NOVEL ANALYTICAL SOLUTIONS AT FOSS
FOR DAIRY HERD MANAGEMENT

Lina V. Moussa, Global Product Manager, FOSS Denmark
THE FUTURE OF GLOBAL FOOD RESOURCES

+60%  
Increasing demand for food of consistent and safe quality

+9 billion  
World population will continue to grow in size

+4.9 billion  
The global middle class will more than double – from today’s 2 billion

2018  

2030  

FOSS
FOSS MISSION AND VALUES

Our Mission
We provide Dedicated Analytical Solutions, which add value to our customers by improving quality and optimising food and agricultural production.

We contribute to the sustainable use of our planet’s agricultural resources and thus to the nutrition and health of the people of the world.

Our Values

FIRST
Because being first is motivating and rewarding.

Customer
Because the customer is the focus of all activity in FOSS.

People and Knowledge
Because FOSS is a company based on knowledge and employees working in collaboration.
FOSS - MORE THAN 60 YEARS OF INNOVATION

- Strive to bring the advantages of new technology to our customers first
- More than 10% of turnover invested in R&D
- More than 300 highly skilled engineers and scientists in R&D
- Partnership with leading international universities
- Tightly woven network of technology partners
- Customer driven innovation

FOSS INNOVATION FACTS
- More than 100 patents
- More than 20 world first introductions
- First to integrate analysis directly in line
HOW WE ADD VALUE

RAW MATERIAL
Payment, segregation and quality control of raw material

PROCESSING
Improved predictability and control of manufacturing processes

FINISHED GOODS
Safe products and compliance with regulatory requirements

On-farm
Receiving points
At-line/In-line production
Quality Control Laboratories
Finished products

DATA INTELLIGENCE
DATA GENERATION
CONTROL & AUTOMATION
CombiFoss™ provides a market leading platform on which to base your milk-testing business.

BactoScan™ The world’s first (and leading) automated bacteriological milk analyser.

Instrument Networking Market leading solutions for management of instrument performance with centralised configuration of multiple instruments.
FOSS IN RAW MILK TESTING

Instruments

- >80 countries
- >3000 MilkoScan™
- >3000 Fossomatic™ + 100 Fossomatic 7 DC
- >1200 BactoScan™

Approvals

- Solutions are in compliance with international and national standards

[Image of world map and certification documents]
FATTY ACID ORIGIN

Application of data from Raw Milk Testing
Fatty Acid Package I – Chain Length

- Short Chain Fatty Acids (SCFA): C\textsubscript{4:0}, C\textsubscript{6:0}, C\textsubscript{8:0}, C\textsubscript{10:0}
- Medium Chain Fatty Acids (MCFA): C\textsubscript{12:0}, C\textsubscript{14:0}, C\textsubscript{16:0}
- Long Chain Fatty Acids (LCFA): C\textsubscript{18:0}, C\textsubscript{18:1}, C\textsubscript{18:2}

Fatty acid Package II – Degree of Unsaturation

- Saturated Fatty Acids (SFA)
- Mono Unsaturated Fatty Acids (MUFA)
- Poly Unsaturated Fatty Acids (PUFA)
- Major Fatty Acids:
  - C\textsubscript{14:0}
  - C\textsubscript{16:0}
  - C\textsubscript{18:0}
  - C\textsubscript{18:1}
FATTY ACID ORIGIN PACKAGE

Fatty acid group:
- De novo
- Preformed

Fatty acids:
- ≤ C14
- C16
- ≥ C18

Origin of fatty acids:
- Synthesized in the mammary gland (de novo or preformed)
- Come from feed or from body reserves

(according to Palmquist, 2006; Vlaemick et al., 2006; Dewhurst et al., 2000)
Rumen
Volatile fatty acids

- Acetate (C2)
- Butyrate (C4)
- Propionate (C3)

Starch and Fiber
DE NOVO SYNTHESIS IN THE MAMMARY GLAND
PREFORMED FATTY ACIDS

Rumen

> C18

Starch and Fiber
Adipose tissue = C16, C18 TG C18

C16, C18 TG C18
C16, C18 TG C16
C16, C18 TG C16
C16, C18 TG C18

C16

C18:1

Blood
Calibrations based on natural material (e.g. raw milk) only

- Development of global models
  - Both reference and spectra samples from around the globe included → robustness
  - Variation in cow breeds and different seasons covered → robustness

- Variation of results in samples is more important than number of samples
REAL LIFE EXAMPLE; FAT AND PROTEIN VS DE NOVO

High **fat %** associated with high de novo contents

→ increased function of rumen as well as production of volatile fatty acids

High **protein %** associated with high de novo contents

→ increased microbial fermentation as well as microbial protein synthesis

→ Opportunity for dairy farmers to increase revenue and profit
What happened?
- Cows started mobilizing
- De novo synthesis went down

Reason?
Change in silage quality (more fibre/less digestible)

Idea:
Changes in fatty acid profile can be noticed a few days before milk or fat yield start to decrease

→ Dairy farmer can react EARLIER and save $$$
DIFFERENTIAL SCC (DSCC)

Application of Data from Raw Milk Testing
CELLS IN MILK

- Lymphocytes
- Polymorphonuclear neutrophils (PMN)
- Macrophages

DSCC % → PMN + lymphocytes

Microscope spot, milk slide

Sordillo and Nickerson, 1998; Nickerson, 1989; Paape et al., 2002; Oviedo-Boyso et al., 2007
Differentiation of cells...

...valuable
...scientific method
...not feasible in connection with DHI programmes

New technology – Fossomatic 7 DC with added DSCC parameter and cadence of 600 samples/h

Focus on practical application on DSCC

100 FM 7 DC sold worldwide
15 FM 7 DC installed in Italy
## DSCC VALUE PROPOSITION ACTIVITIES

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<td>DSCC before, during, and after artificially induced mastitis</td>
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<td>University, Belgium</td>
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More to be done with Mastitis: The challenge and the potential

Differential Somatic Cell Count with the Fossomatic 7 DC - a novel parameter
By: Dr. Daniel Schwarz, Cattle Disease Specialist, FOSS, Denmark

Differential somatic cell count—A novel method for routine mastitis screening in the frame of Dairy Herd Improvement testing programs
Malin Damm,1 Claus Holm, Mette Blaabjerg, Morten Novak Bro, and Daniel Schwarz1,2
Foss Analytical A/S, Foss Allé 1, 3400 Hillerød, Denmark
→ infected and uninfected cows could be differentiated equally by DSCC and SCC as stand alone parameters each.

→ Combination of DSCC and SCC led to increase sensitivity, but slight decrease in specificity.
normal
likely to be infected
likely to be infected
active...
inactive inflammatory response

Schwarz, 2018
Raw milk samples hold a wealth of information – milk quality and dairy herd management

SCC and DSCC as a new tool to improve mastitis management

Other value-added services: Fatty Acid analysis successfully used in many countries around the world

https://www.fossanalytics.com