**Factors associated with passive immunity transfer in dairy calves: combined effect of delivery time, amount, and quality of the first colostrum meal**

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Supplementary Material S1: Cumulative colostrum management score (CMS) validation.

*Supplementary methods*

The validation of the cumulative colostrum management score (**CMS**) consisted in applying it to a new dataset of calves and verifying whether the relationship between CMS and calf serum Ig concentration was repeated with a regression coefficient similar to the one obtained from the study dataset. The validation dataset was generated from data about 72 calves gathered from a study conducted in 2015 by Lora *et al.* (unpublished data). Calves of the new dataset were born from Holstein cows on five Italian dairy farms, and were 63 females and nine males, 60 Holstein purebreds and 12 Holstein-beef crossbreds. Data on calf serum Ig concentration, delivery time, amount, and quality of the first colostrum meal were collected following the same procedure adopted in this study. The CMS was calculated for each calf of the new dataset using the same limits for the single scores and the final formula generated for the study dataset. The relationship between CMS and calf serum Ig concentration was then tested using the same multilevel linear regression model (PROC MIXED, SAS Institute Inc., Cary, NC) adopted for the study dataset, including the effects of calf sex and breed, and considering the farm as random effect. The resulting regression coefficient was finally compared with the regression coefficient obtained from the study dataset using a Student-t test that considered the respective confidence intervals (**CI**). The level of significance was set at 0.05.

*Supplementary results*

The CMS calculated on the validation dataset was related to calf serum Ig concentration with a regression coefficient of 1.77 (Sy.x = 0.42; CI: 0.93–2.61; *P* < 0.001). As confirmed by the Student-t test(*P* > 0.05), this value was similar to the regression coefficient obtained from the study dataset (1.53; Sy.x = 0.22; CI: 1.09–1.97; *P* < 0.001). The CMS developed in this study was therefore validated.