Udder cleft dermatitis and sarcoptic mange in a dairy herd

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Objective—To determine prevalence of udder cleft dermatitis in a dairy herd that was experiencing an outbreak of sarcoptic mange.

Design—Clinical survey.

Animals—1,597 Holstein cows and late-gestation heifers.

Procedure—Animals were examined for udder cleft dermatitis and for skin lesions consistent with sarcoptic or chorioptic mange. Skin scrapings were collected from 56 cows and examined for ectoparasites. The herd was revisited 1 year later, and prevalences of udder cleft dermatitis and lesions consistent with mange were determined in 506 cows.

Results—Of the 1,597 cattle examined, 290 (18%) had udder cleft dermatitis, and 1,397 (87.5%) had lesions consistent with mange. In 43 of 56 (77%) cows, skin scrapings revealed Sarcoptes mites. Udder cleft dermatitis was significantly more common in older than in younger cows. In first-lactation cows, udder cleft dermatitis was less common during the first 4 months of lactation than in the later stages of lactation, but udder cleft dermatitis was identified in cows in all stages of lactation and in cows that were not lactating. The herd was treated with eprinomectin to control mites, and prevalence of lesions consistent with mange 1 year later was only 2.8%. However, prevalence of udder cleft dermatitis was still 12%.

Conclusions and Clinical Relevance—Results suggest that cows in any stage of lactation and cows that are not lactating can have udder cleft dermatitis but that lesions are more common in older cows. Control of sarcoptic mange was accompanied by a moderate reduction in the prevalence of udder cleft dermatitis but did not eliminate the condition. (J Am Vet Med Assoc 2002;221:273–276)

Udder dermatitis, also known as udder rot, udder scald, and intertrigo, has been described infrequently in the veterinary literature but is a familiar problem for milkers, herd managers, and veterinarians. Lesions are often characterized by necrosis of the skin and a foul odor; sloughing of the skin and exposure of underlying tissues can result in erosion into blood vessels and severe hemorrhage. The condition usually is detected when cows are milked or during foot trimming or surgery.

In dairy cows, moist or necrotic dermatitis can develop on the lateral aspect of the udder, where it contacts the medial aspect of the thigh, between the halves of the udder, or on the ventral midline just cranial to the udder.1 Previous descriptions either combine these sites as different manifestations of a single condition or focus on lesions on the lateral aspect of the udder and medial aspect of the thigh.1-3 Dermatitis on the lateral aspect of the udder and medial aspect of the thigh has been attributed to udder congestion and edema near the time of calving, particularly in heifers.2 Mites have been suspected to cause udder sores,4-6 but their role has not been proven.2

The purpose of the study reported here was to determine the prevalence of udder cleft dermatitis (ie, dermatitis between the halves of the udder) among cows in a dairy herd that was experiencing an outbreak of sarcoptic mange. An additional objective was to determine if the prevalence of udder cleft dermatitis decreased following treatment of the herd with eprinomectin.

Materials and Methods

Study herd—The study was conducted on a single 1,800-cow dairy farm in New York state. Lactating cows, nonlactating cows, and heifers within about a month of calving were housed in 2 connected free-stall barns with curtain sides; both barns had continuously operating alley scrapers. Stalls were bedded with mattresses filled with rubber shavings and covered with recycled waste paper pulp. Cows and heifers close to calving and cows that were sick or lame were kept in group pens bedded with shredded paper. In total, animals were kept in 11 pens. For milking, cows were moved to a holding area by pen and milked in a double-40 parallel parlor 3 times daily. One barn had head locks along the feed bunks; the other did not. Contact between pens was extensive because of fence-line contact; movement through the same alleys, holding area, and milking parlor; and frequent movement of animals among pens. Cows were bred initially by artificial insemination and then moved to a pen with approximately 8 bulls. A total mixed ration was fed in feed bunks along the central alley in each barn. Treatment for mite infestation was begun after the initial herd visit; eprinomectin7 was administered according to label directions to all cows at least once. Heifers in the late stages of gestation were treated with eprinomectin 1 month before they were moved to the cow barn and again at the time they were moved.

Identification of udder cleft dermatitis and other skin lesions—Nonlactating cows and heifers within about a month of calving and lactating cows were eligible for inclusion in the study. We attempted to examine all 1,757 eligible animals on 1 of 3 days during a 3-day period, but 160 (9%) eligible animals were missed because other herd management activities made them inaccessible during this time. Therefore, only 1,597 cows and heifers were examined.

Animals were restrained in head locks, by holding them...
in free stalls, or by use of a palpation rail. The area between the halves of the udder was examined with an automobile side mirror attached to a broom handle, and udder cleft dermatitis was recorded as present or absent. Palpation was used to aid the diagnosis if the ventral aspect of the udder could not be seen well with the mirror. Animals were identified by plastic ear tags; results were recorded on a preprinted list of identification numbers.

