

BROLIS

HERDLINE

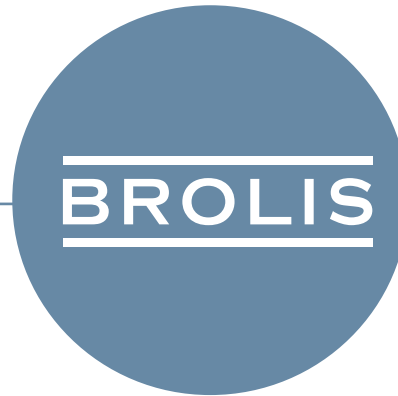


> In-line real-time milk composition analysis by tunable laser spectroscopy for dairy farms

Generic GaSb/Si photonic sensor technology for large markets:
Industrial | Agriculture | Consumer | Medical

BROLIS
Vilnius

- Founded in 2011, Vilnius
- Specializes in:
 - III-V device technology (lasers, detectors)
 - Epitaxy (focus on GaSb)
 - Packaging and Integration
 - Data Science
 - Application validation



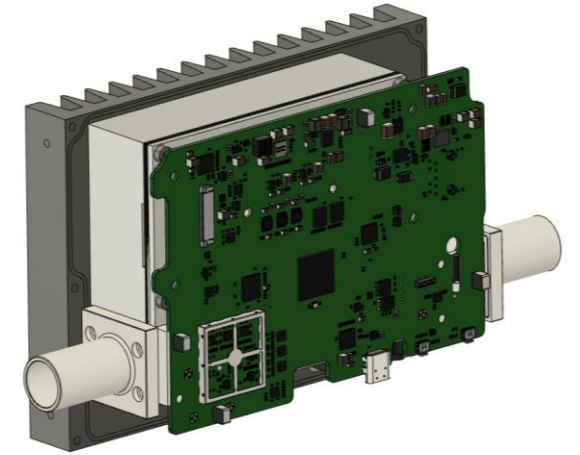
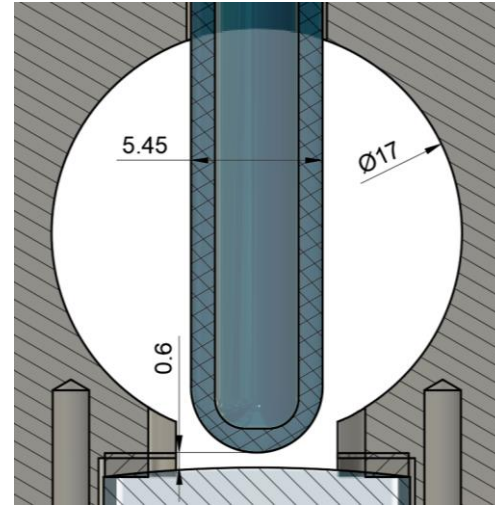
11 patents granted, >50 pending

BROLIS
Ghent

- Founded in 2017, Ghent
- Specializes in:
 - Silicon photonics design
 - IC testing
 - III-V processing & Si post processing



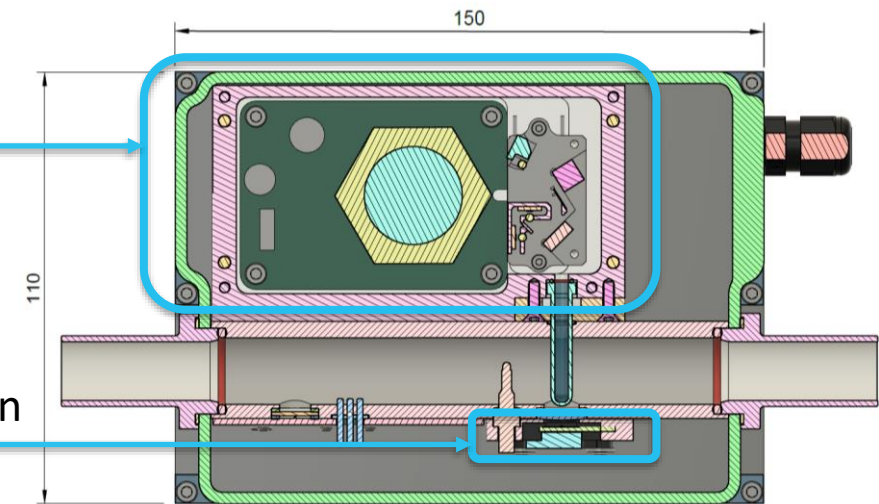
> BROLIS HerdLine milk analyzer 2023 based on tunable laser spectrometer



