Why know now?

How rapid in-clinic PCR changes the game for intramammary infection surveillance in fresh cows

Mastitis has significant economic impact

- A single case of mastitis during the first 30 days in milk is estimated to cost producers $444
- 30% is related to direct costs of treatment and discarded milk at the time of disease occurrence
- Majority of costs are indirect — future milk production losses, premature culling, replacement losses and future reproductive losses

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The cost of clinical mastitis in the first 30 days of lactation: An economic modeling tool

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ABSTRACT

Clinical mastitis results in considerable economic losses for dairy producers and is most commonly diagnosed in early lactation. The objective of this research was to estimate the economic impact of clinical mastitis occurring during the first 30 days of lactation for a representative US dairy. A deterministic partial budget model was created to estimate direct and indirect costs per case of clinical mastitis occurring during the first 30 days of lactation. Model inputs were selected from the available literature, or when none were available, from herd data. The average case of clinical mastitis resulted in a total economic cost of $444, including $128 in direct costs and $316 in indirect costs. Direct costs included diagnostics ($10), therapeutics ($16), non-saleable milk ($75), veterinary service ($4), labor ($21), and death loss ($32). Indirect costs included future milk production loss ($125), premature culling and replacement loss ($182), and future reproductive loss ($9). Accurate decision making regarding mastitis control relies on understanding the economic impacts of clinical mastitis, especially the longer term indirect costs that represent 71% of the total cost per case of mastitis. Future milk production loss represents 28% of total cost, and future culling and replacement loss represents 41% of the total cost of a case of clinical mastitis. In contrast to older estimates, these values represent the current dairy economic climate, including milk price ($0.461/kg), feed price ($0.279/kg DM (dry matter)), and replacement costs ($2,094/head), along with the latest published estimates on the production and culling effects of clinical mastitis. This economic model is designed to be customized for specific dairy producers and their herd characteristics to better aid them in developing mastitis control strategies.

1. Introduction

Clinical mastitis has been identified as the most common cause of morbidity in adult dairy cows in the United States (NAHMS, 2007). Based on surveys conducted in 1996, 2002, and 2007, the percentages of cows with clinical mastitis increased over time. These surveys also indicated the top reasons cows were permanently removed from a herd were udder or mastitis problems and reproductive problems. Additionally, mastitis and calving problems were the top reasons identified for cow mortality. Clinical mastitis results in many negative outcomes for the cow including pain, decreased production, culling, and death. The dairy producer incurs the cost of these negative outcomes through reduced quality and quantity of milk, as well as increased production costs. Intramammary infections may be subclinical infections in which the mammary secretions are not visually abnormal in color or consistency, or they may result in clinical mastitis (CM) in which there are abnormalities detectable in the milk, udder, or animal (Ruegg, 2011). Although subclinical mastitis is more prevalent than clinical mastitis, the economic impact of subclinical infections is more difficult to quantify and predict across herds due to the variability in herd level screening intensity and case definition. There is significantly more published information regarding the impact of CM on health, productivity and culling risk as compared to subclinical mastitis; thus, this study focuses on CM. Lactational incidence of subclinical and clinical mastitis varies greatly between herds, but the probability of acquiring an infection is consistently higher during the early dry period (Bradley and Green, 2004). The apparent incidence of mastitis that develops during the dry period is very low due to the lack of daily observation of the mammary secretions. However, the highest risk period for the detection of CM is in early lactation (Ruegg, 2011), and includes the detection of infections acquired during the dry period, as well as infections that occurred

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Why now?

To reduce risk of spreading infections, do any fresh cows or first-calf heifers this week have an intramammary infection?

What do I need to know?

Is this infection in this cow only?

Is it contagious?

Is she a carrier?

Is the infection treatable, manageable or new to the herd?

Why do I need to know now?