Animals were also examined for lesions consistent with chorioropic or sarcropic mange involving the caudal aspect of the udder, the region between the hind limbs dorsal to the udder and ventral to the vulva, and the tail head. A skin lesion score from 0 to 3 was assigned, with 0 = no visible lesions; 1 = only raised nodules in a small area on the caudal aspect of the udder, the region dorsal to the udder, or the tail head (but not all 3 areas); 2 = alopecia, hyperkeratosis, or diffuse lesions not markedly reddened, crusted, or moist; and 3 = extensive and diffuse reddened, crusted, or moist lesions. All scores were assigned by 1 of 2 investigators who evaluated the first 50 cows together to minimize differences between scoring criteria.

The herd was initially examined in February 2000. One year later, a sample of cows (n = 506) was again examined for udder cleft dermatitis and lesions consistent with mange. Cows were systematically selected for this follow-up examination by examining approximately every fourth cow encountered in head locks or free stalls.

Other tests—For a convenience sample of cows with lesions consistent with sarcropic and chorioropic mange, skin scrapings were collected from the tail head, the region between the hind limbs dorsal to the udder, or the caudal aspect of the udder. Skin scrapings were examined microscopically after KOH digestion and sugar flotation. Additional samples were collected within 3 weeks after the initial herd evaluation from a convenience sample of 6 cows with udder cleft dermatitis (2 of these cows had been treated with eprinomectin 1 day before follow-up sample collection; 1 had been treated with eprinomectin 19 days before follow-up sample collection). These cows were restrained on a table for examination. For 5 of the 6 cows, swab samples of exudate from the udder cleft lesions were collected, placed in transport medium, and submitted for anaerobic bacterial culture. For all 6 cows, scrapings were collected from the margins of the udder cleft lesions and examined for ectoparasites, and skin biopsy specimens were obtained from the margins of the lesion with a 6-mm biopsy punch. Approximately 1 to 2 ml of 2% lidocaine was injected to anesthetize the site before the biopsy specimen was collected.

Production and management data—Milk production of individual cows was measured at each milking by an automated milk recording system and transferred electronically to a dairy records program. Lactation number, the number of days since calving or expected calving date, peak milk production, and 305-day mature equivalent milk production were exported from the herd database at the time of the initial herd evaluation.

Statistical analyses—The Cochran-Armitage trend test was used to test for an association between udder cleft dermatitis and lactation group. Logistic regression was used to test for associations between udder cleft dermatitis and cow characteristics. Main effects that were included consisted of lactation (first, second, third or greater), stage of lactation (not lactating or 0 to 9, 10 to 119, 120 to 179, 180 to 239, 240 to 299, or ≥ 300 days of lactation), skin lesion score (0, 1, 2, or 3), peak milk production (0 to 90, 91 to 103, 104 to 118, or ≥ 119 lb [categories were based on quartiles]), 305-day mature equivalent milk production (0 to 19,629, 19,630 to 23,379, 23,380 to 27,379, or ≥ 27,380 lb [categories were based on quartiles]), calving season (December through February, March through May, June through August, September through November), days since mastitis (0 to 60 days, > 60 days, not diagnosed), retained placenta (yes, no), days since digital dermatitis (foot warts; 0 to 60 days, > 60 days, not diagnosed), and days since interdigital phlegmon (foot rot; 0 to 60 days, > 60 days, not diagnosed). All 2-way interactions between the main effects were also considered. A backward variable-selection procedure was used; a P value of 0.05 was used as the cutoff for retaining variables in the model. Following backward elimination of variables, main effect terms dropped from the model and 2-way interactions among the remaining variables were checked for statistical significance by adding them individually to the model. Skin lesion scores were compared among lactation groups. Confidence intervals for prevalences of skin lesions consistent with mange and udder cleft dermatitis at the time of the follow-up herd visit were calculated by use of normal approximations for the binomial distribution, after adjusting the SE for sampling from a finite population.

Results

Of the 1,597 cows and heifers examined, 280 (18%) were found to have udder cleft dermatitis. Lesions were most often located at the cranial edge of the cleft between the 2 cranial quarters (Fig 1), but some were centered between all 4 quarters. Lesions had variable amounts of purulent exudate, crusting, and necrosis and ranged from approximately 2 to 10 cm in diameter.

