Mastitis Prevalence in Primigravid Heifers at Parturition

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ABSTRACT
Prevalence of intramammary infection was determined for 382 primigravid heifers within 3 d postpartum on 11 Vermont dairy farms. Data collected during a 5-yr period are summarized. Duplicate quarter milk samples were cultured on tryptose-blood agar plates containing 1% esculin. Intramammary infections were diagnosed in 45.5% of the heifers and 18.7% of quarters. Staphylococcus species were the most prevalent bacteria isolated; they appeared in 25.4% of the heifers and 12.1% of quarters. Only 2.6% of the heifers were diagnosed with Staphylococcus aureus; 22.8% had udder infection caused by other staphylococcal species. Environmental mastitis pathogens, coliforms, and streptococci other than Streptococcus agalactiae were isolated from 14.9% of the heifers and 4.8% of quarters. The prevalence of mastitis among these primigravid heifers at parturition indicates a need to improve methods of diagnosis and control programs.

(Key words: mastitis, Staphylococcus species, streptococci)

Abbreviation key: IMI = intramammary infection.

INTRODUCTION
Cost for raising replacement heifers is estimated at $800 to $1200. Emphasis is placed on genetic improvement, reproduction, nutrition, and immunization against diseases unrelated to the mammary gland. Economic losses due to mastitis in lactating cows is estimated at more than $180 per cow annually when not controlled (2). Primary methods of control depend on prevention; udder hygiene receives much consideration (6). Mastitis control receives little consideration in unbred and primigravid heifers because the heifers are generally regarded as uninfected.

Oliver and Mitchell (5) reported on frequency of bacterial isolation and incidence of intramammary infection (IMI) in heifers among 32 primigravid heifers sampled 14 and 7 d prepartum, at parturition, and 7 and 14 d postpartum. Seventy-seven percent of the quarter milk samples were bacteriologically negative, 16% contained coagulate-negative staphylococci, 4% streptococci other than Strep. agalactiae, 4% coliforms, and 1% coagulate-positive staphylococci. Approximately 23% of samples contained mastitis pathogens. In a subsequent survey using similar sampling periods, Oliver (4) reported that 64% of 75 primigravid heifers were infected at parturition. Fifty-nine quarters (19.7%) were infected at parturition. Coagulate-negative staphylococci were diagnosed in 16% of quarters at parturition. Streptococci other than Strep. agalactiae were isolated from 2.7 and 1.7% of quarters.

A more recent survey in Louisiana (8) of 97 unbred and primigravid heifers indicated that approximately 97% had mastitis; 75% of quarters were infected. Staphylococcus aureus was diagnosed for 37.1% of heifers and 14.9% of quarters. Streptococci other than Strep. agalactiae were isolated from 2.7% of quarters.

The majority of IMI were caused by coagulate-negative staphylococci in these heifer mastitis studies (4, 5, 8). Coagulate-negative staphylococci are minor mastitis pathogens that cause SCC increases into the range of $2.5 \times 10^5$ to $4.0 \times 10^5$/ml. Production losses with these SCC can amount to 1 kg/d per cow. Equally important, quarters infected with minor patho-
gens were more susceptible to superinfection by *Strep. agalactiae* (7) and other streptococci (3). Control of minor pathogens during the primigravid period could enhance mastitis control postpartum.

The high prevalence of IMI reported for replacement heifers in southern states (4, 8) was alarming. The purpose of this study was to determine prevalence of mastitis in primigravid heifers at parturition in a northern region.

**MATERIALS AND METHODS**

Cooperator Farms

Eleven dairy farms participated in the study. All 11 farms were cooperators on udder hygiene field trials. Data were collected from 1984 through 1989. Eight herds were Holstein, one was Jersey, one was Brown Swiss, and one herd contained both Holstein and Ayrshire cows. Herd size ranged from approximately 55 lactating cows to more than 270 cows. Mastitis control programs for lactating cows varied widely among the 11 herds from marginal to excellent based on comparison of bulk tank SCC. These SCC ranged from an average of 600,000/ml to less than 100,000/ml at initiation of the hygiene studies.

Replacement raising practices also varied greatly. Calves were tied in comfort stalls or calf hutches, or loose-housed by age groups. All unbred and bred heifers were pastured during the summer months and housed under various conventional methods during the winter.

