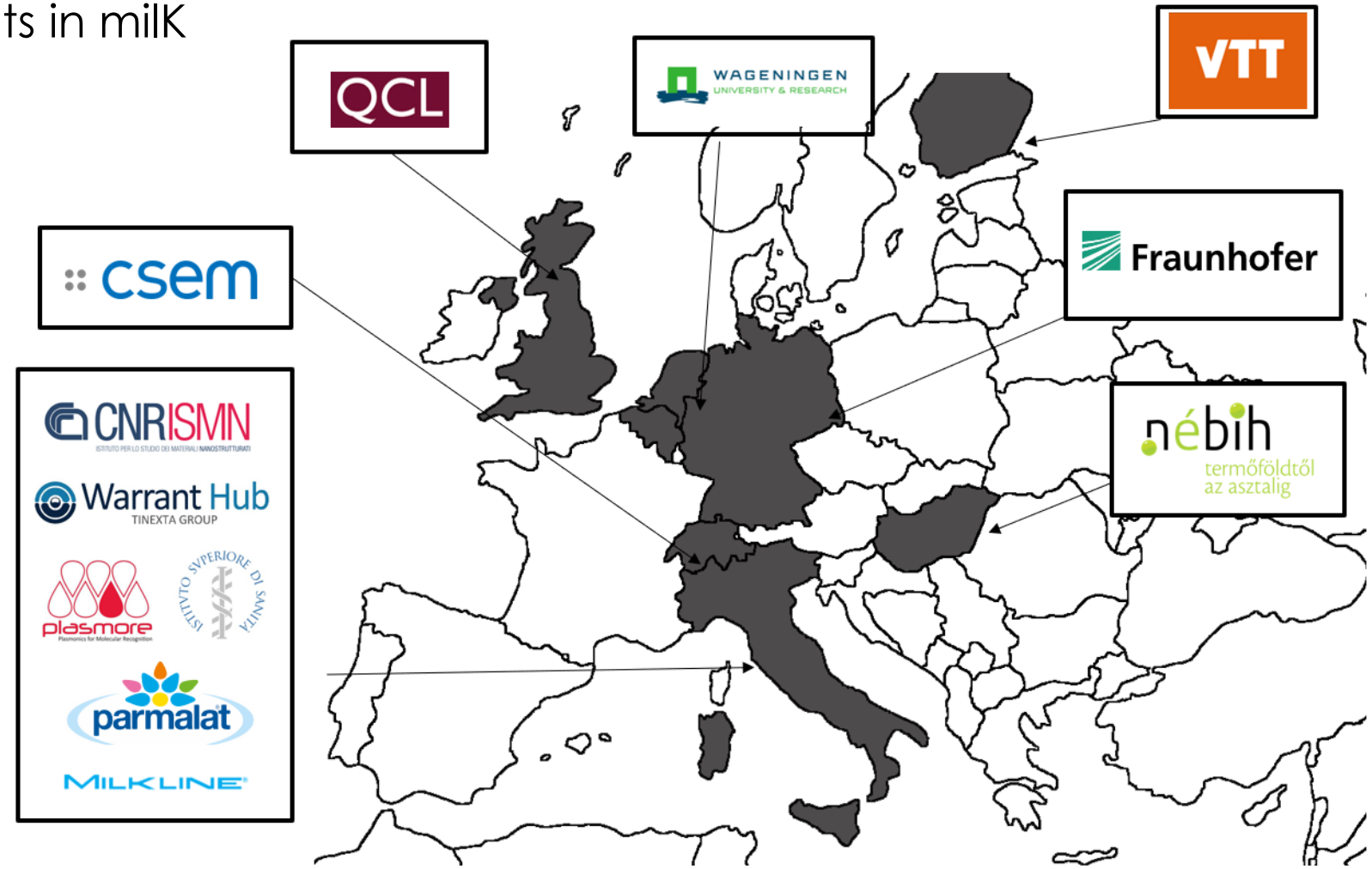
MOLOKO

PHOTONICS21
PHOTONICS PUBLIC PRIVATE PARTNERSHIP

Early mastitis detection: Can **Lactoferrin** evaluation by EU funded project MOLOKO biosensor help?

Paolo Bulgarell, DVM
Milk Purchasing Quality Manager

Multiplex phOtonic sensor for pLasmonic-based Online detection of contaminants in milK



PROJECT REFERENCE: 780839

START/END: Jan 2018 – March 2022

TOTAL COST: EUR 6,036,381.25

EU CONTRIBUTION: EUR 5,479,159

TOPIC: ICT-30-2017 Photonics KET 2017

12 partners from 8 European countries

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Parmalat End User Role:

Why a milk processor so involved in an animal health project?

How to achieve to **Food Safety** goal in the milk supply chain?