Results of anaerobic bacterial culture of swab samples of exudate from the lesions were positive for all 5 cows from which samples were collected. Bacteria isolated included Fusobacterium necrophorum (4 cows), Bacteroides melaninogenicus (3), Prevotella melaninogenica (2), Peptostreptococcus spp (2), Bacteroides spp (2), F mortiferum (1), and Actinomyces spp (1). Scrapings from the margins of the udder cleft lesions were positive for mites in only 1 of 6 cows, and in this cow, only a single egg was seen. Nonspecific histologic changes were seen in skin biopsy specimens from 2 cows. In the other 4 cows, the predominant histologic finding was perivascular-to-interstitial dermatitis with lymphocytes, plasma cells, and variable numbers of eosinophils. In 2 of the 4, eosinophils were the predominant cell type.

Widespread infestation by Sarcoptes scabiei was...
identified in the herd (Fig 2). In 43 of 56 (77%) cows, skin scrapings from the tail head, caudal aspect of the udder, or the area dorsal to the udder were positive for *Sarcoptes* mites. Of the 1,597 cattle examined, 1,397 (87.5%) had lesions consistent with mange and were given a skin lesion score > 0 (823 [51.5%] were assigned a score of 1, 490 [30.7%] were assigned a score of 2, and 84 [5.3%] were assigned a score of 3). The remaining 200 (12.5%) cattle were assigned skin lesions scores of 0. *Chorioptes bovis* was identified in samples from 2 cows obtained during herd visits about 1 month later, but infestation with *C bovis* was much less common than infestation with *S scabiei*.

Udder cleft dermatitis was significantly (Cochran-Armitage trend test; *P* < 0.001) more common in older than in younger cows. Only 1 of 25 (4%) heifers within 1 month of their expected calving dates had udder cleft dermatitis, compared with 74 (10.5%) of 703 first lactation cows, 110 (23.5%) of 468 second lactation cows, and 95 (23.7%) of 401 cows in their third or greater lactation.

Only lactating cows were included in analyses of potential risk factors for udder cleft dermatitis. Complete data were available for 1,523 of the 1,572 cows examined for udder lesions and were included in the logistic regression analysis. Most of the cows that were not included had calved recently, and information on peak milk production or 305-day mature equivalent milk production was not available.

Variables retained in the logistic regression model were lactation group (*P* = 0.02), skin lesion score (*P* = 0.6), days since digital dermatitis (*P* = 0.04), and a term for the interaction between lactation group and skin lesion score (*P* = 0.04). The variable representing days since calving (*P* = 0.8) was forced into the model because of our interest in the relationship between stage of lactation and occurrence of udder cleft dermatitis. Variables for peak milk production, 305-day mature equivalent milk production, calving season, days since interdigital phlegmon, days since mastitis, and retained placenta were not selected. The Hosmer-Lemeshow goodness-of-fit test indicated that the model fit the data well (*P* = 0.8). The association between skin lesion score and prevalence of udder cleft dermatitis was not consistent across lactation groups (Table 1). Cows in their first lactation were more likely to have udder cleft dermatitis if they had high skin lesion scores, but prevalence of udder cleft dermatitis was not associated with skin lesion score for cows in their second lactation, and prevalence of udder cleft dermatitis was negatively associated with skin lesion score for cows in their third or greater lactation.

Stage of lactation and its interactions with other main effect variables were not significant in the logistic regression analysis. Nevertheless, there appeared to be a relationship between stage of lactation and prevalence of udder cleft dermatitis among cows in their first lactation (χ² test; *P* = 0.04) but not for cows in their second or greater lactation (χ² test; *P* = 0.8). For first-lactation cows, udder cleft dermatitis was less common during the first 4 months of the lactating period (5%) than during the later stages of the lactating period or during the nonlactating period (12%).

During a follow-up visit 1 year after the initial herd examination, 61 of 506 (12.1%; 95% confidence interval [CI], 9.6 to 14.5%) lactating cows had udder cleft dermatitis. Twenty-four of 285 cows examined at both visits had udder cleft dermatitis initially and 1 year later. Twenty of these 285 cows did not have udder lesions.

**Table 1—Odds ratios of the occurrence of udder cleft dermatitis (controlling for stage of lactation) among 1,523 cows in a dairy herd experiencing an outbreak of sarcoptic mange**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time since identification of digital dermatitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 60 d</td>
<td>0.5</td>
<td>0.2–1.2</td>
</tr>
<tr>
<td>&gt; 60 d</td>
<td>0.5</td>
<td>0.3–0.9</td>
</tr>
<tr>
<td>Not identified</td>
<td>1.0</td>
<td>NA</td>
</tr>
<tr>
<td>Skin lesion score (first lactation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.2</td>
<td>0.1–0.7</td>
</tr>
<tr>
<td>1</td>
<td>0.3</td>
<td>0.1–0.8</td>
</tr>
<tr>
<td>2</td>
<td>0.3</td>
<td>0.1–0.7</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>NA</td>
</tr>
<tr>
<td>Skin lesion score (second lactation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.4</td>
<td>0.1–1.3</td>
</tr>
<tr>
<td>1</td>
<td>0.6</td>
<td>0.3–1.4</td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>0.2–1.3</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>NA</td>
</tr>
<tr>
<td>Skin lesion score (third or greater lactation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3.2</td>
<td>0.6–14.0</td>
</tr>
<tr>
<td>1</td>
<td>2.6</td>
<td>0.6–11.5</td>
</tr>
<tr>
<td>2</td>
<td>4.7</td>
<td>1.0–21.2</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>NA</td>
</tr>
</tbody>
</table>

CI = Confidence interval. NA = Not applicable (reference category).

