

Milking machine design and mastitis

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A study was completed to evaluate the effect milking machines have on mastitis in dairy cows. The study evaluated number of mastitis infections of lactating Holstein cows milked with LR Gehm LLC's CoPulsation milking system consisting of low collapse force narrow bore liners and pulsation providing a C phase of less than 80 milliseconds when measured at the shell in comparison to a conventional milking system.

The study was a multiple year side by side comparison of the CoPulsation milking system and a conventional system in a small herd of approximately 20 milking cows. The cows were housed and milked in a stanchion barn with the CoPulsation milking system group on one side of the barn and the conventional group on the other. The milking procedures used were the same for both groups with both groups being milked by the same individual to ensure consistency in milking procedures. The side by side study was conducted over a multi-year period to evaluate the long term differences.

The group of cows milked with the conventional milking system were converted over to the CoPulsation milking system at the conclusion of the side by side portion of the study. This change resulted in a substantial reduction in bulk SCC levels into the 200,000 range within six months. The levels prior to conversion were often above 600,000 and had exceeded 820,000. Bulk SCC levels continued to improve in subsequent months to lows in the 100,000 range. This study concluded that mastitis in lactating Holstein cows can be substantially reduced with a change to the milking equipment used to milk the cows.

Mastitis continues to cost the US dairy industry approximately \$2 billion annually. A variety of actions have been taken in recent years to combat the problem with no reduction on the total economic impact to the industry. The average useful life of a US dairy cow is just over two lactations. Mastitis is recognised as being responsible for loss of milk production, diminished milk quality and even reproduction problems.

There has been no fundamental changes to the design of conventional milking machines in the past several decades although patent disclosures at the US Patent and Trademark office indicate that numerous attempts have been made to improve the design of conventional milking machines to combat mastitis and poor milking performance.

The CoPulsation milking system design represents a fundamental change to the design of milking equipment and an oppor-

tunity to evaluate the impact of that design change on mastitis in dairy cows.

A study was devised to provide a long term comparison of cows milked with a conventional milking system to those milked with the CoPulsation milking system.

The study was conducted on a small Holstein dairy herd with one group of cows milked twice a day with a conventional system and the other group milked twice a day with the CoPulsation milking system.

The entire herd was screened at the conclusion of the study to determine the prevalence of mastitis agents in the quarters of each of the cows in the study.

The group of cows milked with the conventional system were then milked with the CoPulsation milking system and bulk SCC levels monitored to show that milk quality was improved significantly with that change.

Materials and methods

This study was conducted on a dairy herd that consisted of approximately 20 cows milked twice a day in a pipeline style facility. Clusters were removed manually based on visual determination of end of milk flow.

One group of cows was milked on one side of the facility using a conventional milking system and the other group was milked on the other side of the facility with the CoPulsation milking system.

Each quarter of each cow in the herd was sampled at the conclusion of the test to determine the presence of mastitis.

The samples were gathered by and evaluated by the Cornell University QMPS organisation. The bulk SCC data for the herd was determined by the company purchasing the milk.

Results

The cows milked with the conventional milking system were found to have a significantly higher prevalence of mastitis than those milked with the CoPulsation milking system.

Table 1 provides a summary of the Cornell QMPS herd survey.

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Table 1. Mastitis pathogen culture.

Milking system	Cow number	Pathogen
CoPulsation milking system	1	None
CoPulsation milking system	2	Staph. aureus
CoPulsation milking system	3	Strep. species
CoPulsation milking system	4	None
CoPulsation milking system	5	None
CoPulsation milking system	6	Staph. species
CoPulsation milking system	7	None
CoPulsation milking system	8	None
CoPulsation milking system	9	Staph. species, C. bovis
CoPulsation milking system	10	Staph. species
Conventional milking system	11	Staph. aureus, Staph. species
Conventional milking system	12	Staph. aureus
Conventional milking system	13	None
Conventional milking system	14	Staph. aureus, Strep. species, G. bacillus
Conventional milking system	15	Staph. aureus, Staph. species
Conventional milking system	16	Staph. aureus
Conventional milking system	17	Staph. aureus, C. bovis

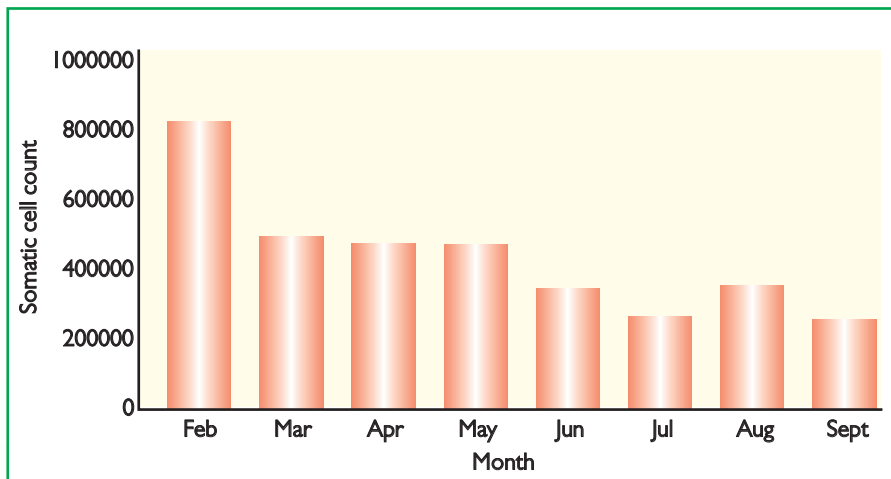


Fig. 1. Results of the bulk somatic cell count level.

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Fig. 1 shows the results of the bulk SCC level following the conversion of the entire herd to the CoPulsation milking system.

The culture data (Table 1) shows that one cow in the CoPulsation milking system had *Staph. aureus* at the conclusion of the study, whereas six of the cows milked by the conventional milking system had *Staph. aureus*.

Five of the cows in the CoPulsation milking system were found to have no mastitis pathogens present, but only one in the conventional group was found to have no mastitis pathogen present.

The herd bulk SCC (Fig. 1) level dropped following the conversion of the conventional group to the CoPulsation milking system.

Bulk SCC levels were reduced by more than 60% within the first six months.

This result is consistent with the mastitis pathogen data in Fig. 1.

Conclusion

Cows milked with a conventional milking system experience a higher incidence of mastitis infections than those milked with the CoPulsation milking system.

Nearly 90% of the cows milked with the conventional system cultured positive for some form of mastitis pathogen with several cows having multiple pathogens present.

In contrast, 50% of the CoPulsation milking system group had no mastitis pathogen present with none having more than one pathogen present.

The conventional group experienced a high rate of contagious mastitis with 75% infected with *Staph. aureus*.

This result is consistent with a prior study which also demonstrated that cows milked with a conventional system experienced a high rate (16:1) of new *Staph. aureus* infections in comparison to the CoPulsation milking system.

Fox of WSU has also documented the fact that cows milked with a conventional milking system can experience an uncontrolled outbreak of *Staph. aureus* in spite of proper procedures.

The design of milking equipment does have an impact on both mastitis and milk quality. The prevalence of both environmental and contagious mastitis pathogens was significantly greater for those cows milked with the conventional milking system than those milked with the CoPulsation milking system.

The herd bulk SCC levels reduced substantially following the conversion of the entire herd over to the CoPulsation milking system.

The results of this study demonstrate that mastitis can be reduced significantly when cows are milked with the CoPulsation milking system and that milk quality can be measurably improved. ■