

Dedicated Analytical Solutions

# KETOSIS SCREENING – EXPERIENCE FROM AROUND THE WORLD

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SEMINARIO AIA Laboratori,  
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**FOSS**

# KETOSIS – THE PROBLEM

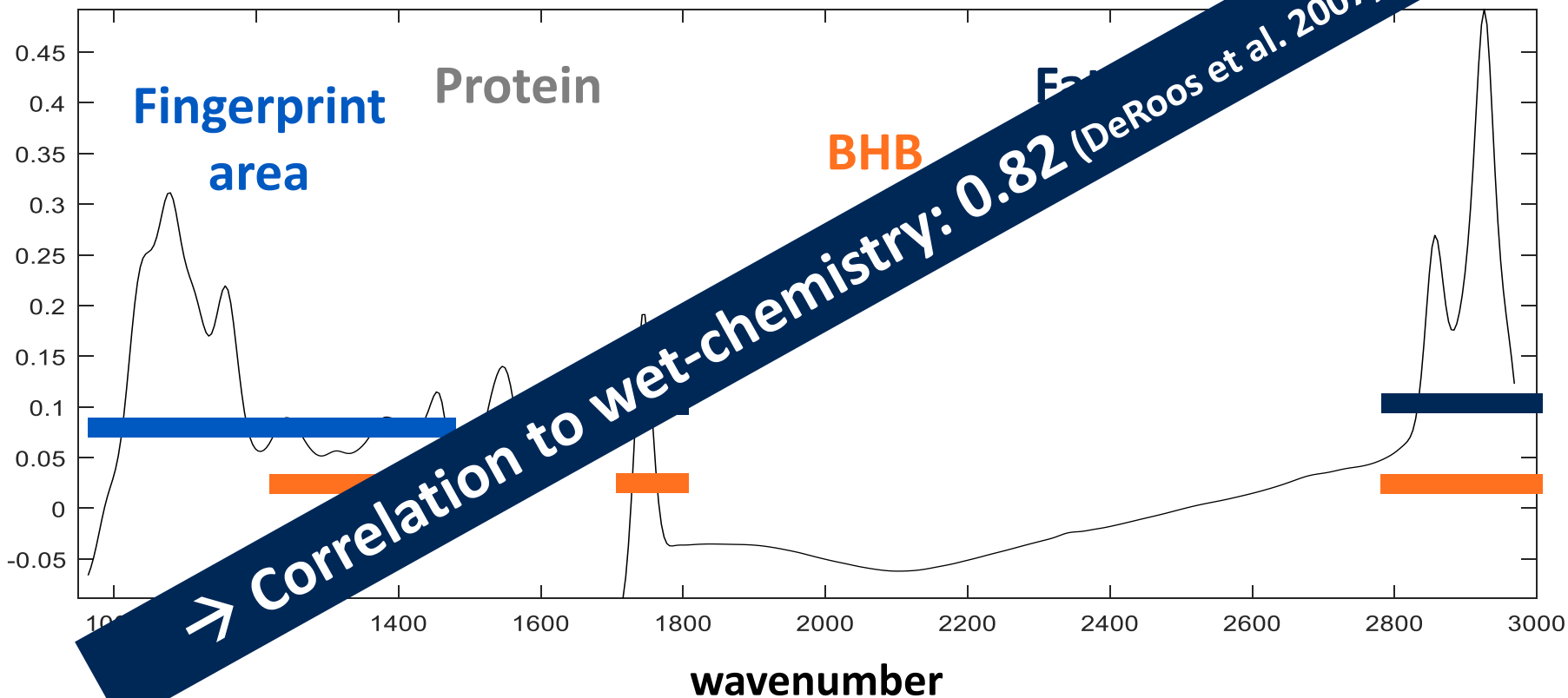
- ▶ Negative energy balance
- ▶ Incidence: 25 to 60%
- ▶ Costs per case: €260



# KETOSIS – DEFINITION & TESTING

- ▶ Ketone bodies elevated in blood
- ▶ Cow-side tests labour-intensive
- ▶ Availability of DHI samples and FTIR technology

## Indirect calibration developed:



# SCREENING FOR SUBCLINICAL KETOSIS ON DHI SAMPLES

1999

- Fourier Transformed InfraRed (FTIR): Fast and inexpensive method for ketosis screening by predicting milk Ac (Hansen, 1999)