Along the very long value chain of milk production and collection, the more **upstream the detection** of analytes for safety and quality, the greater the benefits for all the actors in the value chain

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

List of target molecules

FOOD SAFETY

Antibiotics

Staphylococcus aureus enterotoxin A and B

Aflatoxin M1

FOOD QUALITY

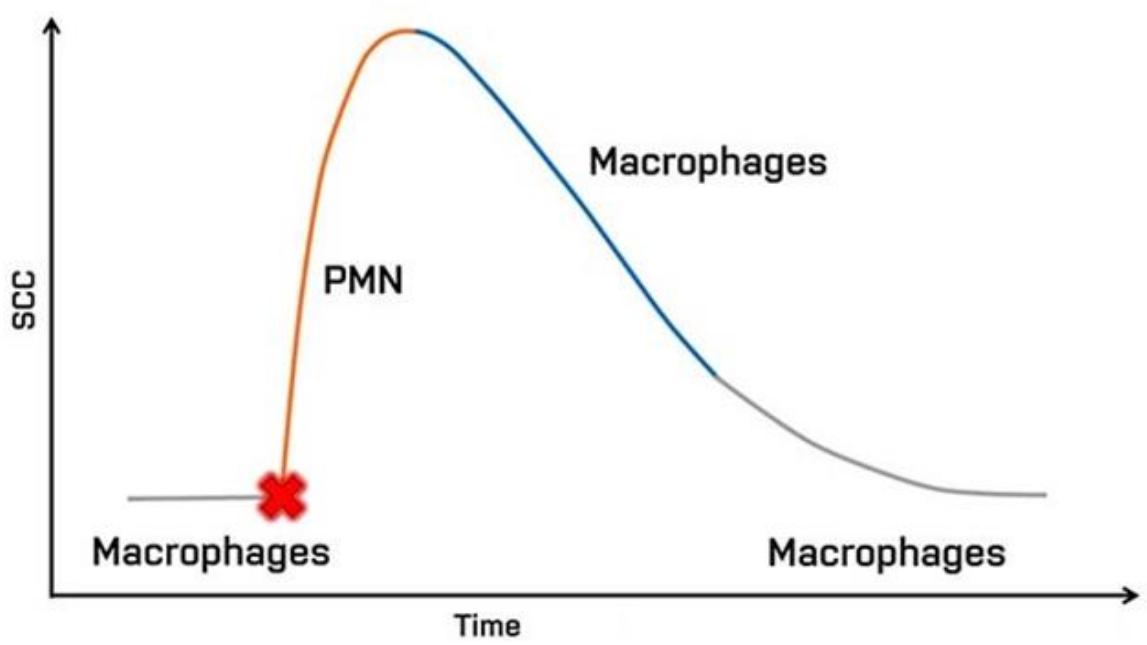
Lactoferrin

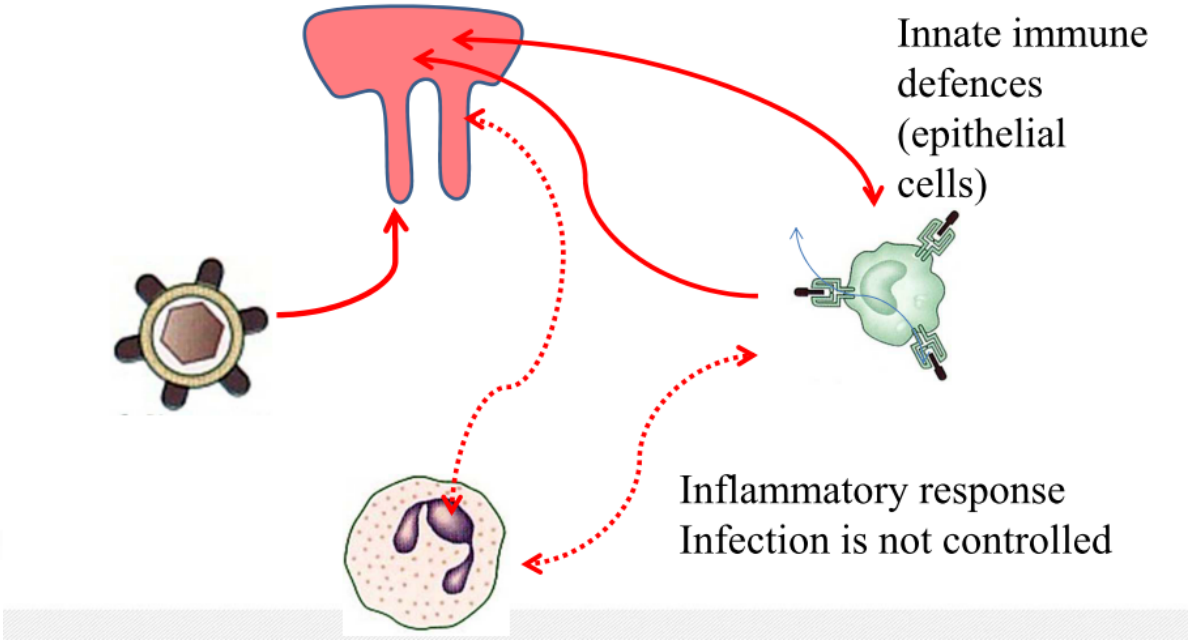
k-Casein B

ß-Casein A2

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Early mastitis detection: Why Lactoferrin?





