

The Effect of a Teat Sealer on Coliform Mastitis

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Summary

The practice of disinfecting teat ends after milking has become an important tool in the control of intramammary infection due to *Streptococcus spp.* and *Staphylococcus spp.* but has shown little benefit in controlling mastitis due to coliforms. It has been theorized that since at least part of the coliform infection occurs in the period between milkings, a mechanical teat sealer may assist in preventing this type of infection. The effect of a teat sealer which contained no germicide was studied. The ability of the film to prevent environmental bacterial contamination between milkings was studied by comparing bacterial numbers present after the film was removed with unsealed teats. The effect on growth of bacteria sealed under such a film was studied by dipping over staphylococcus-contaminated teats, removing the dip and comparing the numbers with controls.

The ability of a sealer to prevent intramammary infection under field conditions was also studied by the use of half-udder dipping in field herds with whole-herd bacteriological examinations every two weeks and comparing the numbers of new coliform infections.

This product was able to prevent over 90% of the environmental bacteria from reaching the teat skin after a twelve hour period. Staphylococcus sealed under the film tended to show a slower growth rate than those on control teats.

Under field conditions, the number of coliform infections was 76% less in the sealed teats than in the unsealed teats on the same cows in the same herds.

It was concluded that the use of a teat sealer can be an effective method of reducing coliform mastitis under field conditions.

The practice of teat disinfection has been shown to be effective in preventing new intramammary infections with *Streptococcus* and *Staphylococcus spp.* but has been disappointingly ineffective in the prevention of coliform mastitis (1, 2). It also appears that the changes in dairy cattle housing which include increased use of total confinement systems results in greater problems with coliform mastitis (1, 3). Because coliform infections take place between milkings as well as during milking, it has been suggested that the use of a teat sealer between milkings would be helpful in prevention of coliform mastitis (3). At the present time, only one of the teat sealers available in the United States has data available on effectiveness. This product is an acrylic latex which is applied as a liquid dip. When dry, it forms a film but

can be rehydrated and easily removed by thorough moistening and rubbing.

The ability of the film to prevent contamination of the teats with environmental bacteria between milkings was studied to determine if further field testing was warranted. The material was applied to three teats of three cows daily for five days and one teat of each cow was left as a control. The cows were housed in a conventional stall barn and allowed to lie down and stand up in the normal manner. Prior to each milking, the film was removed from the dipped teats by careful moistening and peeling and swabs were taken from all teats. The number and type of bacteria on the film protected teats was compared to that of the control.

Table 1

COMPARISON OF AVERAGE NUMBER OF VIABLE ORGANISMS ISOLATED FROM CONTROL AND DIPPED TEATS PRIOR TO MILKING (4)

Organism	Dipped Teats	Control Teats	% Reduction
Streptococcus spp.	67	825	91.9
Staphylococcus spp.	28	212	86.8
Micrococcus spp.	1,937	22,588	91.4
Coliform spp.	24	389	93.8
Total Count	2,223	24,230	90.8

This trial indicated approximately 90% of the common environmental bacteria were prevented from reaching the surface of the teat. It is likely that this number is somewhat low since some bacteria were probably inadvertently transferred to the teats in the process of removing the film.

There has also been some concern that bacteria left on the teat at the end of milking and then "trapped" under a teat sealer might proliferate rapidly due to the protective effect of the film. A study was designed to determine the rate of growth of such "trapped" bacteria. Two cows were utilized in this study for five days. All four teats were dipped in a suspension of 2.3×10^9 cfu/ml of *Staphylococcus aureus*. The suspension was allowed to dry for one hour and the film then applied to three teats. The film was removed at the various times of two, three and four hours and the bacterial numbers on the teats and the film were compared to those on

the control teats. There was considerable variation in the number but in all cases the number of bacteria recovered from the dipped teats was 50% or less than those from the controls. This would indicate the test film does not protect bacteria sealed underneath and enhance their growth but appears to have a detrimental effect.