2006

- Joint project of CRV, FOSS and Qlip; development of milk Ac and BHB predictions; appropriate for herd level screening (de Roos *et al.*, 2007)

## Ketosis screening service on DHI samples:

2011

- Qlip, CRV and MCC Flanders, the Netherlands and Belgium;
- Valacta, Canada

2012

- CLASEL, France

2013

- Polish Breeders Association, Poland;
- Eurofins and Danish Cattle Federation, Denmark;
- Tokachi DHI, Japan

2014

- CanWest DHI, Canada

2015

- AgSource, US

Under evaluation

- DairyOne, US;
- ARAL, Italy;
- CIS, England;
- LIGAL, Spain



**Milk Ac and BHB values:**  
• sensitivity (69 and 87%)  
• specificity of 95%

(de Roos *et al.*, 2007; Denis-Robichaud *et al.*, 2014)

# KETOSIS SCREENING – KEYS TO SUCCESS

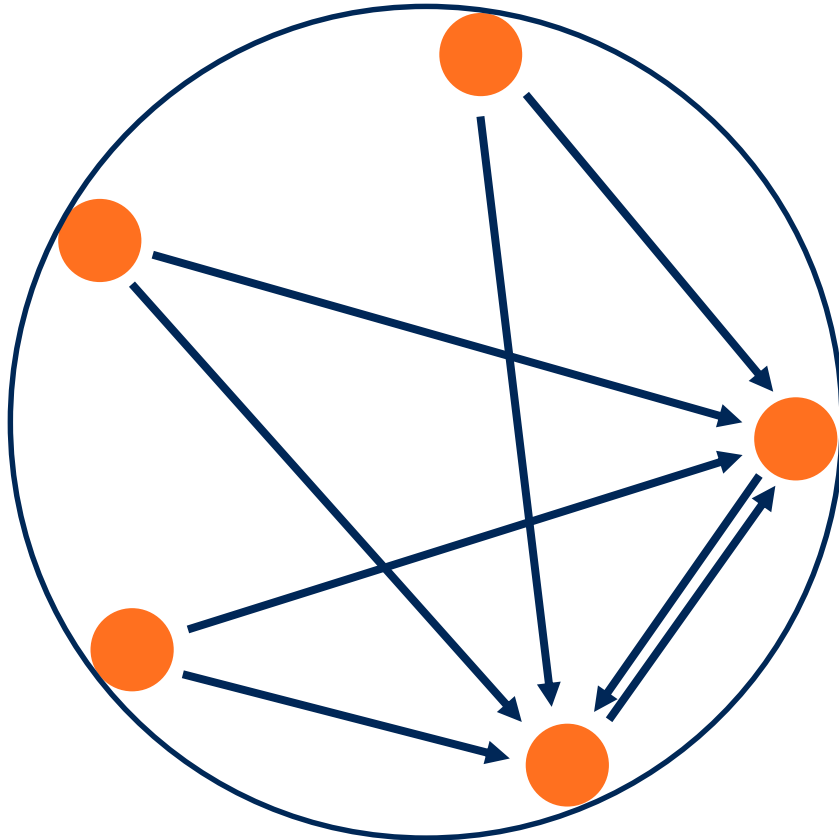
- 1) Performance of laboratory analysis
- 2) Communication of results to dairy farmers





# QA PROGRAMME IN CANADA

- ▶ All laboratories offering ketosis screening participate in QA programme:



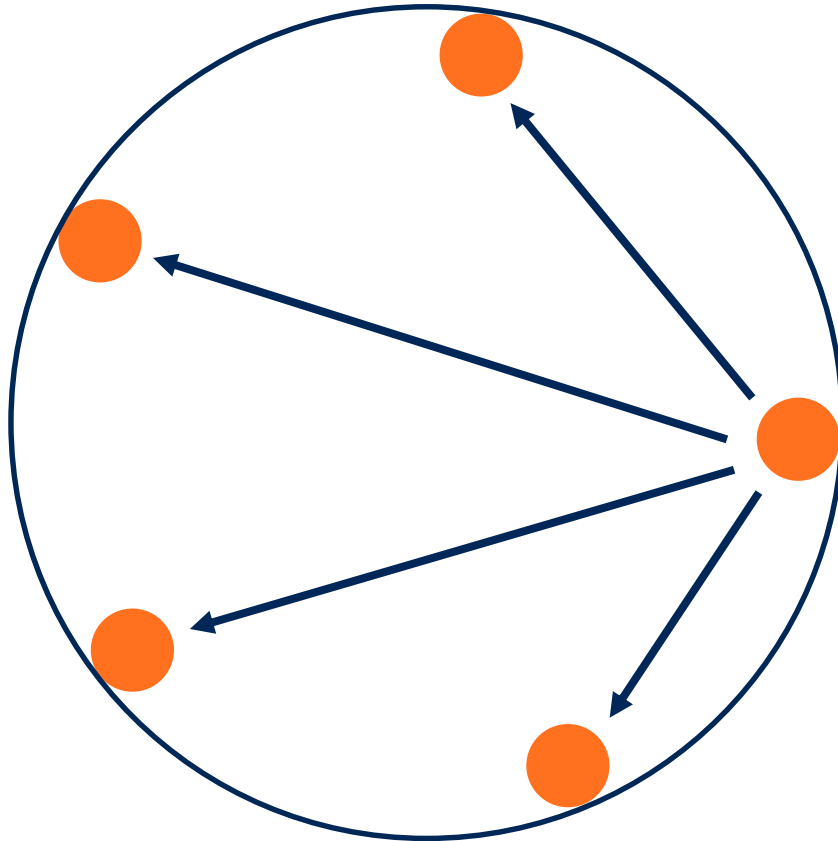
**Valacta, reference results (wet chemistry method) for 100 random samples**

**Provision of BHB pilot samples**

**Frequency: 1/month**

# QA PROGRAMME IN FRANCE

- ▶ All laboratories offering ketosis screening participate in QA programme:



**Reference laboratory, wet chemistry method**

**10 reference samples for BHB (0.05-0.25 mmol/l) and 5 samples for acetone (0.10-0.20 mmol/l)**

**Frequency: 1/month**



# IDF GUIDELINE



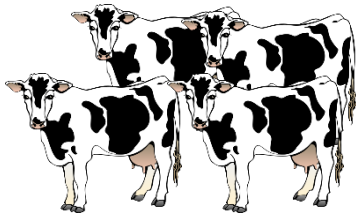
- ▶ Action Team S03b:  
New applications of IR spectrometry
- ▶ New guideline to be published in  
2017

# COMMUNICATION OF RESULTS

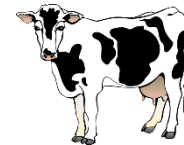
**BHB (and Ac)**

**Cow-related data (e.g. DIM)**

**+ other parameters, e.g. %fat**



**+ cow-site test**



**Ketosis:**

- yes/no
- risk group (e.g. 1-5)
- index (e.g. K!)