Sensor key technology: external cavity tunable laser

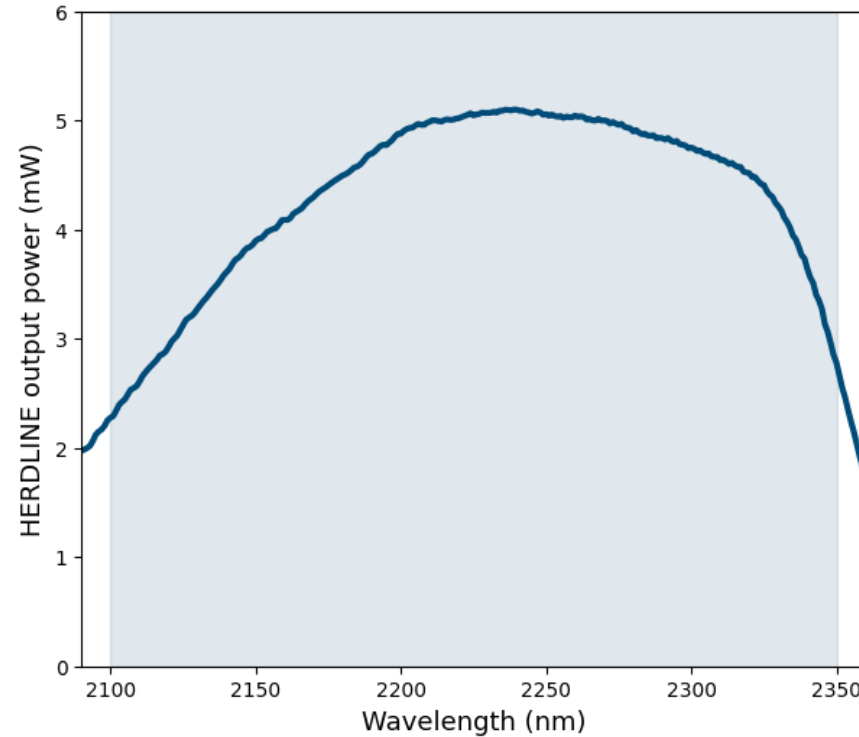
- GaSb based gain chip and photodiodes
- Littman-Metcalf external cavity configuration
- 250 nm tuning range (2100-2350nm) with output power 2-5 mW
- 1000 of full wavelength range absorbance spectra in 1s
- 1 nm resolution
- Design covered by 5 granted patents

Light detection

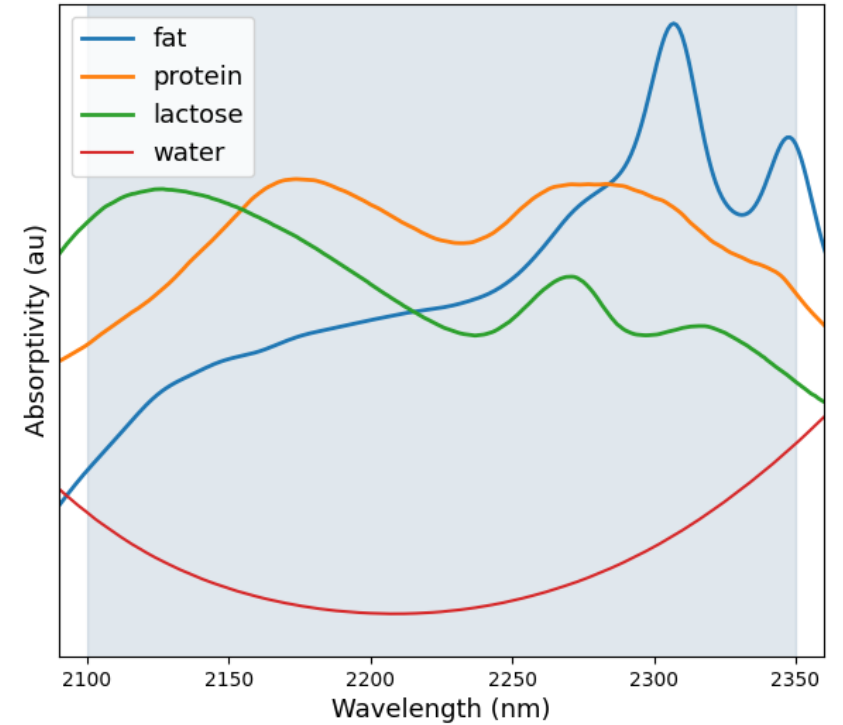


> High spectral density laser output for targeting milk constituents

Brolis HERDLINE laser spectrometer output

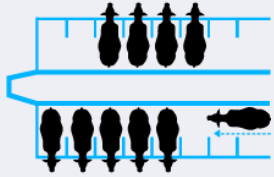


Measured absorbance spectra

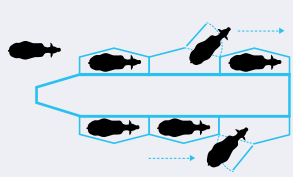


Targeting specific spectral features of fat, protein and lactose that appear in the water transmission window

