BRIEF COMMUNICATION: Influence of management techniques on the levels of mastitis in an organic dairy herd

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INTRODUCTION

In 2001, Massey University set up its Dairy Cattle Research Unit (DCRU) as a system comparison between organic and conventional farming. It is the only comparative grassland-based open grazing dairy study in the world.

The DCRU was split into two similar farmlets; an organic unit of 20.4 ha carrying about 46 cows (2.27 cows/ha) and a conventionally farmed unit of 21.3 ha carrying about 51 cows (2.39 cows/ha). Each of the two units is managed individually according to "best practice" for its particular type of management system. No attempt is made to replicate on one farm what is done on the other. The project has been described in detail by Kelly *et al*. (2006).

In 2003, the organic unit achieved AgriQuality organic certification. Initially, standards were based on those of the European Union (EU) which allow limited use of antibiotics with extended withholding times. From August 2006, all organic dairy suppliers to Fonterra were required to meet the standards set by the US Department of Agriculture (USDA) National Organics Program. Under these standards, any animal treated with antibiotics loses its organic status permanently. There was a one year lead-in time for farms already certified which required the use of antibiotics be discontinued from August 2005.

Both herds are milked through the same shed, the organic cows being milked first. Mastitis control for the conventional herd conforms to the seasonal approach to managing mastitis (SAMM) plan, including selective dry cow therapy. Control in the organic herd is based on similar principles, excluding the use of antibiotics and teat sealant, with modifications evolving over time. An iodine-based teat spray is used on both herds post-milking throughout the season.

MATERIALS AND METHODS

In November 2003, a sampling regime began whereby aseptically collected milk samples from each quarter of each cow in both herds were submitted for microbial culture. Sampling has occurred four times per season; at calving, 14 days after calving, at mid lactation and at drying off (Silva *et al*., 2005). Subsequent culture was carried out by New Zealand Veterinary Pathology Ltd. Additional data were gathered from monthly individual somatic cell counts (ISCC) carried out by the Livestock Improvement Corporation as a part of routine herd testing and bulk milk somatic cell count (BMSCC) provided by Fonterra. Staff at the DCRU recorded cases of clinical mastitis. Measures to detect and control mastitis were instigated.

RESULTS

Results until the end of the 2005/06 season have been described by McLeod *et al.* (2008) and to the end of the 2006/07 season by Thatcher *et al.* (2008).

Average BMSCC for each herd over the period of the project is shown in Table 1.

DISCUSSION

Early in the study it became clear that the most important mastitis-causing organism in the organic herd was *Staphylococcus aureus*. Once some existing environmental issues were addressed, the incidence of *Streptococcus uberis* mastitis dropped to low levels. Although both herds typically show a prevalence of around 8% to 10% of quarters positive to *S. uberis* culture at calving, the majority do not develop clinical or subclinical mastitis and are negative two weeks later, implying the organism does not establish an intramammary infection. The incidence of dry period mastitis is very low.

A relatively rapid turnover of farm managers complicated the development of methods of control for *S. aureus* in the organic herd. Each manager had a different emphasis on a variety

TABLE 1: Seasonal average bulk milk somatic cell count (000s) between 2003 and 2010 for each herd.

Herd	Season						
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Organic	194	199	178	233	226	148	67
Conventional	172	192	126	194	195	154	75
Significance	**	NS	**	**	**	NS	*

of control measures. However, this has been of advantage in the development of strategies suited to the DCRU as a range of ideas have been able to be evaluated.

A number of events in the early autumn of 2006 affected the mastitis incidence in both herds. A manager had recently left, relief milkers were employed until a new manager could start work and there was a drought-induced feed shortage. These circumstances were associated with a rapid increase in the incidence of a positive *S. aureus* culture with 35% and 30% of the quarters being affected in the Organic and Conventional herds respectively. However, the isolate appeared to be of relatively low virulence as the BMSCC of neither herd rose significantly until close to drying-off. The feed shortage necessitated the organic herd being dried-off early and the inadvertently long dry period of 14 weeks, may have contributed to a substantial decline in the prevalence of cultures positive to *S. aureus* which were down to 4% by two weeks after the ensuing calving. In light of the change of rules governing the use of antibiotics, this episode prompted a review of control methods. What became clear was the importance of training temporary staff in a teat spraying technique.

Subsequent to the review, the incidence of positive *S. aureus* cultures has remained low. However, in examining data comparing culture results with individual somatic cell counts, the limitations of bacterial culture as a diagnostic tool for subclinical mastitis became apparent. Intermittent shedding of organisms as well and other factors, may lead to false negative results. Although an elevated incidence of positive cultures may be a useful indicator of the rate of spread of infection, it seems poorly associated with the prevalence of subclinical infections.

The review resulted in a framework of key control measures being put in place:

- Vigilance. Early identification and regular monitoring by rapid mastitis test (RMT) of infected cows. Identification is facilitated by monthly herd testing and small herd sizes. A whole herd RMT may be carried out in response to a rise in BMSCC.
- Separation of infected cows. This can be a problem at the DCRU as there is no feasible way of running separate mobs on each farmlet. Where practical, cows identified as infected can be separated in the yard at milking time and milked last.
- A clean, "stress-free" environment.
- High quality teat spraying and regular inspection to ensure teats are in good condition.
- Post-milking hand stripping of high somatic cell counts quarters. This reduces the count from those quarters at the next milking. It is only of short term benefit but is useful in reducing the peaks associated with the day-to-day variation in SCC from infected quarters.
- Appropriate treatment and supportive therapy.
- Appropriate culling.

Efficacy appears to rely on a consistent integrated approach. A moderately increased input of labour for the organic unit is required compared to that of the conventional unit.

Within the framework of key measures, the two managers employed since 2006 have represented the two approaches most commonly implemented by organic farmers.

Approach 1: Emphasis on maximising saleable milk. Adopted by the manager employed from May 2006 until January 2008, regular monitoring of infected quarters is vital for the effectiveness of this approach. Milk from higher cell count cows is added to the bulk supply when BMSCC is low and withdrawn when it is high. Post-milking stripping of high SCC cows may be important with this system. The risk is that miscalculation may result in a BMSCC penalty, especially on a farm where the milk is being picked up every second day and where there is regular use of temporary staff. Infected cows also pose a potential risk to uninfected herdmates. On five occasions during this period the organic BMSCC exceeded 400,000 cells/mL.

Approach 2: Emphasis on minimising the BMSCC. This is associated with a higher culling rate as reflected by changes in the age structure of the organic herd, and volume of milk discarded. It minimises the risk of spread of contagious organisms and is characterised by a low prevalence of subclinical infections. Pre-milking separation of RMT positive cows and drying off infected quarters are features of this approach. Instituted since the beginning of the 2008/09 season, there has been an associated decline in BMSCC of both herds (Table 1). Organic BMSCC has exceeded 400,000 cells/mL twice, both times in the 2008/09 season.

CONCLUSION

Although the prevalence of mastitis in the organic herd, as measured by BMSCC, has remained manageable throughout the trial, the current key control measures introduced since 2006 have been associated with a reduction in the prevalence of infections and the BMSCC to low levels. Both approaches within the framework of key control measures were associated with a decline in the prevalence of infections detected by bacteriological sampling but Approach 2 was associated with a concomitant reduction in BMSCC.

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