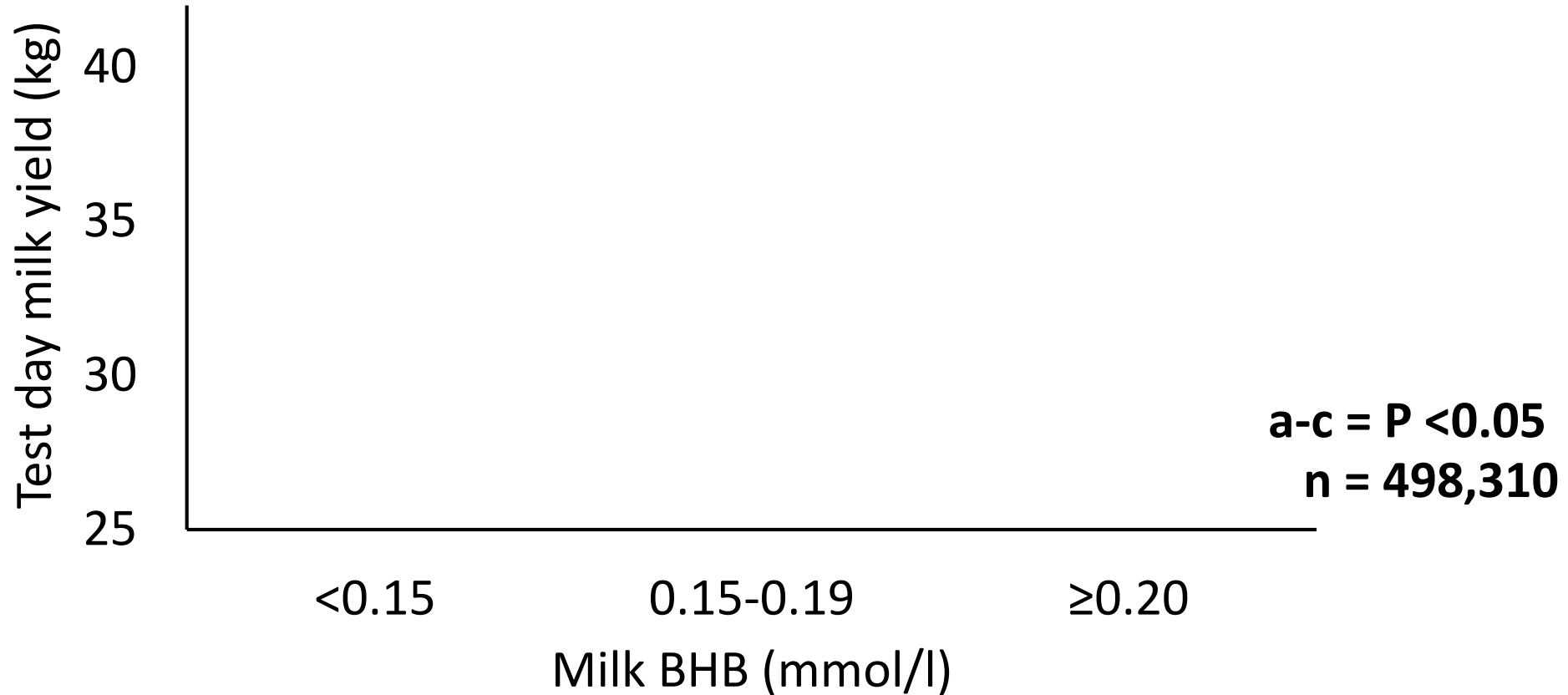


VS.