Several days after freshening, your producers' cows are ready to enter the milking herd and contribute to peak milk

If she's negative, you can give the producer peace of mind

If she is positive, you and your producer can make management decisions that protect the herd

Fresh cow surveillance is not new

However, current bacterial culture processes can be a hassle, expensive and not always suitable for in-clinic testing. Results may take days or weeks can be confounded by false negatives or positives

	Technology	Advantages	Disadvantages
California Mastitis Test (CMT)	Estimates the amount of DNA in milk secretions. The concentrations of DNA and white blood cells (WBCs) in milk are correlated. The CMT reagent lyses cells and exposes DNA.	Inexpensive, rapid and on-farm.	Non-Specific. Measures inflammation, not infection. There can be variability in scoring and interpretation. White blood cells are the Somatic Cells in SCC.
DHIA SCC	Automated counting of somatic cells in milk	More accurate than CMT. No additional on-farm labor needed. Results available via DHIA test results	Non-Specific. Measures inflammation, not infection. Test days may be monthly or more infrequent.
Bacterial Culture	Traditional bacterial culture requires incubation and potential speciation	Can provide identification of a specific pathogen. Previous "gold standard."	Specific, but very sensitive to contamination. Samples must be collected and handled correctly. Can take 3-7 days. Many pathogens require specific tests. Expensive. Many samples show no growth (false negatives)

Acumen Detection is changing the game

By providing in-clinic PCR technology, vets can now give producers the fastest, most specific and convenient way to know if a cow has an intramammary infection specific to a pathogen

	Technology	Advantages	Disadvantages
PCR Off Site Diagnostic Laboratory PCR	PCR (Polymerase Chain Reaction) is a fast technique used to "amplify" - copy - small segments of DNA in a sample. Specific small segments of DNA can be used to fingerprint the bacteria in a milk sample.	Specific, will detect DNA from both live and dead bacteria, making sample handling simpler. Fast. Can use multiplex to detect many types of bacteria in a sample.	Off Site Laboratory PCR requires sample to be shipped or brought to a laboratory that has larger, complex multiplex PCR equipment. Sample results may take 3-7 days. Dx. labs use more expensive steps to lyse the cells in the milk sample to extract the DNA. Expensive
PCR - Acumen Detection	Same	Same but an in-clinic solution that uses a PC with step-by-step guided instructions. Fast (run time is approx. 3 hrs.) Acumen reagents are single or dual channel. Patented milk lysis reagent provides simple low-cost DNA extraction.	Requires some on farm labor to run tests (weekly). Training provided by Acumen.

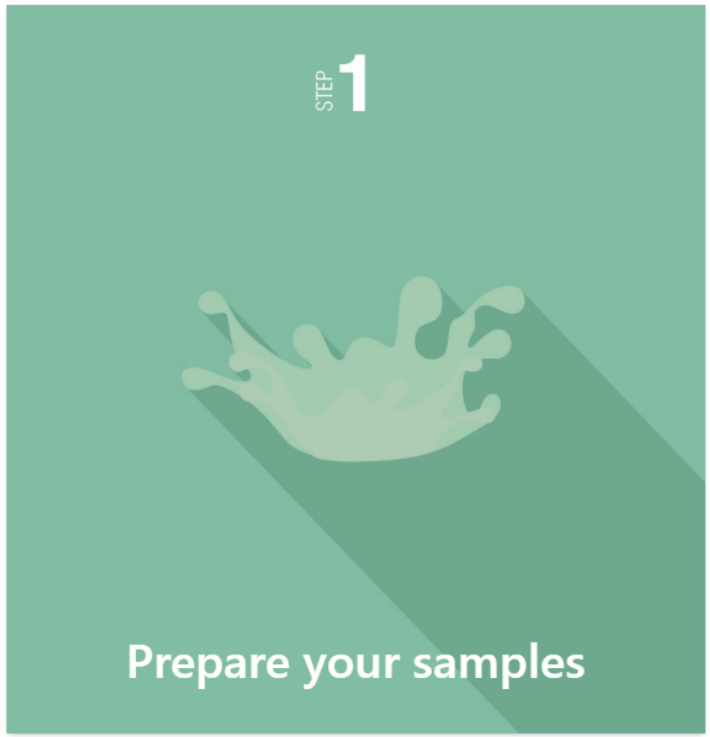
Acumen's ready-to-use reagents make sample prep quick and easy