Preventive Veterinary Medicine 181 (2020) 105079

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Evaluation of the new differential somatic cell count parameter as a rapid and inexpensive supplementary tool for udder health management through regular milk recording

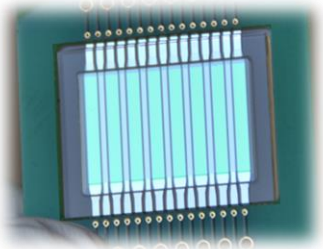
Daniel Schwarz[a,*], Debora E. Santschi[b], Jean Durocher[b], Daniel M. Lefebvre[b]

[a] FOSS Analytical A/S, Foss Allé 1, 3400 Hillerød, Denmark
[b] Lactanet, Ste-Anne-de-Bellevue, Québec, Canada

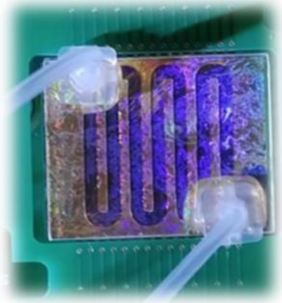
Neutrophils migrate from blood to the mammary gland in response to infection and constitute a major host defense mechanism

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

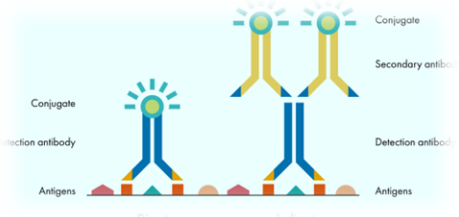
Sensor key components:



