KetoMonitor™
Measure Ketosis Prevalence in Your Herd

KetoMonitor: A research based tool to improve on-farm Ketosis Management

Heather White, Ph.D.; Tawny Chandler, BS; Gary Oetzel, DVM, MS
Robert Fourdraine, Ph.D.

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KetoMonitor™
Measure Ketosis Prevalence in Your Herd

- Collaborative research between
  - UW Department of Dairy Science
    - Heather White, Ph.D.
    - Tawny Chandler
  - UW School of Veterinary Medicine
    - Gary Oetzel, DVM, MS
  - AgSource

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Transition to Lactation

- Successful transitioning is key to production and health
- Transition period brings increased risk of metabolic disorders
- 40 to 60% of dairy cows develop Ketosis

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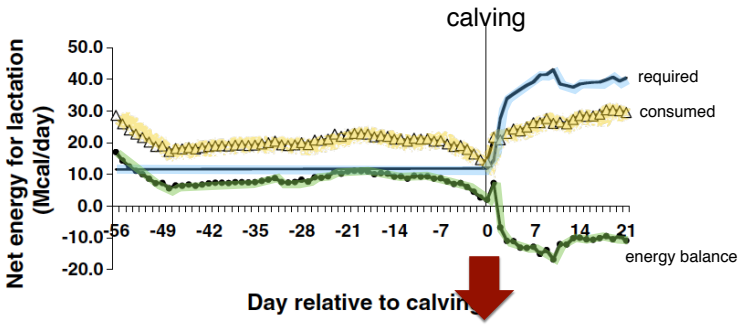
Transition to Lactation



- Energy and Glucose Demands of Lactation
- Insufficient energy and glucose intake
- Negative Energy Balance

Grummer, 2008.

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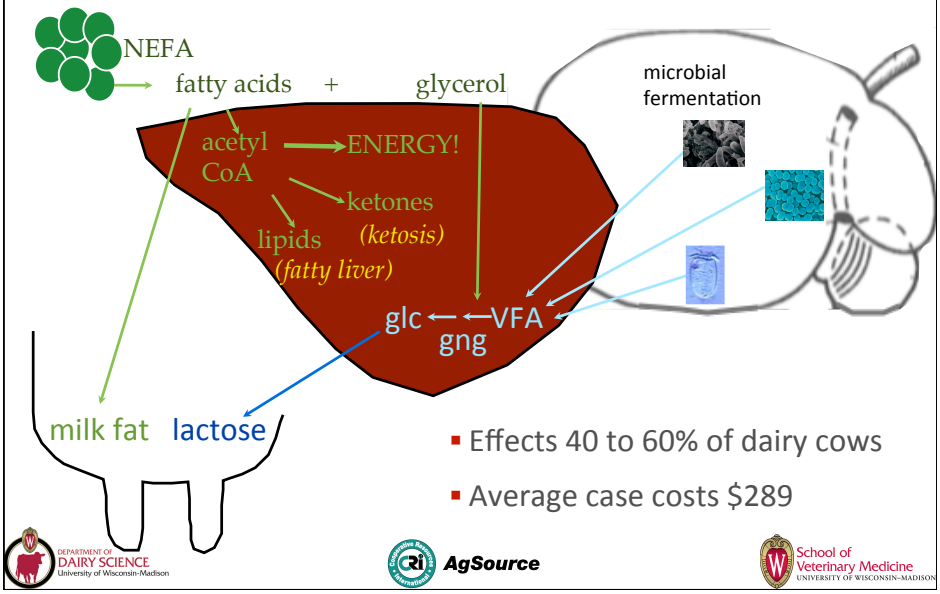
Transition Cow Liver Metabolism



- Effects 40 to 60% of dairy cows
- Average case costs $289

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Ketosis Management

- Etiology and Costs of Ketosis
- Cow level detection and treatment
- Herd level detection tools
- KetoMonitor
  - Development
  - Strength
  - Use
- Ketosis Management, a multi-tool approach

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Ketosis

Hyperketonemia, blood BHBA ≥ 1.2 mM

Clinical Ketosis

- Blood BHBA ≥ 3.0 mM
- Incidence between 10 to 15% of cows
- Observable symptoms

Sub-Clinical Ketosis

- Blood BHBA ≥ 1.2 mM
- Incidence between 40 and 60% of cows
- "Silent Killer"