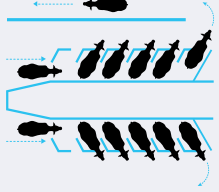
> Sensors deployment in farms



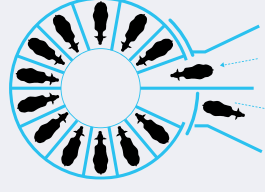
Parallel



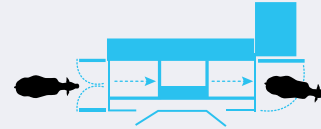
Tandem



Herringbone



Rotary



Robots

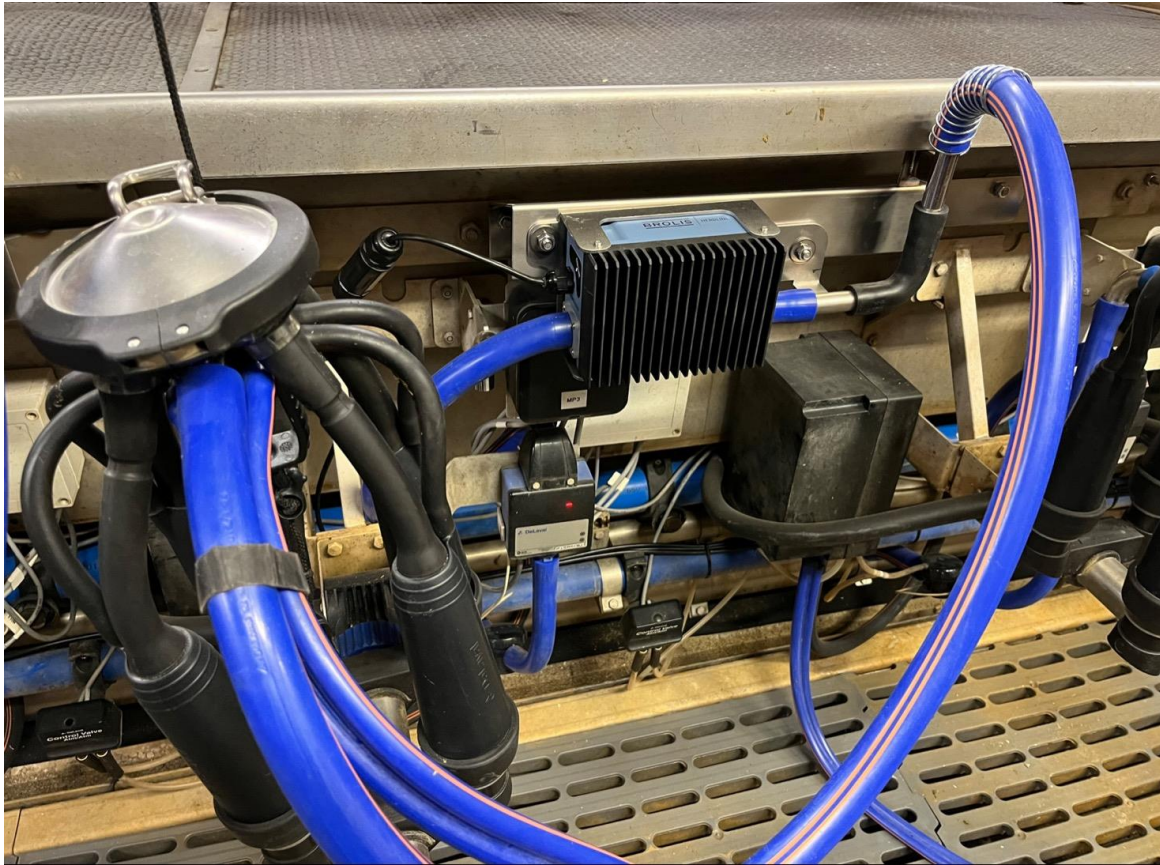


- Compatible with a wide range of milking parlors
- In-line daily milk composition analysis of every milking, every cow
- Early detection of health disorders
- Statistics for herd management

CURRENT STATUS

4 dairy farms
2800 dairy cows
136 sensors

> Compatible with a wide range of milking parlors



> Milk composition and animal health monitoring in farm

Continuous measurements of

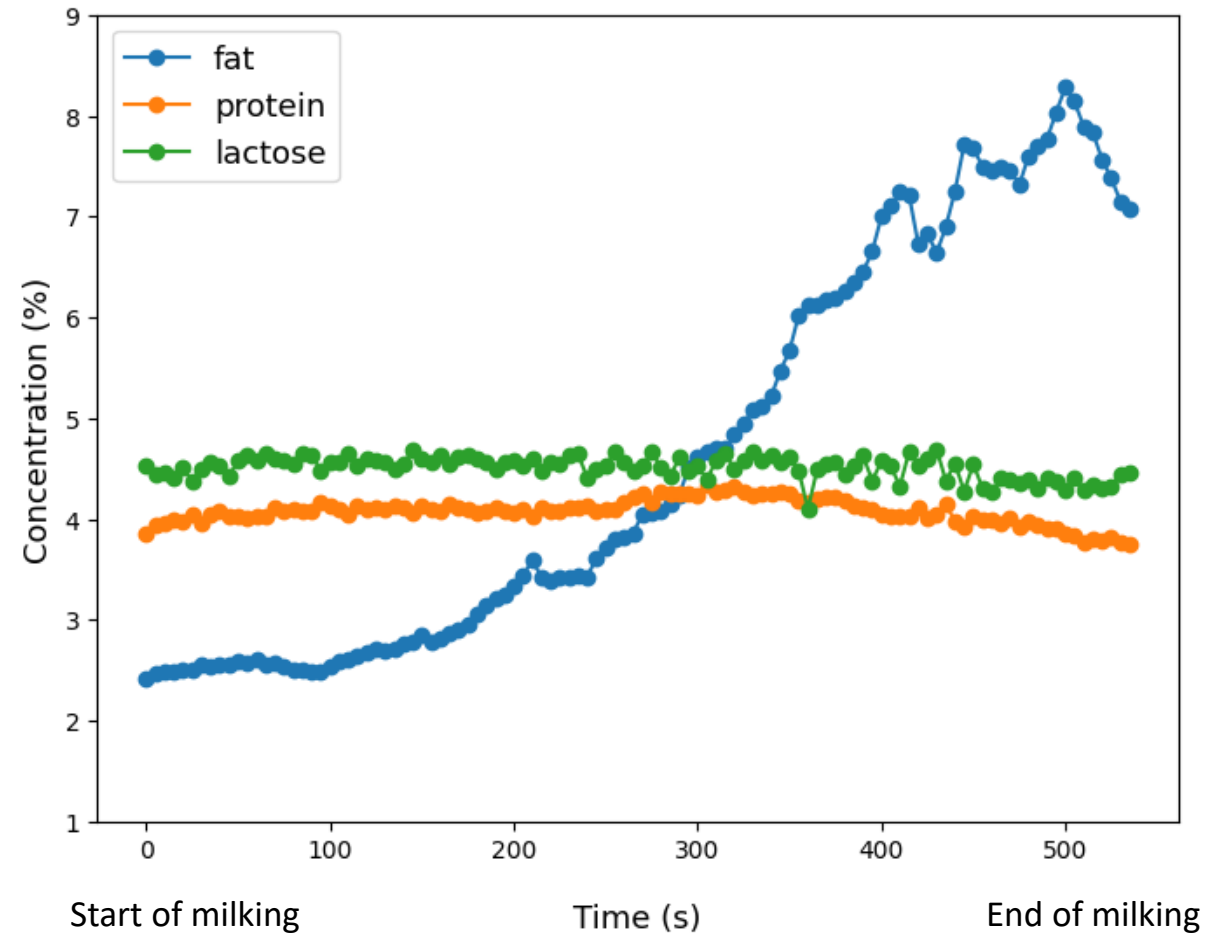
- milk transmission spectra,
- electrical conductivity,
- RGB colors,
- temperature

