NOVEL ANALYTICAL SOLUTIONS AT FOSS
FOR DAIRY HERD MANAGEMENT

FOSS

Lina V. Moussa, Global Product Manager, FOSS Denmark

ANALYTICS BEYOND MEASURE

THE FUTURE OF GLOBAL FOOD RESOURCES

FOSS

2018

+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

2030

ANALYTICS BEYOND MEASURE

FOSS MISSION AND VALUES

FOSS

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

Dairy Grain RMT Meat Wine Laboratories Feed

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

ANALYTICS BEYOND MEASURE

FOSS - MORE THAN 60 YEARS OF INNOVATION

FOSS

- ❑ 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

ANALYTICS BEYOND MEASURE

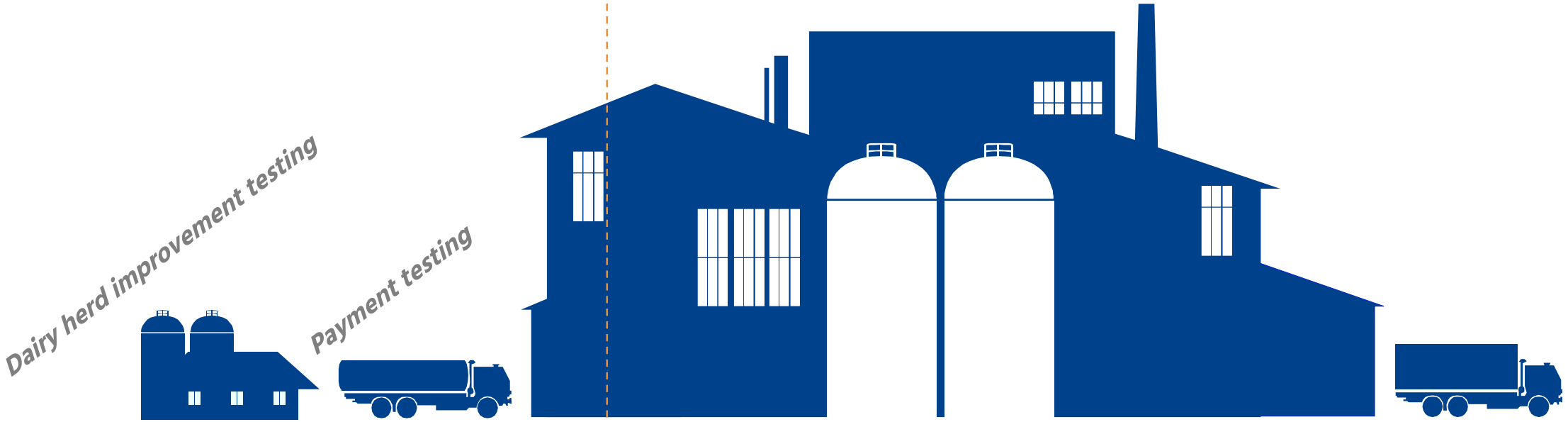
HOW WE ADD VALUE

FOSS

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

INFORMATION MANAGEMENT NETWORK

DATA GENERATION

CONTROL & AUTOMATION

DATA INTELLIGENCE

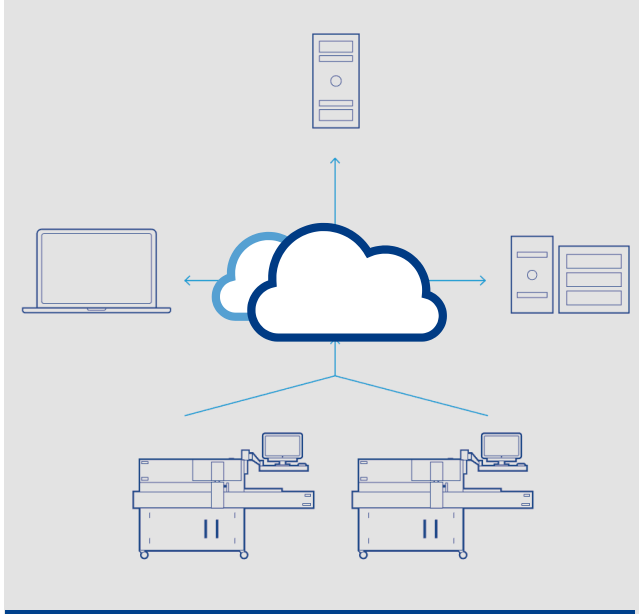
ANALYTICS BEYOND MEASURE

SETTING THE GLOBAL STANDARDS

FOSS

CombiFoss™
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

ANALYTICS BEYOND MEASURE