Both quantified in milk, urine, or blood
Can be primary or secondary

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Sub-Clinical Ketosis

Blood BHBA ≥ 1.2 mM

- Increase risk of DA
- Decreased milk production
- Increased risk of culling in first 30 d
- Decreased reproductive performance

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Sub-Clinical Ketosis

- Cumulative Negative Impacts
  - 3x more likely to develop a DA
  - 50x more likely to be culled within 30 days
  - less likely to conceive to first service
  - produce 180 kg less milk in first 30 days and whole lactation
- Can be managed!
  - Early detection and treatment are key

1.2 mM

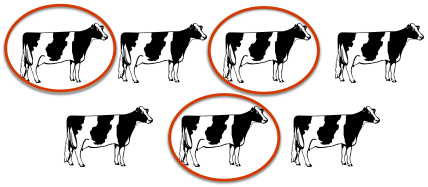
vs.

2.4 mM

McArt et al., 2012

Ketosis

- Incidence
  - Total number of new cases
  - Requires repeat sampling



- Prevalence
  - How many cases present on one day
  - Spot sampling
  - Prevalence x 2 to 2.5 = Incidence

Cost of Sub-Clinical Ketosis

- Each case of hyperketonemia
  - $256 for first-calf heifers
  - $375 for cows
  - Average case $289
- Cost breakdown
  - 41% due to component cost of hyperketonemia
  - 33% due to metritis
  - 26% due to DA

McArt and Nydam, 2014. The Manager.

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Cost of Sub-Clinical Ketosis

1,000 calvings/yr
30% incidence of ketosis

$90,000/yr

IF:

Reduce incidence of ketosis to 15%

$50,000/yr savings

OR:

$50,000 investment to improve transition cow management or comfort that reduces incidence of ketosis to 15% is recouped in 1 yr

McArt and Nydam, 2014. The Manager.

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Reducing Ketosis Incidence

- Transition cow management
- Fresh cow monitoring and treatment
- Ketosis monitoring!
  - Determine prevalence
  - Catch early cases and treat to reduce impact

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Ketosis Testing

Test	Sample	Ketone	Sensitivity	Specificity	Cost per test
Ketostix	urine	Acetoacetate (AcAc)	78%	96%	$0.24
KetoCheck powder	milk	AcAc	41%	99%	$0.28
KetoTest	milk	BHBA	83%	82%	$2.00
Precision Xtra Meter	blood	BHBA	91%	94%	$1.30

*compared to serum BHBA diagnostics; Oetzel, 2004; Townsend and Eastridge, 2011

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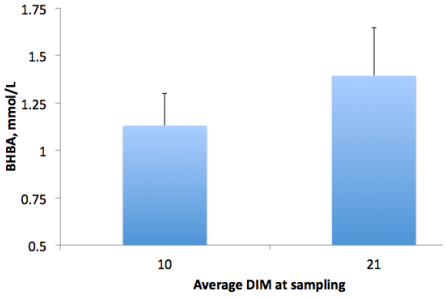
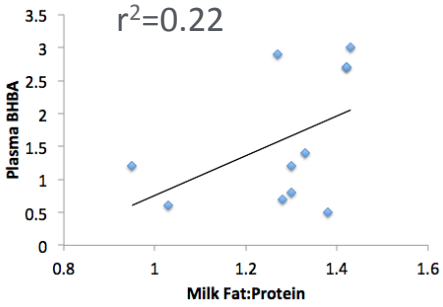
Cowside Detection

- Twice weekly fresh cow testing
  - 4 to 9 DIM
- Weekly fresh cow testing
  - 5 to 20 DIM
  - Test each cow twice
  - cows blood BHBA >1.0 mM previous week

Herd Level Detection



Milk Fat:Protein
is suggestive but alone is not
a strong predictor



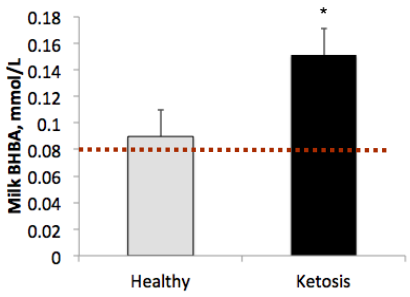
Milk BHBA and Acetone

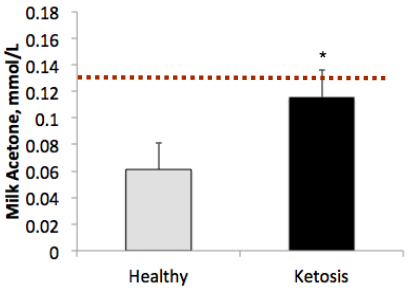
- FOSS equations
  - based on spectra milk analysis
  - milk BHBA and acetone

Nielsen et al., 2005

Milk BHBA and Acetone

$P \leq 0.05$





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How Do We Develop a Better Herd Prevalence Tool?

