Pair housing dairy calves effect on performance and influences of seasons

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The 2014 (and last) NAHMS survey found that about 70% of preweaned dairy calves were individually housed. This was a doubling from 1991 and 1996 NAHMS data, which then jumped to 58 and 68% in 2002 and 2007 surveys (Kertz 2019, Table 1). Since dairy cows are herd animals in social order and behavior, this prompted the question as to whether individual housing of calves was limiting their social behavior and development. There were some studies which showed some improvement in intake and performance by pair housing (Kertz et al., 2017), but definitive data were limiting. Thus, a more extensive study was done to evaluate pair housing effects on performance and as influenced by seasons (Bonney-King et al., 2025).

A total of 150 Holstein heifer calves were used at the University of Florida Dairy Research Unit between September 2020 and June 2022. Calves were healthy and required to weigh ≥75 and ≤ 99 lb.

- Calves were fed 9 qt of quality-controlled colostrum (Brix >25%) by bottle or esophageal feeder within 4 hours of birth. Calves born in May to August (during both enrollment years) received a second colostrum feeding of about 2.4 qt within ~24 hours of birth. Calf serum total protein (STP) was 6.2 ± 0.6 g/dL, with 97% of calves having adequate transfer of passive immunity (≥5.2 g/ dL; Lombard et al., 2020).
- Within days of birth, calves were assigned to 1 of 2 housing treatments: individual housing (n = 50 pens) or pair housing (n = 50 pens). Calves assigned to the same pair pen were within 48 hour of age (actual within-pair age range of 1.0 ± 0.7 days of age); and birthweight range of paired calves was minimized when possible (i.e., if >2 calves were born within 48 hours, calves with closest weights were paired; within-pair body weight range was 6.6 ± 5 lb.
- All calves were housed in wire mesh pens (dimensions of 3 × 6 ft for individually housed calves and 3 × 3 ft for pair housed calves) located under an open-sided barn and bedded with sand that was replaced weekly. The barn provided shade and overhead fans for air circulation. Pens were interspersed between treatments, with distance between pens allowing visual but not tactile contact.

Calves were enrolled year-round in humid subtropical conditions (**Figure 1**), with season as cool (calves born from mid-October to mid-April; n = 20 individual pens, n = 22 paired pens) and warm (calves born from mid-April to mid-October; n = 30 individual pens, n = 28 paired pens).

- The cool season reflected moderate temperatures (62.4 ± 9.4°F) with the possibility of periods of cold stress (mean daily low 77°F and temperature-humidity index consistently >65).

- All calves had access to a pelleted calf starter (22% CP, 28% NDF, 38% NFC, and 2% fat), and water ad libitum from birth (replaced daily at 0800 hours), with 1 water bucket and 1 starter bucket provided per calf. Calves received milk replacer (28% CP and 20% fat, mixed at 12.5%) provided at a rate of 8.5 qt/day in 2 feedings (0630 and 1430 hours) in a teat bucket.
- Pair pens were presented 2 teat buckets simultaneously in different corners of the pen beginning in week 7 (43 ± 3 days of age),
- Calves were weaned gradually over 10 days by reducing the volume of both feedings (total 6.3 qt/day for 4 days, 4.2 qt/day for 4 days, and 2.1 qt/days for 2 days).
- Calves were moved into group pens at the end of 8 weeks (4–5 calves/group; mingled between treatments). Experimental data collection concluded at this time except for a final body weight during week 9.

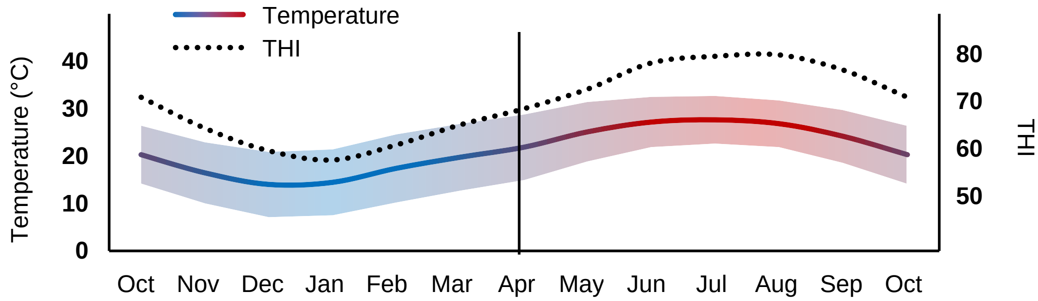


Figure 1. All figures kindly provided by Dr. Emily Miller-Cushon**.**

Several references were cited that temperatures over 68°F (20°C) increased calf respiration rate (NASEM 2021, NRC 2001). Thus, for most of the months during the hot season **(Figure 1)**, calves were under heat stress.

