

Ventilated or Not for Heat Stressed Pair Hutch-Housed Dairy Calves

Al Kertz, PhD, PAS, DIPL ACAN

ANDHIL LLC

St. Louis, MO 63122

andhil@swbell.net

www.andhil.com

There is a dearth of data on heat stress in dairy calves, but even none if calves are pair-housed in hutches. Previously, a study was reviewed on heat stress in hutches (Dado-Senn et al., 2023; Kertz 2023). Heat stress in young calves occurs at or above 77° F (NASEM 2021) when they need to expend additional energy to attempt to stay cooler. Calves may be more prone to heat stress than cows because they, like human infants, have limited ability to regulate body temperature, and they have a greater surface area per unit body mass than cows. In hot weather, preweaned calves with low calf starter intakes do not yet produce much heat of rumen fermentation which allows ruminants to fare well in colder climates but is their bane in hot weather. In hot weather, calves, like cows, can attempt to compensate by eating less and by increasing their respiration rate. According to the most recent NAHMS survey (2014), calf hutch systems accounted for approximately 63% of all calf housing in the United States with 25% indoor and 38% outdoor.

This led to a study at the University of Wisconsin dairy farm (Reuscher et al., 2024) in which 50 Holstein heifer calves were pair-housed (n = 25 pairs) in outdoor hutches. Hutch ventilation was preassigned randomly to one hutch per pair of connected hutches, with the side (left or right) within a pair balanced among pairs, before calf enrollment. Calves were assigned to pairs of hutches sequentially by birth order.

Calves were separated from their dam and fed 4 qt of colostrum within 6 hours of birth. Calves weighing 106 lb or more were excluded from the trial (± 2 SD from the mean weights of the farm's calves from the 12 months preceding the start of the trial). Calves were then temporarily housed in individual hutches and only used when serum protein >5.1 g/dL. Calf birth weights had to be within 22 lb of each other for pairing.

Each pair of calves had 2 south-facing adjacent hutches connected with a thick white plastic board and a 9 × 6 ft long outdoor area. The front door was the only opening, whereas the other hutch was ventilated with two 10 inch diameter-adjustable windows at the rear base and the rear bedding door (25 × 15 inch) held open 7 inches with the built-in wire prop. All hutches and outdoor enclosure were deep bedded with sand.

Pair-housed calves were initially separated with a wire fencing panel dividing the outdoor enclosure. Calves were paired by removing the dividing panel by the end of week 1 (day 6 ± 1 range: days 4–9 of life). Differences in age within a pair were 1 ± 1 day (0 to 3 day range). The ventilation windows were not opened until habituation began during week 2 of life.

Drinking water was offered on the fence outside of the hutches in a black plastic bucket and all calves had ad libitum access to starter beginning on day 3 of life provided in one bucket inside each hutch (*good separation of water and starter sources!*). Amount of starter offered was increased daily based on consumption with $> 5\%$ refusals by weight.

All calves were fed pasteurized whole milk outside of the hutch twice daily between 0400 and 0530 hours and 1500 to 1600 hours. Once calves were determined by farm staff to be drinking 2 qt twice daily sufficiently (day 5 ± 1), milk volume was increased to 3 qt twice daily. When calves reached day 14 ± 1 of life, milk allowance was increased to 3 qt twice daily. All calves were weaned in a step-down fashion, decreasing milk to 2 qt twice daily at day 42 ± 1 , then to 2 qt once daily during the afternoon feeding at day 49 ± 1 .

Calves were completely weaned by day 53 ± 1 and remained in their hutches for at least 6 days (9 ± 2 day). Calf health was evaluated weekly by recording rectal temperature, along with cough, nasal discharge, and eye, ear, and fecal scores using the UW-Madison School of Veterinary Medicine Calf Health Scorer application.

<http://www.vetmed.wisc.edu/dms/fapm/apps/chs.htm>

Table 1. Weather conditions from May to September 2019 ($^{\circ}$ F), standard deviation (SD), and range.

Variable	Mean	SD	Range
Air temperature, $^{\circ}$ F	69.3	5.6	56.6 to 81.8
Relative humidity, %	78.4	8.9	53.4 to 98.8
Temperature Humidity Index (THI)	67.6	4.9	56.7 to 79.2

- Even though the mean ambient temperature was not that high (**Table 1**), the average humidity of 78.4% made the average THI near the lower THI of heat stress for calves.
- And the THI upper range of 79.2 was well above heat stress for calves. Thus, this is often not recognized by dairy producers in the upper Midwest that their calves undergo heat stress every summer.

Table 2. Inside ventilated, and inside non-ventilated hutch air temperatures F° .