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Research Objective

- Collected blood samples on the day of milk test at AgSource member farms
  - 550 cows and heifers
  - 10 Holstein farms (2 Jersey farms)
- Laboratory BHBA assay "Gold Standard"
- Dairy Comp Data
- Milk Analysis

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Analysis

- Statistics run using multiple regression models
- Accuracy
  - Overall ability to predict prevalence
- Strength of the model
  - Sensitivity – avoiding false negatives
  - Specificity – avoiding false positives

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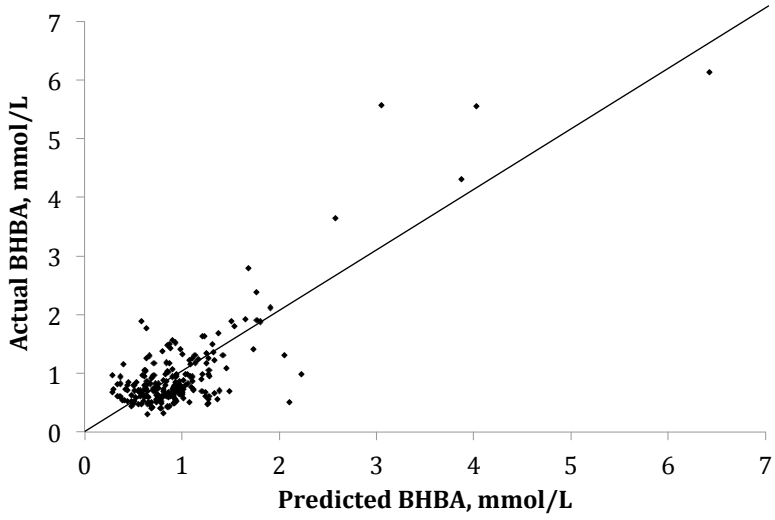
Holstein Cows



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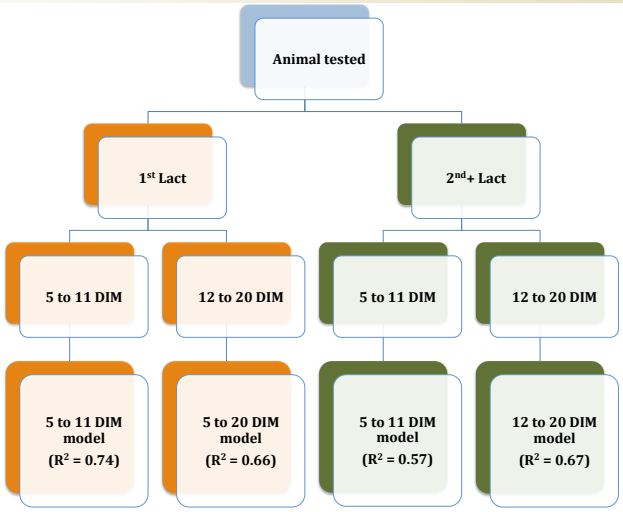
Specific Models Improve Accuracy



Accuracy:	96%	97%	88%	83%

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How Do We Use It?

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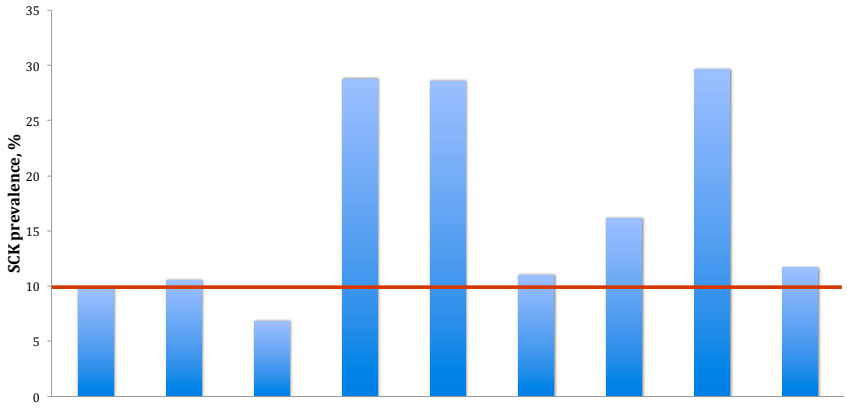
How do we use the Tool?

