? Gram-negatives?

What questions should you be asking?

- What is the primary goal for on-farm culture?
- Is there a target organism or group of organisms?
- Who will be responsible for oversight of the culture process?
- How will quality and accuracy be periodically audited?
- Can these objectives be met with on-farm or is a professional lab required to assist?

Selective Agar



Primary Isolation agar—Blood Agar

- Inexpensive plate
- Requires experienced analyst

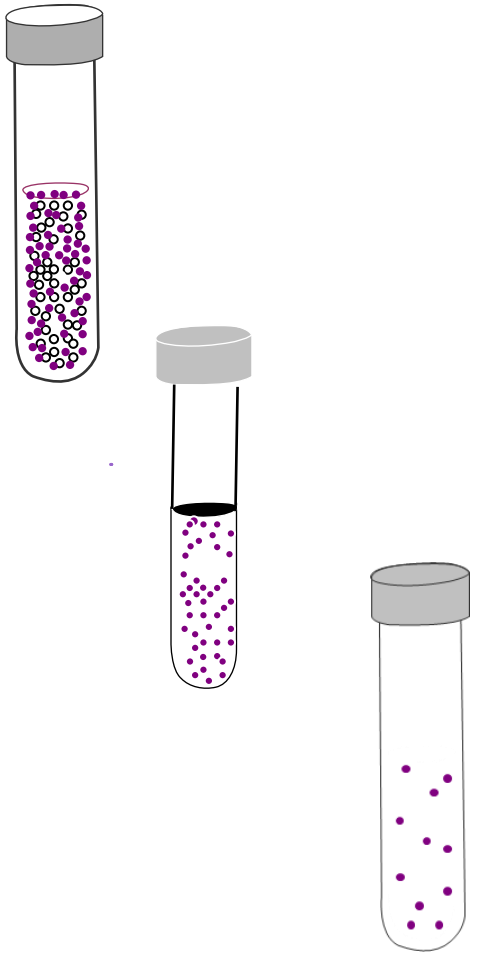
Allows ALL bugs to grow

Specialty Agars

- Selects for specific targets
- Increase sensitivity by allowing larger inoculation size
- Inhibit non-target growth
- Color detection (chromogenic)