+ animal-related information from farm

ML algorithms and statistics:

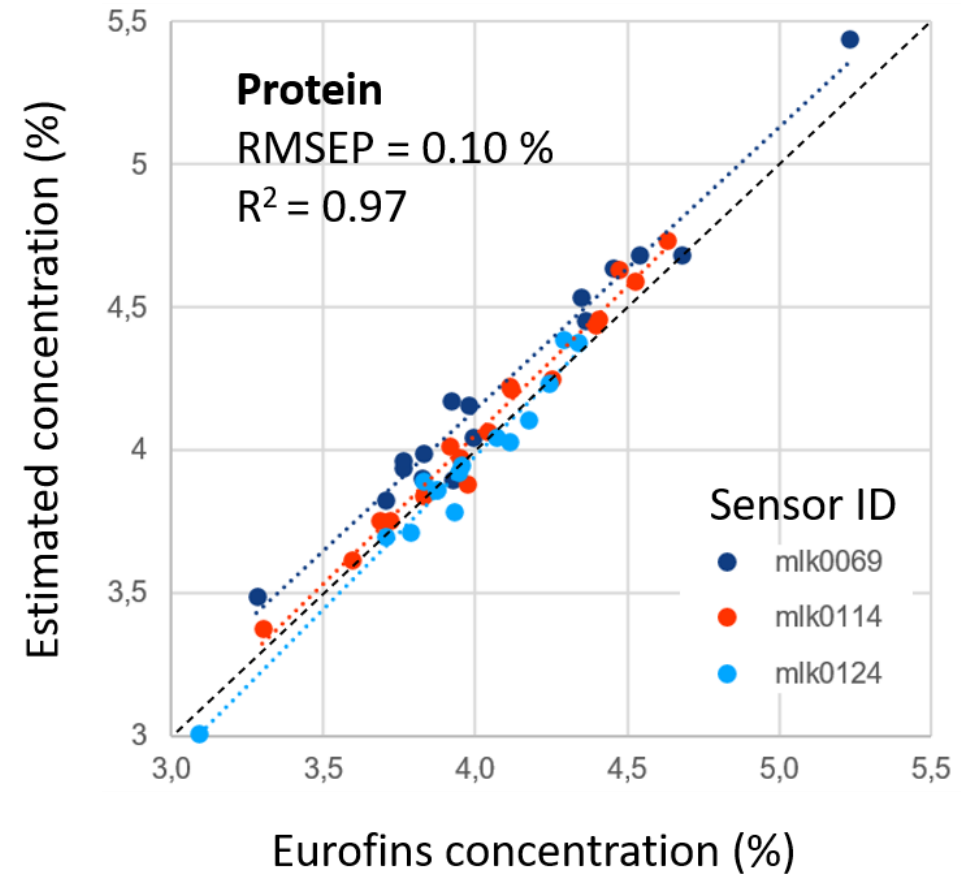
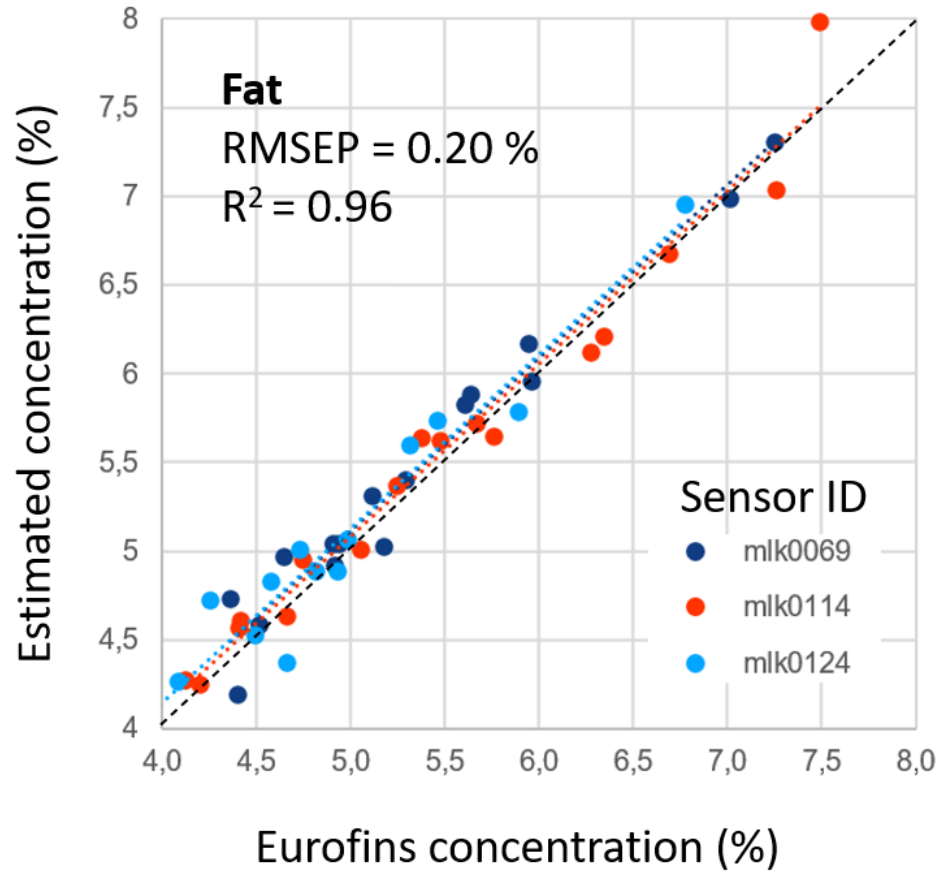
- Milk composition dynamics from transmission spectra
- Average concentrations per milking
- Early cow health disorders detection
- Individual cow, group and herd ratings for herd selection and commercial decisions