- Indicator of herd level prevalence
- Monthly milk test provide a management tool to guide decisions



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Multi-tool Approach

- Economic analysis of SCK testing and treatment
  - If incidence is <15%, periodic monitoring is recommended
  - If incidence is >15%, it is most economical to test cows 2 days/wk from 3 to 9 DIM
  - If incidence is >50%, it is most economical to consider blanket treatments

What is the on-farm prevalence month to month?

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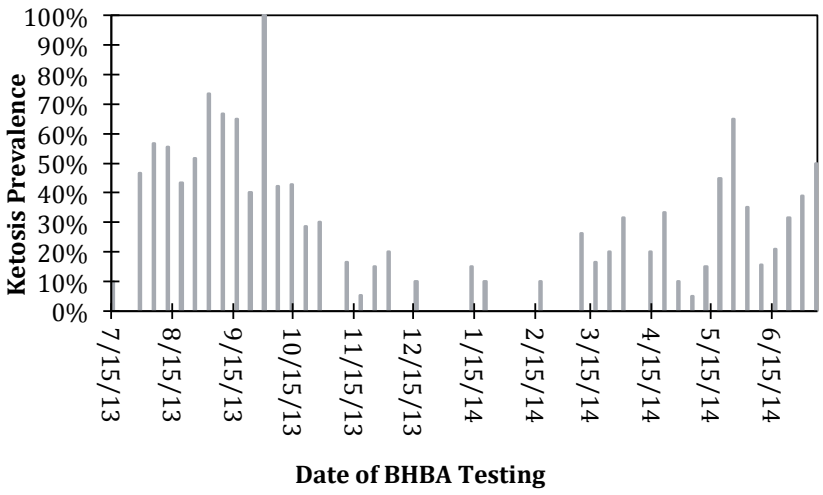
How do we use the Tool?



Prevalence on Each Farm is Dynamic!

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Multi-tool Approach

- Use the KetoMonitor to access relative prevalence
  - Monitor prevalence compared to the target
  - Monitor the impact of changes implemented
  - Monitor shifts in on-farm prevalence
  - Monitor shifts that have regional impacts

Provides a tool to guide nutritional and management decisions!

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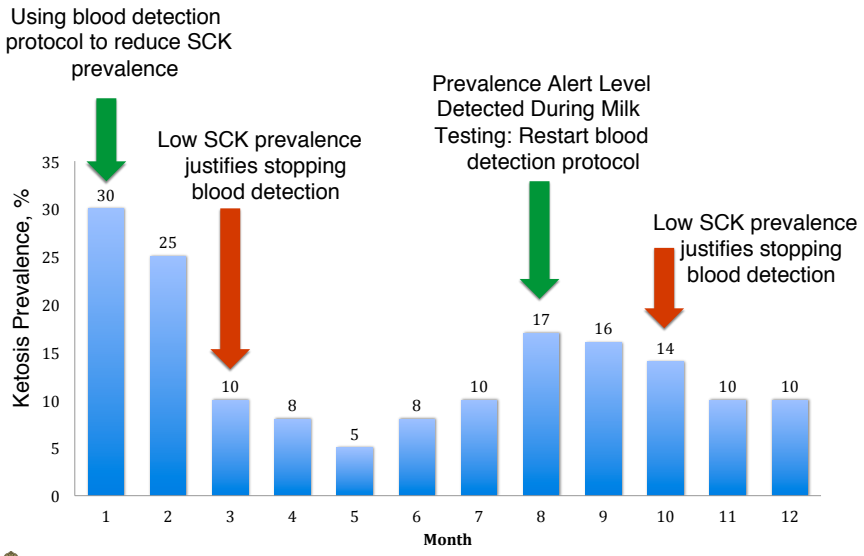
How do we use the Tool?