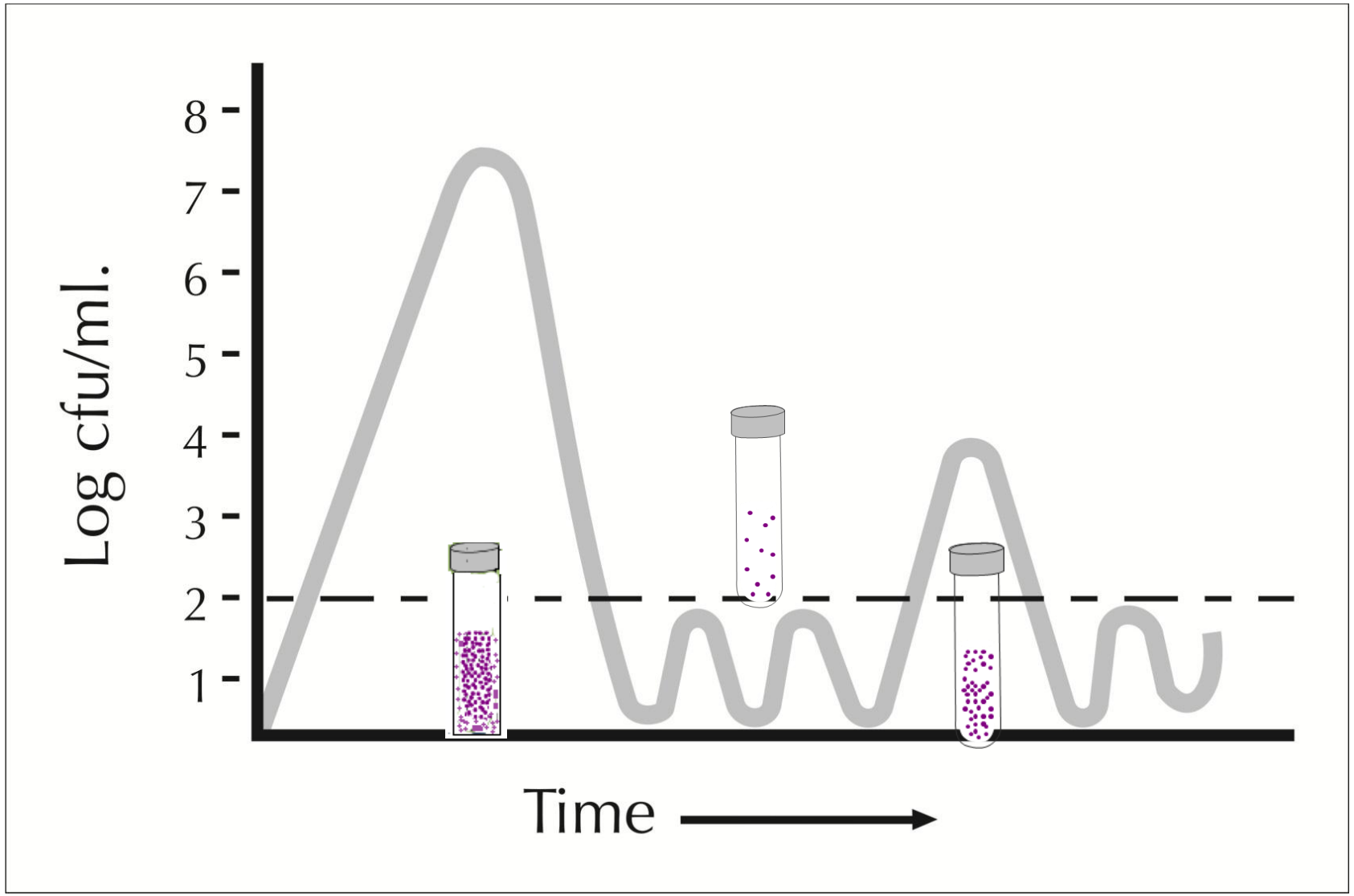
Selective agars have limitations!

Variation in Shedding



- Very High Shedding= Test Positive
  Counts 1000 to 1,000,000 CFU/ml
- Moderate Shedding= Test Positive
  Counts 1000 to 1,000,000 CFU/ml
- Low Shedding= Test Variable
  Counts <100 CFU/ml

Shedding Patterns



Ask yourself…..

…….What are you trying to achieve?

