The Effect of Pre-weaning Feeding and Housing Strategy on Calf Growth Performance and Behavior Following Post-weaning Housing Transition

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INTRODUCTION

Early calf nutrition and management programs can influence calf performance beyond the milk feeding phase.

- Increasing rates of milk fed to calves can delay rumen development and negatively impact growth at weaning.
- Group rearing of calves is thought to provide benefits of social facilitation, increasing performance during introduction to novel environments, pen mates or feedstuffs.

OBJECTIVE

To evaluate the effects of pre-weaning feeding and housing strategy on growth, intake and behavior when calves are moved and group housed following weaning.

MATERIALS AND METHODS

Randomized Block Design

48 male and female Holstein calves were assigned randomly within blocks of 12 calves to 3 treatments:

- **FI:** Fixed (**F**) feeding of milk replacer in individual (**I**) hutches (n = 4)
- **AI**: Ad libitum (**A**) feeding of milk replacer in individual hutches (n = 4)
- **AG:** Ad libitum feeding of milk replacer with 4 calves housed in a group (**G**) hutch (n = 4)
- Experimental unit was a group of 4 calves

Feeding

- Pre-weaning calves were fed milk replacer (24% CP, 20% fat, 14% solids) ad libitum or limit fed by treatment assignment and offered a 23% CP pelleted starter grain ad libitum
  - All calves were weaned over a 7 d period during wk 8
- Post-weaning all calves were offered ad libitum pelleted grain (25.7% CP, 29.8% NDF) and chopped hay (16.1% CP, 58.7% NDF, 56.3% pef $_{>4.76}$)

Housing

- Each experimental unit was moved to a novel greenhouse facility and housed as a group (2.8 m^2/calf) at wk 10 (62 ± 3 d of age)

Data Collection

- Group intake of hay and grain measured daily
- Body measurements made weekly from wk 10 to 12
- Behavioral measurements taken for 5 h post relocation using 5 min scan sampling

Statistical Analysis

Mean data by experimental unit were analyzed as a randomized block design using the MIXED procedure of SAS with significance declared at $P \leq 0.05$ and trends at $P \leq 0.10$

Figure 1. Housing and feeding system used for calves post-weaning

RESULTS

Table 1. Intake and feed efficiency following housing transition

	Treatment				
Item	FI	AI	AG	SE	*P*-value
Grain intake, kg DM/d	4.78^{a}	5.26^{b}	4.75^{a}	0.09	0.01
Hay intake, kg DM/d	0.62	0.59	0.52	0.08	0.74
DMI, kg/d	5.40^{ax}	5.85^{by}	5.29^{a}	0.12	0.02
Feed efficiency, DMI/gain	4.38	6.16	5.67	0.53	0.12

^{ab} Least squares means within a row without a common superscript differ ($P \leq 0.05$)
^{xy} Least squares means within a row without a common superscript tend to differ ($P \leq 0.10$)

Table 2. Performance data following housing transition

	Treatment				
Item	FI	AI	AG	SE	*P*-value
Week 10					
BW, kg	79.2	89.7	88.1	3.2	0.12
Hip height, cm	94.5	96.5	96.5	1.0	0.32
Body length, cm	91.4	94.6	93.1	1.2	0.25
Week 12					
BW, kg	98.5	106.6	105.7	4.9	0.51
Hip height, cm	96.6	99.1	98.4	0.9	0.26
Body length, cm	94.8	99.9	99.2	1.9	0.22
ADG, kg/d	1.20^{x}	0.97^{xy}	0.90^{y}	0.08	0.08
Hip height increase, cm/d	0.15^{xy}	0.17^{x}	0.07^{y}	0.03	0.10
Body length increase, cm/d	0.06^{x}	0.07^{xy}	0.12^{y}	0.02	0.07

^{xy} Least squares means within a row without a common superscript tend to differ ($P \leq 0.10$)

Table 3. Behavior data during the first 5 h following housing transition

	Treatment				
Activity	FI	AI	AG	SE	*P*-value
Latency from pen entry, min					
Contact with another calf	57.92	67.50	14.17	25.93	0.39
Hay consumption	31.25	37.50	21.67	12.74	0.70
Grain consumption	75.83	69.58	42.08	17.82	0.44
Time spent in first 5 h, min					
Eating grain	18.75	28.75	26.25	4.26	0.33
Eating hay	32.08	39.58	50.83	4.95	0.13
Ruminating	27.92	25.83	30.42	9.85	0.95
Lying	106.67	127.50	132.92	12.37	0.55
Grooming	5.83	5.83	5.00	2.58	0.97
Sucking on other calf	2.50	2.08	2.92	0.98	0.84
Sucking on pen	10.83^{x}	11.25^{xy}	22.50^{y}	2.94	0.08
Alone	153.30^{a}	145.42^{a}	81.67^{b}	9.05	0.01
Contact with other calf	40.00^{a}	27.08^{a}	85.42^{b}	8.83	0.02

^{ab} Least squares means within a row without a common superscript differ ($P \leq 0.05$)
^{xy} Least squares means within a row without a common superscript differ ($P \leq 0.10$)

CONCLUSIONS

- Post-weaning feed efficiency and ADG suggest nutritional management during the pre-weaning phase may have a greater impact on post-weaning performance than housing strategy
- Calves raised in a group spent more time in contact with another calf when moved post-weaning to a novel environment which may indicate a less stressful adaptation

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