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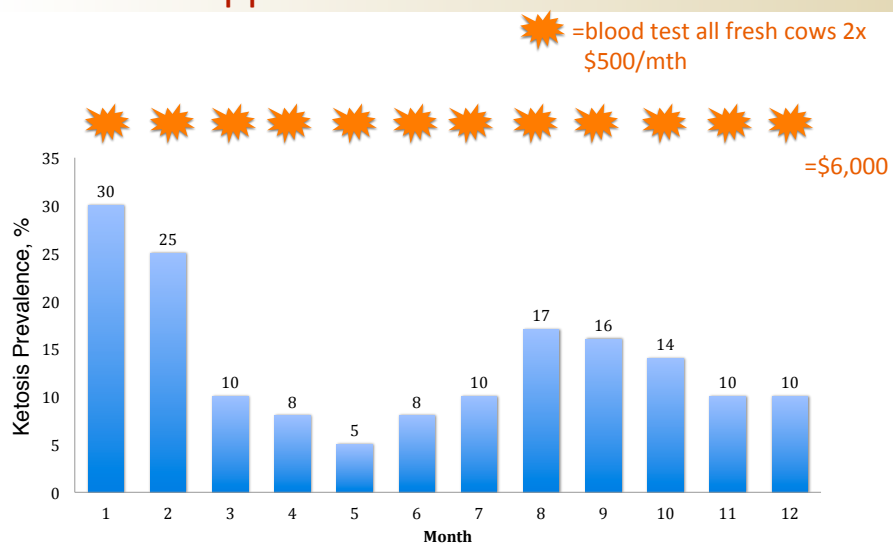
Multi-tool Approach



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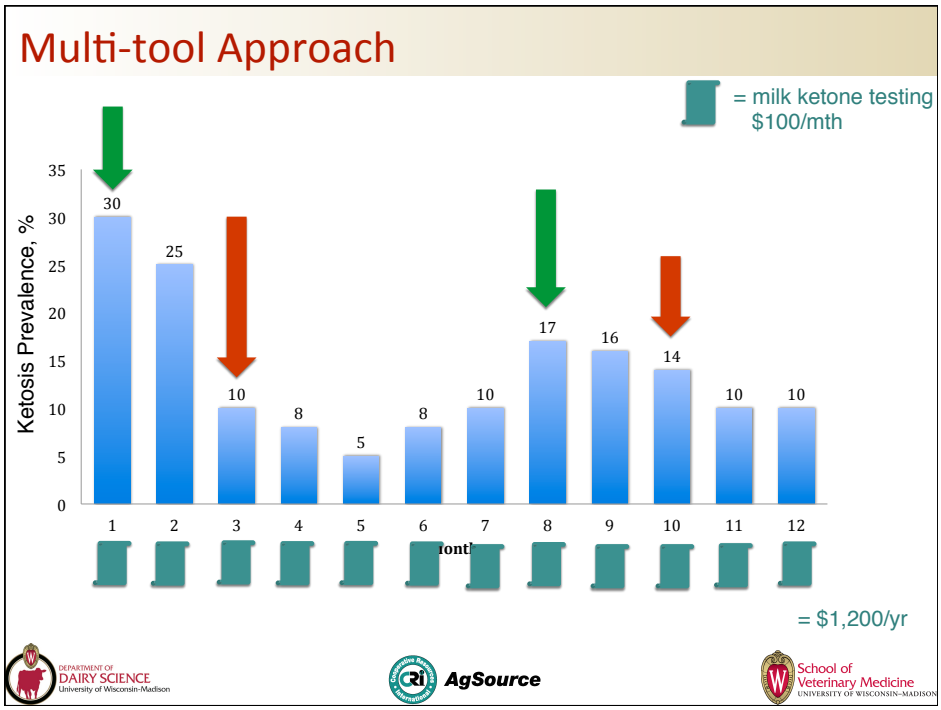
Multi-tool Approach
= milk ketone testing $100/mth
Ketosis Prevalence, %
35
30
25
20
15
10
5
0
30
25
10
8
5
8
10
17
16
14
10
10
1
2
3
4
5
6
7
8
9
10
11
12
= $1,200/yr
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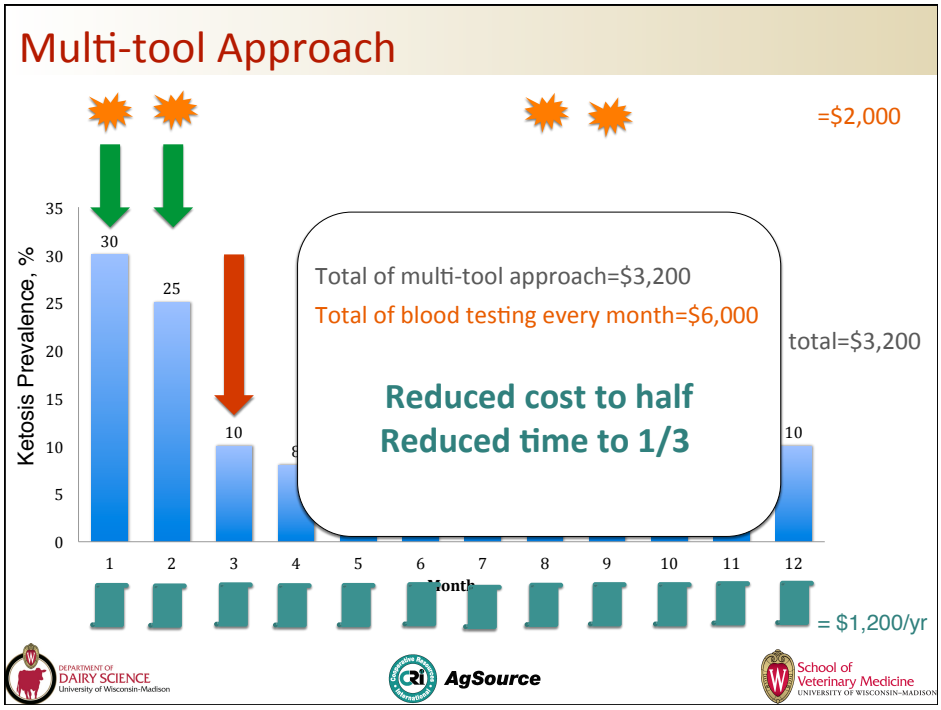
Multi-tool Approach
=$2,000
Ketosis Prevalence, %
35
30
25
20
15
10
5
0
30
25
10
10
1
2
3
4
5
6
7
8
9
10
11
12
Total of multi-tool approach=$3,200
Total of blood testing every month=$6,000
Reduced cost to half
Reduced time to 1/3
total=$3,200
= $1,200/yr
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Benfits of Multi-tool Approach