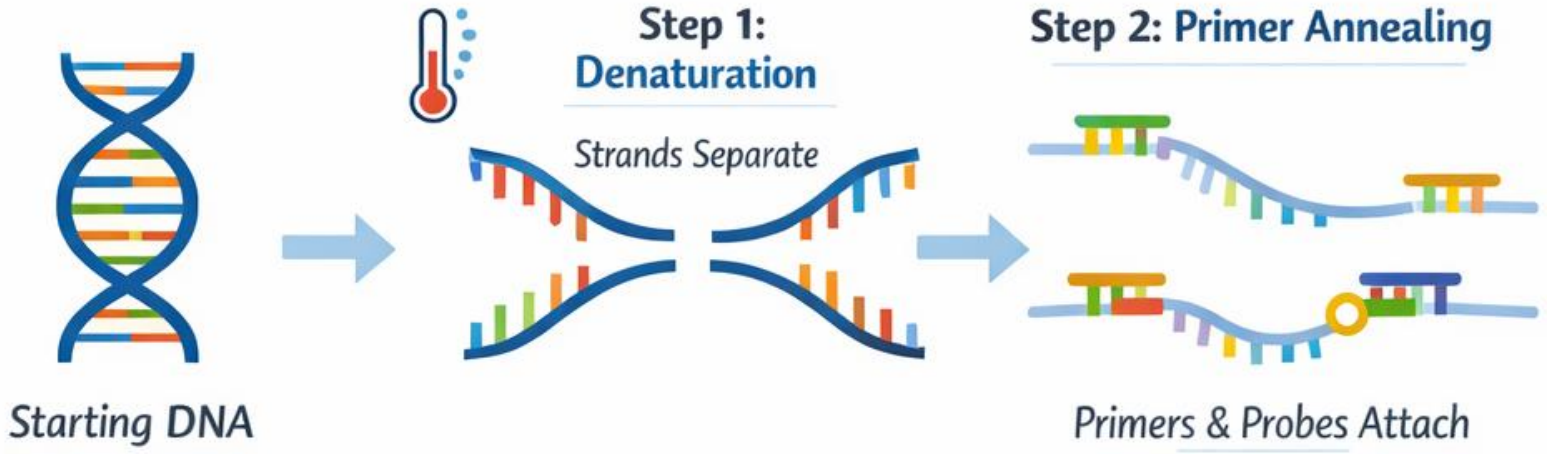
When to hold ‘em and when to fold ‘em

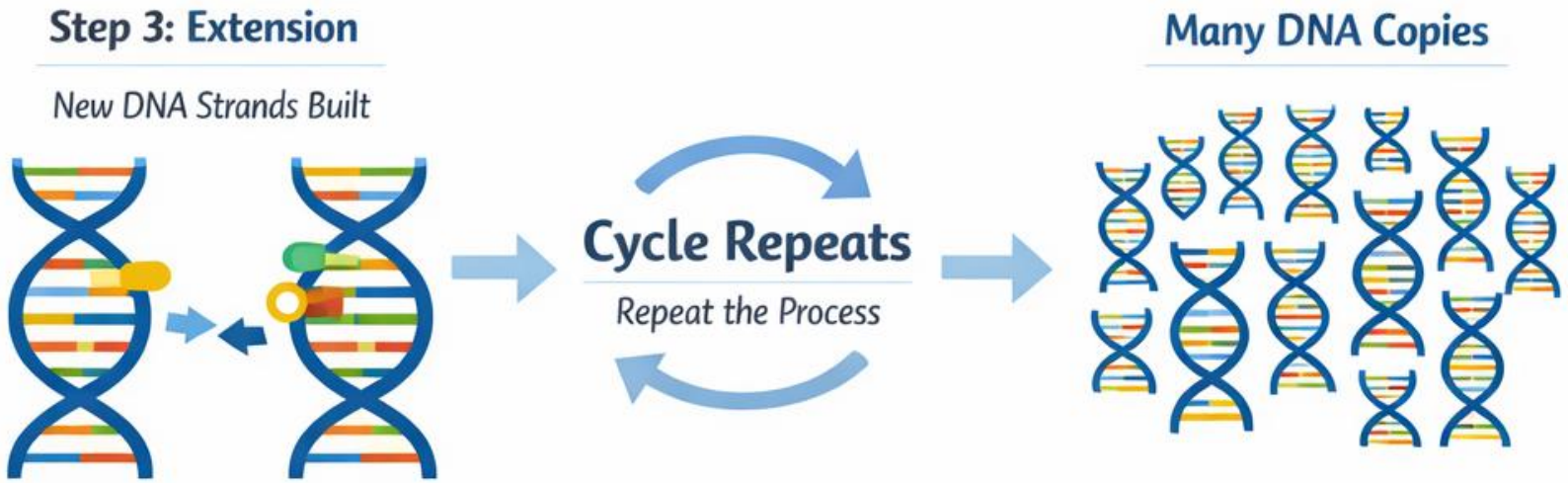
Not Ideal for On-Farm Lab:

- Environmental samples
- Bulk tank cultures
- PCR
- Mycoplasma?

Use sophisticated external lab for these services!