FOSS IN RAW MILK TESTING

FOSS

Instruments

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

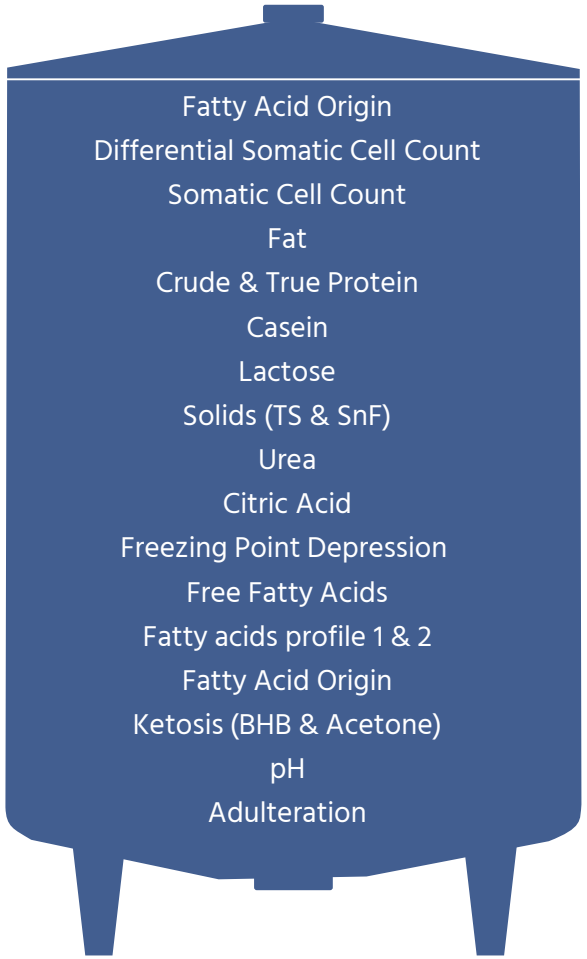
Approvals

- ❑ Solutions are in compliance with international and national standards

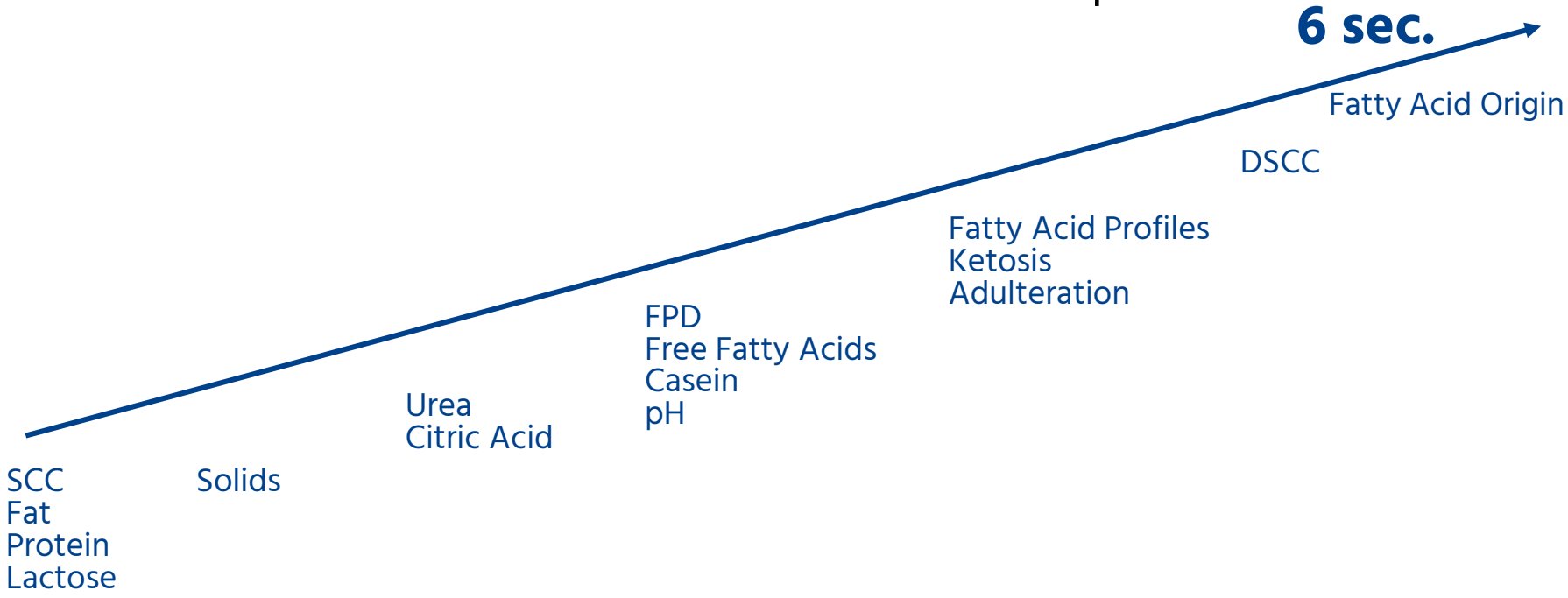
ANALYTICS BEYOND MEASURE

7TH GENERATION COMBIFOSS

FOSS



20 parameters in **6 sec.**



CF 215	CF 360	CF 4000	CF 5000	CF 6000	CF FT+	CF 7 / CF 7 DC
1970s	1980s	1980s	1990s	2000s	2010s	2016 / 2017/ 2019

ANALYTICS BEYOND MEASURE

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ANALYTICS BEYOND MEASURE

FATTY ACID ORIGIN

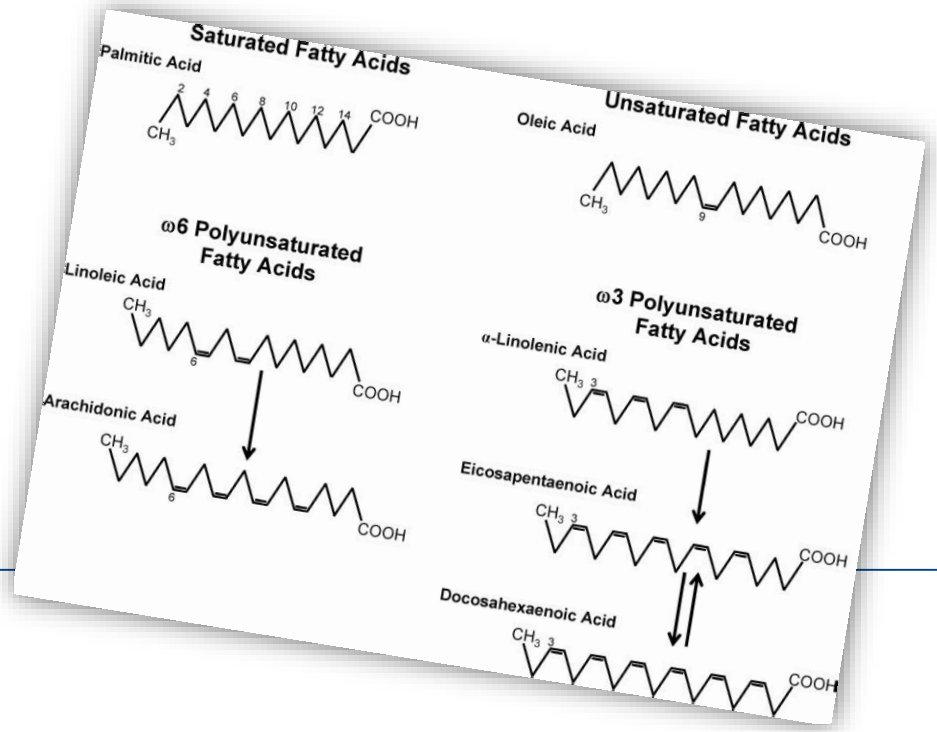
Application of data from Raw Milk Testing

FATTY ACID PACKAGES

FOSS

Fatty Acid Package I – Chain Length

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



Fatty acid Package II – Degree of Unsaturation

- Saturated Fatty Acids (SFA)
- Mono Unsaturated Fatty Acids (MUFA)
- Poly Unsaturated Fatty Acids (PUFA)
- Major Fatty Acids
  - $C_{14:0}$
  - $C_{16:0}$
  - $C_{18:0}$
  - $C_{18:1}$