1,000 calvings/yr
30% incidence of ketosis

$90,000/yr

- Reduces unnecessary blood testing, saving money and time
- Aids farms that don't have labor to consistently blood test
- Guides nutrition and management decisions
- Flag the impact of an implemented transition cow change (intentional or unintentional)

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What Does It Look Like?

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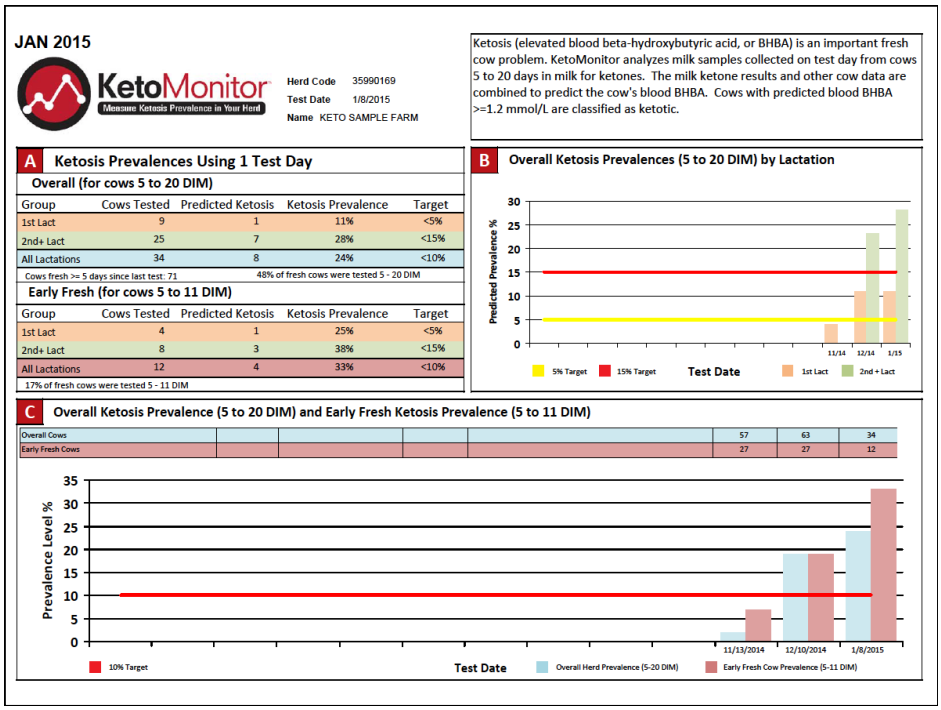