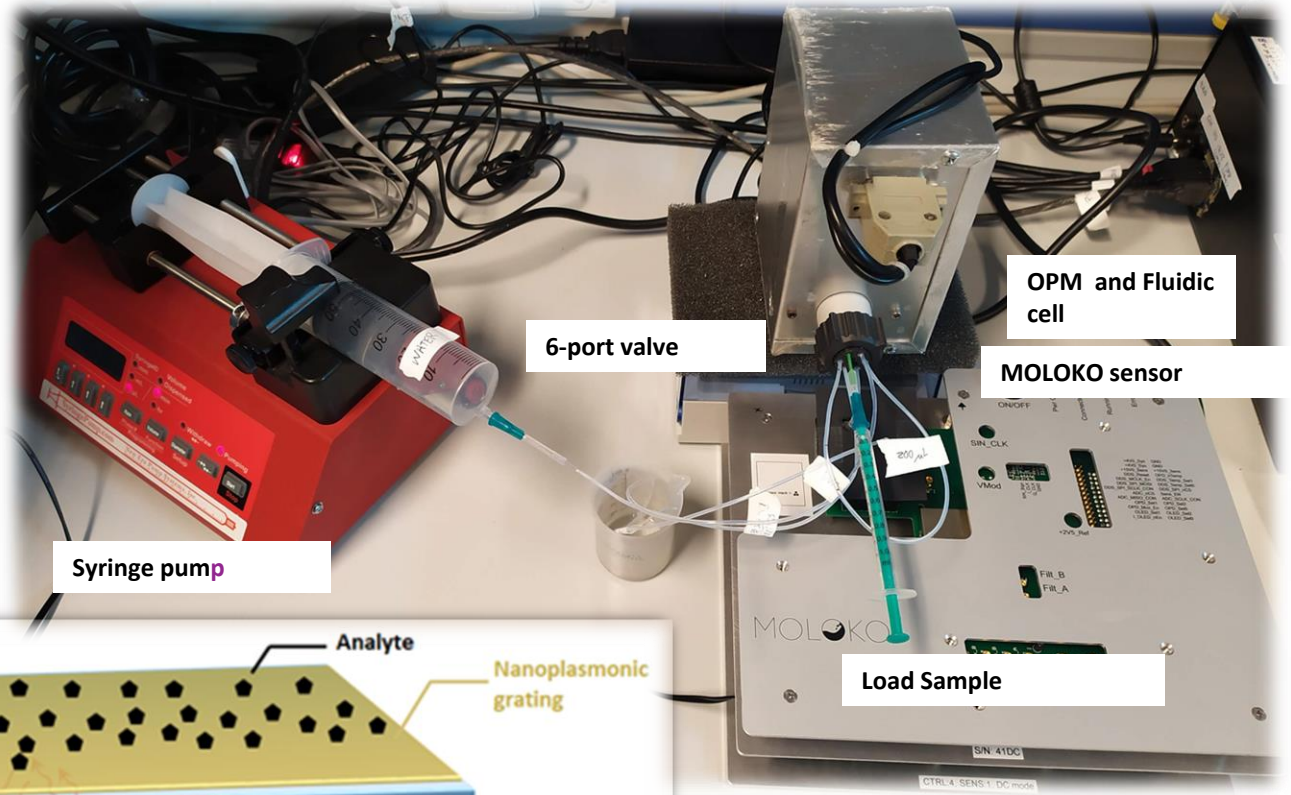
Photonic Organic Module

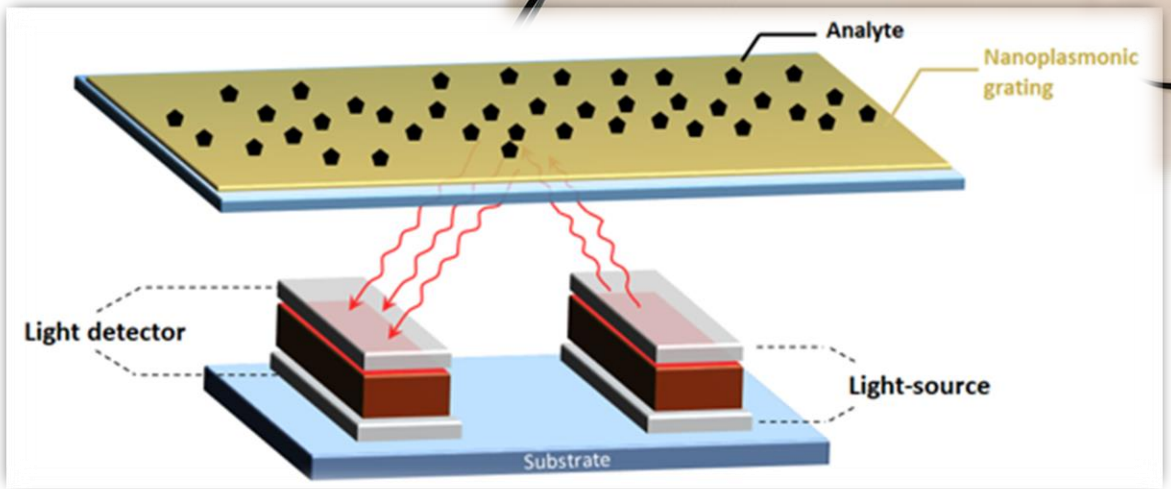


SPR Sensing Surface



Immunoassay Technology

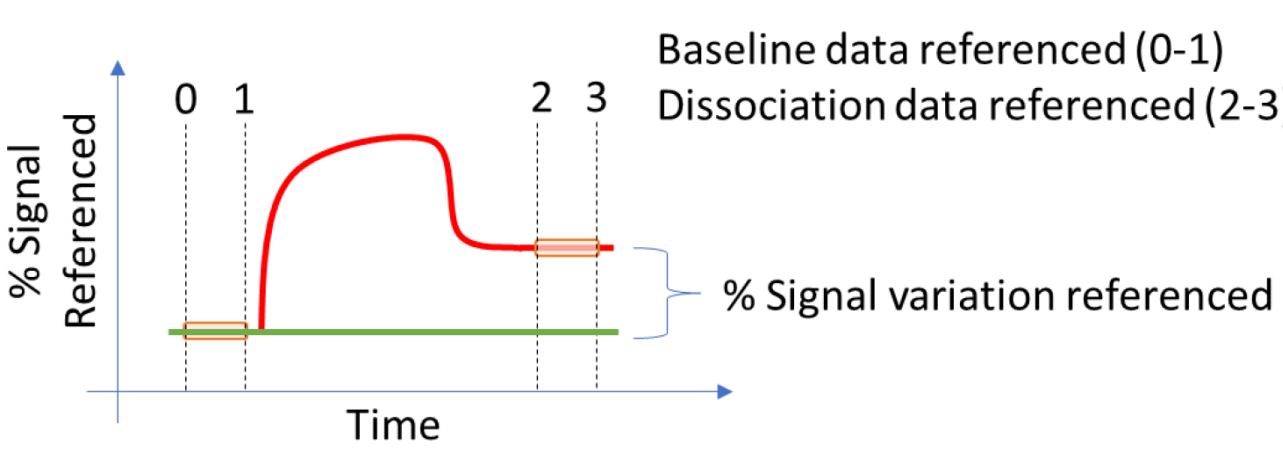


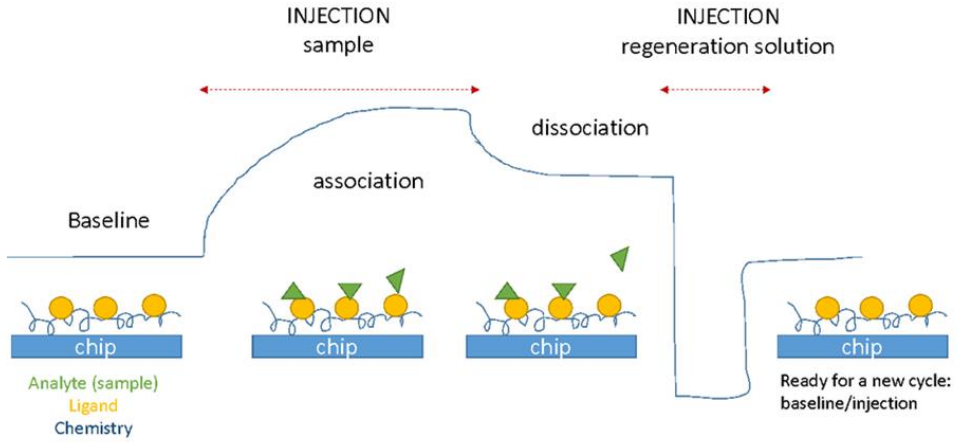


Cloud-based

