Feeding Mastitic Milk to Calves: Review

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ABSTRACT
Milk from cows treated with antibiotics for mastitis and other disorders has been fed to young calves in fresh or fermented form. Growth of calves so fed has been similar to that of control animals offered fermented colostrum or other liquid feeds. Incidence of health disorders in mastitic milk-fed calves has been no greater than in those fed control milks. Mastitic milk preserved by addition of propionic acid or formaldehyde was relatively unpalatable to the calves. Limited data indicate that first-lactation cows fed mastitic milk as calves suffered no more udder trouble than did their mates formerly given other liquid feeds.

INTRODUCTION
Mastitic milk could be defined as that produced by cows with an active mammary infection. Usually one or more quarters will have been treated with an antibiotic. For purposes of this discussion the term will be broadened to include milk from animals that have received antibiotic treatment for metritis and other health problems; in some studies such milk was included with the strictly mastitic milk. I prefer the term "waste milk" first used by Chik et al. (2). Such milk must be withheld from market until it contains no drug residue. It represents an economic loss (4) and causes problems of disposal on the farm.

Use of colostrum as a calf feed has become accepted generally; waste milk possibly could be utilized similarly. Colostrum is fed in fresh form, after frozen storage, following treatment with preservatives, or as fermented colostrum. Preservation, storage, and form of feeding waste milks will be considered herein. Use of waste milk would supplement colostrum. It would permit liquid milk feeding to all calves born on the farm or the feeding of greater quantities of milk to individual heifer calves if only the latter are reared.

The practice of feeding mastitic milk has been discouraged in the past because of possible transfer of pathogens to the young, although experimental evidence was not always convincing. For example, in two studies (5, 13) in which calves were fed mastitic milk for 6 to 10 mo, incidence of mastitis was high at subsequent calving. Unfortunately, control data were inadequate. Roy (11) found no differences in performance of calves fed milk from a cow suffering from coliform mastitis and those given normal whole milk. Khakimova and Abzolova (9) fed colostrum from healthy and infected cows to newborn calves. A number of those fed mastitic colostrum developed dyspepsia and several died. Pathogenic organisms isolated from the feces were identical to those isolated from mastitic colostrum. Volovenko (14) reported 50 to 71% morbidity rates in calves fed colostrum from udders infected with streptococcal and staphylococcal mastitis. The gut of newborn calves may be more permeable to organisms at birth than after a day or so of age. As pointed out by Keys (6) newborn calves should not be fed mastitic milk.

In spite of recommendations to the contrary, field observations long have indicated that dairymen did feed mastitic milk. Observation by Schaffer and McGuffey (12) was similar.

MEANS OF PRESERVING WASTE MILK
Waste milk may be fed fresh as in Louisiana (2) and Pennsylvania (1) trials. Practical experience indicates that if containers are kept clean, waste milk can be held satisfactorily under refrigeration for up to 3 days. Some problems of lack of constant supply may be
encountered, but in larger herds there usually are at least a few lactating cows undergoing treatment at all times. This would permit feeding a portion of the calves on waste milk, the remainder on fermented colostrum. The advisability of mixing waste milk and colostrum has not been investigated.

Waste milk may be fermented and stored for subsequent use. Studies by Keys et al. (6, 7, 8) showed that milk produced during milkings three to six after antibiotic treatment fermented as easily as did normal milk and sometimes more rapidly than colostrum. That produced during the first two milkings fermented slowly, because of antibiotic content. Use of a starter culture was recommended to speed fermentation. In all studies on feeding fermented waste milk to calves, production from all six post antibiotic treatment milkings has been pooled and allowed to ferment (6, 10, 12).

Only limited information is available on use of preservatives with waste milk. Otterby et al. (10) acidified waste milk (or colostrum) with propionic acid at .7% vol/wt and stored it in plastic-lined garbage cans. One group of calves in the Pennsylvania study (1) was fed waste milk treated by addition of .05%, by weight, of formaldehyde and stored in plastic containers. In both studies, calves were reluctant to accept the preserved milks.

CALF PERFORMANCE

As shown in Table 1, weight gains of calves fed waste milks have been similar to those of controls during the milk feeding period. Intakes of milk were similar, usually by experimental design, and consumption of dry feed did not differ greatly. Because of differing experimental conditions, comparisons between experiments or between fresh and preserved waste milks probably are not in order.

Reported gains in body weight for the post milk-feeding period generally were similar. Schaffer and McGuffey (12) monitored gains to age 12 mo, and they were almost identical between calves formerly fed fermented waste milk or herd milk.

EFFECT ON ANIMAL HEALTH

Antibiotic Content of Waste Milk.