Milk composition dynamics during one milking



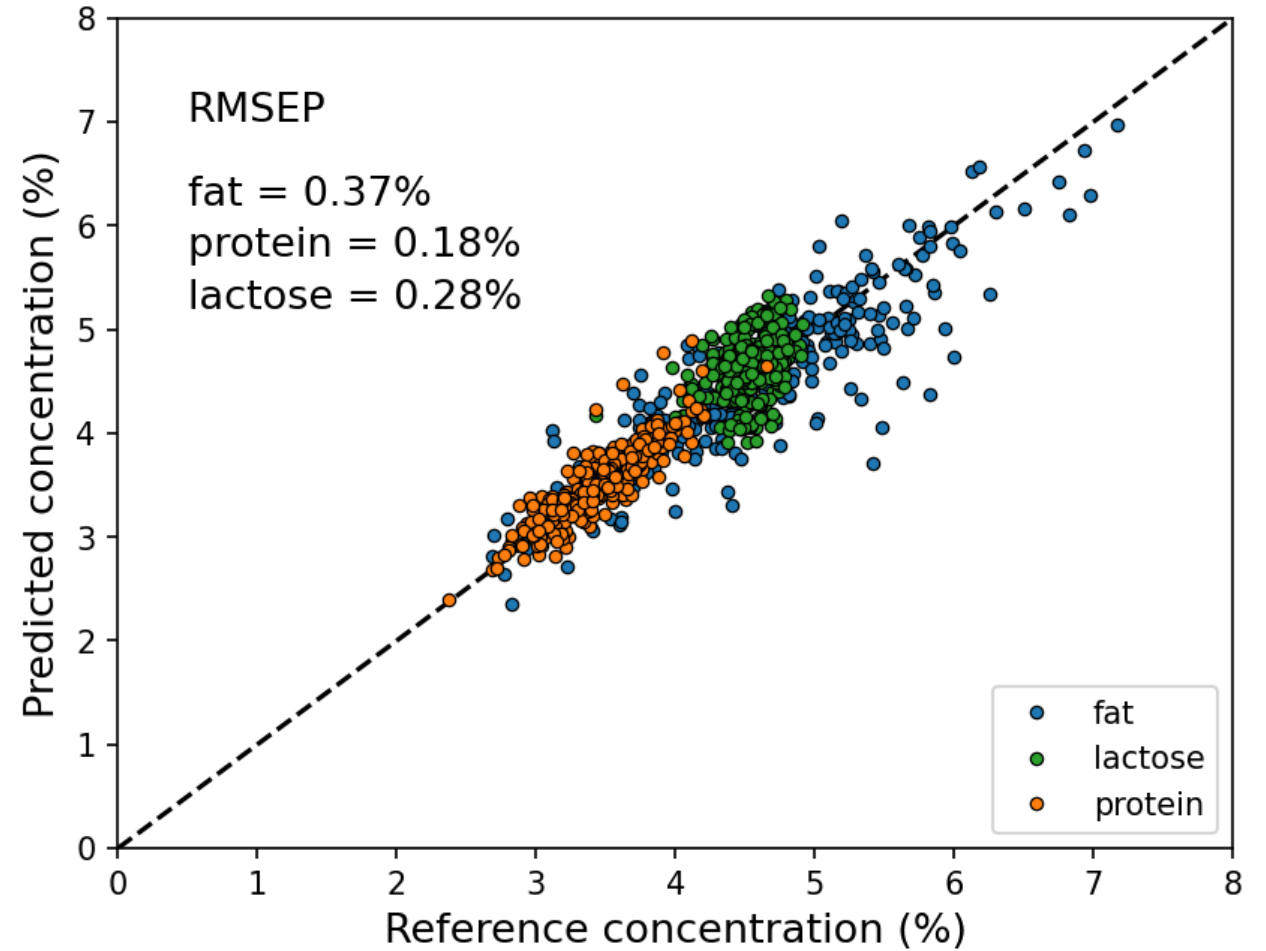
> In-line sensors accuracy from third party farm data

