Effect of oral supplementation of Pro-Dairy ® on lactating dairy cows in late lactation

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Abstract

Objectives: This study was performed to determine the effects on lactation of supplementing late lactation pasture-fed cows with Pro-Dairy® for a period of 10 weeks.

Methods: Cows were stratified according to age and pregnancy status and then randomly assigned to either treatment (10mls of Pro-Dairy® daily *per os*) or control (no treatment). All cows were also orally drenched daily with a routine dose (60g) of magnesium oxide suspension. Herd tests were performed prior to the start of treatment, and at the end of treatment. Body condition was assessed prior to the start and at the end of treatment.

Results: Treated cows tended to produce more milk solids (MS) over the treatment period. Both treatment and control groups dropped in production during the period of the study. Treatment cows showed a trend towards a smaller fall in milk protein (MP) ($p = 0.082$) production than control cows; and they experienced a significantly smaller drop in milk fat (MF) ($p = 0.031$) and MS production ($p = 0.041$) over the period. Both groups of cows experienced an increase in BCS over the period of the trial.

Conclusions: Administration of Pro-Dairy® to cows in late lactation significantly lessened the drop in both daily MS and particularly daily MF production during the period of administration.

Introduction

Pro-Dairy® (ACVM regn A008265) is a liquid probiotic digestion enhancer. It is manufactured for use in dairy cattle as an oral compound and contains live cultures of Lactobacillus *acidophilus*, Lactobacillus *thermophilus*, Lactobacillus *casei* and Bifidobacter *bifidus*.

Previous smaller scale studies have indicated that feeding Pro-Dairy® to lactating cows had a beneficial effect on milk production. Pilot study data has shown that MS production may increase by 13% (0.96 vs 0.85kgs, Leeston Trial); by 4% (1.25 vs 1.2kgs, Putaruru Trial); and by 6% (2.12 vs 2.00kgs, Feilding Trial). These were smaller scale trials where the cows were fed for 4-5 weeks. These data were used for the initial power analysis to determine the size and scope of the study.

Probiotics are naturally occurring bacteria that have been shown to enhance the rumen flora. This can lead to increased efficiency. If a ruminant is able to more efficiently convert feed to milk or meat then this reduces feed requirements and in turn could increase productivity. Moreover, improved feed utilisation could reduce methane output.

The principal goal of this study was to determine if feeding the product to late lactation dairy cows had any effect on production or milk composition; or on body condition score. There was a feeling that the effect seen in early lactation could be amplified in later lactation. The trial was a randomised blinded controlled trial.

Materials and Methods

A herd of cows in Southland was selected on the basis that they performed daily oral drenching and kept good records. The herd comprised 399 Jersey and Jersey cross cows. Cows were in late lactation, and were fed predominantly from pasture. A small amount of supplement (baleage) was introduced mid way through the study.

Cows were stratified according to age and pregnancy status (early, mid, late, empty) and randomly assigned to either a treatment or control group. 10mls of Pro-Dairy® was administered orally combined in the normal drench (60g Magnesium Oxide suspension) to the treatment group, divided into twice daily drenches at milking time from early March (6^{th}) until late (25^{th}) May 2007. Treatment cows were identified by a purple ear tag in the ear for ease of drenching. Control cows received only the normal drench at each milking.

A herd test was performed at the beginning of the study (5^{th} March) and 75 days later at the end of the study (19^{th} May). Body condition score (BCS) was measured at the start and end of the study. Outcomes of interest were changes in milk production (milk fat, milk protein, total milk solids (MS)) and quality (SCC), and changes in BCS during the period of treatment. The total production of MS, MF, and MP produced in the 75 day period between herd tests was measured; as was the total daily production of MS, MP, MF produced at both herd tests; and finally the difference between the daily production of MS, MF and MP at each herd test was measured. The latter measurement was the most sensitive and was used in the final analysis.

In calf status was dichotomised into early in calf, and the remainder ('Incalf2'). The hypothesis being that any effect of pregnancy on milk production is largely confined to the latter trimester and so unlikely to be an issue for this study, when the earliest calving cows were still 90 days away from calving at the end of the study.

BCS measurements were performed by 2 independent veterinarians. The same veterinarians were used for both the first and second BCS measurements, and these were blinded to groups. Cows were pregnancy scanned prior to being assigned to either treatment or control groups and were categorised as either early in calf, mid, late or empty.