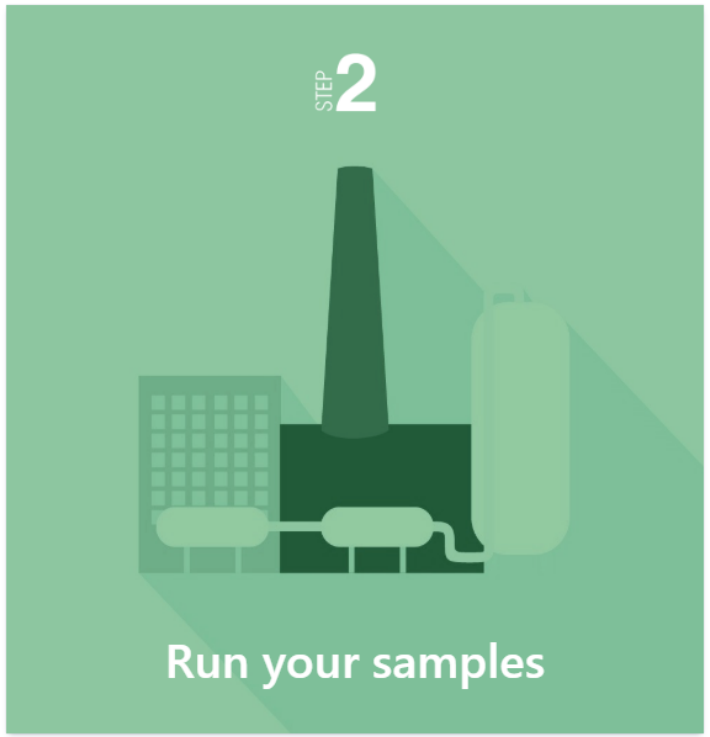
The included software program guides the user through every step of the testing process, and results are easy to read for anyone on staff

Acumen products

- **Milk lysis reagent**
- **Dual channel reagents**
  - MYPRO: Mycoplasma spp. & Prototheca spp.
  - SASUB: Staphylococcus aureus & Streptococcus uberis
  - STREP: Streptococcus uberis & Streptococcus spp.
  - STAPH: Staphylococcus aureus & Staphylococcus spp.
- **Single channel reagent**
  - MYCOB: Mycoplasma bovis

