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Feeding calves waste/mastitic milk leads to serious questions

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The practice of feeding pooled waste/mastitic milk to young calves seems to have increased as dairies have grown larger, creating a larger pool and the means to segregate this milk from saleable milk.

This was acknowledged by the authors of the 1996 National Animal Health Monitoring System (NAHMS) study (*Feedstuffs,* Sept. 10, 2001), who noted that the pattern of older age at weaning (beyond eight weeks of age) is consistent with this practice. This leads to a fundamental question: Is it a good practice to feed waste/mastitic milk to young calves?

In the late 1970s and early 1980s, research on and the practice of feeding fermented (sour) or acidified colostrum was in vogue. Kesler (1981) reviewed six studies that fed mastitic milk and found mixed results with the incidence of scouring. No milk replacers were fed in these studies, and the role of the calf starter was not considered in this evaluation.

Kesler issued three precautions in feeding mastitic milk: (1) delay feeding beyond the first day so as to avoid possible absorption of mastitic microorganisms through the permeable gut, (2) house calves so they cannot suckle each other to avoid increased incidence of mastitis when they become first-calf heifers and (3) avoid feeding to calves intended for meat so as not to have antibiotic residues from the medicines used to treat cows with mastitis.

The above period was followed by a high level of interest and research on *ad libitum* feeding of cold, acidified milk replacers in the mid- to late 1980s. More recently, there have been concerns about biosecurity aspects of feeding waste/mastitic milk coupled with increased interest in pasteurizing this milk.

The primary study evaluating the economics of feeding pasteurized colostrum and waste milk was done at a large, 5,000-cow dairy (Jamaluddin et al., 1996) with calves born from May 28 to June 28, 1993. Both male and female calves were used, but since results were similar, only data from the 75 heifer calves per treatment will be reported here. Calves in the treatment group received two to four liters of pasteurized colostrum at two to three hours after birth, and calves in the control group were treated the same except with unpasteurized colostrum.

Calves were housed individually in hutches, fed four liters of their respective liquid twice daily for a month and then four liters once daily until weaned at 10-12 weeks.

The authors said water and a 22% protein (dry matter basis) pelleted calf starter were provided *ad libitum* from the third day after birth until weaning. However, the authors said later in the report that starter was limit-fed at 1 lb. per day during the first month, 3 lb. per day during the second month and 5 lb. per day during the third month until weaning. Thus, limit-feeding of starter was a constraining factor in this study. Results are shown in Table 1.

There appears to be an error in that the $4.19 loss associated with mortality was not added into the health costs, but it was added into the total variable costs. The primary difference between calves fed nonpasteurized milk and the calves fed pasteurized waste milk was the higher health cost and mortality cost, partially offset by the cost of pas-

TABLES

1. Economics of feeding pasteurized milk

	Pasteurized	Nonpasteurized
Total variable costs, $	70.45[a]	73.37[b]
Feed costs	61.23	61.09
Starter	30.74	30.66
Waste milk and colostrum	24.82	24.78
Labor on feeding	5.67	5.66
Health costs	5.74[a]	8.09[b]
Drugs for diarrhea treatment	2.91	3.80
Drugs for pneumonia treatment	0.60[a]	1.39[b]
Labor on diarrhea treatment	0.93	1.20
Labor on pneumonia treatment	0.29[a]	0.69[b]
Loss associated with mortality	0.00	4.19
Miscellaneous	1.01	1.01
Pasteurization cost	3.60	0.00
Total revenue, $	191.11[a]	186.28[b]
Calf value at birth, $	86.82	87.49
Gross margin, $	33.83[a]	25.42[b]

[a,b]Means differ significantly ($P < 0.05$).

2. Composition of colostrum and whole milk

	Postpartum milking					Whole
	1 (Colostrum)	2	3	4	5	milk
Total solids, %	23.9	17.9	14.1	13.9	13.6	12.9
Total protein, %	14.0	8.4	5.1	4.2	4.1	4.0
Casein, %	4.8	4.3	3.8	3.2	2.9	2.5
Immunoglobulin, %	6.0	4.2	2.4	0.2	0.1	0.09
Fat, %	6.7	5.4	3.9	4.4	4.6	4.0
Lactose, %	2.7	3.9	4.4	4.6	4.7	4.9
Minerals, %	1.11	0.95	0.82	0.82	0.81	0.74
Specific gravity	1.056	1.040	1.035	1.033	1.033	1.032

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teurization, resulting in the reduction of $2.92 in total variable costs for the pasteurization treatment. The gross margin per calf in Table 1 is puzzling because the authors defined gross margin as the difference between total revenue for each calf at weaning and average total variable costs. In Table 1, that would have been $120.66 for calves fed pasteurized or $112.91 for calves fed nonpasteurized waste milk.

