Milk components predicted by mid-infrared spectrometry as indicators of the udder health status of the dairy cow

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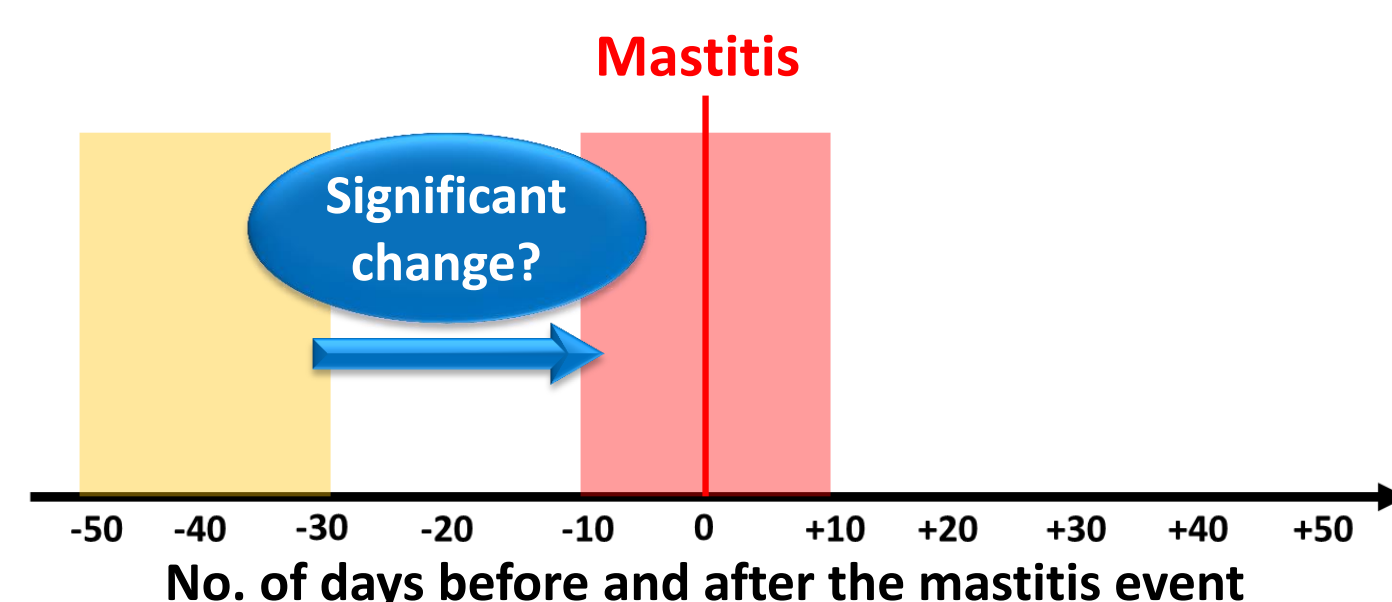Contact: catherine.bastin@ulg.ac.be

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Background

➤ Bovine mastitis is one of the most frequent and most costly diseases of the dairy industry (Halasa et al., 2007, Vet.Q. 29:18-31). Sustainable milk production should aim at implementing efficient prevention measures.

➤ Milk composition is affected by mastitis. Hence, early detection of mastitis could be based on indicators present in milk (Pyörälä, 2003, Vet. Res. 34:565:578; Chagunda, 2006, J. Dairy Sci. 89:2980-2998).

➤ Prediction of fine milk composition using mid-infrared spectroscopy (MIR) is easy, quick, inexpensive and potentially available within milk recording schemes.

Objective: Investigate components predicted by mid-infrared analysis of milk as early indicators of the udder health status of the dairy cow

Conclusion

➤ Significant difference before and during mastitis was observed for milk yield, somatic cell count and the contents in milk of protein, urea, lactose, lactoferrin, Na, Mg, K, C12:0, C14:0, saturated and medium chain fatty acids.

➤ Mid-infrared prediction of fine milk components could be used for detection of mastitis.

Material & Methods

➤ Mastitis data from 38 Walloon herds were merged with test-day data (including fine milk composition) collected as a part of milk recording.

➤ 249 mastitis events associated with
  ✓ records from a test-day occurring **before** the infection (from 30 to 50 days before the mastitis)
  ✓ records from a test-day occurring **during** the infection (from 10 days before to 10 days after the mastitis)

➤ Parameters investigated
  ✓ milk yield, somatic cell count (SCC), contents of fat, protein, urea, and lactose
  ✓ fine milk composition: titrable acidity (Colinet et al., 2012, Proc. of 63rd EAAP meeting), lactoferrin (Soyeurt et al., 2012, Animal, 6:1830-1838), minerals (Na, Ca, P, Mg, and K; Soyeurt et al., 2009, J. Dairy Sci., 92:2444-2454), and 17 individual and groups of fatty acids (FA; Soyeurt et al., 2011, J. Dairy Sci., 94:1657-1667)

➤ Paired t-tests were used to identify significant differences in milk components before and after mastitis

Mastitis

Significant change?

