Heat production of primiparous Holstein cows with different feeding strategies during early lactation.

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The objective of this study was to estimate heat production in dairy cows with different feeding strategies during early lactation. Primparous Holstein cows calved in autumn were used (n=18; 528±40 kgBW; 3.2±0.2 BCS) in a randomized block design with two nutritional treatments. At calving, cows were assigned to either: (G0) total mixed ration (TMR) *ad libitum* (17 kgDM/d offered; 70% forage, 30% concentrate) or (G1) grazing of alfalfa (*Medicago sativa*; 6-h am grazing in 3-d strips; pasture allowance=20 kgDM/d) + TMR (70% of *ad libitum* TMR; 12 kgDM/d offered) during the first 65 days postpartum (DPP). Cows were milked twice a day, both groups consumed 2.2 kgDM/day of a commercial concentrate in each milking. Milk production and composition were recorded daily and weekly respectively. At 45 ± 5 DPP, heart rate (HR) was measured every 5 sec. using HR monitors during 4 consecutive days and at the beginning or end of the HR measurement period, oxygen consumption per heart beat was determined for each cow to enable conversion of the diurnal HR patterns to heat production units. Data were analyzed as repeated measures in a mixed model which included nutritional treatment, time of day and their interaction as fixed effects, cow as a random effect and calving date as a covariate. Milk energy output tended ($p=0.07$) to be greater for G0 than G1 cows (20.9 vs. 19.2 ± 0.57 Mcal ENL/d), being the most marked differences from +30 to +60 DPP. Cow BW and BCS did not differ ($P> 0.30$) between treatments. Heart rate and heat production were not affected ($p>0.28$) by nutritional treatment (86.2 vs 90.3 ± 2.3 beat/min and 853 vs. 899 ± 41 kJ/(d*$BW^{0.75}$) for G0 vs. G1 cows, respectively), but they differed along the day ($p<0.001$) and were affected by the interaction between nutritional treatment and time of day ($p<0.02$). Heart rate and heat production reached the minimum values early in the morning, increased throughout the day and decreased markedly after 19:30h (evening). However, minimum values were reached earlier and maximum values later in G0 than G1 (at 5:30 vs. 7:30 h and 16:30 and 18:30 h, respectively). In addition, HR was greater between 3:30 and 5:30 h and at 9:30 h in G1 than G0 cows. These results might suggest that regardless of the nutritional treatment, both walking and eating activities increased HR and heat production. Differences between treatments along the day would probably reflect different time allocation for eating activity.

Keywords: grazing, oxygen consumption, dairy cows