Effect of calf rearing with mother contact compared to bucket feeding on health and welfare of calves

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Extended Abstract

Introduction

Early separation of cow and calf is still common practice on dairy farms. In recent years, interest in mother-bonded calf rearing practices has increased. They are considered to be animal-friendly, labour-saving and health-promoting for the calf. However, these systems are challenging, e.g. regarding the cow's willingness to let down milk or the pain of separation after establishing a social bonding.

We tested the hypothesis that calves allowed dam suckling (DS) twice a day would benefit concerning weight gain, health-related traits and show fewer behavioural disorders (oral manipulations) compared to bucket fed (BF) group mates. Furthermore, we investigated the impact of cow-calf contact compared to bucket feeding on selected immune parameters in calf blood and cow milk.

Material and methods

We conducted two on-farm trials with local German Black Pied (DSN) (farm 1: n= 18 DS vs 17 BF) and Swiss Fleckvieh calves (farm 2: n= 12 DS vs 11 BF) until the age of four months between October 2018 and June 2020.

All calves were scored for health-indicating traits (weekly during their first month of life and monthly afterwards) and weighted weekly. Additionally, the farmers checked and documented the health status of the calves once per day and documented medical treatments. One treatment cycle was defined as a medical treatment of at least one day and a maximal of seven consecutive days for the same reason (i.e. 1 to 7 treatment days=1 cycle, 8-14 treatment days=2 cycles and so on). A subsequent treatment event was counted as a new treatment cycle if the treatment was interrupted for at least seven days. Behaviour (manipulation of objects or pen mates) was directly observed three hours (1.30 to 4.30 p.m.) weekly. Manipulations had to be executed for at least 5 seconds to be counted. After an interruption of 5 seconds, the execution of oral manipulation was counted as a new event. The avoidance distance of calves was measured as the distance between the animal's muzzle and the palm of the assessor's hand estimated in intervals of 10 cm. It was assessed by approaching calves from a distance of around three meters with the arm overhand at an angle of approx. 45 degrees in front of the body (Waiblinger et al., 2003), approaching the animals at a speed of one step of 50-60 cm per second until the animal either withdrew or tolerated being touched (Windschnurer et al., 2008).

Lactose content (mmol/L, norm reference <2.2 mmol/L, high values can indicate stress) of calf blood was determined weekly in the first month of life and monthly thereafter, using a handheld lactose analyser (Lactate Scout, EFK Diagnostics GmbH, Mannheim, Germany). Total protein content (g/L, norm reference: 50-70 g/L) in calf blood serum was determined with a

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portable refractometer (Euromex, Arnhem, The Netherlands) as an indicator for colostrum supplementation within 48 hours postpartum, as well as weekly in the first month of life and monthly thereafter. Packed cell volume (PCV in %, norm reference: 30-36%, low values can indicate iron deficiency anaemia) was measured in centrifugated EDTA conserved blood using a graphic reading device (Micro Haematocrit, Thermo Scientific™ 7600-0938) weekly in the first month of life and monthly after that.
Cow milk sampled according to the same time scheme as blood in calves was analysed for lactoferrin (mg/L) and immunoglobulin G content (mg/L).
The effect of feeding (DS versus BF) on all variables was analysed using generalised linear mixed models and mixed effects logistic regression models in R version 3.6.3 (2020-02-29, R Core Team 2020) on each farm separately. Apart from feeding, starting models contained lactation status of the mother (levels: primiparous or multiparous), sex of the calf (levels: male or female) as fixed factors, age of the calf in days as covariate and interactions between these variables. Animals were nested within the trial or treated as random effects for repeated measured data on farm 1 and farm 2, respectively. Treatment data (aggregated at animal level) was analysed using generalised linear models without random effect nor age of the calf. The difference between the least square means of the fixed effect feeding was assessed by Tukey tests using the «emmeans» package (version 1.4.5, Lenth, 2020) for the respective final model obtained after backward selection. The variable "feeding" was always retained in the final model during the selection process, regardless of its significance. Normal distribution of the residuals of final models was assessed by visual inspection of residual plots.
Statistical significance was assumed at $P<0.05$, with tendency between $P>0.05$ and $P<0.10$.

Results

On farm 1 average daily weight gain (g/d) did not significantly differ between feeding groups. By contrast, calves of primiparous cows on farm 2 benefited from mother-bonded rearing, but no statistical difference was found in calves of multiparous cows. Clinical findings regarding vitality, body condition traits, indicators for diarrhoea and respiratory disorders did not differ between feeding groups on either of the farms, but levels differed between farms. This was also true for number of medical treatment cycles.
Number of oral manipulations of pen mates was consistently higher in bucket fed calves across both farms, while objects were not manipulated with different frequencies between feeding groups.
Avoidance distance did not differ between feeding groups on neither of the farms, with average higher levels on farm 1 compared to farm 2. This difference was in accordance with higher lactate levels above the stress indicating threshold of 2.2 mmol/L found on farm 1, but did not differ between feeding groups.
Total protein content tended to be higher in DS calves compared to BF calves on farm 1 but did not statistically differ between feeding groups on farm 2. PCV differed significantly favouring DS calves on farm 1 and was below the critical threshold for BF calves, but the difference on farm 2 was not statistically significant.

The immunoglobulin G (mg/L) content in cows' milk with or without calf contact showed no statistically significant difference, and both were on similar levels. In week three, lactoferrin (mg/L) content tended to be higher in cow milk from cows with calf contact on farm 2, but apart from this, they did not differ.

Conclusions

We conclude that restricted access to the mother alone only had a minimal effect on the traits investigated. Most parameters changed with age; however, the patterns varied considerably between farms, underlining the relevance of management, which is also reflected in different levels between the two farms. The only consistent difference between feeding groups we found was significantly fewer behavioural disorders in oral manipulations of pen mates in mother-bonded calves across both farms.

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