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Lactoferrin - Dose-response curve in manual controlled MOLOKO sensor



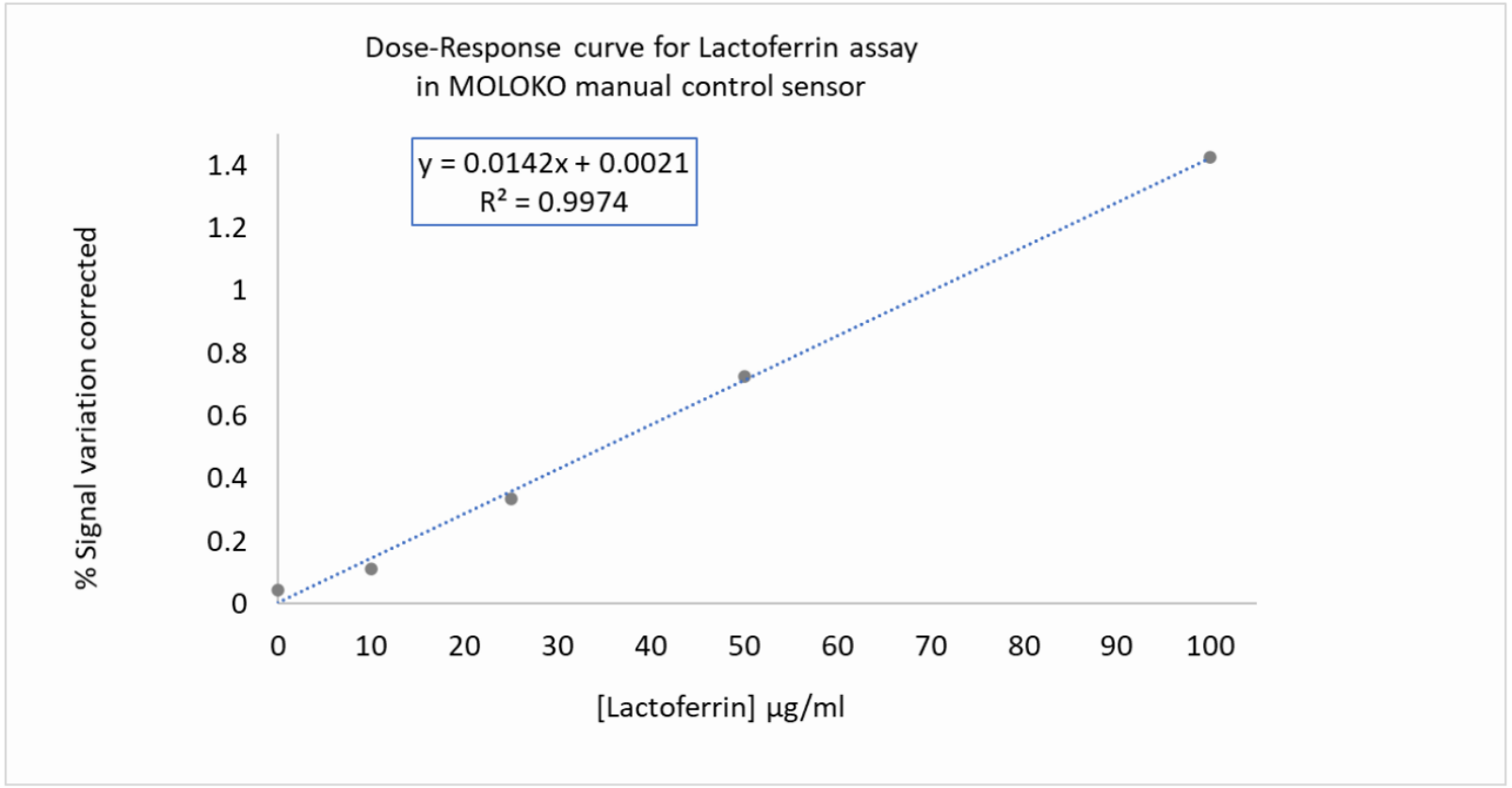


Sensorgram type for protein tests
or calibration of assays and milk samples measurements.