JAN 2015

KetoMonitor
Measure Ketosis Prevalence in Your Herd

Herd Code 35990169
Test Date 1/8/2015
Name KETO SAMPLE FARM

Ketosis (elevated blood beta-hydroxybutyric acid, or BHBA) is an important fresh cow problem. KetoMonitor analyzes milk samples collected on test day from cows 5 to 20 days in milk for ketones. The milk ketone results and other cow data are combined to predict the cow's blood BHBA. Cows with predicted blood BHBA >=1.2 mmol/L are classified as ketotic.

A Ketosis Prevalences Using 1 Test Day

Overall (for cows 5 to 20 DIM)

Group	Cows Tested	Predicted Ketosis	Ketosis Prevalence	Target
1st Lact	9	1	11%	<5%
2nd+ Lact	25	7	28%	<15%
All Lactations	34	8	24%	<10%

Cows fresh >= 5 days since last test: 71 — 48% of fresh cows were tested 5 - 20 DIM

Early Fresh (for cows 5 to 11 DIM)

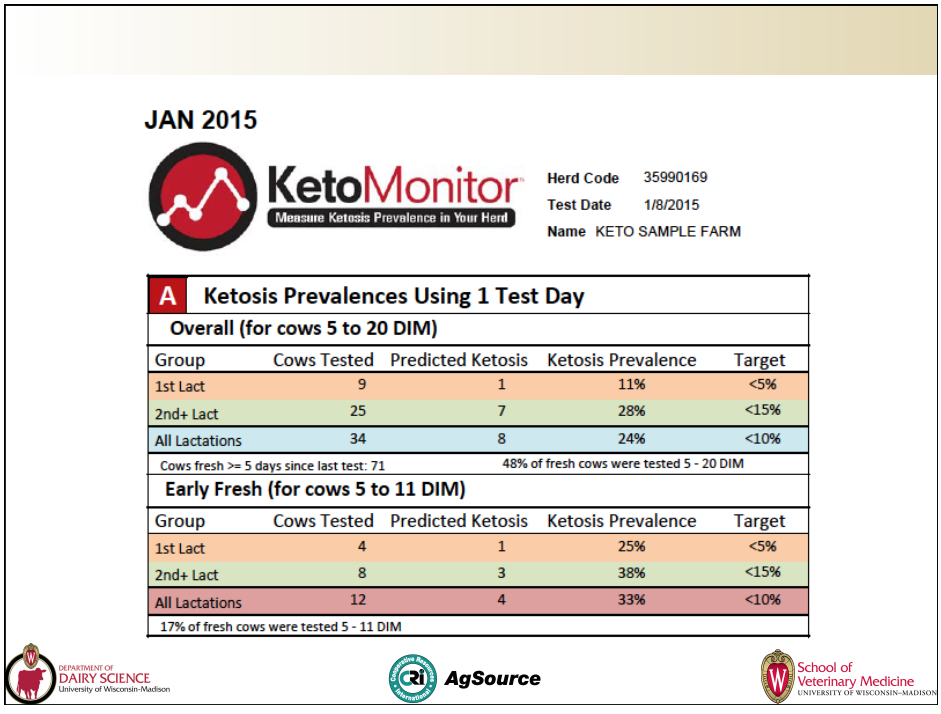
Group	Cows Tested	Predicted Ketosis	Ketosis Prevalence	Target
1st Lact	4	1	25%	<5%
2nd+ Lact	8	3	38%	<15%
All Lactations	12	4	33%	<10%

17% of fresh cows were tested 5 - 11 DIM

B Overall Ketosis Prevalences (5 to 20 DIM) by Lactation

C Overall Ketosis Prevalence (5 to 20 DIM) and Early Fresh Ketosis Prevalence (5 to 11 DIM)