Table 1. Health parameters for calves raised in cool or warm seasons and housed individually or in pairs.

Variable	Cool-single	Cool-pair	Warm-single	Warm-pair
Fever, % of calves/week	21.7	23.0	13.6	26.7
Age of scours onset, day	8.2	7.7	8.4	7.4
Duration of first scours, days	4.9	6.5	2.5	5.6

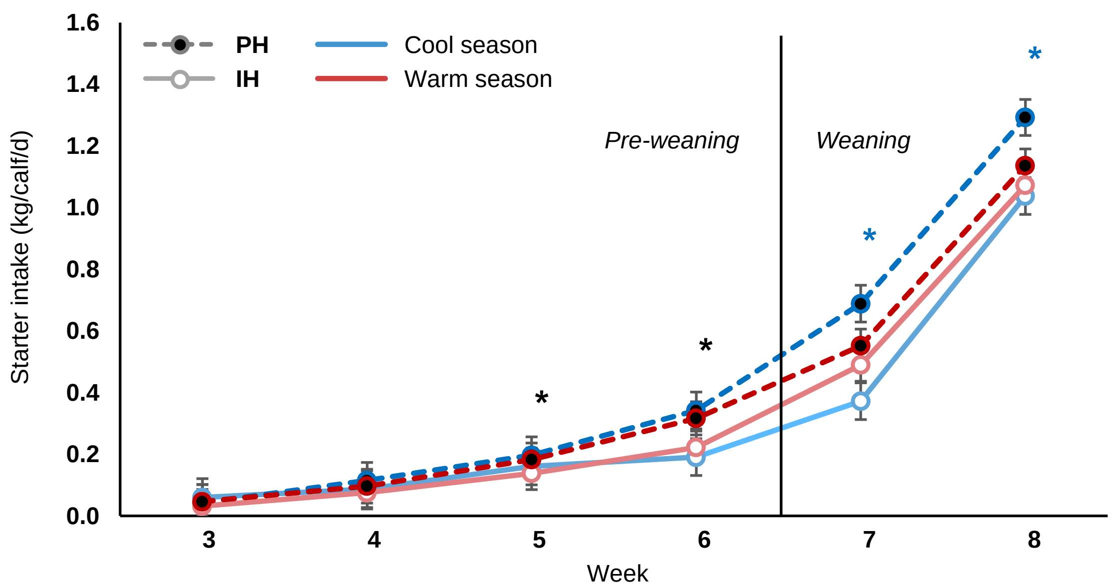
- More calves had a fever overall during the warm season, but fewer single versus pair housed calves had a fever within the warm season.
- Age at onset and duration of the first scours event was not affected by housing treatment.
- But the first scours event occurred at a younger age and persisted for more days for pens of calves born in the warm season.

Table 2. Performance for calves raised in cool or warm seasons and housed individually or in pairs.

Variable	Cool-single	Warm-single	Cool-pair	Warm-pair
Initial body weight, lb	84.1	82.6	88.7	82.4
Weaning body weight, lb	139.4	138.7	154.0	140.4
Post weaning body weight, lb	161.6	162.7	172.4	166.3
Starter intake, lb/day				
Preweaning	0.29	0.31	0.44	0.37
Weaning	1.78	1.89	2.16	1.98
Daily gain, lb				
Preweaning	1.32	1.30	1.48	1.34
Weaning	0.84	0.99	0.75	1.08
Postweaning	1.89	2.20	2.64	2.20
Standing, hours/day				
Preweaning	5.9	5.6	6.2	6.2
Weaning	6.3	6.6	6.5	7.1