Skin lesion scores ranged from 0 to 3 with 0 = no visible lesions; 1 = only raised nodules in a small area on the caudal aspect of the udder, region dorsal to the udder, or tail head (but not all 3 areas); 2 = alopecia, hyperkeratosis, or diffuse lesions not markedly reddened, crusted, or moist; and 3 = extensive and diffuse reddened, crusted, or moist lesions.
Discussion

Results of the present study suggest that udder cleft dermatitis represents a separate condition from dermatitis of the lateral aspect of the udder and medial aspect of the thigh. Dermatitis involving the lateral aspect of the udder and medial aspect of the thigh has been described as developing soon after calving and as being more common in first-parturition cows than in older cows. In contrast, we found that udder cleft dermatitis was more common in older cows in this herd and could be identified in cows in all stages of the lactating period and in nonlactating cows. In first lactation cows, the prevalence was lowest during the first 4 months after calving. These results suggest that factors other than edema at the time of calving may be important in causing udder cleft dermatitis. Peak milk production and 305-day mature equivalent milk production were not significantly associated with prevalence of udder cleft dermatitis in this herd. Having collected data at only 2 time points, we could not rule out the possibility that lesions of udder cleft dermatitis begin to develop early in lactation and persist for months or years.

Although little has been written about udder cleft dermatitis, others have speculated that mites are an important cause of the lesions. Unfortunately, results of the present study do not allow us to confirm or refute this hypothesis. We found histologic changes consistent with ectoparasitism in udder lesions of 2 cows. In addition, in 1 of 6 cows, evidence of mite infestation was identified in scrapings from the margins of udder cleft lesions; however, only a single mite egg was seen. Any conclusions drawn from these observations should be tempered by the fact that we did not collect samples from unaffected cows for comparison with samples from affected cows. In addition, udder cleft dermatitis was less common, but had not been eliminated, 1 year after the initial visit, following successful control of sarcoptic mange, and we documented that new udder cleft lesions developed after the herd had been treated for mange in some cows examined at both visits. Longitudinal studies with more frequent observations are needed to determine whether mites or other factors play a role in the pathogenesis of udder cleft dermatitis.

Results of bacterial culture of swab specimens from the udder cleft lesions were consistent with the necrotic appearance of the lesions and the odor associated with anaerobic bacterial infections in cattle. Infection by these bacteria may have occurred after some other inciting cause or as a result of the moist anaerobic environment.

We investigated the association between udder cleft dermatitis and several common diseases in dairy cows in the present study, including mastitis, retained placenta, digital dermatitis, and interdigital phlegmon. A previous report described concurrent outbreaks of digital dermatitis, superficial (ie, peracute foot rot that does not respond to typical treatments), and udder sores in 2 herds. In the present study, on the other hand, cows in which digital dermatitis had been diagnosed previously were less likely to have udder cleft dermatitis. None of the other diseases analyzed were significantly associated with udder cleft dermatitis in the present study.

Following treatment with eprinomectin in the present study, the prevalence of lesions consistent with mange decreased from 87.5 to 2.8%, and S scabiei was not identified in skin scrapings collected at the time of the follow-up visit 1 year after the initial herd treatment. Fourteen cows examined at the time of the follow-up visit had mild lesions consistent with mange, and skin scrapings from 2 cows were positive for C bovis. This may have been a reflection of cows inadvertently missed during the herd treatment or transmission of mites from heifers to cows, despite the heifer treatment program that was adopted. Control of mange in this commercial farm was consistent with findings of Barth et al, who demonstrated high efficacy of eprinomectin against sarcoptic and chorioptic mange in cattle. Efficacy of eprinomectin in control of sarcoptic and chorioptic mange was also demonstrated in commercial dairy farms in the United Kingdom and Germany.

In Germany, no C bovis mites were detected in skin scrapings collected approximately 1 year after the initial treatment. In the United Kingdom, no lesions consistent with mange were identified for approximately 2 years after a single treatment with eprinomectin in a herd experiencing an outbreak of sarcoptic mange.

References