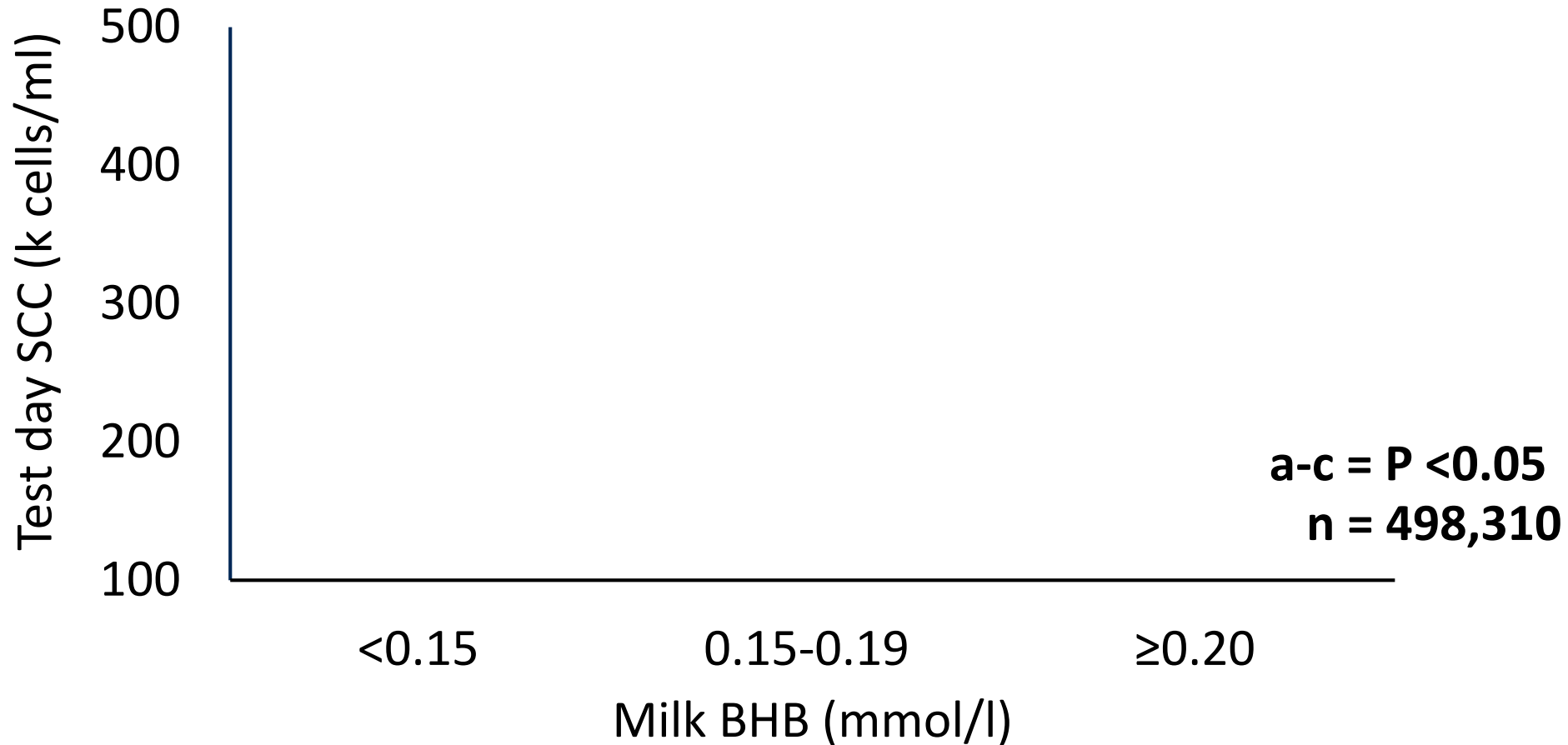


▶ No consensus on correlation

# MILK BHB AND MILK YIELD



# MILK BHB AND MASTITIS



# Achievements in Canada, France, Belgium and the Netherlands

### Overview on the proportion of samples, farms and cows under ketosis screening from January 1, 2012 to December 31, 2014.

Laboratory	Total number of DHI samples analysed	Proportion of samples with milk BHB analysis (%)	Proportion of farms using ketosis screening (%)	Proportion of cows under ketosis screening (%)
Valacta	7,600,000	54	71 <sup>1</sup>	54
CLASEL	9,600,000	100 <sup>2</sup>	48	51
Qlip	35,000,000	100 <sup>3</sup>	85	90

<sup>1</sup> Proportion of farms that used the service for at least one test-day

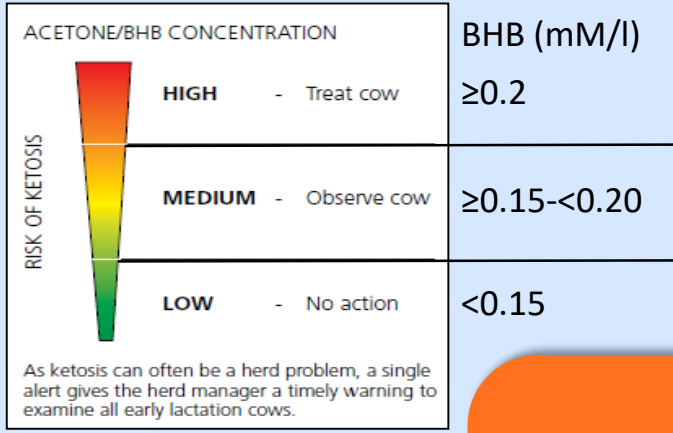
<sup>2</sup> Ac and BHB values were predicted for all samples, but reported back to farms enrolled for CetoDetect® only

<sup>3</sup> All milk recording samples; however, just reported back for cows with days in milk < 60



# DHI LABORATORY: CLASSIFICATION AND APPLICATION OF RESULTS

valacta



Combination of Ac and BHB values with:

- fat:protein ratio
- parity
- month of milk recording

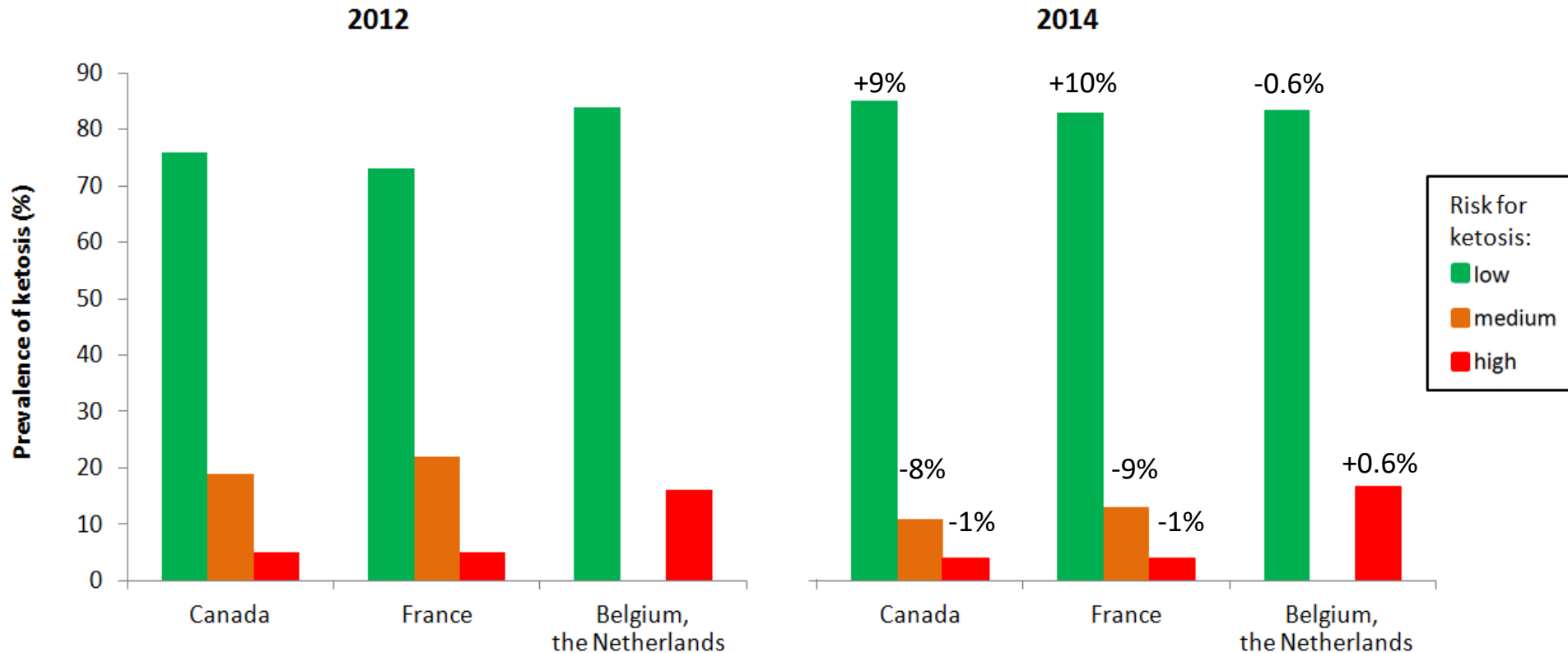
→ binary (yes/no) score for ketosis for cows with DIM <60 only



## Decision tree including Ac and BHB



# DEVELOPMENT OF KETOSIS PREVALENCE OVER TIME



Prevalence of ketosis (low, medium, high risk) in Canada (Valacta), France (CLASEL) and Belgium (region Flanders) and the Netherlands (Qlip) in 2012 and 2014, respectively. Data for Belgium and the Netherlands are expressed as ketosis yes (high risk) or no (low risk).

# KETOSIS IMPACTS PROFITABILITY



## Simulation for a herd with 50 cows

### 1) Economical losses

a) Milk loss	€
300 l/lactation; ketosis prevalence: 15%; 2.250 l/lactation and herd; 0.33 €/l	750
b) Losses due to associated diseases	
2 mastitis cases (150 € per case)	300
3 metritis cases (50 € per case)	150
Lameness, displaced abomasum, other	300
<b>Total losses</b>	<b>1,500</b>