The signal from the reference channel is shown in green and the specific assay channel in red.

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Lactoferrin - Dose-response curve in manual controlled MOLOKO sensor



The Dose-response curve showed a linear correlation between the signal of the MOLOKO biosensor and the concentration of LF.

The LOD for the LF assay was calculated as 3 times the signal of the noise and corresponds to 8.8 µg/ml.

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Lactoferrin - On Farm

Real environment evaluation:

2 different herds

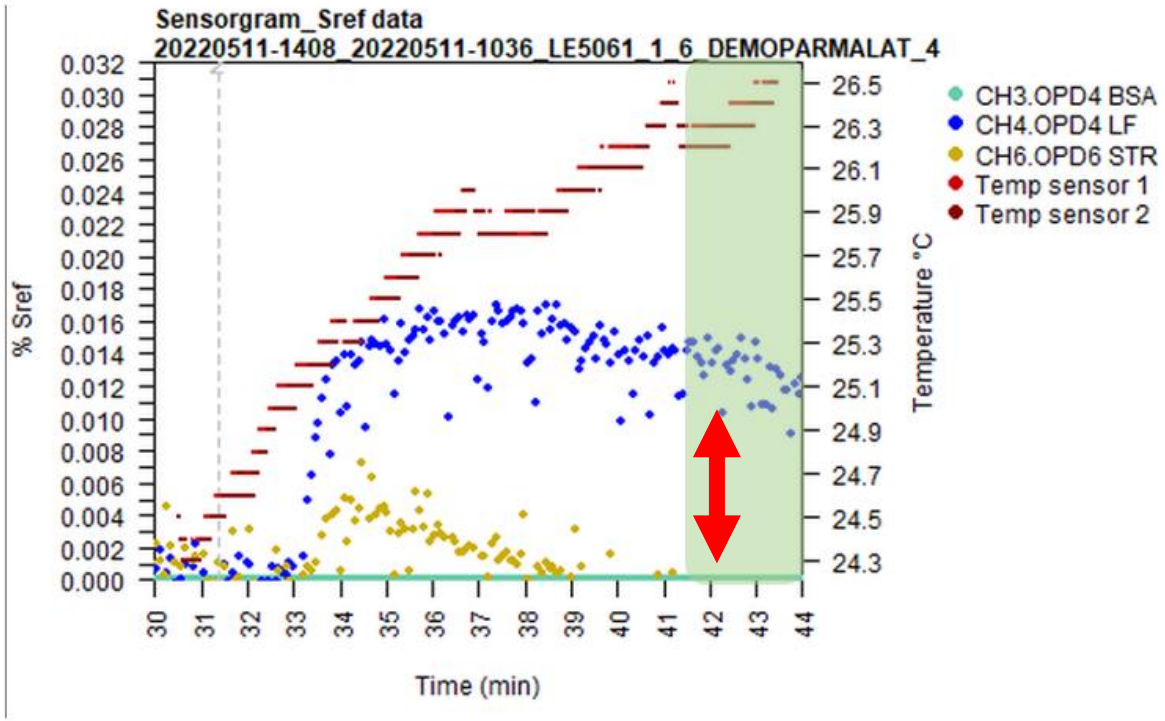
600 lactating cows with a milking parlour system