ANALYTICS BEYOND MEASURE

FATTY ACID ORIGIN PACKAGE

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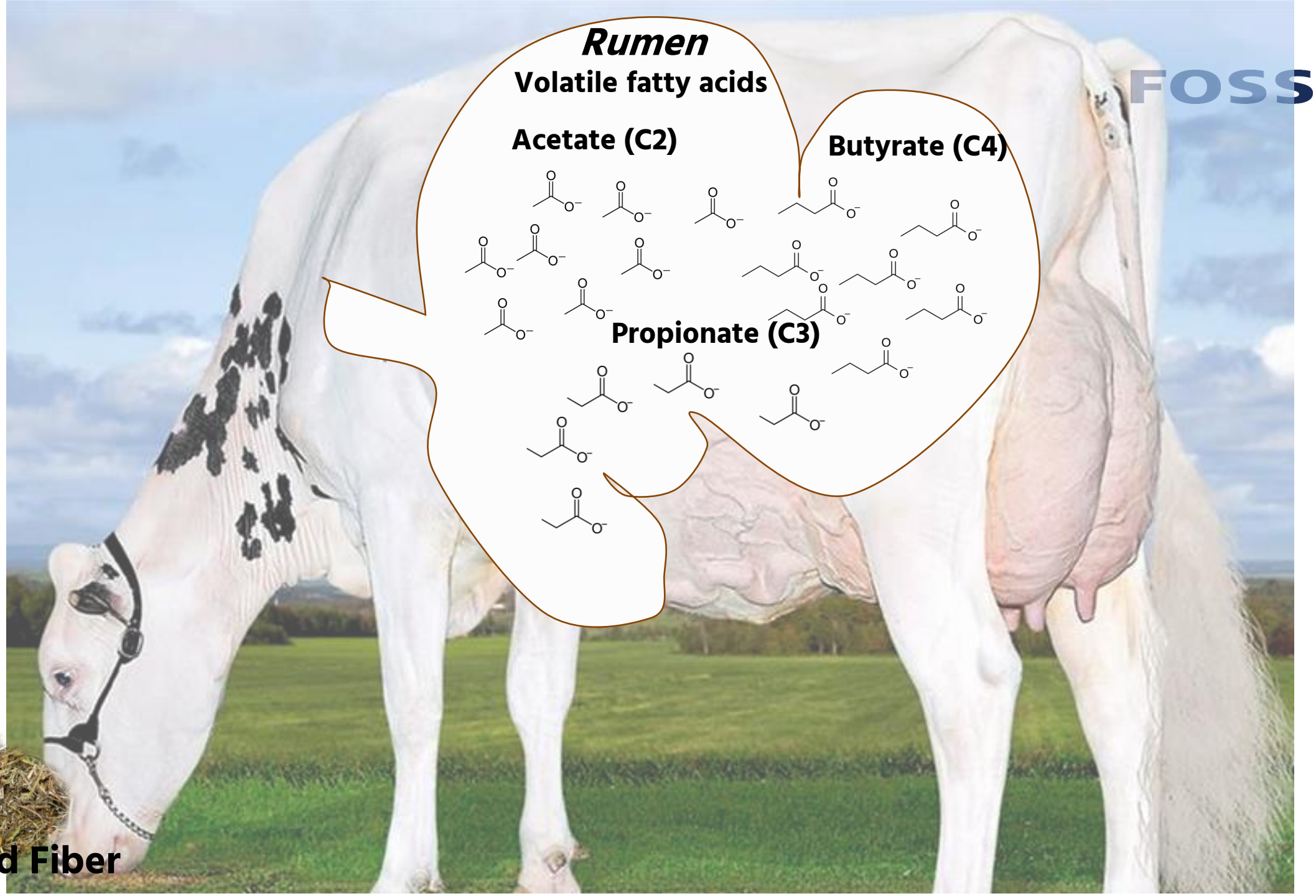
	De novo	Mixed	Preformed
Fatty acid group:			
Fatty acids:	≤ *C14*	*C16*	*C15* *C17* *≥C18*
Origin of fatty acids:	Synthesized in the mammary gland	de novo or preformed	Come from feed or from body reserves

(according to Palmquist, 2006; Vlaemick et al., 2006; Dewhurst et al., 2000)

ANALYTICS BEYOND MEASURE

DE NOVO SYNTHESIS



Starch and Fiber

FOSS

ANALYTICS BEYOND MEASURE

DE NOVO SYNTHESIS IN THE MAMMARY GLAND

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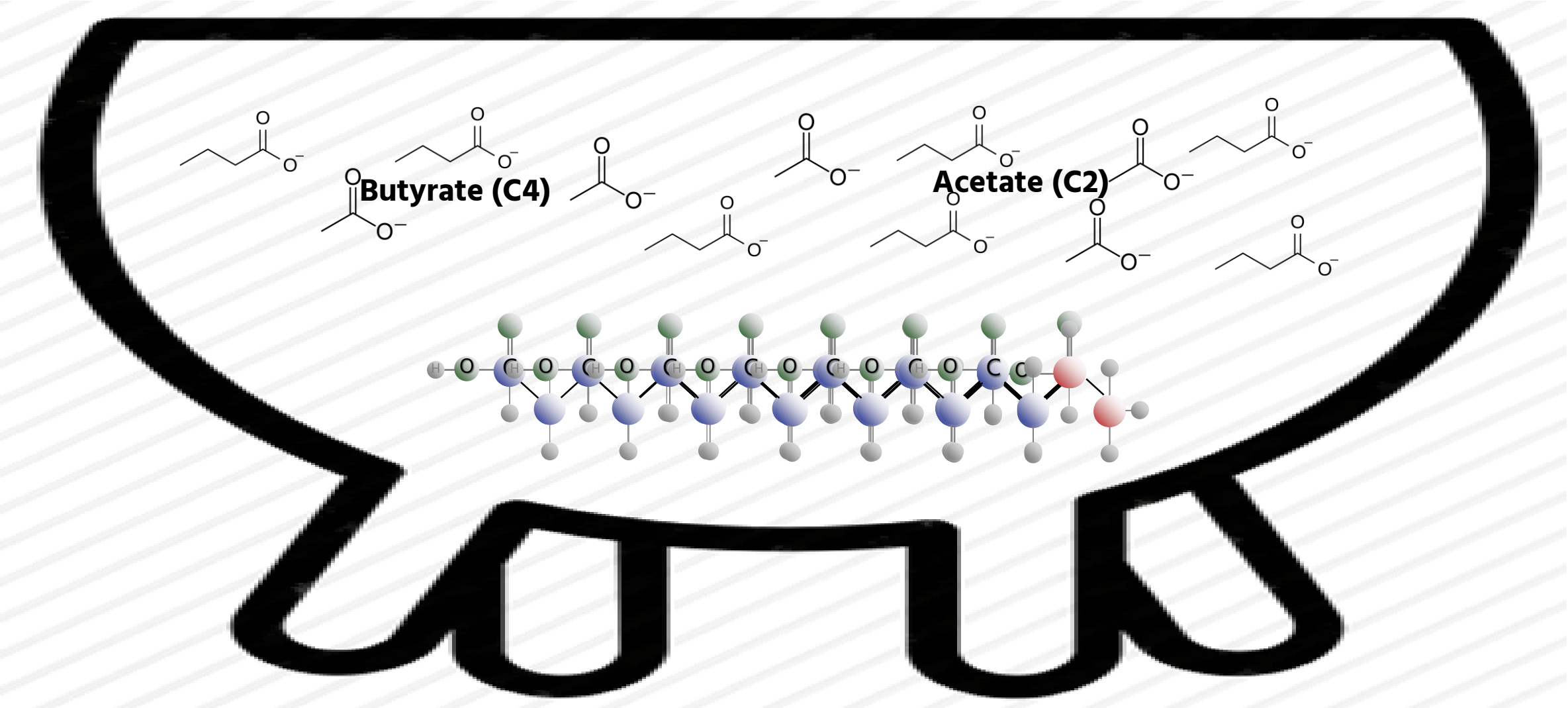
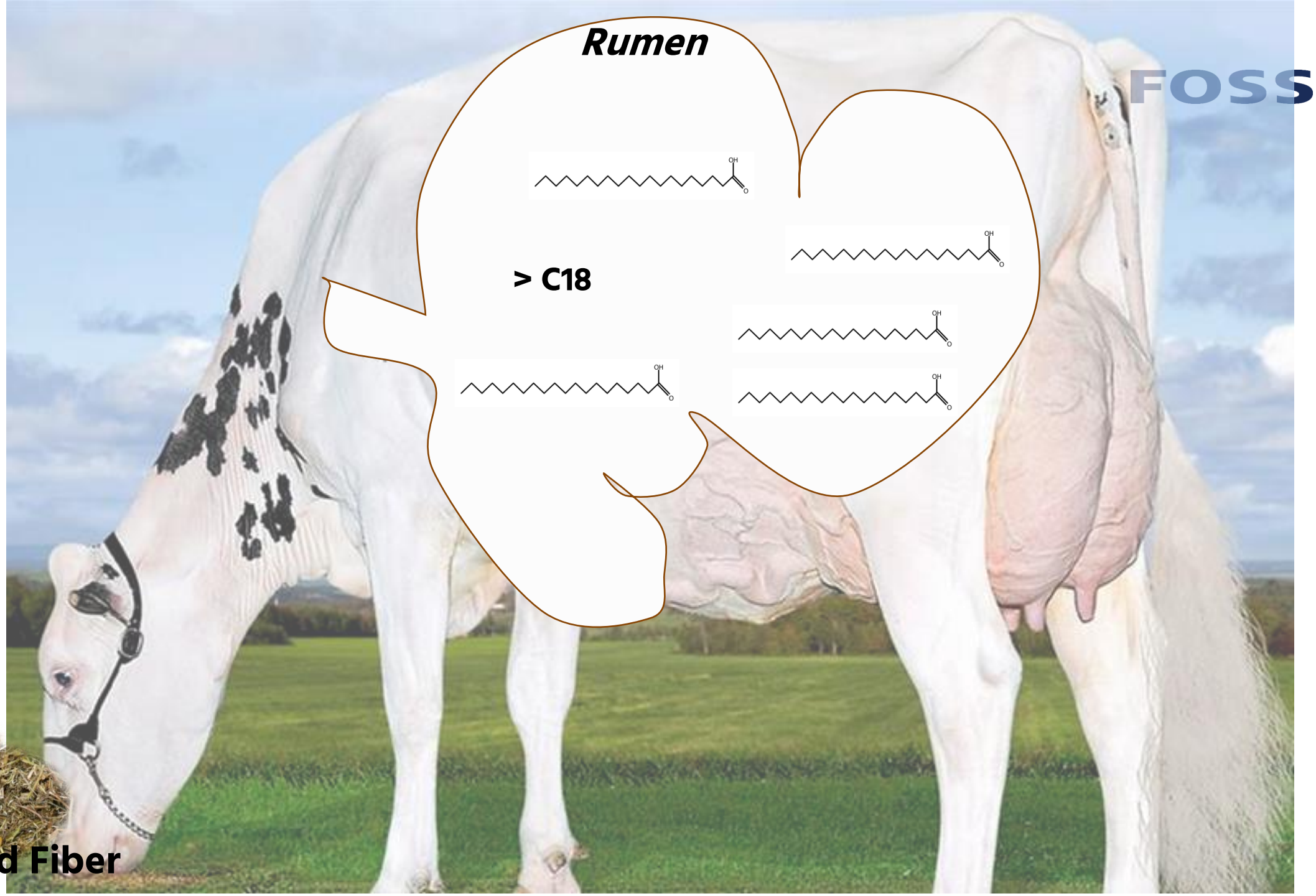