No. of days before and after the mastitis event

Results & Discussion

Figure 1. Average difference (and P-Value associated) for traits that showed significant difference

➤ 13 parameters changed significantly

➤ Changes could be attributed to:
  ✓ disease combating response of the cow
  ✓ reduced secretory activity
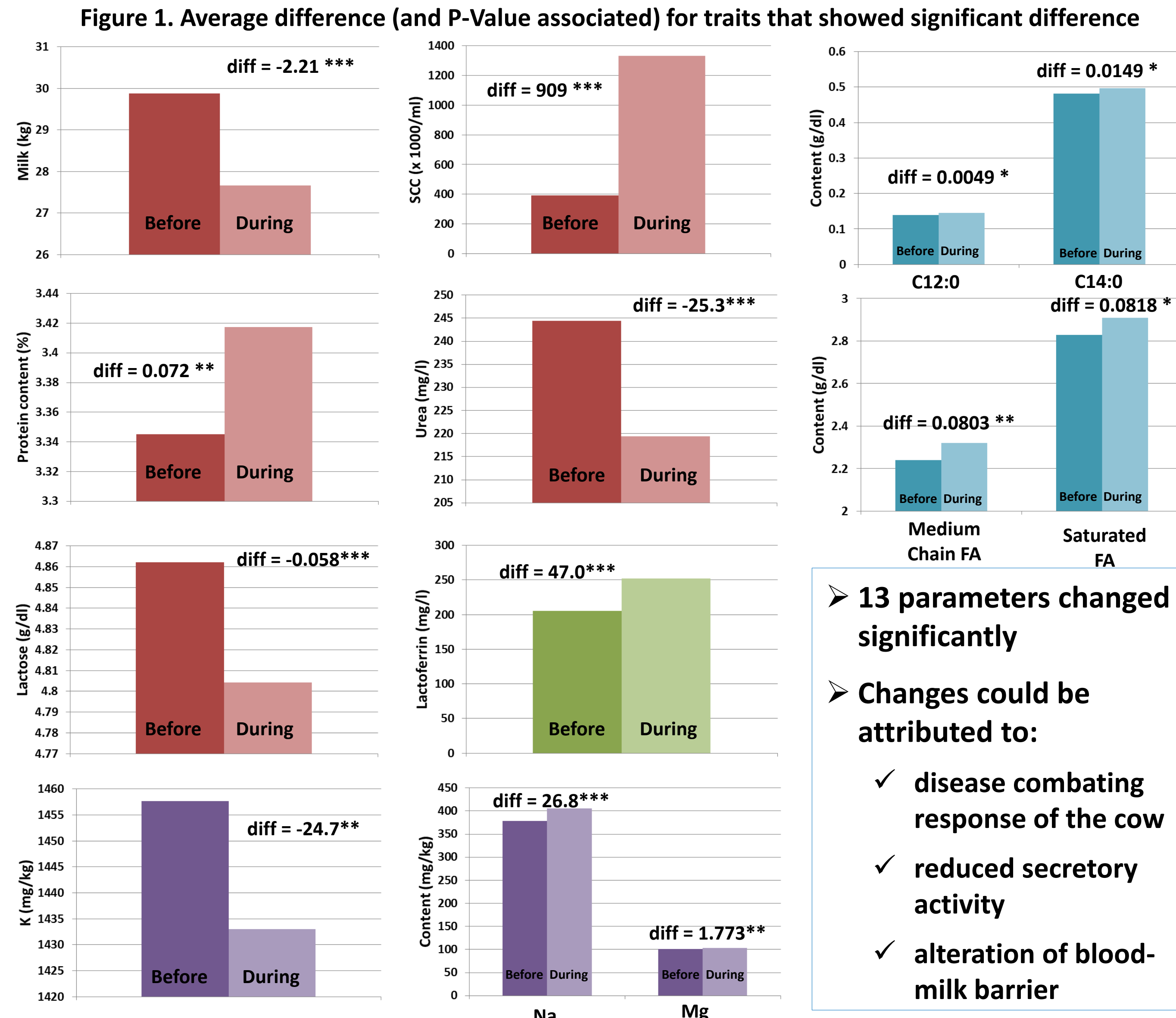 ✓ alteration of blood-milk barrier

Table 1. Average difference (and P-Value associated) for traits that showed no significant difference

Milk components	Average difference	P-Value
Fat (g/kg)	0.082	0.07
Titrable acidity (dornic degree)	-0.200	0.05
Ca (mg/kg)	15.529	0.06
P (mg/kg)	1.411	0.84
C4:0 (g/dl)	-0.0024	0.13
C6:0 (g/dl)	0.0001	0.93
C8:0 (g/dl)	0.0004	0.53
C10:0 (g/dl)	0.0025	0.16
C16:0 (g/dl)	0.0410	0.05
C17:0 (g/dl)	0.0005	0.22
C18:0 (g/dl)	0.0017	0.83
C18:1 cis-9 (g/dl)	-0.0118	0.48
Unsaturated FA (g/dl)	-0.0012	0.95
Monounsaturated FA (g/dl)	0.0035	0.16
Polyunsaturated FA (g/dl)	-0.0016	0.94
Short chain FA (g/dl)	0.0016	0.73
Long chain FA (g/dl)	-0.0042	0.88

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