Data was collated from both herd tests, from the BCS measurements and from herd health records, and transferred into Excel (Microsoft.com) for manipulation and into SPSS (SPSS.com) for statistical analysis. This study was performed under the auspices of the Invermay AEC. Data were analysed using the generalised linear model procedure, with treatment group, age and in-calf status as fixed effects.

Results

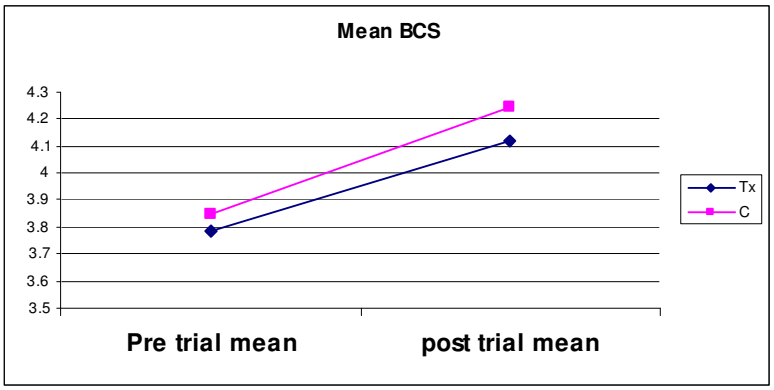
A total of 179 treatment and 178 control cows had full datasets and were used in the final analysis. Chi square analysis of the initial groups showed no differences between the groups with regard to any of the outcome or postulated explanatory variables (with the exception of LnSCC – p = 0.037). (Table1)

Table 1: balance of initial treatment and control groups

	Tx	Mean	Std. Deviation	Std. Error Mean	sig 2 tailed
age	1	23.719	40.045	2.860	
	0	29.164	42.901	3.072	0.195
marchBCS	1	3.779	0.417	0.032	
	0	3.841	0.400	0.030	0.157
DIM1	1	184.413	25.192	1.799	
	0	184.349	20.872	1.495	0.978
age2	1	30.357	16.114	1.151	
	0	28.313	16.570	1.187	0.217
lnSCC1	1	4.271	1.322	0.095	
	0	4.562	1.424	0.102	0.037
incalf2	1	1.408	0.493	0.035	
	0	1.492	0.501	0.036	0.095

Both groups showed an increase in BCS during the trial period but there was no significant difference between the groups. (Figure 1)

Figure 1: BCS change



Daily milk protein and daily milk fat fell for both groups: the control group fell further than the treatment group (Figure 2). The difference in daily milk fat production between the start and end of the trial period for the treatment group was significantly smaller than for the control group (mean difference -0.0382 vs -0.0676kgs; $p = 0.031$). There was no significant difference between the treatment and control groups for MP (0.0617 vs 0.0766kgs; $p = 0.082$). The full ANOVA table for MF is reproduced below (Table 2).

Figure 2: daily MF and MP production

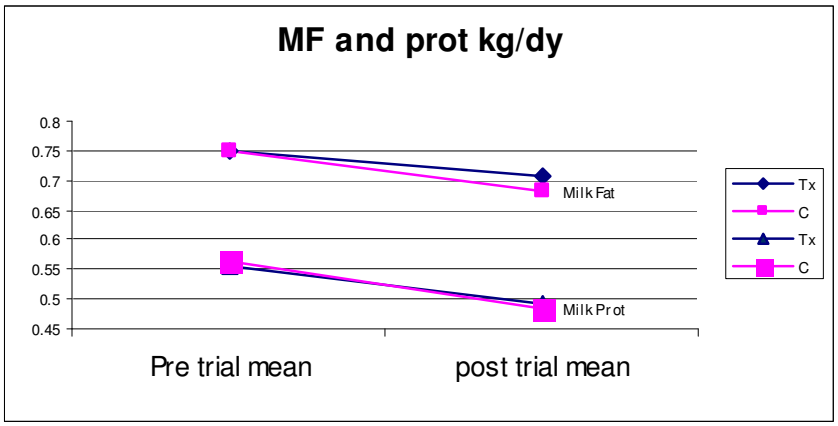


Table 2: Full ANOVA output for daily MF production

Dependent Variable: diffMFkgdy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.298(a)	5	.060	2.835	.016
Intercept	.992	1	.992	47.120	.000
Tx	.099	1	.099	4.700	.031
age2	.171	2	.086	4.066	.018
Tx * age2	.043	2	.021	1.021	.361
Error	7.392	351	.021		
Total	8.686	357			
Corrected Total	7.690	356			

a R Squared = .039 (Adjusted R Squared = .025)

Total daily MS fell for both groups: further for control group (Figure 3). The difference in daily milk solids production between the start and end of the trial period for the treatment group was significantly smaller than for the control group (0.0998 vs 0.1442kgs; p = 0.041). The full ANOVA table is reproduced below (Table 3).