- 45 Random milkings in the period of two weeks from 20 different cows
- Reference milk samples were measured in EUROFINS lab



> In-line sensors accuracy from test farm data

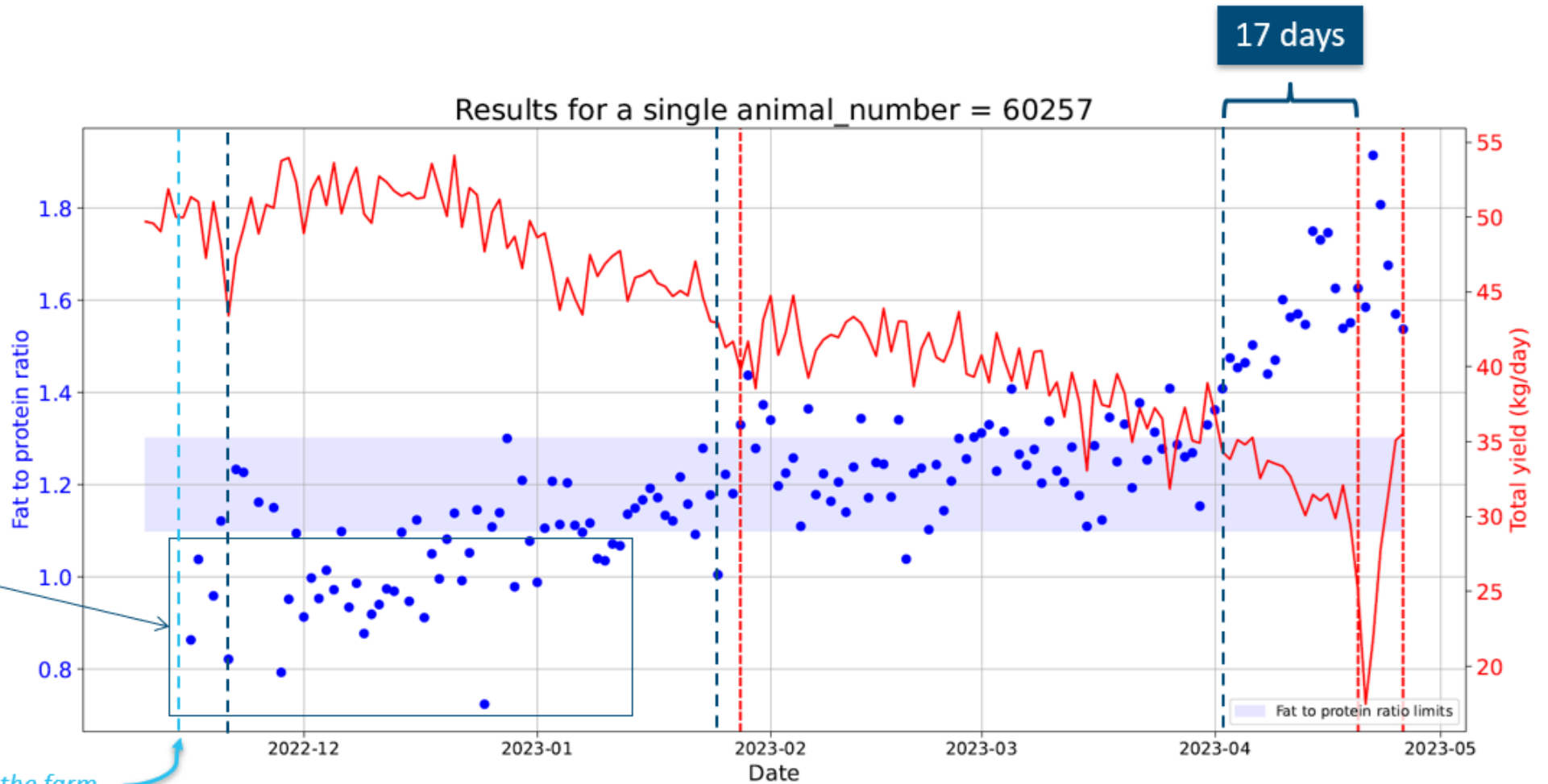
- 316 milkings with 24 sensors in test farm
- Standard farm's milk composition control measurements