100 lactating cows with AMS

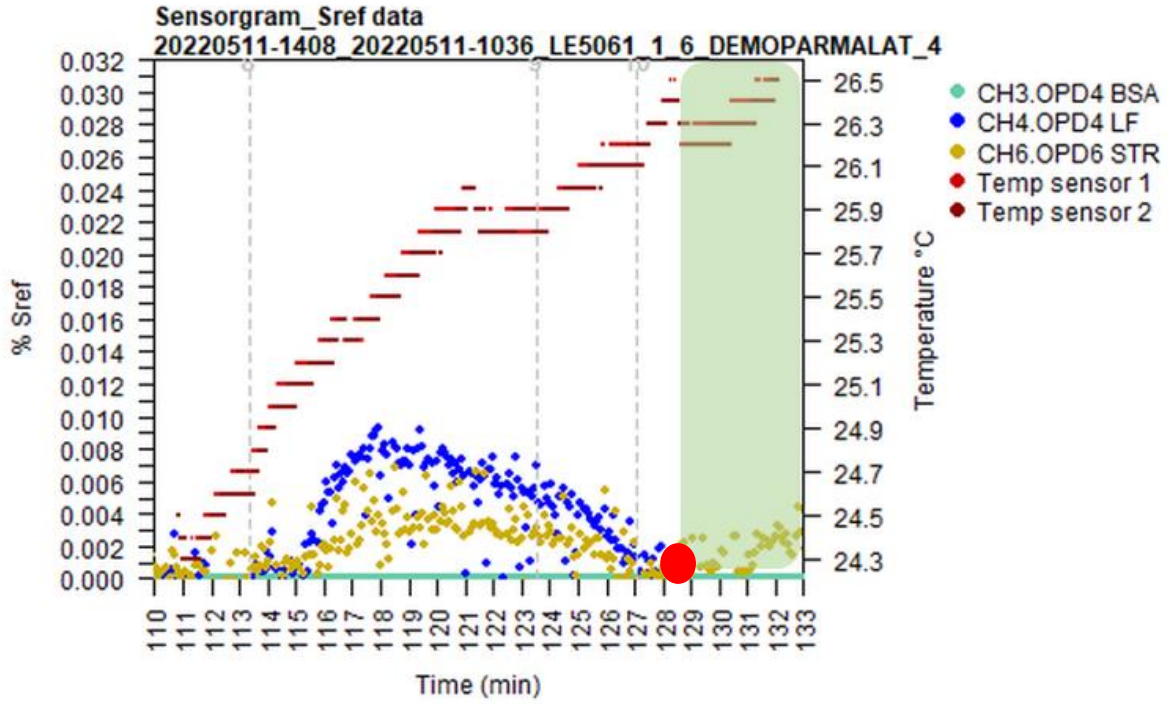
524 individual milk samples tested with gold standard ELISA

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Lactoferrin - On Farm



Interaction of Lactoferrin at 100µg/ml in buffer.



Interaction of milk sample diluted 100 times.

Blue line shows signal from the specific channel for Lactoferrin detection.
Green region corresponds to the dissociation phase in which the level of analyte is evaluated

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Lactoferrin - On Farm

Individual milk samples have been also analysed for:

1. Fat
2. Protein
3. Lactose
4. Somatic Cell Count
5. Differential Somatic Cell Count
6. Bacteriological culture
7. F-
8. K+
9. Na+
10. Ca2+
11. Cl-
12. NO3-
13. NH4+
14. pH
15. Redox
16. Conductivity

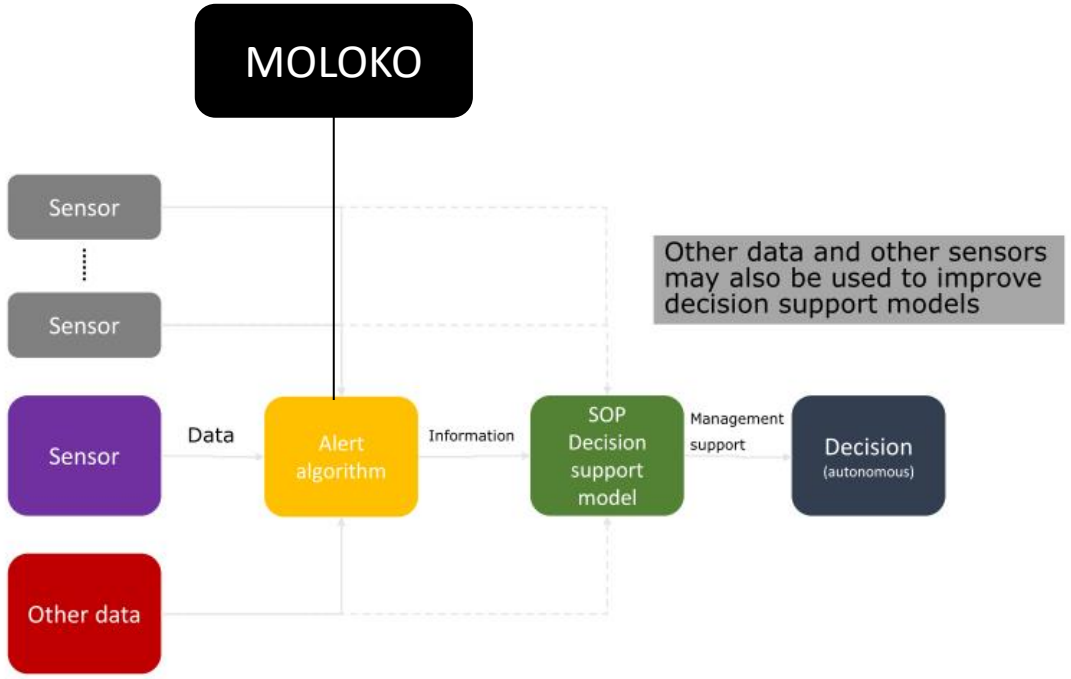
And also this parameters have been taken into consideration:

1. DIM
2. Parity
3. Mastitis events

Using this others with an algorithm together with Lactoferrin threshold ?