There are several limitations to this study. First, calves were constrained in the amount of starter fed so they could not eat more if predisposed to do so. This may have limited the healthier calves most. Second, a third treatment of a good-quality milk replacer would have made the comparison more complete with normal practices.

Limitations of feeding waste/mastitic milk are several. Biosecurity concerns, such as with Johne's disease, favor either using a milk replacer following colostrum or pasteurizing the waste milk to be fed. In the above study, colostrum was pasteurized by the high-temperature/short-time (HTST) method while waste milk was pasteurized by a batch-pasteurization method.

Using pasteurization places an additional burden on the dairy producer to have an ongoing, regular quality control program. If not, a false sense of security may result from assuming the pasteurization is consistently working. The equipment is a major investment in itself. There can be little room for error. Consider that HTST conditions are usually 161°F for 15 seconds. However, the milk to be pasteurized is not consistent in its composition, and some protein denaturization can occur at 165°F. Also, how well will disease microorganisms be killed if pasteurization is not consistent with what it should be? Pasteurization is not sterilization. Should waste milk be pasteurized by the batch or continuous (HTST) method?

Additionally, the endotoxins already produced by microorganisms may not be affected by pasteurization. These can have negative effects on calf health and performance, especially if the integrity of the calf's gut has been impaired (comment by a DVM/Ph.D. at the Informal Calf Session on Calves, 1995 American Dairy Science Assn. [ADSA] annual meeting, Cornell University). Finally, pasteurization will not diminish antibiotic residues present in the milk from treating cows for mastitis or other diseases.

Selim and Cullor (1997) noted that antibiotic residues that would constitute violative amounts and existence of multiple antibiotic-resistant bacterial strains are concerns in calf health management and dairy food safety.

While the above factors are significant issues in themselves, there are a few other issues often ignored. First is the variable nutrient composition of waste/mastitic milk. Foley and Otterby (1978) comprehensively reviewed and compiled data on the composition of colostrum and whole milk — primarily from Holsteins milked twice daily — shown in Table 2.

The waste/mastitic milk pool is a composite due to the number of cows contributing, the amount of milk they contribute, the composition of that milk and the disease state or reason they are a contributor to this pool. Data with which I am familiar indicate that average amounts of milk produced during the first three days after calving are about 35, 45 and 55 lb., respectively, but with a coefficient of variation of about 35-55%. Cows with mastitis produce milk with little or no change in protein content, but fat and nonfat solids each decrease about 0.5% (Ashworth et al., 1967). Also, we have not even considered the role of this feeding practice on starter intake, the weaning process and rumen development.

Finally, why is there so much waste/mastitic milk on hand? If the colostrum (first or second milking) is fed, and then all of the next two days' milkings are collected as not saleable, that is enough for feeding a 1 gal. per day per calf for about 12 days or 24 days if only heifer calves are saved and fed. If calves are weaned past eight weeks of age as the NAHMS data indicate, then another 40 days of milk must be coming from mastitic and treated cows. Is that an acceptable quantity being produced and not saleable? Is that a suitable way to determine when to wean calves? Why would you feed the most vulnerable animals on a dairy the most variable and potentially hazardous feed?

If there are this many concerns about feeding waste/mastitic milk, then why is it so popular? If waste/mastitic milk is viewed as "free" without significant impediments to its being fed to young calves, then this may be expected. Have we made this a "sacred cow" that cannot be challenged on the basis of "not telling the dairy producer what he/she does not want to hear?" If you challenge this practice, are you going to be labeled as simply wanting to sell milk replacer or not have the dairy producer's best interests at heart?

At the 2002 Midwest ADSA/American Society of Animal Science meetings, even I was somewhat surprised to hear one scientist say (and another agree) that the worst biosecurity issue in the U.S. animal industry is the feeding of waste milk to dairy heifer calves and their relocation/pooling at a young age.

The Bottom Line

The practice of feeding waste/mastitic milk to young calves needs to be critically reviewed in light of biosecurity, variable nutrient and deleterious composition, antibiotic residues and goals/objectives for feeding and weaning young calves.

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