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When MIR spectrometry helps to promote a local and vulnerable breed

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The dual purpose Belgian Blue breed (DP-BBB) is a vulnerable breed rooted in the tradition of the Walloon Region of Belgium. Those animals have interesting feature (*e.g.*, robustness, good longevity, and ease of calving). Due to its dual purpose type, income generated by both milk and meat is more stable and more flexible in responding to market fluctuations.

Inside the INTERREG IVa project BlueSel, several partners in Walloon Region of Belgium and in Northern France work jointly on the conservation and the use of the genetic heritage of the dual purpose Blue Breeds in this cross-border region. One objective of this project is the valorization of these breeds. In particular, through DP-BBB milk advertising, direct selling by DP-BBB farmers could be promoted.

Aim

Using milk components predicted by mid-infrared (MIR) chemometric methods, the aim of this study was to investigate differences between milk composition of DP-BBB, Holstein (HOL), and Montbeliarde (MON) cows in Walloon Region of Belgium in order to have arguments to promote DP-BBB milk to consumer.

Material and Data

- 1,039 single-breed herds
- 56,704 selected cows (at least 90% purebred)
- 497,030 test-day (TD) milk yields and mid-infrared records from routine milk recording between January 2007 and April 2011
- Fatty acids (FA) contents predicted using the mid-infrared calibration equations developed by Soyeurt *et al.*, 2011 (*J. Dairy Sci.*, 94, 4, 1657-1667)

Statistical analysis

Milk production and composition traits were analyzed separately as continuous traits using GLM procedure of SAS according to the model that included the following fixed effects:

- Breed
- Herd nested within breed
- Year of the TD recording (5 levels)
- Month of the TD recording (12 levels)
- Parity (3 levels: 1st, 2nd and 3th parity)
- Lactation stage (12 classes of 30-d intervals)

Presented values are Least Square Means of breed, LSM (± Standard Error, SE). LSM are compared using Pdiff statement.

Results

On average, each cow had 8 TD-records with MIR spectra.

Global P-value of each model was < 0.0001.

Adjusted means for the three breeds and the relative differences between DP-BBB and HOL using the HOL as reference are presented in Table 1:

- DP-BBB milk fat content and daily milk yield were the lowest;
- Milk protein content was almost the same in DP-BBB and HOL and the highest in MON;
- Milk saturated FA content was the lowest in DP-BBB;
- DP-BBB mono- and polyunsaturated FA contents in milk fat were the highest;
- DP-BBB milk fat contained more Omega-9 than HOL and MON milk fat.

Conclusion

Using new technologies, like the prediction of additional milk components from MIR spectrometry, differences in milk compositions could be highlighted.

Results indicated that milk from DP-BBB cows seems to be slightly more favorable for human health compared to HOL, with differences due to breeds themselves, but also to environmental effects as herd management and feeding.

Table 1: LSM of breed effect (± SE) for production traits and predicted FA contents in milk. Δ% corresponds to the relative difference between DP-BBB and Holstein LSM with the Holstein breed as reference. Presence of letters corresponds to differences highly significant between breeds (P value < 0.0001).

	BREED						
	HOL		DP-BBB		MON		
No. of cows	55 553		1 002		745		
No. of herds	997		22		20		
Production traits	**LSM**	**SE**	**LSM**	**SE**	**LSM**	**SE**	**Δ%**
Daily milk yield (kg/day)	24.4 ^{A}	0.2	13.2 ^{B}	1.9	20.9 ^{C}	1.0	- 46 %
Milk fat content (g/dl milk)	4.08 ^{A}	0.00	3.66 ^{B}	0.02	3.96 ^{C}	0.01	- 10 %
Milk protein content (g/dl milk)	3.41 ^{A}	0.00	3.43 ^{A}	0.01	3.54 ^{B}	0.01	+ 1 %
Predicted FA contents	**LSM**	**SE**	**LSM**	**SE**	**LSM**	**SE**	**Δ%**
Monounsaturated FA (g/dl milk)	1.153 ^{A}	0.001	1.108 ^{B}	0.007	1.146 ^{A}	0.003	- 4 %
(g/100g milk fat) *	27.7 ^{A}	0.0	29.8 ^{B}	0.1	28.3 ^{C}	0.1	+ 8 %
Polyunsaturated FA (g/dl milk)	0.174 ^{A}	0.000	0.169 ^{B}	0.001	0.178 ^{C}	0.001	- 3 %
(g/100g milk fat) *	4.2 ^{A}	0.0	4.6 ^{B}	0.0	4.4 ^{C}	0.0	+ 10 %
Saturated FA (g/dl milk)	2.850 ^{A}	0.002	2.443 ^{B}	0.019	2.728 ^{C}	0.008	- 41 %
(g/100g milk fat) *	67.6 ^{A}	0.0	65.4 ^{B}	0.1	66.9 ^{C}	0.0	- 3 %
C18:1 n-9 (cis) (≈ ω9) (g/dl milk)	0.816 ^{A}	0.001	0.784 ^{B}	0.006	0.801 ^{C}	0.003	- 4 %
(g/100g milk fat) *	19.6 ^{A}	0.0	21.0 ^{B}	0.1	19.8 ^{C}	0.0	+ 7 %

* Any corrections for the bias and the slope were used to calculate the FA content in milk fat. Therefore, it involves a decrease of accuracy (more details in Soyeurt *et al.*, 2011). However, additional GLM including a regression on the milk fat content as fixed effect were used separetely for each predicted FA contents in milk. The obtained results were consistent with results presented in this table (data not shown).

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