Example of early metabolic disorders by tracking fat to protein ratio

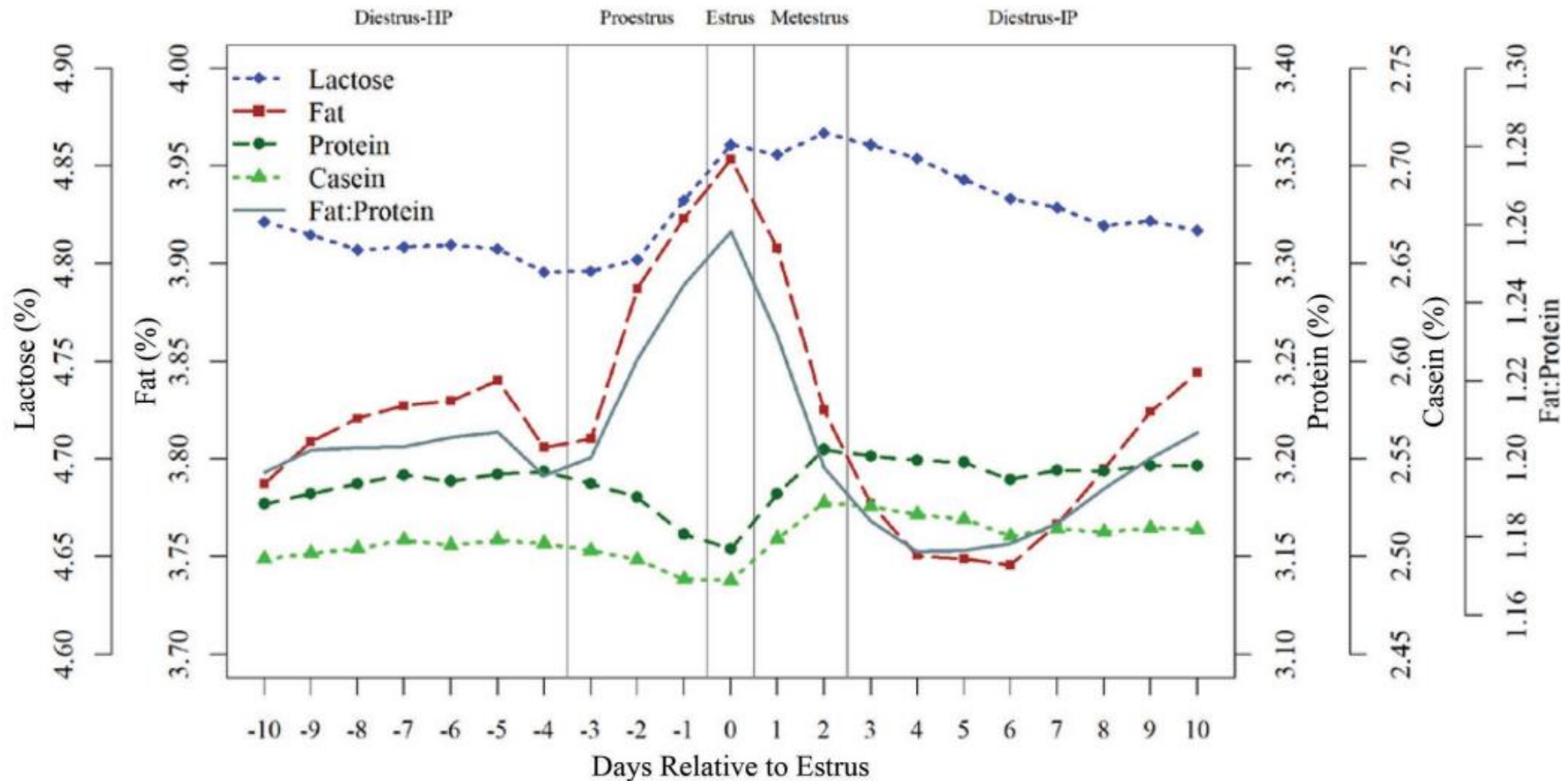
lactation = 3
dim = 307
*This animal had to be culled.

Animal is prone to acidosis, however, no activity tracker alert is present.



Sensors installed in the farm.

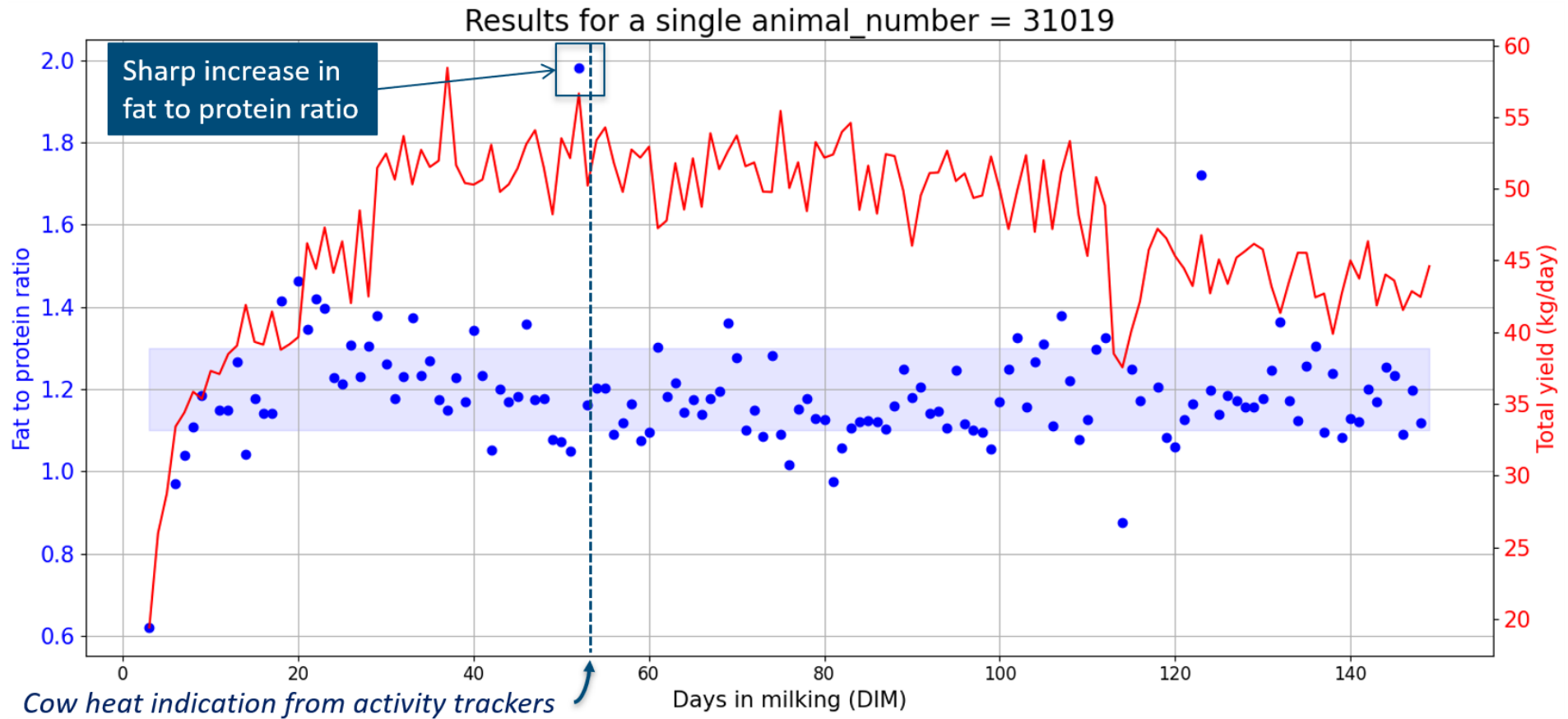
Changes in milk characteristics during the estrous cycle in dairy cows