ANALYTICS BEYOND MEASURE

PREFORMED FATTY ACIDS



Starch and Fiber

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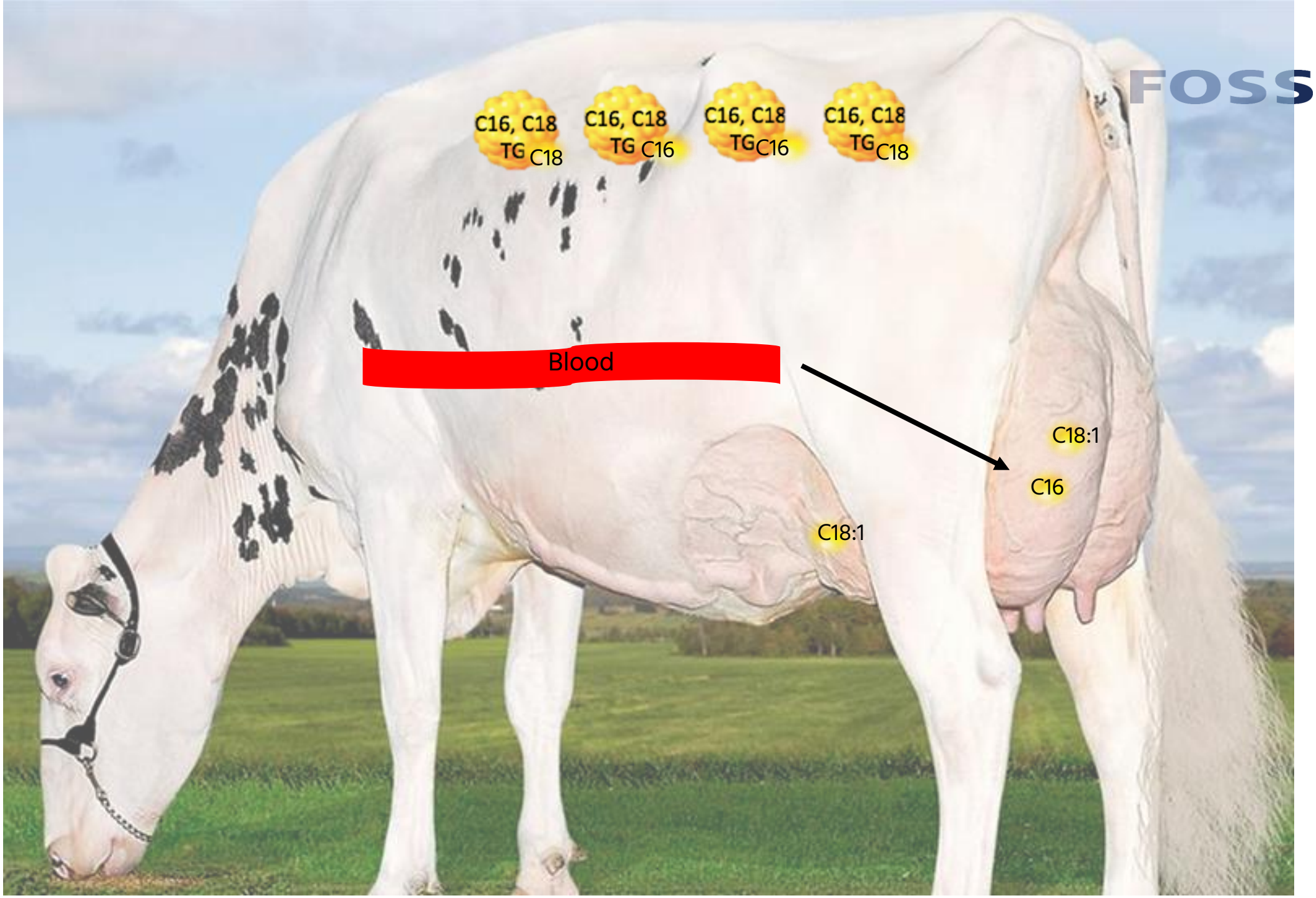
ANALYTICS BEYOND MEASURE

