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Abstracts

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213 Heat load assessment in lactating cows on commercial dairy farms in a continental climate. I. Obadare* and G. Tresoldi, *The Ohio State University, Columbus, OH.*

Heat stress is a persistent challenge in dairy production, with well-documented impacts on cow welfare and productivity. However, in commercial dairies, heat abatement practices and cow responses to heat load vary widely and are not consistently documented. The objectives of this study were to (1) describe heat abatement strategies and cow behavioral and physiological responses, and (2) evaluate associations between environmental conditions and cow responses, accounting for differences in heat abatement across farms in a continental climate. On-farm assessments were conducted on 7 freestall dairies (herd size range: 208 to 3,757 cows). Direct observations were conducted over 3 consecutive days (~6 h/d) in a group of high-producing cows (197 ± 103 cows; milk yield of 43 ± 7 kg/cow/d). Every 30 min, the proportion of cows engaged in feeding behavior was recorded, and respiration rate was measured in a subset of 15 focal cows. Environmental conditions were monitored concurrently. Associations between environmental conditions and cow responses were evaluated using mixed models accounting for repeated observations within cows and farms. Across farms, air temperature (AT) and temperature–humidity index (THI) averaged $27.6 \pm 2.1^\circ\text{C}$ and 76 ± 3 , respectively. All dairies provided fans, and 3 dairies also provided soakers at the feedline. Respiration rate averaged 70 ± 6 breaths/min across farms and increased with ambient temperature ($\sim 2\text{--}3$ breaths/min per 1°C ; $P < 0.0001$), with a steeper temperature-related increase in farms using fans only compared with farms using fans plus soakers (AT $\times$ heat abatement, $P < 0.0001$). At the group level, the proportion of cows feeding differed by heat abatement strategy and showed a temperature-dependent pattern, with a lower proportion of cows feeding in fans-only systems as temperatures increased ($P < 0.01$). In commercial dairies, cow behavioral and physiological responses to heat load varied systematically with environmental conditions and the heat abatement strategies used.

Key Words: heat stress, respiration rate, heat abatement, on-farm assessment, lactating dairy cows, climate stress

214 Behavior dynamics of Holstein and Jersey lactating cows under heat stress. H. Joshi¹, A. Bethini³, A. McBride², A. Ardoin², J. Hawkins¹, M. McGee¹, A. Woolums⁵, and P. Fan^{1,4}, ¹*Department of Animal and Dairy Sciences, Mississippi State University, Starkville, MS*, ²*Department of Biochemistry, Nutrition, & Health Promotion, Mississippi State University, Starkville, MS*, ³*Raspet Flight Research Laboratory, Mississippi State University, Starkville, MS*, ⁴*Institute for Genomics, Biocomputing & Biotechnology, Starkville, MS*, ⁵*College of Veterinary Medicine, Starkville, MS.*

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Jersey cattle are generally considered more heat tolerant than Holsteins. However, differences in their behavior under heat stress remain unclear. This study aims to evaluate maintenance and social behavior among breeds under heat stress. Twelve Holstein and 12 Jersey lactating cows were housed in freestall pen by breed in summer for 14 d with limited access to fans or sprinklers (THI > 72 from 1200 to 2000 h). Behavior was video recorded. Maintenance behaviors (standing, lying, eating, and drinking) of 13 h/d (0700–1100, 1100–1200, 1300–1500, 1900–2300, and 0100–0300 h) was analyzed for 7 d using pre-trained (93% precision) YOLOv8-based models, where behaviors were defined from posture and labeled/animal, splitting into train:validation:test set (70:20:10). Models were validated against a reference: trained observers annotated