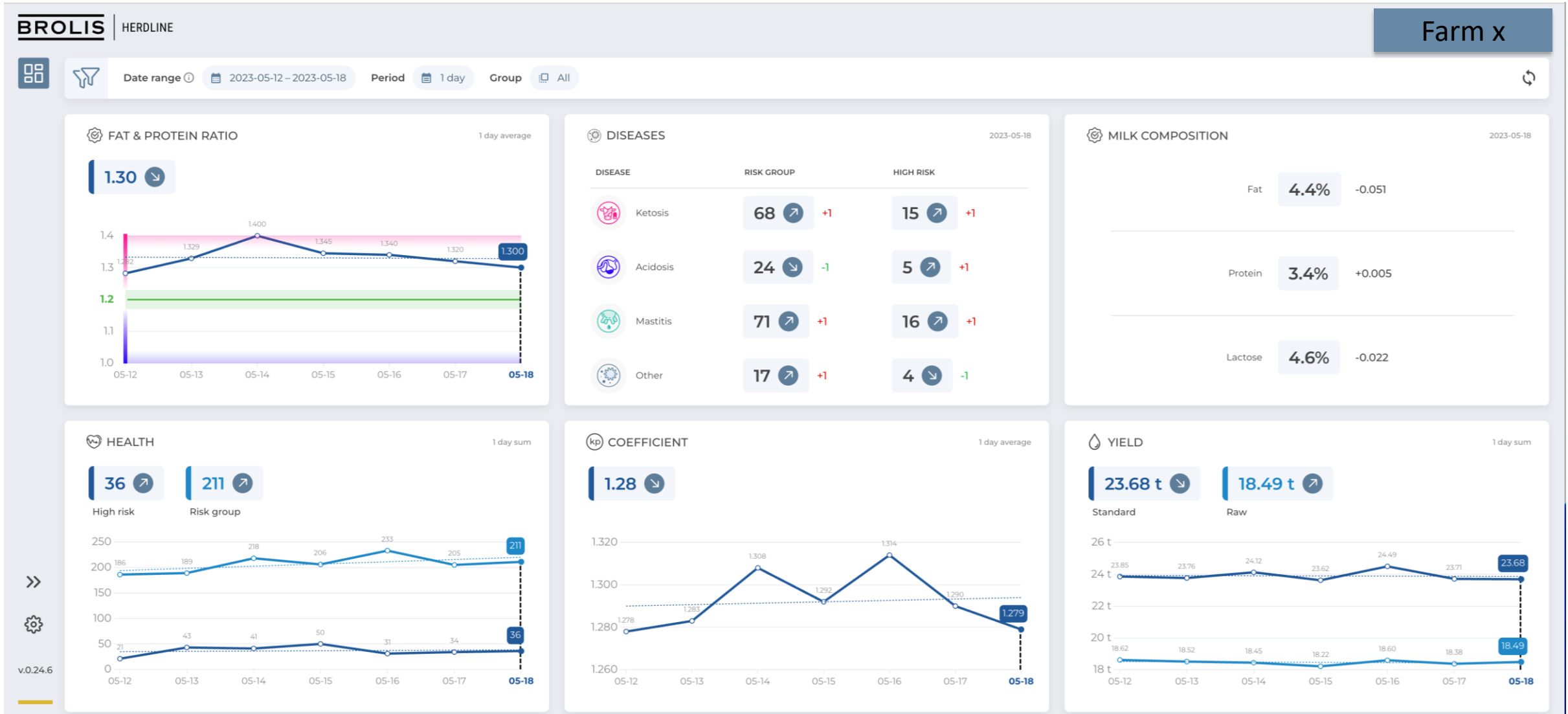
Hugo Toledo-Alvarado et. al. „Changes in milk characteristics and fatty acid profile during the estrous cycle in dairy cows“ (2018)

> Example of estrus detection

Monitoring the estrus cycle and changes of milk composition have the potential to serve as indicators for determining the optimal timing for insemination.



BROLIS Herdline milk monitoring API



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> Thank you!