LIPOLYSIS

=

Adipose tissue



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ANALYTICS BEYOND MEASURE

CALIBRATION DEVELOPMENT

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FOSS Standards

- ❑ 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

ANALYTICS BEYOND MEASURE

REAL LIFE EXAMPLE; FAT AND PROTEIN VS DE NOVO

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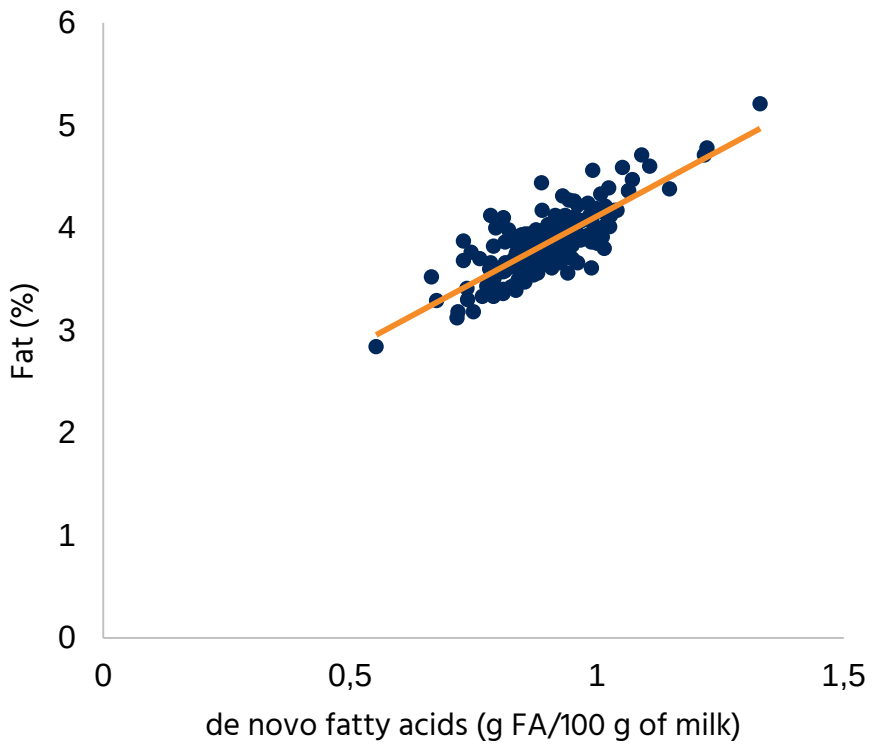
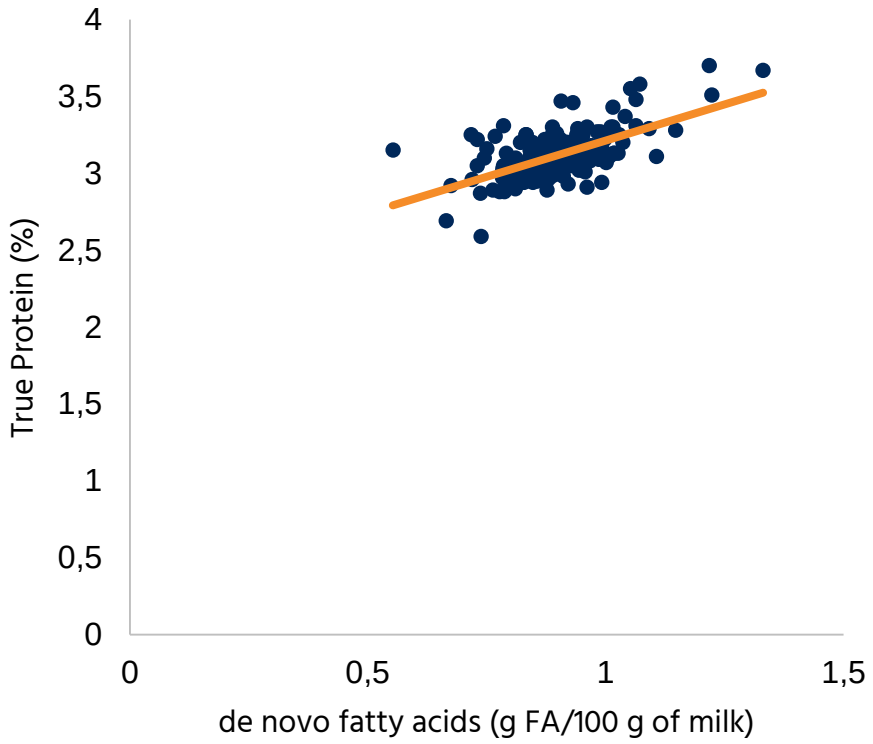




High **fat %** associated with high de novo contents

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

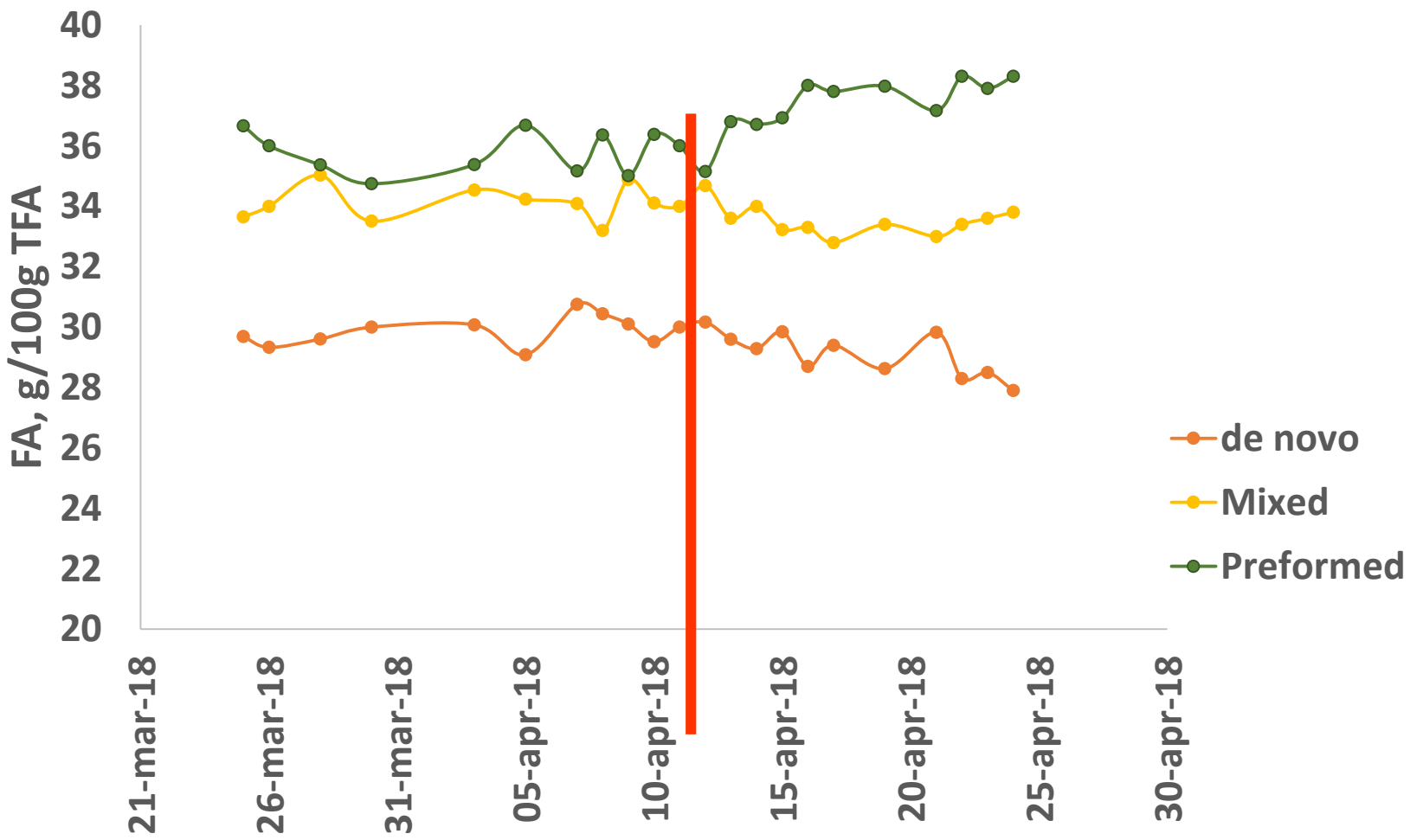
High **protein %** associated with high de novo contents