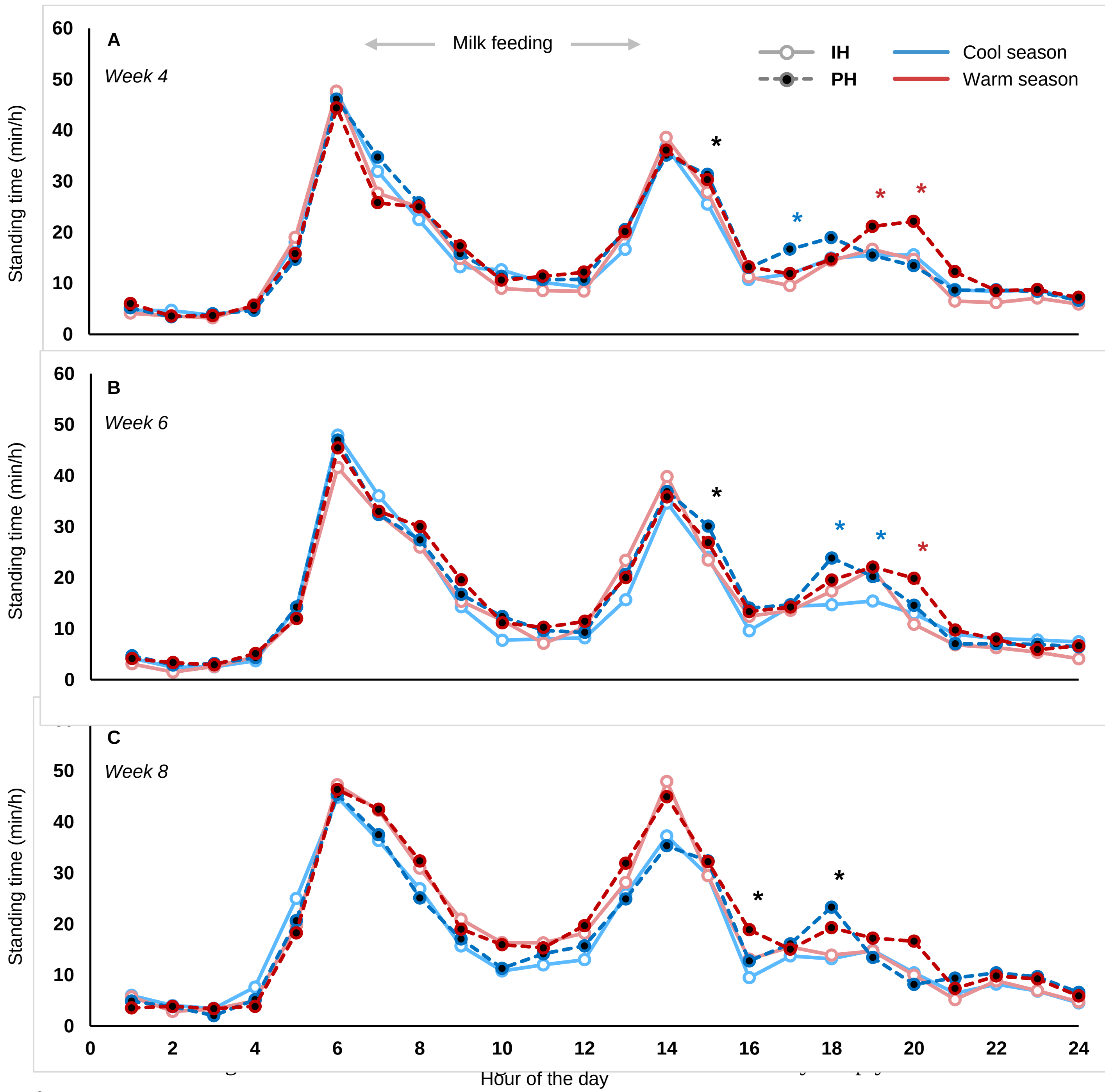
- Paired calves had greater ($P < 0.05$) body weight and daily gains than individually housed calves at the end of weaning and postweaning.
- The greater postweaning body weight and daily gains of 2.20 and 2.64 lb are a bit puzzling because there were no starter intakes for that period.
- Starter intakes were greater ($P < 0.05$) for paired versus individually housed calves during both preweaning and weaning periods. But, somewhat surprisingly, starter intakes did not differ for cool and warm seasons (**Figure 2)**.
- Paired calves spent more ($P < 0.05$) time standing than individually housed calves (**Figure 3)**.

Figure 2. Starter intakes for individually housed versus paired calves and for cool versus warm season of birth.



- Starter intakes begin to differ at 2-3 weeks of age and widened by 6 weeks of age and through the weaning period.
- This is illustrative of how starter intakes often double from week to week (Stamey et al., 2012). Therefore, the sooner starter intake begins, the better it is for the calves.

Figure 3. Hourly standing by calves individually versus paired housing and for cool versus warm season.



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- Greater standing was also associated with greater starter intake. This may simply be that when calves are eating, they are standing.
- Greater standing during later in the day for calves during weaning was attributed by the authors to that cows stand more when heat stressed. In this case, somewhat paradoxically, calves ate more starter during warm versus cool seasons.

This was a well-done study with many calves. But here are a few caveats:

- The starter was all pelleted
- There was no starter intake measured during the week postweaning
- A well-texturized starter may have produced some differences (Ghaffari and Kertz 2021). Also, monitoring rumination would have provided additional pertinent data such as in Silva et al., 2026.
- Did the additional colostrum feeding only to warm season calves of 2.4 qt benefit them versus cool season colostrum feeding?

The Bottom Line

Paired versus individual housing for calves had some benefits in starter intake and daily gain. Fever and scour incidence measurements may need further scrutiny since health issues have been a main concern with pairing preweaned calves in housing.

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