

Extra walking of dairy cows to access the pasture in a grazing system: Effect on intake and digestibility

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Introduction

The distance to the grasslands is viewed as a problem in grazing dairy systems because the cows need walking, what constitutes an energy-expensive process. Further, the exercise of dairy cows also has effects on their physiology (Davidson and Beede, 2003) and possibly on their digestive function. Furthermore, while walking, cows are under a fasting period. Even a short fasting period can affect dry matter intake (DMI) (Beauchemin, 2018), rumen fermentation and feed digestibility by dairy cows (Gregorini et al., 2008). However, despite the evidence of the potential negative impact of walking on productive performance of dairy cows, it is not known which would be the contribution of the exercise or the fasting period during the walking on this variable. Therefore, the objective of this study was to investigate the digestive effects in dairy cows walking 5 km between the milking parlour and the pasture plot in a grazing system, separating the effects of walking itself from the fasting associated to walking.

Material and methods

The experiment was conducted at the Departamento de Producción Animal de Facultad de veterinaria (IPAV, UdelaR, Uruguay; 34°40'S, 56°32'W), on spring of 2017, in accordance with regulations governing the use of experimental animals (Comisión Honoraria de Experimentación Animal, UdelaR, protocol: 606/17). Thirty Holstein x Jersey cows were assigned in a randomized complete block design to one of 3 treatments: *i*) grazing (GRA), the cows had access to the pasture immediately after a.m. milking until previous p.m. milking, *ii*) walking (WALK), the cows walked 2.5 km before and after grazing at the pasture totalizing a walk of 5 km/d, and *iii*) fasting (FAS), the cows fasted in a paddock without food and water while WALK group walked, and afterwards accessed to the pasture. After p.m. milking all groups acceded the pasture at same time, remaining until a.m. milking. In both grazing turns, all cows grazed a pasture, with a target allowance of 30 kg of DM/cow per day (measured at 0 cm), and were supplemented with 3.6 kg of DM/cow per day of soybean hulls at the milking parlour. The cows of each treatment grazed in separate paddocks, entering in a new paddock in each grazing session. The intake was measured during 5 consecutive days. The individual intake of pasture was determined using titanium dioxide as an external marker (Glindemann et al., 2009), and indigestible neutral detergent fiber as an internal marker (Huhtanen et al., 1994). Daily intake of soybean hulls was determined individually by weighing the amount offered and refused at each milking. Total DMI was calculated as the sum of pasture and soybean hulls intake. Intake of DM, OM, PC and NDF were calculated by multiplying DMI and each nutrient concentration for each ingredient of the diet. Apparent total-tract digestibility coefficient for nutrients of diet was obtained as: $\{[(\text{intake (kg/d)} - \text{fecal output (kg/d)}) / \text{intake (kg/d)}] \times 100$. Pre-planned orthogonal contrasts were used to separate the means; the cows with permanent access to the pasture were compared with the other two groups (fasting effect: GRA *vs.* WALK+FAS), and cows that walked (with the associated fasting) with the group that were only fasting (walking effect: WALK *vs.* FAS). The differences were declared at $P \leq 0.05$.

Results and discussion

Total DMI and nutrient intake were not affected by walking or fasting ($P > 0.05$, Table 1). The NDF digestibility was lower for the fasting effect ($P < 0.05$, Table 1). No differences were found for nutrient digestibility for the walking effect ($P > 0.05$, Table 1).

Two main factors could explain the decrease in NDF digestibility of FAS cows: (1) the greater passage rate of particles of diet (Bach et al., 1985) and (2) an imbalance in the rumen environment (Gregorini et al., 2008). As in the current study the passage rate of particles of diet was not affected by fasting (unpublished dates), it is possible that a more imbalanced rumen fermentation in the FAS treatment negatively affected the NDF digestibility. Previous authors reported that rumen

pH at values below 6 inhibits growth and activity of cellulolytic bacteria (Russell and Dombrowski, 1980). Thus, it is possible that the lower values of pH observed in the FAS treatment (Capelesso et al., 2018) may have decreased the NDF digestibility.

Table 1. Impact of walking or a short fasting period on intake and digestibility by dairy cows in a grazing system

Item	Treatments ¹			SEM ²	Orthogonal contrasts	
	GRA	WALK	FAS		GRA vs. WALK+FAS	WALK vs. FAS
<i>DMI, kg/d</i>						
Pasture	14.6	15.7	15.0	0.740	0.823	0.270
Soybean hulls	3.0	3.2	2.9	0.254	0.502	0.508
Total	17.6	18.9	17.9	0.846	0.665	0.227
<i>Nutrient intake, kg/d</i>						
CP	3.2	3.5	3.3	0.163	0.619	0.266
NDF	7.2	7.7	7.2	0.358	0.593	0.239
<i>Digestibility, %</i>						
DM	64.8	65.6	65.6	0.734	0.118	0.253
CP	66.1	69.6	65.9	2.376	0.505	0.311
NDF	51.5	58.8	44.6	2.084	<0.001	0.015

¹Grazing (GRA); Walking (WALK) and Fasting (FAS), after a.m. milking before getting access to the pasture and before p.m. milking.

²Standard error of the mean.

Conclusion

The walking exercise or the short-time fasting period during walking did not affect the intake by dairy cows. However, the NDF digestibility decreased due the short fasting period.

Keywords: pasture dairy system; milk yield; short fasting

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