→increased microbial fermentation as well as microbial protein synthesis

→ Opportunity for dairy farmers to increase revenue and profit

ANALYTICS BEYOND MEASURE

CONCEPT OF FATTY ACID ORIGIN PROFILING



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 $$$

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valacta
ANALYTICS BEYOND MEASURE

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ANALYTICS BEYOND MEASURE

DIFFERENTIAL SCC (DSCC)

Application of Data from Raw Milk Testing

CELLS IN MILK

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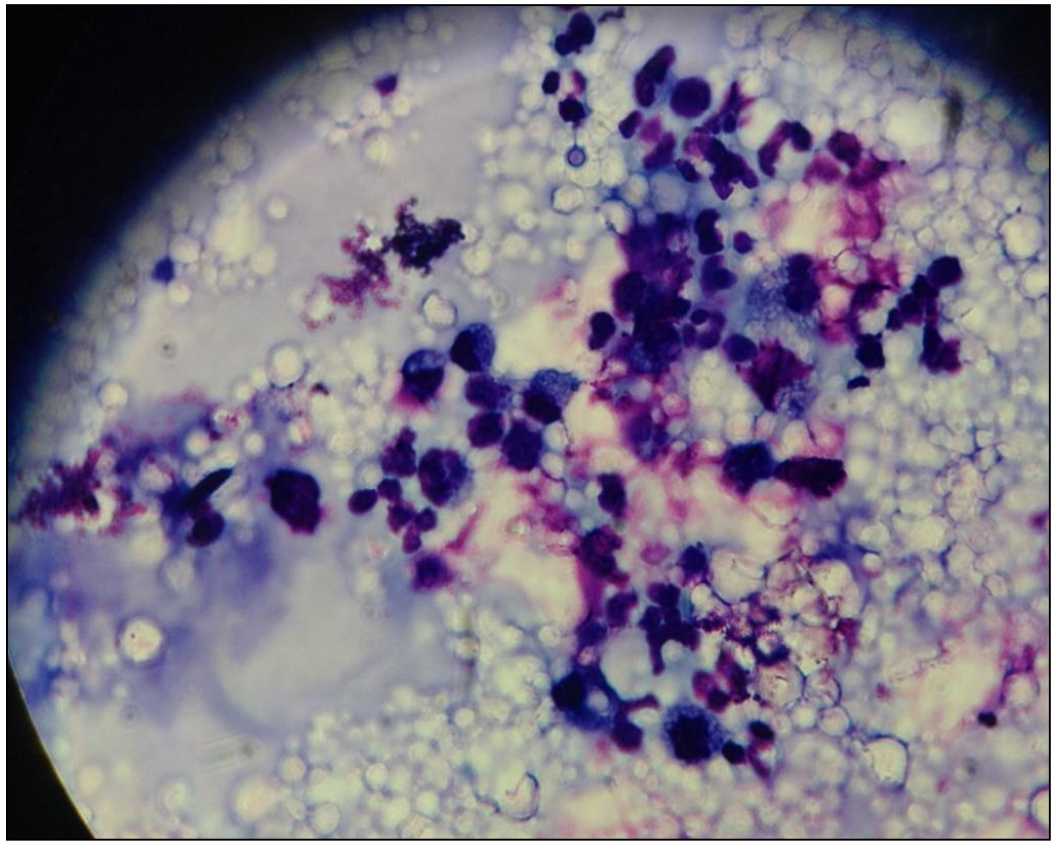
- ❑Lymphocytes
- ❑Polymorphonuclear neutrophils (PMN)
- ❑Macrophages

DSCC % → PMN + lymphocytes



Microscope spot, milk slide

ANALYTICS BEYOND MEASURE

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

EVOLUTION OF DSCC

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100 FM 7 DC sold worldwide

15 FM 7 DC installed in Italy

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

2014 **2017** **to 2019**

ANALYTICS BEYOND MEASURE

DSCC VALUE PROPOSITION ACTIVITIES

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Project	Objectives
University, Switzerland	DSCC before, during, and after artificially induced mastitis
University, Belgium	Value of DSCC for selective dry cow therapy
Valacta, North America	Investigation of correlation between DSCC and udder health status in a longitudinal study – selective dry cow therapy
AgSource, North America	DSCC for enhanced analysis of udder health in fresh lactating cows
CLASEL/Agranis, MyLab, Shanghai BD, Europe/Asia	DSCC as parameter for improved microbiological testing
DTU, Denmark	Longitudinal study to develop general guidelines for application of DSCC in practise
DLQ, Germany	Implementation of DSCC in routine DHI analysis – development of application guidelines

ANALYTICS BEYOND MEASURE

TECHNICAL ARTICLES

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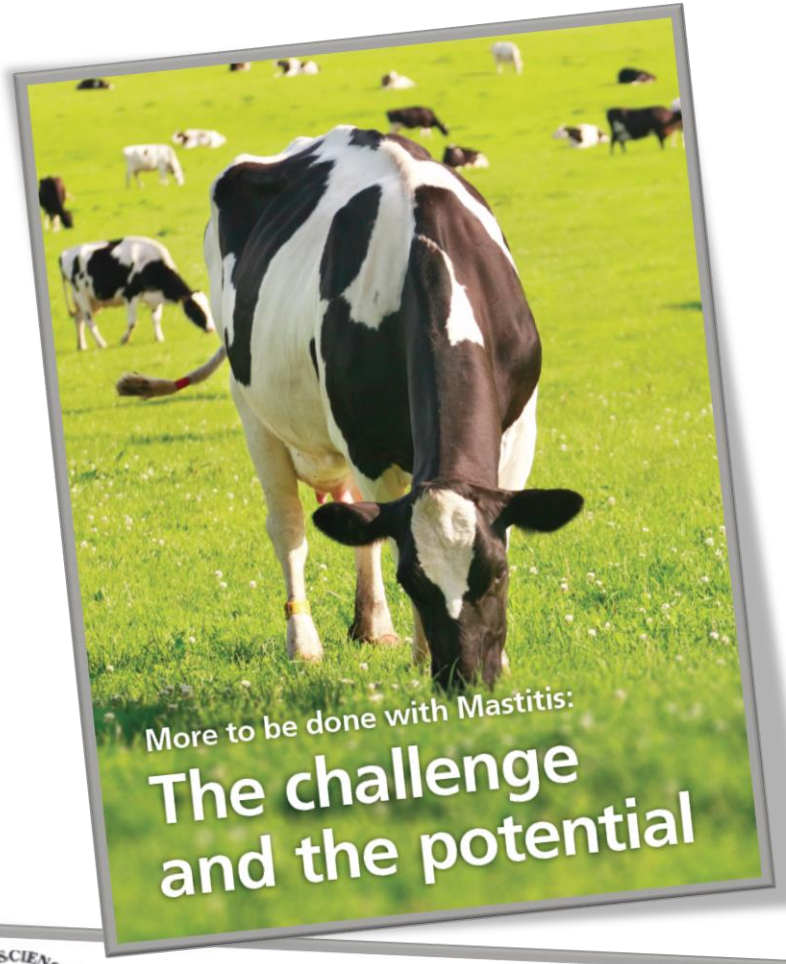