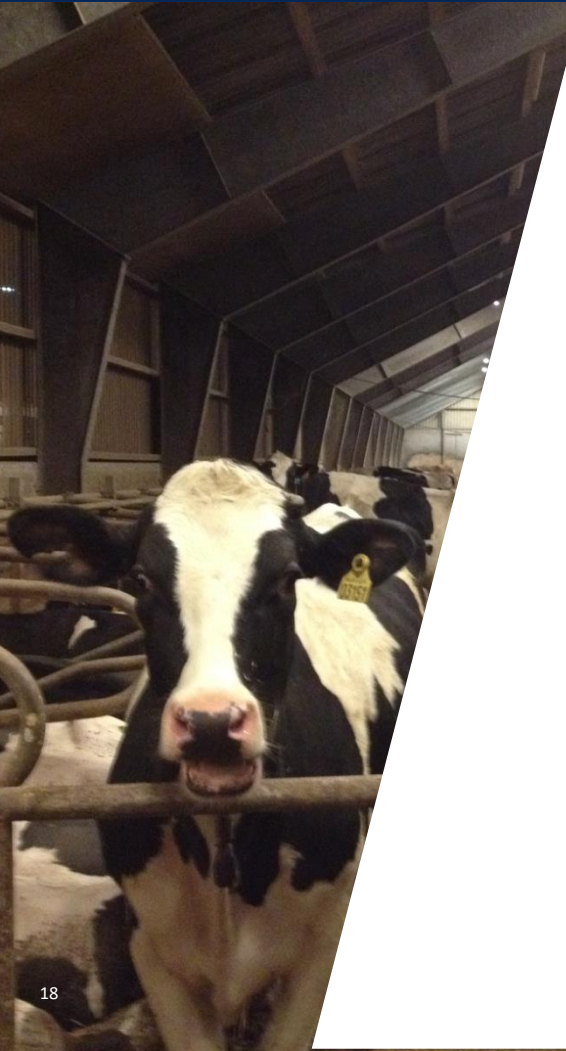
### 2) Costs for ketosis screening

a) 3 € per cow and year	150
b) Interventions (e.g., treatment, optimised feeding ration)	?
<b>Total costs</b>	<b>150</b>

### 3) Assumption: Improved animal health management due to ketosis screening

a) Reduction of milk loss by 50%	375
b) Prevention of 50% of the associated diseases	375
<b>Total gain</b>	<b>600</b>

**Return on investment: 4**



# Examples for communication of Ketosis Screening

# REAL LIFE EXAMPLE – KETOSIS MANAGEMENT



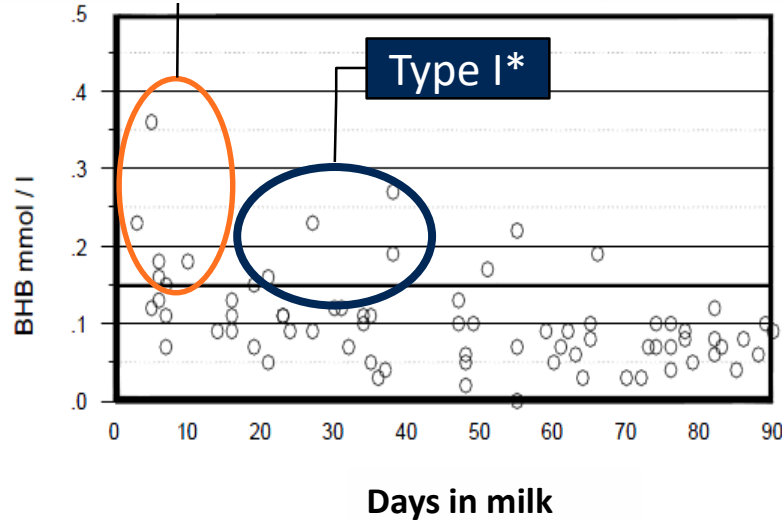
Herd Results April 2013



Type II\*\*

Overview 1:

BHB values in cows with less than 90 days in milk



Advisor's suggestion:  
"Focus first on dry cow  
(far-off) rations as they  
obviously bring too  
much energy."

\*Type I (Fresh cow; Production > Dry matter intake, NEB)  
\*\*Type II (Starts before calving; "fat cow syndrome"; insulin resistance)

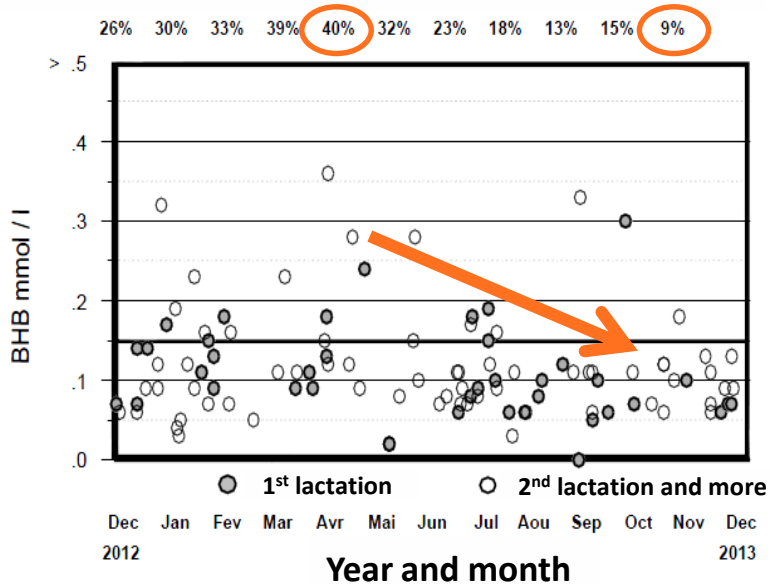
# REAL LIFE EXAMPLE – KETOSIS MANAGEMENT