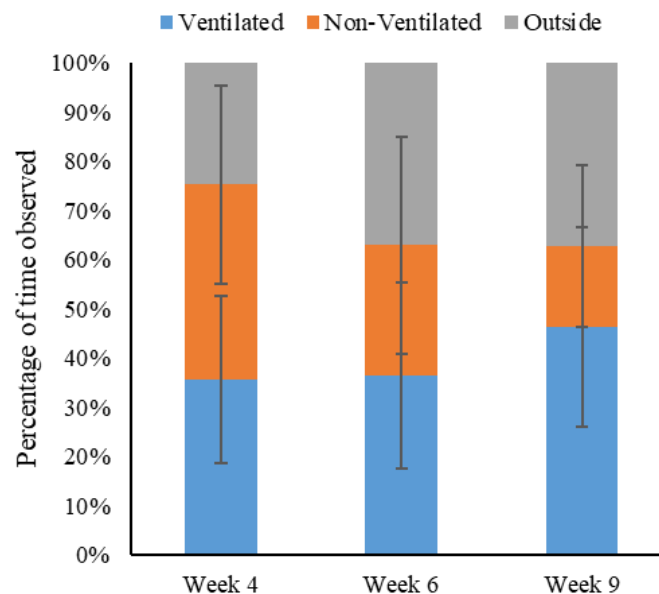
Variable	Inside ventilated hutch	Inside non-ventilated hutch
Before restriction	79.5 ± 7.2	82.6 ± 9.7
Week 4	80.0 ± 6.8	84.0 ± 7.6
Week 6	83.5 ± 6.3	87.6 ± 5.2
Week 9	77.5 ± 7.4	79.5 ± 7.4

- Note that inside non-ventilated hutch temperatures were 3 to 5 F° greater than inside ventilated hutch temperatures except for week 9. But at that time, it was September and both temperatures had decreased from previous weeks.
- Ventilated hutches had a lesser THI increase (+ 0.90 THI units, SEM = 0.16) after the 1 hour of restriction relative to the nonventilated hutches (+1.79 THI units).
- There was a main effect of week of life with a greater THI increase after the 1 hour of restriction in week 9 versus 6 (+1.81 vs. 0.73 THI units).
- There was a respiration rate ventilation treatment main effect (not shown) when calves came out of ventilated hutches as they had a greater reduction in respiration rate (-14.4 breaths/minute, SEM = 1.7) after the 1 hour of restriction relative to when coming out of the nonventilated hutches (-0.9 breaths/minute). There was a tendency for where 2 calves inside a hutch together had a lesser reduction in respiration rate

during the 1 hour of restriction in week 9 versus 6 (-3.1 vs. -13.4 breaths/minute in week 9 vs 6, respectively).

- Ocular temperatures (data not shown, graphed in text) were greater in individually housed calves after the 1-hour restricted time than for pair-housed calves. This may have been due to the stress of isolation in addition to heat stress. But there was no main effect for treatment or interaction for rectal temperature.

Figure 1. Percentages of time pair-housed calves preferred to be together at various weeks of age.



- Calves preferred to be together during each of the 3-week segments regardless of location while in weeks 6 and 9 they preferred the ventilated hutch.
- Calves were older during weeks 6 and 9 and most likely ate more calf starter which would have increased heat of rumen fermentation. Thus, even though there was more body heat generated and the THI increased, calves preferred to be together 80% of the time.

The Bottom Line

Calves like to be together even when that increased inside hutch temperatures during summer heat stress. Calves prefer ventilated versus non-ventilated hutches. As calves age and presumably eat more calf starter, that increases heat of rumen fermentation. This exacerbates heat stress and would most likely decrease or limit intake and possibly daily gain.

References

Dado-Senn, B., V. Ouellet, V. Lantigua, J. Van Os, and J. Laporta. 2023. Methods for detecting heat stress in hutch-housed dairy calves in a continental climate. *J. Dairy Sci.* 106:1039–1050.

Kertz, A. F. 2023. Detecting heat stress in hutch-raised dairy calves. June 1, 2023.

Kertz, Alois F. *Dairy Calf and Heifer Feeding and Management—Some Key Concepts and Practices*. Outskirts Press, July 31, 2019, 166 pages.

<https://outskirtspress.com/dairycalfandheiferfeedingandmanagement>

National Animal Health Monitoring System. Dairy 2014. Dairy Cattle Management Practices in the United States. United States Dept. of Agric., Animal Plant and Health Inspection Service, Veterinary Services, February 2016, Fort Collins, CO.

https://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/dairy14/Dairy14_dr_Mastitis.pdf

National Academies of Science Engineering Medicine (NASEM). 2021. Nutrient Requirements of Dairy Cattle, Eighth Revised Edition. Washington, DC.

Reuscher, K.J., R. S. Salter, and J. M. C. Van Os. 2024b. Thermal comfort and ventilation preferences of dairy calves raised in paired outdoor hutches during summertime. *J. Dairy Sci.* 107: 2284-2296