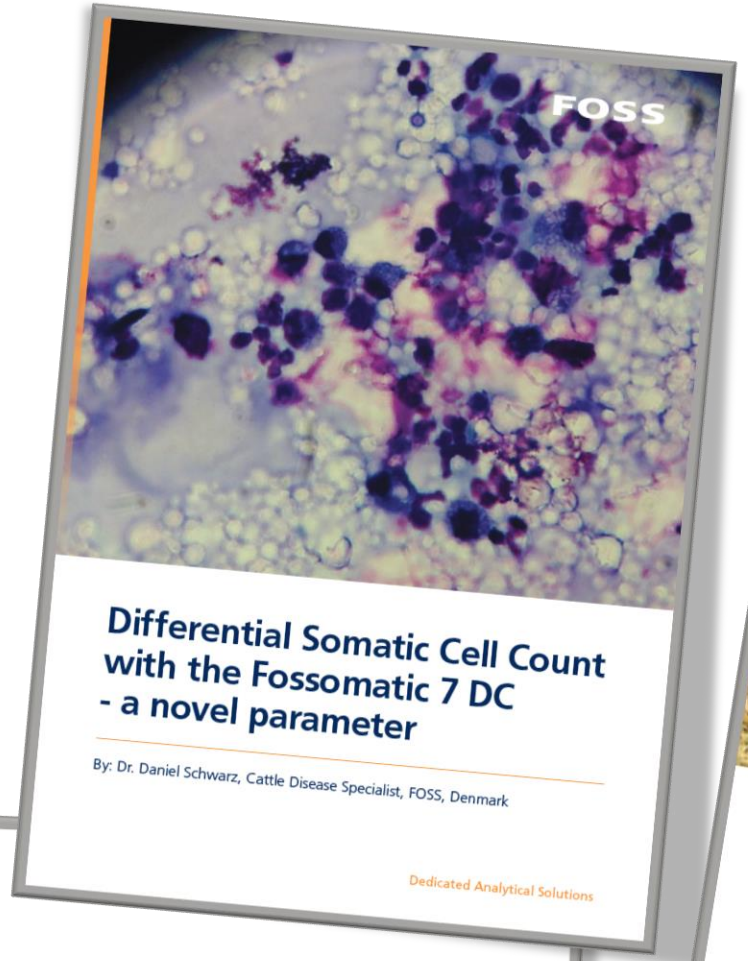

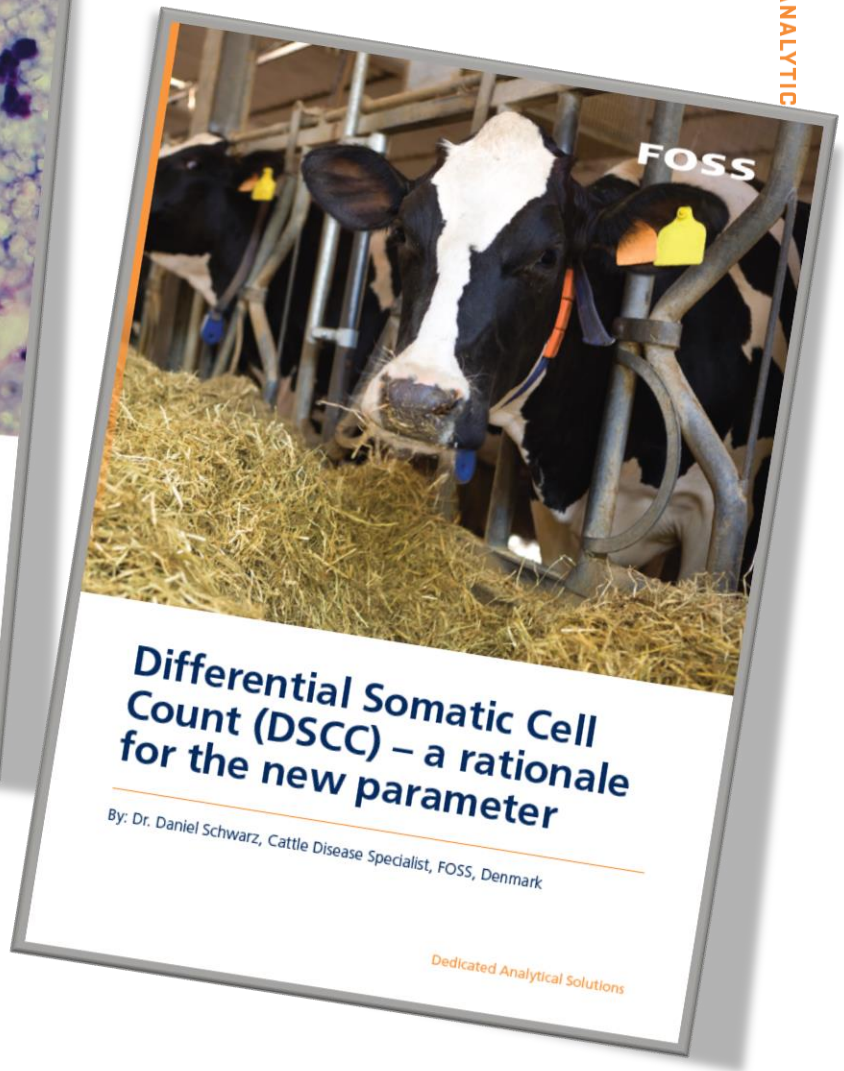

J. Dairy Sci. 100:4926–4940
https://doi.org/10.3168/jds.2016-12409
© American Dairy Science Association®, 2017.

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 Schwarz[1,2]
Foss Analytical A/S, Foss Allé 1, 3400 Hillerød, Denmark