ground-truth and matched to reference labels. Social behaviors of 7 h/day (0700–1100, 1100–1200, 1300–1500) were manually annotated and analyzed. Data were analyzed using mixed models in SAS 9.4, with breed, day, and breed $\times$ day as fixed effects for maintenance behavior, and breed as a fixed effect for social behavior. Holsteins spent more time lying than Jerseys/day (6.7 vs. 5.3 h, $P = 0.006$). At noon (1100–1200), Holsteins showed greater lying time (35.29 vs. 27.06 min, $P = 0.016$), whereas Jerseys spent more time standing (26.53 vs. 18.95 min, $P = 0.01$) and drinking (6.65 vs. 4.38 min, $P = 0.008$). During evening (1900–2300), Jerseys spent more time standing than Holsteins (1.7 vs. 1.4 h, $P = 0.007$). Day effects were observed. With increasing days of heat stress, noon lying time decreased ($P = 0.014$) and standing time increased ($P = 0.04$), afternoon standing ($P = 0.05$) and drinking time ($P = 0.0004$) decreased, whereas evening standing ($P = 0.01$) and eating time ($P = 0.01$) increased. Social behavior analysis (times/day per cow) showed Jerseys performed greater agonistic (5.52 vs. 4.13, $P = 0.04$) and affiliative (2.54 vs. 0.91, $P = 0.008$) behavior than Holsteins. Overall, our results showed Jerseys exhibit active heat-stress coping behavior, like greater standing and drinking behavior, and a higher frequency of interactions compared with Holsteins.

Key Words: behavior, heat stress, Holstein, Jersey

215 Nutritional strategies on heat-stressed Holstein heifers' ingestive behavior. W. Chen, M. Giovanna, G. Savoini, and G. Invernizzi*, *Department of Veterinary Medicine and Animal Sciences, University of Milan, Lodi, Italy.*

This study evaluated the impact of different feeding strategies on ingestive behavior of heat-stressed heifers during the summer period in northern Italy. Two consecutive experiments (42 and 35 d long) were conducted under naturally occurring heat stress conditions. In Exp. 1, 36 heifers (13.7 mo old) were randomly assigned to 1 of 3 groups: (F) 12 heifers fed once daily at 1200 h and housed with water-cooled mattresses, feeders and waterers; (N) 12 heifers fed twice daily at 0600 and 2300 h without cooling systems; and (C) 12 heifers fed once daily at 1200 h without cooling. In Exp. 2, building upon the experimental set up of Exp. 1, all heifers (10.62 mo old) were fed a basal diet once daily at 1200 h and assigned to one of the following treatments: (F) heifers housed with water-cooled mattresses, feeders and waterers; (T) heifers supplemented with calcium gluconate (10 g/head per day) without cooling; and (C) heifers receiving no supplementation or cooling. Environmental temperature and relative humidity were continuously monitored, and the temperature–humidity index (THI) was calculated. Feed intake (FI), dry matter intake (DMI), and water intake (WI) were recorded. Feeding and drinking behavior were further characterized by the number of visits to feeders and waterers and the time spent eating and drinking. Data were analyzed using proc GLIMMIX of SAS and significance was assigned at $P \leq 0.05$. In Exp. 1, FI and DMI did not differ among treatments ($P > 0.05$). However, feed intake within the first 3 h after feed delivery was greater in once-daily fed heifers (C: 5.64 ± 0.30 kg; F: 5.30 ± 0.30 kg) than in twice-daily fed heifers (N: 3.51 ± 0.18 kg in the morning and 3.30 ± 0.18 kg in the evening; $P < 0.05$). When THI > 75 , heifers in C and N spent more time at the watering station than those in F. In Exp. 2, no differences were observed among treatments in FI or DMI ($P > 0.05$), nor in FI during the first 3 h post-feeding ($P > 0.05$). Drinking behavior differed among treatments ($P < 0.05$): daily WI was greater in T (48.50 ± 2.59 L) and C (44.98 ± 2.59 L) than in F (36.54 ± 2.59 L), and time spent at the watering station was also longer for T and C (13.71 ± 1.32 min; 12.79 ± 1.32 min) compared with F (7.02 ± 1.32 min). In conclusion, under summer heat stress conditions, feeding frequency and cooling systems modulated ingestive behavior

by altering the temporal distribution of intake rather than increasing total daily intake. In contrast, nutritional supplementation with calcium gluconate exerted limited effects on behavioral responses.

Key Words: heat stress, ingestive behavior, feed intake, water intake, heifer, cooling system