Overall Cows					57	63	34
Early Fresh Cows					27	27	12



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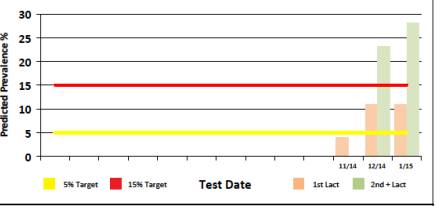

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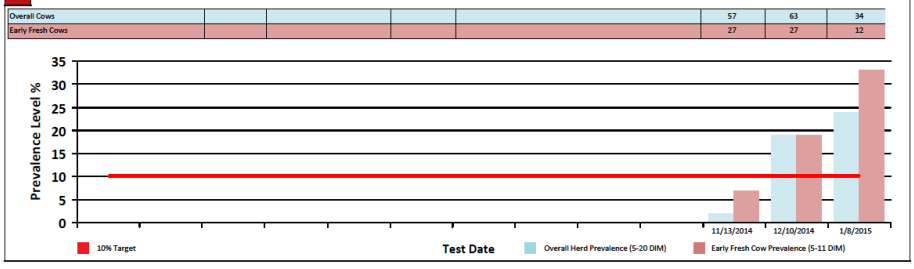
C Overall Ketosis Prevalence (5 to 20 DIM) and Early Fresh Ketosis Prevalence (5 to 11 DIM)



D Fresh Cows Predicted to Have Ketosis (5 - 20 DIM) — 48% of fresh cows were tested 5 - 20 DIM

Barn Name	Vis ID	Pen	Lact Num	DIM	Days Dry	Age at 1st Calving
4667		7	3	5	139	
4758		7	3	9	79	
5919		8	1	9		22
4308		7	4	10	50	
3422		6	6	15	73	
4815		6	3	16	58	
4627		6	3	18	147	
4197		6	4	19	69	

This management information prepared by:

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Please direct questions to 800-236-4995 or email custserv@agsource.com

How to Use This Report

Block A: This report represents 2 tools. The overall herd (5 to 20 DIM) predicted ketosis prevalence (top of panel) should be used to monitor monthly prevalence to aid in guiding management and nutritional decisions. The number of fresh cows tested and the number of cows that freshened since the last DHI test is provided. Because milk testing is only once per month, not every fresh cow is tested for ketosis. Given the etiology of ketosis, this model is especially strong in the early fresh period (5 to 11 DIM); therefore, separate data are provided for this DIM range to aid in management.

Block B: Ketosis is expected to be more prevalent in cows in their 2nd or greater lactation. The overall prevalence of ketosis by lactation group (1st Lact and 2nd+ Lact) are provided for the current and 12 previous months.

Block C: Monthly prevalence is provided for the current and 12 previous months for overall herd ketosis (5 to 20 DIM) and early fresh cow ketosis (5 to 11 DIM range). The total number of cows tested for each prevalence is noted in the table above the graph.

Block D: The ketosis prediction model is able to identify cows that are likely to have ketosis on the day of milk test. These cows may benefit from treatment for ketosis. Remember that this is not an exhaustive list of ketotic cows and some ketotic cows may not be flagged on this list due to the single time point testing. This list can help identify patterns in early ketosis onset; however this list does not indicate the day of ketosis onset. Remember that because this is a single time point prevalence test, cows in the 12 to 20 DIM list may have actually become ketotic prior.

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What Have We Learned So Far?

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Statistics

Fresh Cows Tested	Herd Prevalence	Heifer Prevalence	Cow Prevalence
46,583	19.3%	7.2%	26.1%

- Highlights higher than desirable prevalence, primarily due to high prevalence in older cows

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Statistics

KM result	Fresh Cows	30-d Culling Rate
negative	37,465	1.2%
positive	8,977	3.6%

- Analyzed KetoMonitor data for subsequent outcomes
- Cows predicted with ketosis by the KetoMonitor
  - Culling was 3x greater

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Summary

- Ketosis is a costly but manageable disease
- KetoMonitor provides herd level prevalence monitoring
  - New approach to herd level testing
  - Can be used in conjunction with blood testing
  - Provides an economical option for farms that don't always need to do blood testing, or don't have the labor to do blood testing
  - Can assist in reducing the negative outcomes associated with ketosis

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Questions?

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