**Herd Results December 2013  
(8 month later)**



## Overview 2:

### BHB values at first test day over time



→ Proportion of cows with high BHB decreased from 40% to less than 10%

Danish Cattle Federation, Denmark



## Overview 1: Number of freshening cows with elevated BHB values

	Number of freshening cows (5-35 DIM)	Proportion of cows with elevated BHB values (>0.15 mmol/l)	Status
1 <sup>st</sup> calving	Too few animals**		
2+ calvings	11*	27%	

**Threshold for alert: 15%**

**Recommended interventions:**

- 0 - 15%:           Uncritical
- 15 – 25%:        Observation of further development
- Over 25%:         Adjustment of dry cow management

\*Calculation includes the last freshening cows from last 2 DHI testings

\*\*Minimum of 10 animals required for calculations

## Overview 2: BHB value for individual cows

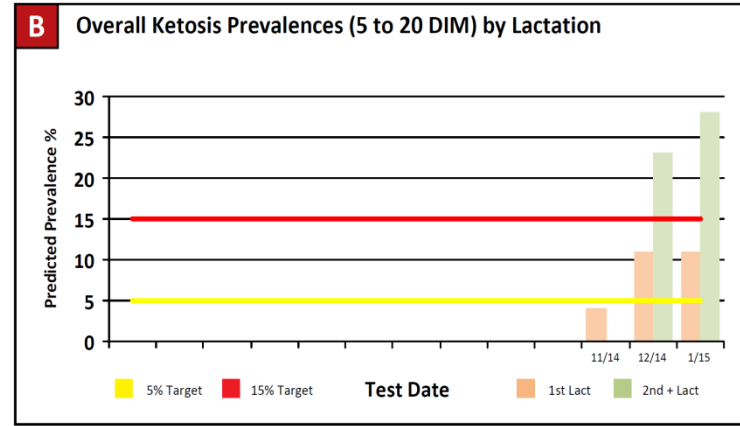
Date	Milk kg	Fedt		Protein		EKM kg	Urea	BHB
		%	Gram	%	Gram			
12/12/2013	35.1	4.03	1415	3.20	1123	34.7	56	0.076
27/11/2014	0.0	0.00	0	0.00	0	0.0	406	0.0
21/11/2013	34.5	4.19	1446	3.15	1087	34.6	35	0.014
04/03/2014	34.5	3.04	1049	3.32	1145	30.2	138	0.015
07/04/2015	57.0	2.52	1436	2.90	1653	44.5	39	0.096
30/01/2014	30.9	2.76	853	3.28	1014	25.9	105	0.042
09/10/2014	19.3	3.04	587	3.52	679	17.2	357	0.091
13/05/2014	30.1	3.17	954	3.26	981	26.7	208	0.100
12/08/2014	35.2	3.15	1109	3.39	1193	31.5	299	0.063



# FROM LAB TO FARM – USA



<b>A Ketosis Prevalences Using 1 Test Day</b>				
<b>Overall (for cows 5 to 20 DIM)</b>				
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		
<b>Early Fresh (for cows 5 to 11 DIM)</b>				
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				



**D Fresh Cows Predicted to Have Ketosis (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	

# FARMER'S COMMENT



Mike Larson, general manager of Larson Acres (2,400 dairy cows)

**“We were surprised to learn just how many of the cows in our herd had subclinical ketosis. Since there were no symptoms, the condition went otherwise undetected and untreated.”**

**PROGRESSIVE  
DAIRYMAN**



**AgSource  
Laboratories**

A Subsidiary of Cooperative Resources International

**“It has helped us to not only understand the frequency of subclinical ketosis in our herd but also the patterns behind the subclinical cases. This allowed us to focus on those challenge areas.”**

**FOSS**

# A MESSAGE TO TAKE HOME



- ▶ Simple, practical, rapid and inexpensive tool
- ▶ Keys to success in establishment: QA and communication
- ▶ Evidence of success of ketosis screening in various countries

