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A comparison of different milking frequencies in an automated milking system integrated with grazing

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Introduction

In 2001 automatic milking (AM) technology was incorporated with a commercial pasture-based system (Greenall *et al.*, 2004). A study by Garcia and Fulkerson (2005) revealed a reduced milking frequency and milk yield and increased milking interval with AM in a pasture system compared to an indoor system. A recent study by Lyons *et al.* (2013) observed that operating a three-way grazing system, where the herd has access to three different grazing sections over 24 hours, increased milking frequency and milk production and reduced milking intervals compared to a two-way grazing system. Three-way grazing therefore allows better flexibility to manage milking intervals and thus increase the utilisation of the AMS unit. The aim of this study was to assess the effects of different milking frequencies on milk production characteristics and cow traffic in a three-way system in late lactation.

Material and methods

The farm-let with the AMS consisted of a 24 ha milking platform. The land area was divided into 3 grazing sections (A, B and C) of 8 ha each and these sections were further divided into 1 ha paddocks. Cows moved voluntarily between the grazing sections A, B and C. Cows had access to new pasture in A from 12:30am, B from 09:30am and C from 16:30pm. The dairy featured one Fullwood Merlin 225 AMS unit. There were 70 primiparous and multiparous cows of various breeds on the system. Cows were randomised into two groups of 35 cows based on lactation, breed, the average milk yield and milking frequency from the previous 21 days milking results and days in lactation. Settings on the AMS were manipulated to allow one group of cows to milk 2 times per day (Group 1) and the other group to milk 3 times per day (Group 2). There was an adjustment period of 10 days (August 21st to 31st 2013) prior to the data collection period (September 1st to 20th 2013). During the trial period 11kg DM grass, 4kg concentrate and 5kg DM silage were fed per cow per day. A non-parametric statistical model (Mann-Whitney test) was used to determine significance between groups using Graphpad Prism software.

Results and discussion

The milk quality for the herd was characterised by an average fat percentage of 5.12% (range: 4.81 – 5.44%), protein of 4.14% (range: 4.02 – 4.27%), lactose of 4.51% (range: 4.41 – 4.56%) and somatic cell count (SCC) of 130×10^3 (range: 85 – 199×10^3). The trial targeted a milking frequency of 2 and 3 times a day. However as the system relies on cows voluntarily presenting themselves for milking without being fetched from the paddock, a milking frequency (MF) of 1.4 and 1.9 was achieved. Although these milking frequencies were significantly different between the groups the milk

yield (MY) per day was not significantly different between groups (Table 1).

Table 1: Average milking frequency (MF), milk yield (MY), feed allowance (FA), actual feed intake (AFI), number of returns (R) per cow per day and the average return time (RT) [hh:mm] wait time (WT) [hh:mm] and milking interval (MI) [hh:mm] per cow per visit for each group.

	Group 1		Group 2		P-value
	Average	SEM	Average	SEM	
MF/Day	1.4	0.03	1.9	0.04	<0.001
MY/Day (kg)	13.4	0.61	13.73	0.76	0.946
FA/Day (kg)	3.33	0	3.33	0	>0.999
AFI/Day (kg)	2.31	0.05	2.71	0.04	<0.001
R/Day	2.8	0.08	3	0.11	0.196
RT/visit	06:07	00:09	05:45	00:10	0.139
WT/visit	01:24	00:10	01:16	00:10	0.613
MI/visit	14:29	00:39	11:52	00:25	<0.001

Both groups were allocated the same amount of concentrate at the AMS (FA), cows with the higher milking frequency consumed significantly higher amounts of feed (AFI) (0.4 kg/day). Cow traffic analysis revealed that cows voluntarily returned (R) to the AMS yard the same number of times regardless of milking frequency. The return time (RT), from when a cow left the AMS yard until return, and the wait time (WT) in the milking yard were not different between groups. Although the milking interval (MI) was significantly longer per visit for cows with the lower milking frequency (2hours 37min), milk yield and cow traffic performance indicators were unchanged (Table 1).

Conclusions

In the latter end of lactation it is possible to reduce the milking frequency of cows on an automated milking system without compromising milking characteristics of the herd, reducing milk production or affecting voluntary cow traffic performance.

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