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Next step - Precision Livestock Farming (PLF)



Detection results clinical mastitis

Necessary performance (ISO)
- Sensitivity 80% – specificity 99%

In practise
- Sensitivity 21% - specificity 99%
- Sensitivity 50% - specificity 90%

In theory
- Sensitivity 57% - specificity 98%

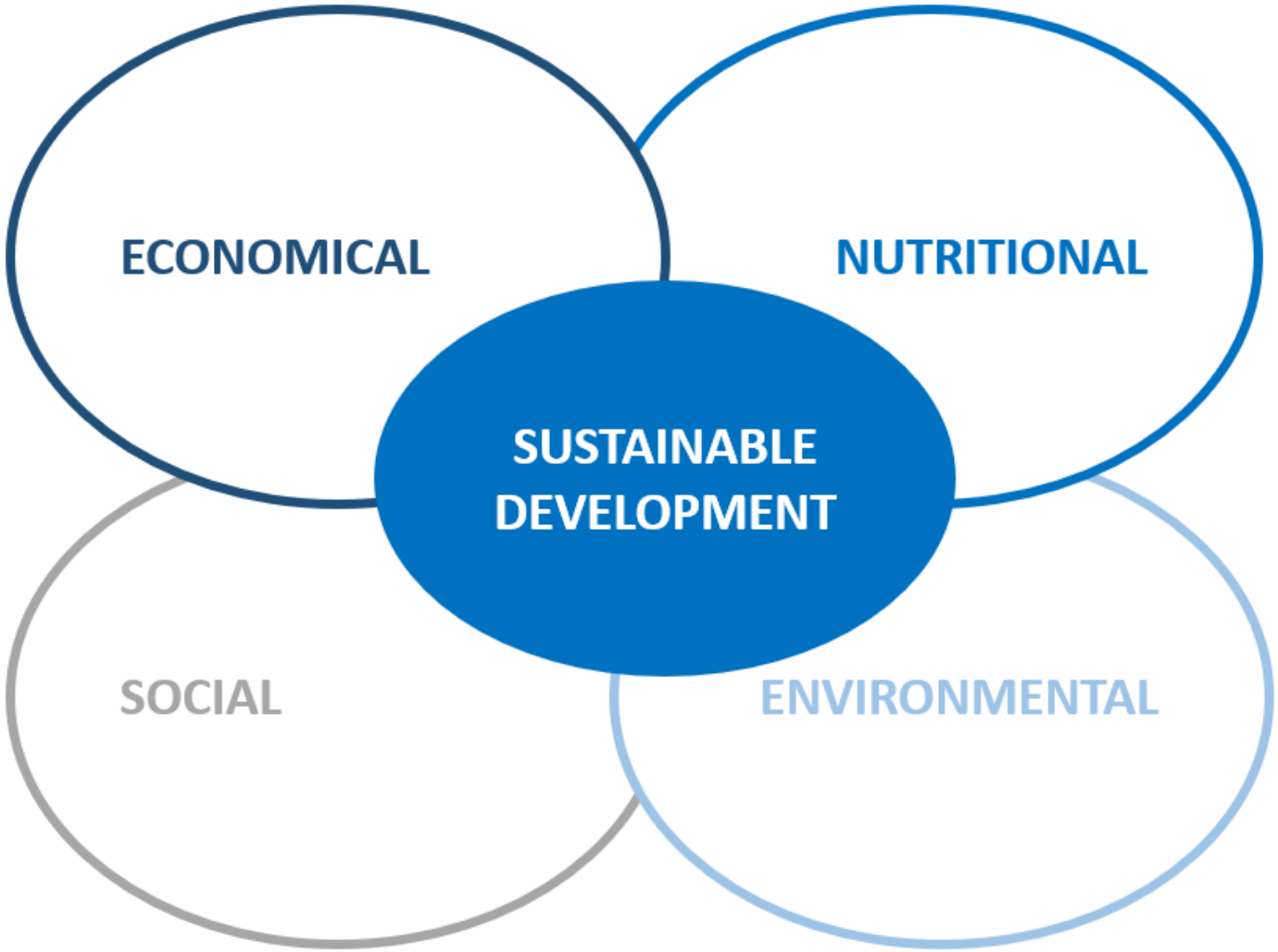
Recently (with SCC):
- Sensitivity 90% - specificity 90%

NMC san diego 2022 proceeding –Short course Sensor-based mastitis management (Henk Hogeveen, Ilka Klaas, David Kelton & Alfonso Zecconi)

What about others heard situations? Dry off, subclinical, etc

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

Conclusion:



"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No780839".

MOLOKO

PHOTONICS PUBLIC PRIVATE PARTNERSHIP

Grazie per l'attenzione

Paolo BULGARELLI
PARMALAT
paolo.bulgarelli@it.Lactalis.com

www.moloko-project.eu