Comparison of Two Systems of Pasture Allocation on Milking Intervals and Total Daily Milk Yield of Dairy Cows in a Pasture-Based Automatic Milking System

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Introduction

In pasture-based automatic milking systems (AMS), cows usually have a lower milking frequency (MF, the number of milking events in any 24 h period) than those reported in indoor housing systems (García and Fulkerson 2005). Moreover, milking intervals (MI, the interval between consecutive milking events, measured at every milking session in hours since the previous milking event) are higher, with up to 30% of milking events occurring with intervals above 16 h in grazing systems (NA Lyons unpublished data). Milking events occurring with long intervals have a negative effect on milk yield (Schmidt 1960) and udder health (Hammer *et al.* 2012).

Recognising that feed is the main incentive to achieve voluntary cow traffic (Prescott *et al.* 1998), some initial reports have depicted the potential importance and effect of incentives put in place per day (Jago *et al.* 2007). Yet to date no research has been published that quantifies the actual impact of number of feed allocations, on animal performance in pasture-based systems.

The aim of this study was to determine the impact of 2 different grazing treatments (2-way grazing [2WG] versus 3-way grazing [3WG] allocations of feed per 24 h period), on MI, MF and daily milk yield (DY, in kg milk/d). It was hypothesised that an increase in frequency of feed allocation would result in increased cow traffic, MF and DY.

Material and Methods

A pilot study was conducted during November and December 2010 at the FutureDairy pasture-based AMS research farm (Camden, NSW, Australia). The herd consisted of 145 mixed age and breed cows that were milked through 2 DeLaval VMS units (Tumba, Sweden).

Cows were offered their daily pasture allocation (18 kg/d) in equally sized portions according to the established treatments (2WG = 2 x 9 kg/d and 3WG = 3 x 6 kg/d). In addition to pasture, cows were supplemented with 4 kg DM/d concentrate in the milking station. Cows would access each allocation for a consistent period of time within treatment (active access hours = 24 h/number of allocations/24 h period). In addition to the active access time, cows had a period of 10 h in which they were expected to voluntarily exit the allocation but during which, no additional cows gained access to this allocation. Any cows that did not voluntarily exit a paddock were fetched and encouraged from the paddock to the dairy 2 h prior to the subsequent allocation closing for access. The study consisted of a 7-d adaptation period, during which cows were managed with 3WG, followed by a 4-d measurement period with 3WG. At the conclusion of the 3WG treatment period, the pasture management was reverted back to the traditional 2WG treatment with a 3-d adaptation period and a 4-d measurement period.

Table 1. Effect of 2-way grazing (2WG) and 3-way grazing (3WG) allocations per 24 h on return time (RT), waiting area time (WT), milking interval (MI), milking frequency (MF) and daily milk yield (DY) of cows in a pasture-based AMS

	2WG	3WG	*P* - value
RT (hh:mm)	17:26	11:21	< 0.001
WT (hh:mm)	2:00	1:55	0.738
MI (hh:mm)	20:10	13:59	< 0.001
MF (milkings/d)	1.28	1.78	< 0.001
DY (kg milk/d)	19.3	23.2	< 0.001

Milking permission was granted at selection gates if time since the previous milking was greater than 4 h for cows less than 70 days in milk, or greater than 8 h for cows over 70 days in milk.

The MI for each milking event was divided into return time to the dairy (RT) and waiting area time (WT). Additionally, MF and DY were analysed.

Results and Discussion

The provision of 3 allocations of feed per day caused a reduction (P<0.001) in RT and MI, as well as an increase (P<0.001) in MF for a herd managed in a pasture-based AMS. There was no effect (P = 0.738) of number of pasture allocations on WT. Overall, the provision of an extra pasture allocation per day increased (P<0.001) DY by almost 4 kg milk/d. (Table 1).

These results are in agreement with previous reports (Rodenburg and Wheeler 2002, Jago *et al.* 2004, Jago *et al.* 2007) whereby increasing the frequency of incentive allocations was a possible way to increase cow traffic in an AMS. There was a reduction in the amount of feed made available under 3WG (in total kg DM/allocation), which

created the potential for feed depletion to occur more rapidly thereby creating an incentive for cows to exit the allocation sooner in search of additional feed. Secondly, the maximum amount of time cows could spend in one allocation was reduced under 3WG (22 h for 2WG versus 14 h for 3WG). This was associated with a reduced active access period to each allocation and a reduced voluntary exiting period (before fetching), both of which likely affected mean RT.

The impact of the 3WG management is particularly attractive, because it not only increased the MF and milk yield in early lactation cows, but also in late lactation cows which are notoriously more difficult to motivate. Overall the 3WG treatment was associated with a higher utilisation and consequentially higher yields of milk harvested per AMS unit. The benefits under 3WG seem to justify the time spent conducting an 'extra' daily fetching and the provision of an additional pasture allocation.

Conclusion

Our results indicated that the provision of 3 allocations of pasture increased cow traffic, reduced MI and increased DY of cows in a pasture-based AMS.

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