DSCC – INTRAMMARY INFECTION STATUS

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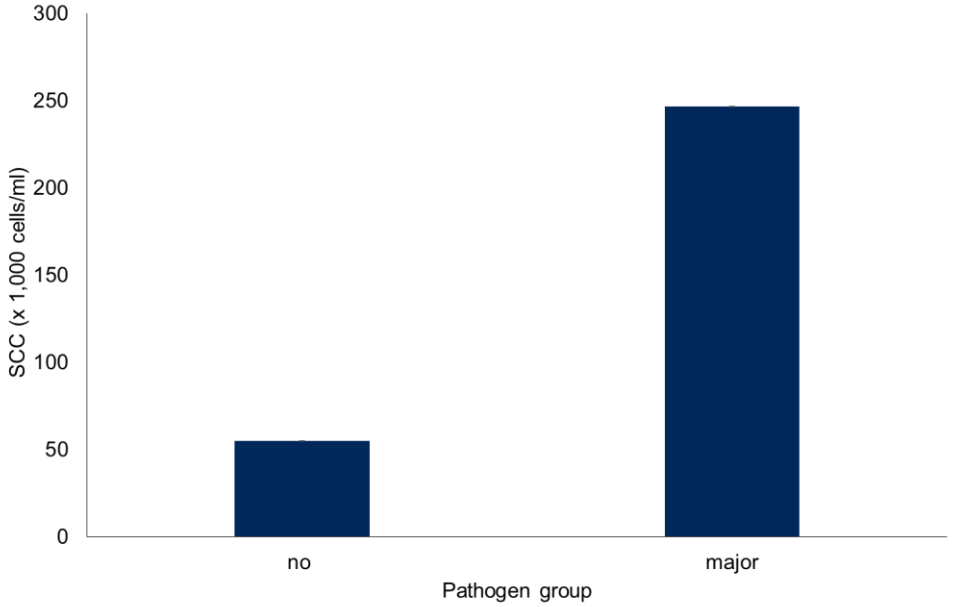
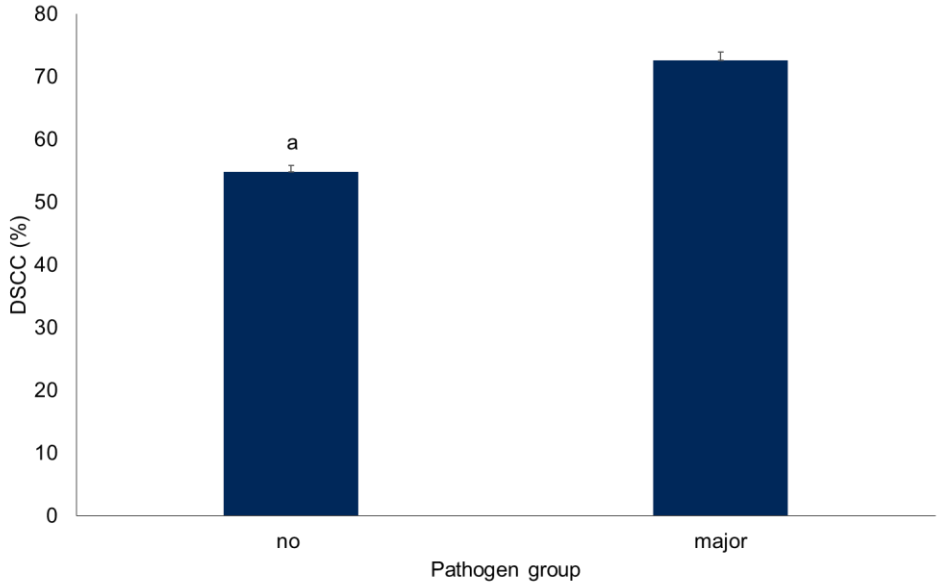
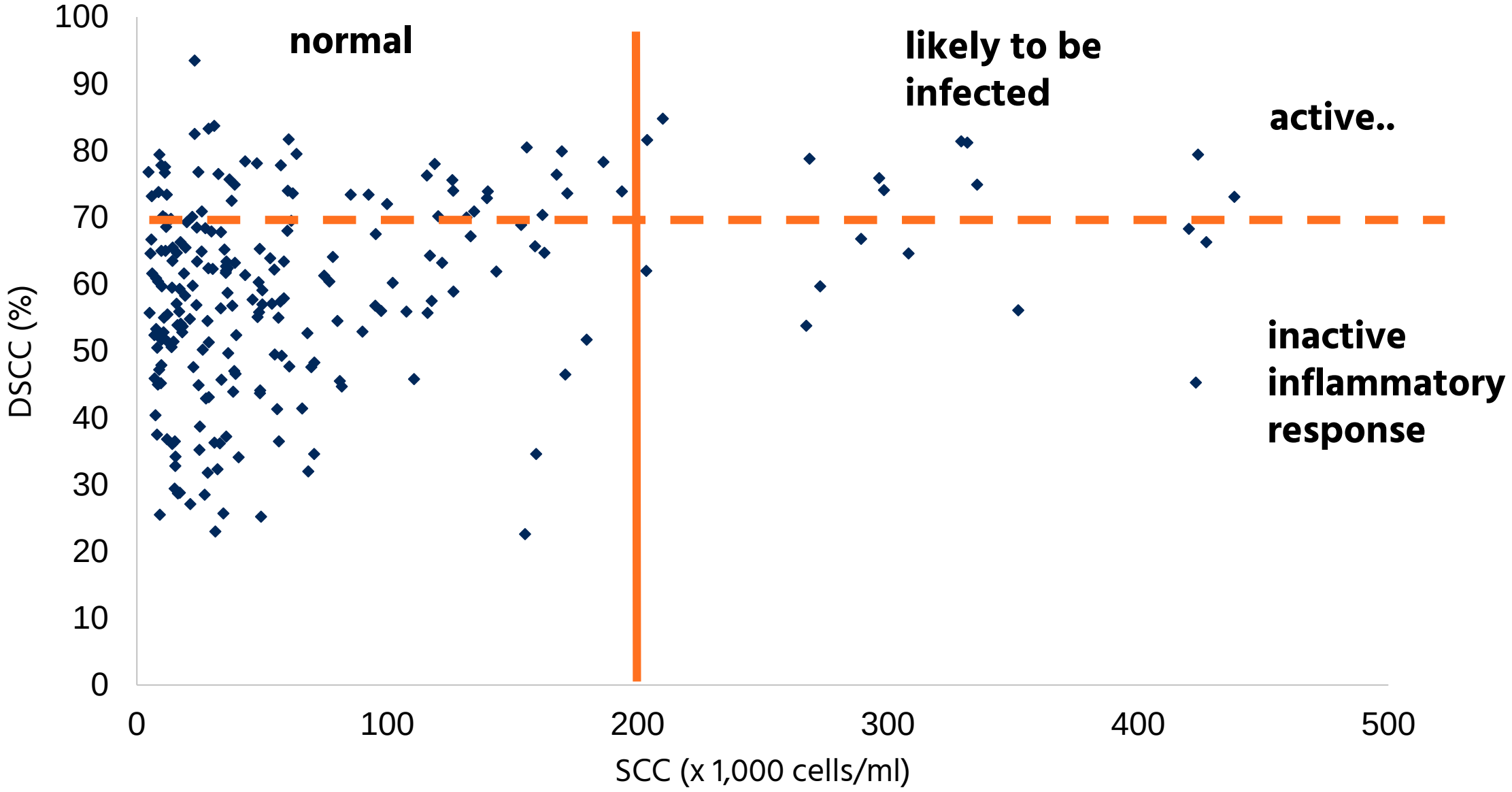




→infected and uninfected cows could be differentiated equally by DSCC and SCC as stand alone parameters each

→Combination of DSCC and SCC led to increase sensitivity, but slight decrease in specificity

ANALYTICS BEYOND MEASURE



Schwarz, 2018

SUMMARY

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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

ANALYTICS BEYOND MEASURE

https://www.fossanalytics.com