Figure 3: daily MS production

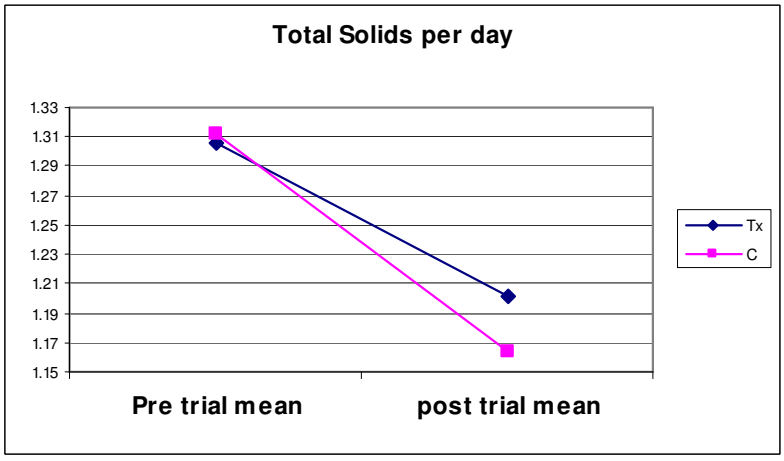


Table 3: Full ANOVA results for daily MS production

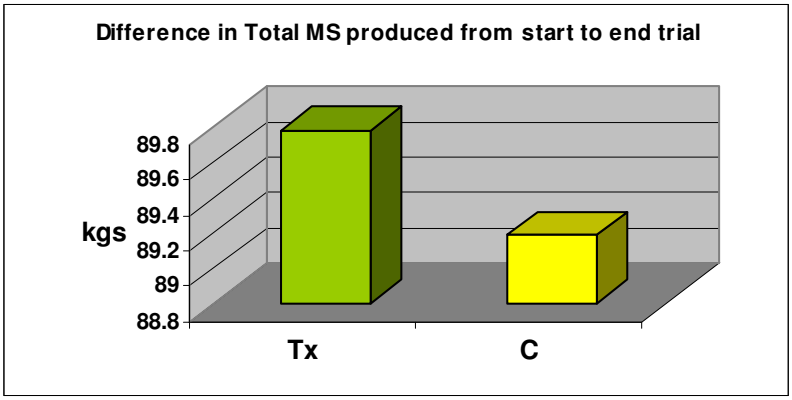
Dependent Variable: diffMSkgdy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.701(a)	7	.100	1.887	.071
Intercept	4.812	1	4.812	90.710	.000
Tx	.222	1	.222	4.192	.041
incalf2	.053	1	.053	.991	.320
age2	.425	2	.212	4.001	.019
Tx * incalf2	.007	1	.007	.130	.719
Tx * age2	.041	2	.020	.384	.682
Error	18.515	349	.053		
Total	24.523	357			
Corrected Total	19.216	356			

a R Squared = .036 (Adjusted R Squared = .017)

The treatment group produced more MS between the start and the end of the trial than the control group (Figure 4).

Figure 4: Total MS produced between herd tests



Although the control group began with a higher SCC at the first herd test, measurement of the change in SCC between the first and second test revealed no differences between the groups.

Discussion

The effect of a lesser reduction in MS production among the treated cows compared with the control cows is largely mediated via a lesser reduction in MF production. This has been seen previously in the earlier studies. Whilst there was a small reduction in MP between groups, this was not significant.

It is likely that the probiotics contained in the product enhance the efficiency of the propionic acid pathway in the cow, leading to an increase in MF production (or a smaller decrease over time during late lactation). It is interesting that this was achieved without any negative effect on BCS, as this is a factor that is often overlooked in production enhancing products. This suggests that the improvement in production can only come from either increased efficiency of food metabolism and conversion; or from increased food (dry matter) intake. If the latter, one would

expect a similar effect on MP during the period of the study, which was not the case. Total feed intake was not measured during this study.

Other factors which showed an effect on milk production were, unsurprisingly, age and pregnancy status. While there was no significant difference at the start of the study, cows deemed early in calf were producing slightly less by the end of the study. Older cows produced more than younger cows.

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