Segregation or Use of Separate Milking Units for Cows Infected with *Staphylococcus aureus* Reduced Prevalence of Infection and Bulk Tank Somatic Cell Counts

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Abstract

Dairy herds (n = 76) with initial prevalence of Sta*phylococcus aureus* IMI≥ 10% were included in this study, from among approximately 2800 herds visited between January 1992 and July 1994 by the Quality Milk Promotion Services at Cornell University. The farms were located in New York and Pennsylvania. Other inclusion criteria were that herds did not change teat dipping or dry cow treatment practices, were not segregating cows that were positive for *S. aureus* at the initial visit, and did not cull > 50% of those found positive on the initial visit. Paired *t* tests and Wilcoxon rank sum tests were methods of statistical analysis. Mean herd size was 59 lactating cows, and herd size ranged from 28 to 436 cows. Percentage of herds teat dipping, using dry cow treatment, and mean herd size were not different among segregation groups. Mean number of visits (3.5 per herd) did not differ among groups. During a follow-up period (6-to-24 mo), segregation or separate milking of cows (n=21 herds) that were positive for *S. aureus* resulted in reduction of prevalence from 29.5 to 16.3%, and bulk tank SCC from 600,000 to 345,000/ml. Prevalence of *S. aureus* mastitis was unchanged for herds (n=55 herds) not segregating *S. aureus* cows, 22.5 to 20.2%, and the change in SCC from 698,000 to 484,000 for nonsegregated herds was less of a reduction than for the segregating herds. Segregation or use of separate units for cows known to be positive for *S. aureus* is an effective mastitis control practice.

Introduction

Staphylococcus aureus remains a major contagious mastitis of financial importance in dairy herds.[5] Of dairy herds surveyed in the northeastern United States, mastitis caused by *S. aureus* was present in 78.7%.[8] Culling of all infected cows, especially younger or high production animals, is not usually cost-effective or practical,[4] considering that *S. aureus* mastitis is not an eradicable disease. Cow-to-cow transmission at milking time is a major source of spread of this disease, particularly on inflations of the milking units.[1,6] A retrospective study was conducted to determine whether segregation of cows with *S. aureus* mastitis by milking positive cows last or with separate milking units is effective in reducing prevalence of this mastitis.

Approximately 2800 dairy herds located in New York and Pennsylvania were visited by personnel from the Quality Milk Promotion Services at Cornell University between January 1992 and July 1994. The majority of herds visited (66%) used this service as a monitoring tool once or twice per year, and 34% did so in response to bulk milk SCC >750,000/ml. A sample of 76 farms which met the criteria for this retrospective study was drawn from this group.

Materials and Methods

Composite milk samples were aseptically collected from all lactating cows in 99% of the herds visited, and

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from cows with a DHIA SCC linear score of >4.5 for the rest of the herds. Microbiological culture was performed as described previously.[2]

The following criteria were met by 76 dairy herds from among the 2800 herds visited during the 2-yr study period: 1) initial prevalence of *S. aureus* IMI of ≥10% found on culture from the entire lactating herd, 2) at least one follow-up culture of the entire lactating herd between 6 and 24 mo later, 3) no change in teat dipping or dry cow treatment practices, 4) were not segregating cows that were positive for *S. aureus* at the initial visit, 5) culled ≤50% of the cows that were positive for *S. aureus* on the initial visit. The latter three practices were monitored by completion of a management questionnaire on the farm, which was updated at each follow-up farm visit or telephone contact with the farm. Culling of <50% of cows that were positive for *S. aureus* was verified by confirming that the majority of cows positive on the initial herd visit were still present in the herd at the second visit.

Adoption of suggested management changes and timing of the farm visits were by mutual agreement of the farm management and Quality Milk Promotion Services. Segregation of cows that were positive for *S. aureus* was recommended to all dairy producers, as was adoption of teat dipping and dry cow therapy if these measures were not already in use. Prevalence of *S. aureus* at the last visit (regardless of how many visits were made) during the follow-up period (6 to 24 mo) was compared with prevalence at the first visit. Somatic cell counts in bulk milk as measured by the farm's receiving milk plant were also compared.

Statistical Analysis

Paired *t* tests were used to test for significant changes in *S. aureus* prevalence or bulk milk SCC within segregating and nonsegregating herds. Comparisons among the two groups (segregating and nonsegregating) for *S. aureus* prevalence at end of follow-up, change in *S. aureus* prevalence, bulk milk SCC at end of follow-up, and change in SCC were performed using Wilcoxon rank sum tests. Rank sum tests were used because the two groups differed in sample size and sample variance. Analysis was performed using STATISTIX (Analytical Software).[7]

Results

Of the 76 study farms, 69 used postmilking teat dipping, and 75 treated all cows with a dry cow antibiotic at the end of lactation. Segregation by either milking cows that were positive for *S. aureus* last or with separate milking units was practiced by 21 farms, but not by 55 farms. Mean herd size was 59 lactating cows, and herd size ranged from 28 to 436 cows. Percentage of herds teat dipping, using dry cow treatment, and mean herd size were not different among segregation groups.