**Sample Collection**

Duplicate quarter milk samples were collected aseptically (1) by the cooperators from heifers within 3 d postpartum. Samples were stored frozen and delivered to the laboratory within 2 to 3 wk after collection.

**Bacteriological Procedures**

Milk samples were thawed at room temperature and .01 ml streak-plated on quadrants of tryptose-blood agar containing 5% washed bovine red blood cells and .1% esculin. Plates were incubated at 37°C for 48 h and presumptive identification of isolates made. Species identification was by recommended methods (1).

**Diagnosis of Infection**

A quarter was diagnosed as infected by one of the following criteria: 1) both milk samples contained 500 cfu/ml, or more, of the same microbial isolate; or 2) a clinical sample, abnormal secretion, contained at least 100 cfu/ml of an isolate.

**RESULTS**

A total of 45.5% of the heifers and 18.6% of quarters had IMI at parturition (Table 1). These results indicate that fewer heifers had mastitis in Vermont herds than the 64% from Tennessee (4) or the 97% from Louisiana (8). *Staphylococcus* spp., excluding *Staph. aureus*, were the most prevalent pathogen, affecting approximately 23% of heifers and 11% of quarters. Oliver (4) reported a similar percentage of *Staphylococcus* spp. (14% of quarters). Environmental pathogens were isolated from approximately 15% of the heifers and 5% of quarters. These results are in agreement with the previous reports (4, 8). *Staphylococcus aureus* was diagnosed in 2.6% of cows and .7% of quarters. Trinidad et al. (8) reported much higher prevalence; 37.1% of heifers had *Staph. aureus* IMI. Reasons for this large difference between southern and northern locations have not been determined. *Streptococcus agalactiae* was not isolated from any colostrum samples.

Twenty-six quarters in 20 cows were diagnosed as “other” (Table 1). These included 12 bacteriologically negative samples that were considered clinical cases due to the abnormal

**TABLE 1. Prevalence of mastitis at parturition in 382 primigravid heifers on 11 Vermont dairy farms.**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Bacteriological status</th>
<th>Cow</th>
<th>Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(no.) (%)</td>
<td></td>
<td>(no.) (%)</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>10 2.6</td>
<td>11  .7</td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus species</em></td>
<td>87 22.8</td>
<td>174 11.4</td>
<td></td>
</tr>
<tr>
<td><em>Streptococcus species</em></td>
<td>29 7.6</td>
<td>39  2.6</td>
<td></td>
</tr>
<tr>
<td>Coliforms</td>
<td>28 7.3</td>
<td>34  2.2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20 5.2</td>
<td>26  1.7</td>
<td></td>
</tr>
<tr>
<td>No microbes</td>
<td>208 1² 54.4</td>
<td>1249² 81.7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>1535³</td>
<td></td>
</tr>
</tbody>
</table>

¹All four quarters were bacteriologically negative.
²Includes all bacteriologically negative quarters.
³Five quarters had multiple infections.

appearance of the colostrum. Yeast were isolated from two quarters and coryneform bacteria from three quarters. Four bacterial isolates were not identified and five quarters were not lactating at parturition.

Major mastitis pathogens caused IMI in approximately 18% of heifers and 6% of quarters in the Vermont study. Approximately 35% of heifers (4) and 25% of quarters (8) were infected in previous studies. All these prevalence figures are higher than commonly observed in a lactating herd that practices an effective mastitis control program. Replacement programs should be monitored routinely to determine infection status of primigravid heifers. No correlation was determined between mastitis prevalence in heifers and prevalence among the lactating herd or for replacement heifer management practices (8).

**DISCUSSION**

Replacement heifers are generally considered mastitis-free. Studies from three locations across the US indicated that approximately 50 to 97% of heifers will have IMI at parturition. The majority of IMI are caused by the minor pathogens, *Staphylococcus* spp., but 18% of heifers in the Vermont study had IMI caused by major pathogens. Environmental bacteria were the most frequently isolated major mastitis pathogens in Vermont and Tennessee (4, 5); in Louisiana, *Staph. aureus* was the predominant major pathogen (8).

Individual cow SCC for heifers should be monitored routinely and bacteriological cultures used for early detection of mastitis problems originating among primigravid heifers. Veterinarians and dairy farmers should be aware that heifers are a potential source of mastitis entering the lactating herd.

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**REFERENCES**