The most effective and reliable method of measuring the effect of the teat sealer as with most teat dips is to compare the effect on treated and control teats in farmer managed dairy herds. Four commercial dairy herds varying in size from 35-45 cows were selected for a field trial. Three herds were housed in conventional stall barns and one was housed in a conventional loose housing system and milked in a milking parlor. The milking equipment was above standards in one herd, adequate in two herds and substandard in the fourth herd. The herds were observed for one year. The right two teats were dipped on all cows and the teats on the left side remained as controls. The cows were observed every two weeks. At one observation, the CMT was conducted and all quarters were examined bacteriologically and direct microscopic somatic cell counts performed. The bacteriological examinations were performed in the manner recommended by the National Mastitis Council (5). Quarters were considered infected with *Streptococcus agalactiae* or *Staphylococcus aureus* if the organisms were isolated, but a cell count of greater than 1 million was required along with the isolation of any other organism before it was considered to be an infected quarter. Once a quarter was infected, it was required to have two negative bacteriological examinations before it could be considered re-infectable. The results are shown in Table 2.

The 75% reduction of new coliform infections appears to be an important finding since most disinfectant type teat dips do not reduce the infection rate of the group of organisms (2, 5, 13, 16). However, the reduction of new infections associated with *Streptococcus agalactiae* (17.4%), *Staphylococcus aureus* (28%) and *Staphylococcus epidermidis* (33.3%) was less than is usually observed in similarly conducted trials with disinfectant type teat dips. The effectiveness in preventing infections of streptococcus other than *Streptococcus agalactiae* (11.3%) was particularly low. This study indicates that a teat sealer may

provide an effective means of preventing coliform infections and could be especially useful in special situations where coliform infections are a particular concern. Even though the findings of this study show the teat sealer to be less effective in preventing Gram positive infections than the disinfectant type teat dips commonly used, a teat sealer may be practical when used as discussed above since many of the coliform problems are encountered in herds that have a low prevalence of Gram negative mastitis pathogens (7).

Table Two

NUMBER, RATE, AND PERCENTAGE REDUCTION IN INTRAMAMMARY INFECTIONS BASED ON QUARTER MILK SAMPLES COLLECTED (6)

Infection Type	Number of quarters With Infections		Total Numbers of Infections (including repeat infections)		
	Treated	Control	Treated	Control	Reduction
<i>Staphylococcus aureus</i>	51	74	67	93	28.0
<i>Staphylococcus epidermidis</i>	82	111	106	159	33.3
<i>Streptococcus agalactiae</i>	78	93	95	115	17.4
<i>Streptococcus</i> spp. other than <i>agalactiae</i>	83	87	115	124	7.3
Coliform spp.	7	24	7	29	75.9

References

1. Eberhart, R. J. and Buckalew, J. M. Evaluation of Hygiene and Dry Period Therapy Program for Mastitis Control. *J. D. Sci.* 55: 1603-1691 (1972).
2. Wesen, D. P. and Shultz, L. H. Effectiveness of Postmilking Teat Dip in Preventing New Udder Infections. *J. D. Sci.* 53: 1391-1403 (1971).
3. Jasper, D. E., Neuman, L. E., Newbould, F. S. H., Natske, R., Eberhart, R. J., Hutledge, E., McCarthy, B., and Neave, F. K. The Problem of Coliform Mastitis and Its Implications for Research. Report of the Coliform Res. Comm., National Mastitis Council, Inc., 910 Seventeenth St., N. W., Washington, D. C.
4. Wyman, L. R., Farnsworth, R. J., and Semaan, K. C. Teat Shield Test Data and Results. 3M Company, 3M Center, St. Paul, MN p. 2.
5. Brown, R. W., Morse, G. E., Newbould, F. H. S., and Stanetz, L. W. Microbiological Procedures for the Diagnosis of Bovine Mastitis. National Mastitis Council, Washington D.C., (1969), p. 621.
6. Farnsworth, R. J., Wyman, L., and Hawkins, R. The Use of a Teat Sealer for Prevention of Intramammary Infections in Lactating Cows. *J.A.V.M.A.* In press.
7. Schalm, O. W., and Woods, C. M. Characteristics of Coliform Mastitis and Treatment with Dihydrostreptomycin. *J.A.V.M.A.* 120: 385 (1952).

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