Efficacy of Dodecylaminoalkyl Glycine Teat Dip Against
Staphylococcus aureus and Streptococcus agalactiae Mastitis

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ABSTRACT
Dodecylaminoalkyl glycine teat dip,1 diluted to 1.5% active ingredients, was evaluated in a controlled experimental challenge study to determine efficacy for preventing new intramammary infections with Staphylococcus aureus (Newbould 305) and Streptococcus agalactiae (McDonald 44). The dip reduced the incidence of intramammary infection with Staphylococcus aureus by 81.2%. Reduction of Streptococcus agalactiae intramammary infection was 67.5%.

INTRODUCTION
Many noniodine teat dip formulations have been tested under experimental challenge conditions and were found effective in preventing new intramammary infections (IMI) by Staphylococcus aureus and Streptococcus agalactiae (1, 2, 4, 5). This study was to determine efficacy of dodecylaminoalkyl glycine teat dip against Staph. aureus and Strept. agalactiae.

MATERIALS AND METHODS
The Hill Farm Research Station dairy herd of 121 Jersey cows was used in a 5-wk study to evaluate the experimental teat dip. Before the study began, the bacterial status of each quarter was determined by collecting and culturing duplicate milk samples. A third sample was collected from specific quarters when results from the first two samples differed. During the study, samples were collected weekly and specific quarters were resampled to confirm new IMI. Only quarters initially uninfected with a pathogen were eligible for an infection.

Prior to sampling, three or four streams of foremilk were discarded, and the teat apex was scrubbed vigorously with cotton moistened with 70% alcohol. All samples were refrigerated immediately after collection for overnight storage, then plated on tryptose blood agar containing 5% calf blood and .1% esculin. Plates were incubated at 37°C for 48 h. An IMI was confirmed when: 1) Staph. aureus or Strept. agalactiae was isolated from a clinical quarter; 2) two consecutive samples yielded >500 cfu/ml of the same pathogen; or 3) three consecutive samples contained 100 to 400 cfu/ml of the same pathogen.

Preparation of the experimental challenge was as in (2). The dodecylaminoalkyl glycine formulation was provided as a concentrate containing 12.0% germicide and was diluted with water to a 1.5% solution prior to dipping. During the study, the lower third of all teats was dipped with the challenge suspension of Staph. aureus (Newbould 305) and Strept. agalactiae (McDonald 44) immediately after the p.m. milking, Monday through Friday, except wk 1 when challenge began on Tuesday p.m. Bacterial challenge suspensions were diluted in milk to approximate 50 × 10^6 cfu/ml. Within 10 to 15 s following challenge, right front and left rear teats were dipped full length with the teat dip; left front and right rear teats were undipped controls.

Reductions of infection rates were calculated from percent eligible quarters becoming infected according to:

\[ t = (P_1 - P_2)/\left[\left(P_1/Q_1/N_1\right) + \left(P_2/Q_2/N_2\right)\right]^{-5} \]

where \( t \) approximates a standard Student’s \( t \)
TABLE 1. Efficacy of dodecylaminoalkyl glycine teat dip against *Staphylococcus aureus* (Newbould 305).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. quarters eligible at beginning of study</th>
<th>New quarter infections, wk</th>
<th>% Quarters</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dip</td>
<td>224</td>
<td>0 0 0 2 2 4</td>
<td>1.8</td>
<td>81.2†</td>
</tr>
<tr>
<td>Control</td>
<td>228</td>
<td>4 5 4 3 6 22</td>
<td>9.6</td>
<td></td>
</tr>
</tbody>
</table>

†P < .001.

TABLE 2. Efficacy of dodecylaminoalkyl glycine teat dip against *Streptococcus agalactiae* (McDonald 44).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. quarters eligible at beginning of study</th>
<th>New quarter infections, wk</th>
<th>% Quarters</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dip</td>
<td>224</td>
<td>0 1 3 5 0 9</td>
<td>4.0</td>
<td>67.5†</td>
</tr>
<tr>
<td>Control</td>
<td>228</td>
<td>10 5 7 3 3 28</td>
<td>12.3</td>
<td></td>
</tr>
</tbody>
</table>

†P < .005.

RESULTS AND DISCUSSION

Infection data are summarized in Tables 1 and 2. A total of 26 *Staph. aureus* IMI were confirmed; 22 in control quarters and 4 in dipped quarters. Thirty-seven *Strep. agalactiae* IMI were diagnosed, 28 in control and 9 in dipped quarters. The teat dip reduced infection rate 81.2% (P < .001) for *Staph. aureus* and 67.5% (P < .005) for *Strep. agalactiae*.

Mean daily concentrations of *Staph. aureus* and *Strep. agalactiae* used during the study for challenge suspension were $43.7 \pm 6.6 \times 10^6$ cfu/ml and $46.4 \pm 6.8 \times 10^6$ cfu/ml, respectively. No teat irritation or teat end abnormalities were noted during the study.

Experimental exposure trials are of value for evaluating teat dips because they are done quickly (4 to 8 wk), milking procedures and machines are monitored closely, bacteriological history of experimental cows is accessible, and efficacy data are determined against selected pathogens. In addition, efficacy data correlate closely for several products tested by both experimental challenge and natural exposure studies (3). The experimental challenge model used in the present investigation once again proved to be an effective tool in the evaluation of a new teat dip against two common mastitis pathogens.

ACKNOWLEDGMENTS

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REFERENCES