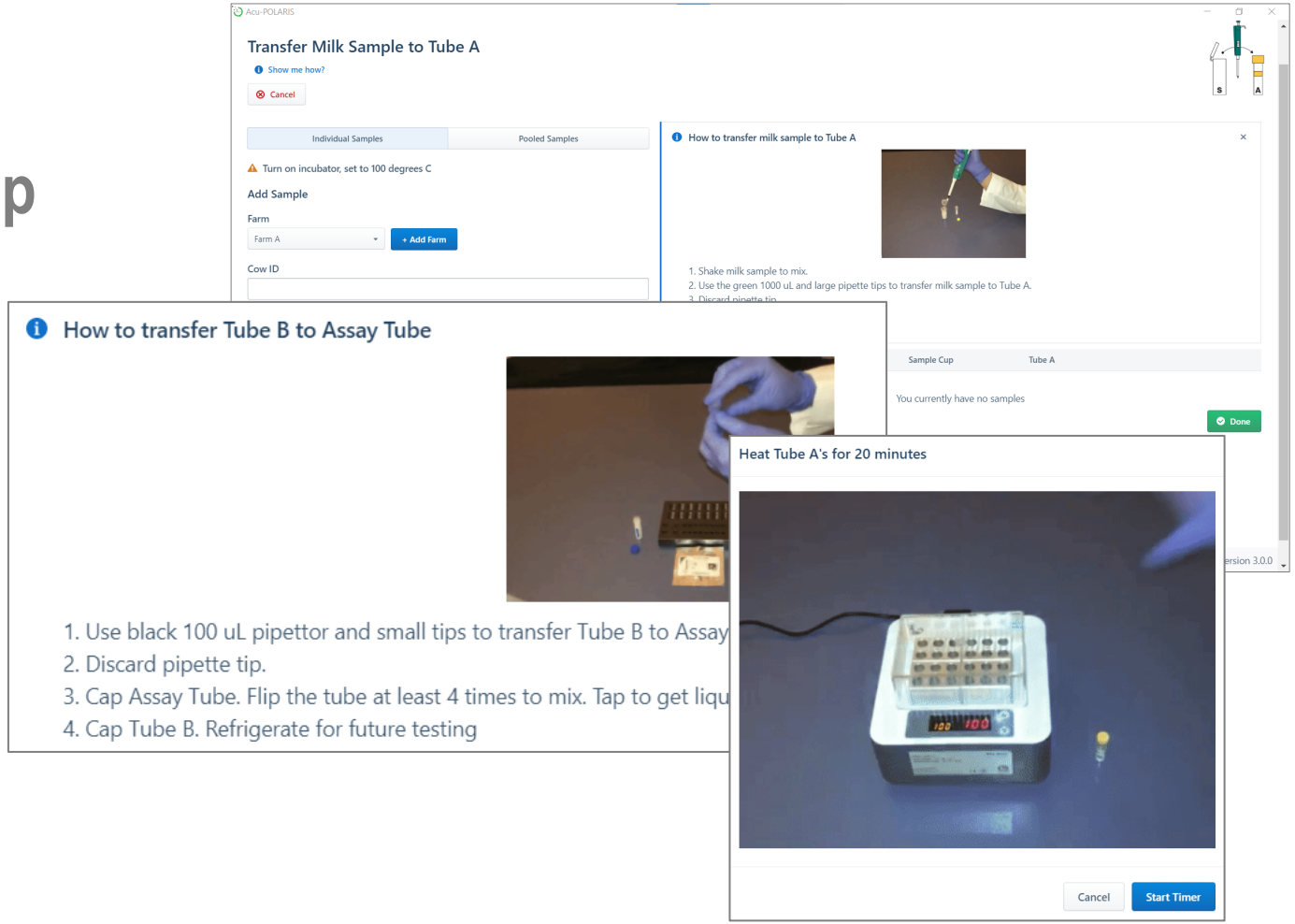
Simple testing procedure





Step-by-step guidance

- Provided software program walks staff through each step of the testing process
- Includes tutorials on how to complete each activity
- Supplies clearly marked to ensure accurate testing



Easy-to-read results

Experiment: 2020-02-06 01:48:06 PM

Farm	COW ID	Quarter	Assay	Channel 1	Channel 2
Farm A	LOT 12	COMPOSITE SAMPLE	SASUB	Streptococcal Absent RFU:12.21312 CT:3.1231	Streptococcal Uberus Absent RFU:12.21312 CT:3.1231
Farm A	46998	COMPOSITE SAMPLE	SASUB	Streptococcal Absent RFU:12.21312 CT:3.1231	Streptococcal Uberus Absent RFU:12.21312 CT:3.1231
Farm A	47836	COMPOSITE SAMPLE	SASUB	Streptococcal Absent RFU:12.21312 CT:3.1231	Streptococcal Uberus Absent RFU:12.21312 CT:3.1231
Farm A	48095	COMPOSITE SAMPLE	SASUB	Streptococcal Absent RFU:12.21312 CT:3.1231	Streptococcal Uberus Absent RFU:12.21312 CT:3.1231
Farm A	LOT 3	COMPOSITE SAMPLE	SASUB	Streptococcal Present RFU:12.21312 CT:3.1231	Streptococcal Uberus Present RFU:12.21312 CT:3.1231
Farm A	LOT 7	COMPOSITE SAMPLE	SASUB	Streptococcal Present RFU:12.21312 CT:3.1231	Streptococcal Uberus Present RFU:12.21312 CT:3.1231
Farm A	LOT 10	COMPOSITE SAMPLE	MYCOB	--	Retest suggested RFU:12.21312 CT:3.1231

Close | Export to Excel

Fresh cow surveillance procedure

1

Sample milk from fresh cows between 4 DIM and 10 DIM

2

Can test individual quarters or individual cows (composite 4 Qtr. sample)

3

Can test pooled samples from up to 5 cows. Retest the individual animals if the pooled sample is positive

4

View results in three hours. Document results in DC305 cow record or similar.