PCR Basics





- Detection of DNA, not live bacteria
- If target is in sample, it WILL detect!
- Higher risk of cross-contamination…Why?
  - ➢ Amplification!

Heifers will spontaneously calve Myco positive

- Being closed helps but does not prevent
- Calving with Mycoplasma is a matter of “when”, not “if”
- May carry Mycoplasma in other body sites without expressing in the udder

Acholeplasma

- 40-50% of cow samples may be contaminated with Acholeplasma (soil organism)
- This false positive organism lives on ALL dairies

Speciation matters!

- M. bovis is not the only pathogenic Mycoplasma
- M. bovigenitalium is a very common, non-contagious Mycoplasma

Mycoplasma (lesser-known facts)

Mycoplasma species in the Udder

- *M. bovis*
- *M. californicum*
- *M. alkalescens*
- *M. canadense*
- *M. arginini*
- *M. bovigenitalium*

- *Acholeplasma spp.* ⟶ Non-pathogenic “false positive”

Mycoplasma Plate PCR Data

Outlab (2019-2025)		
Acholeplasma sp.	1665	41.59%
Undetermined	174	4.35%
M. alkalescens	102	2.55%
M. arginini	24	0.60%
M. bovis	1191	29.75%
M. bovigenitalium	404	10.09%
M. canadense	67	1.67%
M. californicum	364	9.09%
Mycoplasma sp.	12	0.30%
Total run	2164	54.06%
Total	4003	100.00%

UHS Plates (2019-2025)		
Acholeplasma sp.	6443	59.14%
Undetermined	354	3.25%
M. alkalescens	187	1.72%
M. arginini	61	0.56%
M. bovis	2455	22.53%
M. bovigenitalium	761	6.98%
M. canadense	139	1.28%
M. californicum	459	4.21%
Mycoplasma sp.	36	0.33%
Total myco	4098	37.61%
Total	10895	100.00%

Mycoplasma PCR

 Not all PCR assays are equal!	Machine & Assay determines capability → Why does this matter to you?
 PCR used for colony confirmation	Immediate differentiation of false positives (Acholeplasma) from Mycoplasma
 Same day or next day results of direct milk testing allows for faster response time	Identify infected animals sooner Shorten outbreak, save animals and reduce replacement cost
 Using PCR Results	***PCR does not differentiate between live and dead DNA***

Myco Outbreak – Hospital Transmission

- Hospital pen is involved in high percentage of outbreaks
- Non-mastitis cows may enter hospital and leave with Mycoplasma
- Intensive sanitation barely enough; clinical Mycoplasma cows shed extremely high load
- Hands, aprons, liners, etc. all can spread
- Freeze Hospital movement and sample ALL cows
- Repeat until no new positives

PCR Takeaways

Detects DNA, Not Live Bacteria

Environmental DNA Can Cause False Positives

Rapid Results Are Beneficial

Risk of Cross-Contamination

PCR Takeaways

- PCR will NOT differentiate between live and dead DNA
- Environmental DNA in the sample WILL be detected as positive
- DNA cannot be “killed” by germicides; must be denatured
- Rapid turnaround highly beneficial in appropriate situations
- Cross-contamination a real risk

Identifying the *agent* directs you to the solution to problem

- Biggest challenge of running a lab is training and quality management
- Bad information can be worse than no information
- Use **Cow Culture** to identify cause of clinical and subclinical mastitis.
- Use **Bulk Tank Culture** to monitor herd milk quality
- Eliminate contagious mastitis infected cows
- Identify and control environmental agents

“You don’t know what you don’t know!”

Preventing the Problem

Control programs will be more than the cost of the disease, *if they are done correctly*

- Key to success is compliance and consistency
  - Set the bar high; there will be slippage
  - Focus on what you can control
- Disease cost will far outweigh cost, if unmanaged
  - May take years!
- If you don't measure it, you can't manage it

If you don't have a plan for contagious mastitis, it has a plan for you!

Questions?

justinebritten@gmail.com
(208) 409-1840