Effect of Calving Management on Calf Vitality, Blood Gas, Behavior, and Intake for 24 Hours after Birth

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INTRODUCTION

- Ideal calving management should provide a low stress environment, opportunities for seclusion, low health risk for the cow and calf, and convenience for people.
- Improper calving management introduces stress, interrupts the calving process and may compromise the well-being of cows (Proudfoot et al., 2013).
- Limited research has been reported addressing the impact of calving management on calf vitality and well-being.

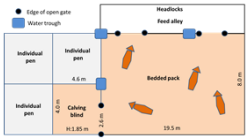
OBJECTIVE

- To determine the effect of calving management of primigravid Holstein heifers on calf well-being within 24 hours of birth.

MATERIALS AND METHODS

Completely Randomized Design

- 47 primigravid Holstein heifers
- Treatments were applied when calving was imminent
  - **GRP**: Remained in bedded pack close-up pen enhanced with a calving blind (n = 23)
  - **IND**: Moved to individual calving pen (n = 24)
- Calves were fed colostrum replacer (675 g, The Saskatoon Colostrum Co. Ltd) at 1.5 h and offered 1.89 L of milk replacer at 12 h after birth



Data Collection

- Respiration rate, heart rate, and temperature (0, 12, and 24 h)
- Acid-base balance: arterial blood gas analysis (0, 12, and 24 h)
- Postnatal behavior: 1st standing attempt and standing (video camera, < 90 min of birth); standing and lying activity (data logger, 1.5 – 24 h)
- Feeding performance: suckling reflex , feeding response and intake (for the first two feedings)
- Passive immune transfer: serum total protein and IgG (0, 12, and 24 h), and apparent efficiency of IgG absorption (24 h)

Statistical Analysis

- Data were analyzed as a completely randomized design using SAS
  - MIXED procedure with repeated measures
  - FREQ or NPAR1WAY procedure as needed

RESULTS

Table 1. Duration of events of labor, calving assistance and description of calves.

Variables	GRP	IND	SEM	*P*-value
Move to IND pen to expulsion, min	--	89 ± 11		
Abdominal contraction to birth, min	91	118	11	0.08
Feet presence to birth, min	46	58	6	0.12
No. of assisted / unassisted births	6/17	11/13		
No. of bull / heifer calves	13/10	14/10		
Calf birth weight, kg	38.2 ± 0.8	37.9 ± 1.1		
Wither height, cm	75.2 ± 0.6	75.0 ± 0.6		
Hip width, cm	21.8 ± 0.4	21.8 ± 0.5		
Body length, cm	73.0 ± 0.8	74.4 ± 0.9		

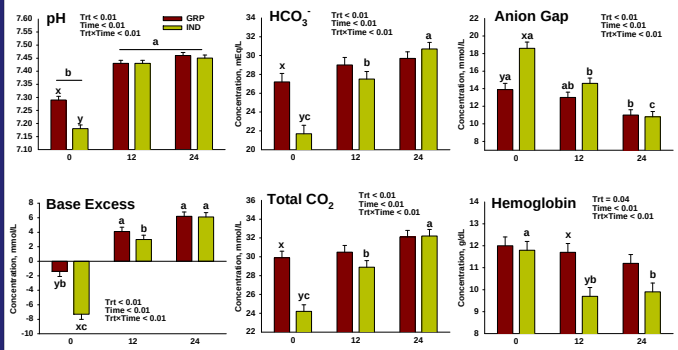


Figure 1. Blood gas and acid-base analysis of calves measured at 0, 12, and 24 h after birth. Columns with different top-marks (x, y) indicate significantly different between two treatments ($P < 0.05$). Columns with different top-marks (a, b, c) indicate significantly different across time points ($P < 0.05$).

Table 2. Standing and lying activities of calves within 24 h of birth.

Variables	GRP	IND	SEM	*P*-value
Time to 1st standing attempt, min	36	47	4	0.07
Time to achieve standing, min	68	72	5	0.49
Standing time, min (1.5 – 24 h)	152	156	13	0.82
Lying time, min (1.5 – 24 h)	1198	1194	13	0.82
Position change, n (1.5 – 24 h)	28	24	2	0.13

Table 3. Vitality measurements of calves.

Variables	Time, h	GRP	IND	SEM	*P*-value		
					Trt	Time	Trt×Time
Rectal temperature, ºC	0	39.3	39.5	0.1	0.30	<0.01	0.32
	12	38.7	38.8	0.1			
	24	38.8	38.8	0.1			
Heart rate, bpm	0	125	122	5	0.94	<0.01	0.86
	12	144	146	5			
	24	138	139	5			
Respiratory rate, bpm	0	48	47	3	0.50	<0.01	0.53
	12	55	60	3			
	24	61	63	3			

Table 4. Feeding behavior of calves.

Variables	GRP	IND	SEM	*P*-value
First feeding				
No. of intubated calves	2	5		0.41
Suckling reflex score	1.6	1.4	0.2	0.56
Feeding response score	0.5	0.8	0.2	0.19
Duration, min	15	21	5	0.21
Second feeding				
Suckling reflex score	2.0	1.8	0.3	0.52
Feeding response score	0.9	1.3	0.2	0.17
Duration, min	17	24	5	0.16
Milk replacer consumed, mL	1430	1110	130	0.08

Table 5. Serum total protein and IgG concentrations and apparent efficiency of IgG absorption (AEA) of calves.

Variables	Time, h	GRP	IND	SEM	*P*-value		
					Trt	Time	Trt×Time
Total protein, g/dL	0	4.2	4.3	0.06	0.67	< 0.01	0.72
	24	5.5	5.5	0.09			
IgG, g/L	0	0.4	0.4	0.1	0.77	< 0.01	0.92
	24	19.1	19.3	0.7			
AEA, %	24	34.3	34.4	1.2	0.94		

CONCLUSIONS

- Moving and isolation of primigravid heifers during calving interrupted normal calving progress and increased labor duration, which may have increased prenatal hypoxia of the calf; increasing indicators of metabolic acidosis, delaying the first attempt to stand and reducing appetite at 12 h of birth.
- Allowing primigravid heifers to calve in a group environment (GRP) has the potential to improve calving outcome and calf well-being.