5

Determine action steps, discuss plan with your veterinarian or milk quality expert.

6

Execute plan

7

Repeat

Our staff works with you during the setup process

Ensures process works within your operation and can help you accomplish your producers' herd health and milk quality goals

Return on investment

Vet Clinic ROI example

Scenario: Fresh Cow Surveillance on herds totaling 5,000 cows

Costs

System: $8,500 (one-time cost)

Consumables: $25,000/year
5,000 cows at $2.5 per cow (5 cow pools)

Labor (testing): $8,334/year
$20/hour
5 minutes per cow x 5000 cows

Total costs
Year 1: $41,834
Years 2-5: $33,334/year

Benefits

Direct revenue: $90,000/year
$18 per cow x 5000 cows

Additional vet consults: $?/year
$put in your own estimates here

Total benefits
Year 1-5: $90,000/year

Return on investment: Year 1 = 2.1:1 **Net profit: $48,166 / year**

Years 2-5 = 2.7:1 **Net profit: $56,666 / year**

Producer ROI example (500 cows)

Scenario: Reduce SCC from 160,000 to 140,000 and reduce clinical cases by 15%

Producer's Costs

Vet testing charge: $9,000/year
500 tests at $18 per test

Labor (collecting samples): $833/year
$20/hour **x** 5 minutes per cow x 500 cows

Total costs
$9,833 / year

Benefits

Quality premiums: $12,000/year
$0.10/cwt premium x 240 cwt/cow/year x 500 cows

Reduced clinical mastitis: $8,325/year
$444 total lost per case x 500 cows x 25% incidence x 15% fewer clinicals

Total benefits
$20,325/year

Return on investment: 2.1:1

Net producer benefit: $10,492 per year

Producer ROI example (1,500 cows)

Scenario: Reduce SCC from 160,000 to 140,000 and reduce clinical cases by 15%

Producer's Costs

Vet testing charge: $27,000/year
1,500 tests at $18 per test

Labor (collecting samples): $2,500/year
$20/hour **x** 5 minutes per cow x 1,500 cows

Total costs
$29,500 / year

Benefits

Quality premiums: $36,000/year
$0.10/cwt premium x 240 cwt/cow/year x 1,500 cows

Reduced clinical mastitis: $24,975/year
$444 total lost per case x 1,500 cows x 25% incidence x 15% fewer clinicals

Total benefits
$60,975/year

Return on investment: 2.1:1

Net producer benefit: $31,475 per year

Operational benefits

- In-clinic detection of DNA in milk which may be from pathogens
- Test results in about three hours — no waiting days for culture results
- Fresh cows can be tested for as low as $2 - $2.50 per cow when using five-cow pooled samples
- Fresh cow surveillance provides data for early action to assess mastitis, and may reduce reliance on blanket treatment with antibiotics
- Opportunity for producers to increase milk quality premiums
- Opportunity for vet practice for additional consults

Your resources

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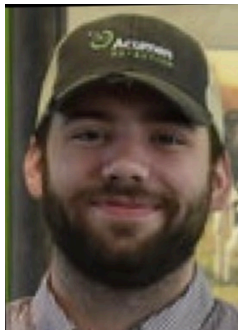

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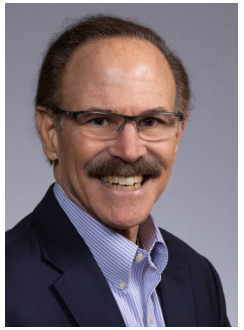

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How we can help

- Up to 6-month in-clinic trial periods
- References from DFA members and veterinarians who are using the system
- In-clinic and virtual support available from our staff
- Collaboration from consultants on developing surveillance and other protocols for your producers

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