Chardavoyne et al. (1) found appreciable antibiotic residues in weekly samples of the waste milks being fed. Fermented colostrum also occasionally exhibited antibiotic activity. This may have been from residues remaining from dry period treatment for mastitis, from Lactenin 1 in the colostrum (6), or from antibiotic-like substances produced by lactic acid bacteria during the fermentation process (1). Keys et al. (8) found high concentrations of penicillin and novobiocin in the first milking after treatment of one gland of mastitic cows. Significantly lower amounts were in subsequent milkings, with no novobiocin after the second post treatment milking. Their incubation studies indicated that bacteria involved in the incubation process degraded or destroyed the antibiotics. Penicillin was less resistant to destruction than was novobiocin. Schaffer and McGuffey (12) noted a mean antibiotic concentration of 1.2 IU/ml in fresh mastitic milk and .01 IU/ml in that which had been fermented, again indicating that fermentation destroys the antibiotic.

Types of Microorganisms

Presumably the numbers and types of microorganisms in waste milk will depend on the type of mammary infection suffered by the cow. Schaffer and McGuffey (12) isolated five major species from fermented antibiotic-containing mastitic milk. However, 12 of 19 samples of fresh mastitic milk did not support bacterial growth, probably because of antibiotics. Additional research is needed on types and numbers of organisms in waste milks.

EFFECT ON HEALTH

Schaffer and McGuffey (12) and Chik et al. (2) experienced a higher incidence of scouring among calves fed waste milk compared with controls (Table 1). Others (1, 3, 6, 10) reported either low incidences of health problems, no differences between treatments, or actually fewer scour days per calf on waste milk compared with control. Reported death losses were relatively low in all studies.

The question arises as to whether heifer calves fed waste milk will suffer an increased incidence of mastitis or blind quarters during their first lactation. Reports, (5, 13) indicated that such might occur. Keys (6) recently reported that only one case of blind quarter...
TABLE 1. Weight gains and health of calves fed mastitic milk compared with that of calves on control diets during milk feeding period.

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. of calves/treatment</th>
<th>Waste milk</th>
<th>Control milk</th>
<th>Scour days</th>
<th>Deaths</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Type</td>
<td>Type</td>
<td>Avg. gain/</td>
<td>Avg. gain/</td>
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<td></td>
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<td>day, kg</td>
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<tr>
<td>Chik (2)</td>
<td>13</td>
<td>Fresh</td>
<td>Fermented</td>
<td>.38</td>
<td>.40</td>
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<tr>
<td>Chardavoyne (1)</td>
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<td></td>
<td></td>
<td>.43^a</td>
<td>.36</td>
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<td>Chardavoyne (1)</td>
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<tr>
<td>Trial 1</td>
<td>8</td>
<td>Fresh</td>
<td>Herd milk</td>
<td>.43</td>
<td>.36</td>
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<tr>
<td>Trial 2</td>
<td>15</td>
<td>Fresh</td>
<td>Fermented</td>
<td>.40</td>
<td>.34</td>
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<td>Trial 3</td>
<td>13</td>
<td>Fresh</td>
<td>Fermented</td>
<td>.44^a</td>
<td>.35</td>
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<tr>
<td>Schaffer (11)</td>
<td>29 exp, 57 controls</td>
<td>Fermented</td>
<td>Herd milk</td>
<td>.38</td>
<td>.43</td>
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<td>Keys (6)</td>
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<td>Fermented</td>
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<td>Fermented</td>
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<td>.18</td>
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<td>Otterby (10)</td>
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<td>.46</td>
<td>.41</td>
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<td>Fermented</td>
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<td></td>
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<td></td>
<td>Fermented</td>
<td>.46</td>
<td>.41</td>
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<tr>
<td>Gonzalez (3)</td>
<td>12</td>
<td>Mastitic milk</td>
<td>Normal milk</td>
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^a Higher than control (P<.05).
^b Number of treatments for scours.
^c Gains reported as not significantly different.
resulted in 64 first-lactation heifers originally fed fermented mastitic milk. The number of cows which suffered mastitis was similar among groups which had been fed fermented mastitic milk or fermented colostrum (Table 2). Cases of mastitis among heifers that had been fed herd milk were 72% higher than in groups previously given mastitic or control milks (Table 2). Summary of the incidence of first-lactation udder trouble among the female calves in the Pennsylvania study is in Table 2. Incidences of mastitis, particularly coliform infections, were numerous in the herd at the time. However, little difference existed between groups previously fed mastitic or control milks.

**SUMMARY AND CONCLUSIONS**

Milk from cows treated with antibiotics for mastitis and other disorders can be fed safely to calves. It can be fed in fresh or fermented form. Calf growth will be at least equal to that obtained by feeding fermented colostrum or other liquid feeds. Health problems, including scours, will be less, or no greater, than in feeding control milks. Limited data indicate that incidence of udder trouble will not increase above normal when heifer calves fed waste milk eventually reach their initial lactations.

I believe three precautions should be taken in feeding waste milk. Delay feeding of mastitic milk until after the 1st day of life of the calf because of possible permeability of the gut to microorganisms (6, 9). House calves so that it is impossible for them to suckle each other during milk feeding. Exercise caution in feeding waste milk to calves intended for meat. Antibiotic residues may remain in the tissues; there have been no definitive studies on whether such is true or on clearance rates.

**REFERENCES**


young calves fed a milk replacer, "waste milk", or fermented colostrum. J. Dairy Sci. 58:742. (Abstr.)