

# EVALUATION OF COLOSTRUM QUALITY IN CZECH DAIRY HERDS

Staněk, S.<sup>1</sup>, Šlosárková, S.<sup>2</sup>, Nejedlá, E.<sup>1</sup>, Faldyna, M.<sup>2</sup>, Šárová, R.<sup>1</sup>, Krejčí, J.<sup>2</sup>, Fleischer, P.<sup>2</sup>

<sup>1</sup> Institute of Animal Science, Přátelství 815, 104 00 Prague, Czech Republic,

<sup>2</sup> Veterinary Research Institute, Hudcova 296/70, 621 00 Brno, Czech Republic



## INTRODUCTION

Colostrum is essential for survival, health, and future productivity of dairy calves. But only high-quality and uncontaminated colostrum can provide a sufficient nutrition and immunologic defense for calves<sup>1</sup>. Several methods have been developed to evaluate colostrum quality by measuring the colostral IgG concentration either directly (RID) or indirectly (e.g. colostrometer, refractometer), but few of them are applicable in farm conditions<sup>2</sup>. Refractometers show considerable potential for being useful management tools to be included in a colostrum monitoring program to improve neonatal calf health on dairy operations<sup>1</sup>.

In the Czech Republic, the number of dairy farms that routinely use refractometers constantly increases. They can be used for estimation of:

- IgG content in colostrum,
- total protein content in calves' blood serum,
- dry matter content in milk and milk replacer for calves,
- correct concentrations of CuSO<sub>4</sub> in preventive or curative foot baths.



## MATERIAL AND METHODS

- 34 dairy herds: 19 Czech Fleckvieh (C), 12 Holstein (H), 3 (C and H)
- Period: August 2015 to December 2016
- Colostrum from 1<sup>st</sup> milking after delivery (sterile 30 mL vessel) and frozen
- Total 1,265 colostrum samples were evaluated by:
  - Optical refractometer (OPT) – scale 0 to 32 % Brix (Photo 1)
  - Simple digital (S.DIGI) – scale 0 to 85 % Brix (Photo 2)
  - Digital Misco (MISCO) – scale 0 to 85 % Brix (Photo 3)
- IgG content (g/L) was determined using our radial immunodiffusion (RID)
- Statistical analyses performed in the Statistica CZ 10

## RESULTS Gold standard – RID assay IgG

- **Mean (±SD)** 83.2 ± 43.1 g/L
- **Median** 76.9 g/L
- **Minimum** 5.9 g/L
- **Maximum** 205.4 g/L
- **Only 22.7% of samples contained <50 g/L IgG – poor-quality colostrum.**

Table 1: Assessment of colostrum quality by different refractometers (1,265 samples)

Parameter (% Brix)	Optical refractometer	Simple digital refractometer	Digital MISCO refractometer
Mean (±SD)	22.9 ± 4.7	18.6 ± 5.3	22.8 ± 4.8
Median	22.9	18.9	22.9

Table 2: Spearman's correlation – 3 types of refractometers (% Brix) and RID assay IgG (g/L)

Season	OPT refractometer	S.DIGI refractometer	MISCO refractometer	Radial immunodiffusion
OPT	1.00	0.90	0.99	0.64
S.DIGI	0.90	1.00	0.90	0.58
MISCO	0.99	0.90	1.00	0.64
RID	0.64	0.58	0.64	1.00

P < 0.001

Table 3: Published comparisons of Brix refractometry and IgG assay by radial immunodiffusion (bovine colostrum only)

Reference	n	r
<sup>3</sup> Chigerwe et al. (2008)	171	0.64
<sup>4</sup> Quigley et al. (2013)	183	0.75
<sup>5</sup> Bartier et al. (2015)	460	0.64
<sup>1</sup> Elsobaby et al. (2017)*	258	0.71; 0.72

\* Correlation between RID and Brix scores from the optical and digital refractometer

Photo 1: Optical refractometer



Photo 2: Simple digital refractometer



Photo 3: Digital MISCO



## CONCLUSIONS

### Comparison with recent studies:

- lower prevalence of poor-quality colostrum vs. most of them,
- the same or lower correlations between RID and Brix refractometry,
- the worst results from simple digital refractometer (S.DIGI).

### The differences in quality of digital refractometers (S.DIGI x MISCO) may be due:

- different numbers of detector elements (NDE):  
S.DIGI 128 NDE vs. MISCO 1024 NDE,
- different PPI resolution (pixels per inch)  
S.DIGI 400 PPI vs. MISCO 3256 PPI,
- the fact, that more precise types of refractometers (e.g. MISCO) are equipped with a protective evaporation cover to reduce the measurement error (distribution of light and refraction in the liquid).

<sup>1</sup>Bielmann, V., Gillan, J., Perkins, N., R., Skidmore, A., L., Godden, S., Leslie, K., E. 2010. An evaluation of Brix refractometry instruments for measurement of colostrum quality in dairy cattle. J. Dairy Sci., 93:3713-3721.

<sup>2</sup>Elsobaby, I., McClure, J., T., Cameron, M., Heider, L., C., Keefe, G., P. 2017. Rapid assessment of bovine colostrum quality: How reliable are transmission infrared spectroscopy and digital and optical refractometers? J. Dairy Sci., 100:1427-1435.

<sup>3</sup>Chigerwe, M., J., Tyler, W., Middleton, J., R., Spain, J., N., Dill, J., S., Steevens, B. 2008. Comparison of four methods to assess colostral IgG concentration in dairy cows. J. Am. Vet. Med. Assoc., 233:761-766.

<sup>4</sup>Quigley, J., D., Lago, A., Chapman, C., Erickson, P., Polo, J. 2013. Evaluation of the Brix refractometer to estimate immunoglobulin G concentration in bovine colostrum. J. Dairy Sci., 96:1148-1155.

<sup>5</sup>Bartier, A., L., Windeyer, M., C., Doepel, L. 2015. Evaluation of on-farm tools for colostrum quality measurement. J. Dairy Sci., 98:1878-1884.