All 76 farms had at least one follow-up survey of mastitis prevalence of the entire herd. Two follow-up visits (3 total) were conducted on 57 farms, and 3 follow-up visits (4 total) were conducted on 37 farms. All findings at subsequent visits were compared with initial visits, but the only significant results were based on analysis of the last visit compared with the first visit (n = 76). Mean number of visits (3.5 per herd) did not differ among groups. Distribution of herds among time intervals until the last herd visit was as follows: 6 to 12 mo, 30 herds; 13 to 23 mo, 37 herds; 24 mo, 9 herds; and was also the same among the segregation groups.

Beginning levels of SCC and initial prevalence of *S. aureus* were the same among herds that elected to segregate and those that did not. Ranges of initial herd prevalence of cows that were positive for *S. aureus* were: 10 to 15%, 30 herds; 16 to 49%, 41 herds; > 50%, 5 herds; these also were not different among the two groups. Segregation or separate milking of cows that were positive for *S. aureus* resulted in reduction of prevalence from 29.5 to 16.3% ($P < .05$; *t* test) and bulk tank SCC from 600,000 to 345,000/ml ($P < .05$; *t* test). Prevalence of *S. aureus* remained unchanged in herds not segregating cows, 22.5 to 20.2%. The SCC in nonsegregating herds dropped significantly also from 698,000 to 484,000 ($P < .05$). However, reduction in SCC was significantly greater for segregating herds, and the ending SCC of 345,000 was significantly lower than the 484,000 level achieved by nonsegregating herds ($P < .001$; Wilcoxon rank sum).

Discussion

Bulk milk SCC decreased in herds segregating cows that were positive for *S. aureus* more than it did for nonsegregating herds. The nonsegregating group of farms decreased in SCC also; farms with a mean SCC of nearly 700,000/ml are facing the possible loss of their milk market. When presented with a diagnosis of a high prevalence of *S. aureus* mastitis (in this sample the mean was greater than 20%), it is common that herd management will cull at least some cows identified by individual SCC testing or CMT testing as high SCC cows. Maintaining the existing teat dipping, dry cow therapy, or culling rate practices does not preclude most dairy farmers in such circumstances from attempting to reduce SCC immediately by culling or by early dryoff of a few problem cows; this likely explains why even nonsegregating herds used the mastitis diagnostic information to make some progress. However, the results suggest that lower SCC and prevalence of *S. aureus* can be attained by segregation. The objective of this retrospective analysis was to control for the influence of major

mastitis control practices such as teat dipping, dry cow therapy, and heavy culling of known positive cows. The study population consisted of farms with a high prevalence of *S. aureus* that did not change the aforementioned practices to the extent that this could be verified by follow-up contact, observation of management practices, and direct identification of surviving positive cows on the second farm visit. The major difference between the two groups of dairy farms studied was whether or not cows that were known to be positive for *S. aureus* were milked last or with separate milking unit(s). An earlier study found that four segregating herds did not have significant differences in incidence or prevalence of *S. aureus* IMI from five control herds.[3] However, incidence was 14% less within the segregating herds, and except for 3 cold winter months, during which time one of the segregating herds ceased dipping teats and had a 20% increase in herd prevalence over 3 months, incidence of *S. aureus* IMI was lower in segregating herds.[3] One segregating herd was the only herd to achieve 0% infection rate with *S. aureus* IMI. The authors of that study concluded that segregation may be an effective component of control of *S. aureus* mastitis. An excellent point was made by those authors: segregation should be only one part of a mastitis control program which includes milking time hygiene.[3]

It is practical for dairy herds with any type of housing, milking facility, or size to milk cows that are positive for *S. aureus* last or with a separate milking unit (or units) for these cows. Most herds prefer to identify distinctively, usually by leg bands, the cows with *S. aureus* IMI and milk them with units identified as only for use on those cows. The teat cup inflation is the major fomite of cow to cow transmission of new IMI with this pathogen.[1,6]

Avoidance of using inflations from cows known to be positive for *S. aureus* to milk those cows presumed to be free of *S. aureus* mastitis should reduce rate of new IMI, and therefore prevalence, over time. Results of this study suggest that prevalence of *S. aureus* mastitis and bulk milk SCC are reduced significantly by milking these infected cows separately or last.

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