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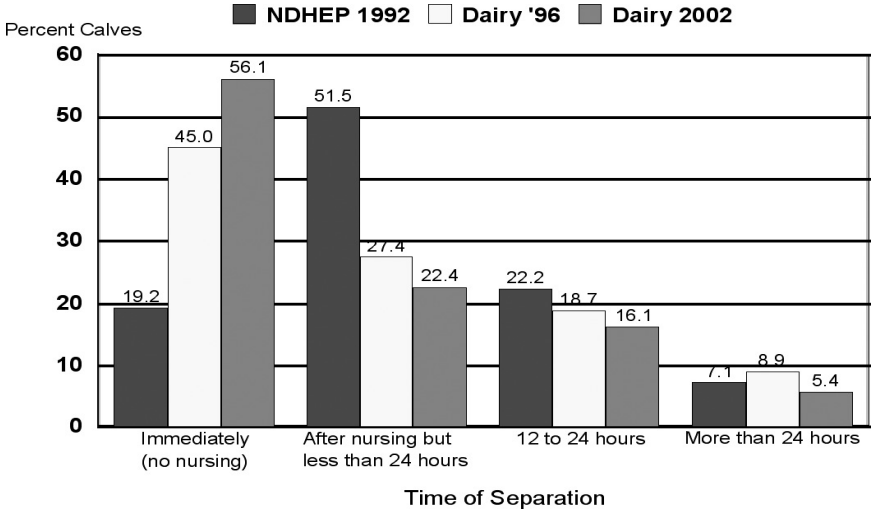
Dairy 2002 Results: Colostrum Feeding

In 1991-92, the National Animal Health Monitoring System's (NAHMS) National Dairy Heifer Evaluation Project (NDHEP) asked 1,811 dairy producers in 28 States about their colostrum management practices. NDHEP was followed by NAHMS Dairy '96 and Dairy 2002, both of which also included questions about colostrum feeding and management. The following comparisons depict the change, or lack thereof, in this important management realm.

Separating calves from their dams decreases their risk of swallowing the dams' feces or bedding contaminated by the dams' feces and therefore decreases the chance of transmission of diseases such as Johne's. The 1992 NDHEP reported that 28.0 percent of producers separated calves from their dams at birth, before nursing. This percentage increased to 47.9 percent in Dairy '96 and to 52.9 percent in Dairy 2002. Figure 1 shows the percentage of calves separated from their mothers, by length of time following birth. Overall, Dairy 2002 indicated that 94.6 percent of calves were separated in 24 hours or less.

Figure 1. Dairy heifers (%) separated from mothers, by length of time after birth.



Feeding colostrum to calves by hand assures the dairy producer of the quantity of colostrum being fed. Figure 2 shows the percent of calves by the amount of colostrum fed by hand during the first 24 hours of life, in 1992, 1996, and 2002. The NDHEP also indicated that 31.6 percent of calves received their first feeding from their mothers. Since NDHEP, other studies have shown that feeding from the dam can increase the chance of infection and often does not provide an adequate amount of antibodies to build sufficient immunity. In addition, the amount of colostrum that calves receive cannot be determined accurately using this feeding method. The NDHEP researchers attributed over half the calf death loss they observed to insufficient colostrum absorption. Dairy '96 reported a decrease in the percentage of calves that received their first feeding of colostrums from nursing (29.4 percent of calves). In Dairy 2002, the percentage of calves that received their first feeding of colostrum from their mothers dropped to 23.1 percent

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A Different Look At Forage Evaluation

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Undersander and co-workers (1993) developed a method to estimate milk per ton of forage dry matter (DM) as an index of forage quality, based on energy content of the forage predicted from acid detergent fiber (ADF) content and DM intake potential of the forage predicted from neutral detergent fiber (NDF) content. This index has been modified (Shaver and co-workers, 2002), and an easy to use Excel 5.0 spreadsheet called Milk2000 has been developed (on the internet (http://www.uwex.edu/ces/forage/pubs/milk2000.). MILK2000 uses forage analyses (crude protein, NDF, in vitro NDF digestibility, starch, and non-fiber carbohydrate) to estimate energy content using a modification of the NRC (2001) summative approach and DM intake from NDF (Mertens, 1987) and in vitro NDF digestibility (Oba and Allen, 1999) to predict milk production per ton of forage DM. Forage DM yield multiplied times the milk produced per ton of forage DM provides an estimate of the milk produced per acre and combines yield and quality into a single term. Milk per ton and milk per acre calculations provide relative rankings of forage samples, but should not be considered as predictive of actual milk responses in specific situations.

Milk production decline with diminishing alfalfa quality (increasing ADF and NDF contents) is well established (Nelson and Satter, 1990). The MILK2000 spreadsheet was used to assess the impact of alfalfa quality on estimated milk per ton of DM and per acre. For the first scenario, alfalfa NDF content was varied from 40% to 50% while holding NDFD constant at 50% of NDF. The milk per ton and milk per acre results and gross milk returns are presented in Table 1.

The estimated milk per ton benefit for alfalfa with a relative feed value (RFV) of 175 (40% NDF) over alfalfa with an RFV of 125 (50% NDF) equates to about $10,000 annually per 100 cows. Because of reduced yield for the immature alfalfa, the estimated milk per acre benefit for 175-RFV alfalfa over 125-RFV alfalfa equates to about $3,000 annually per 100 cows. Data from Wisconsin quality-tested hay auctions show that dairy producers pay $0.90 per point of RFV above the RFV of a base quality alfalfa (Undersander, 2002). So, 175-RFV alfalfa would sell for $45 more than 125-RFV alfalfa. Based on the estimated milk per ton, the 175-RFV alfalfa was worth $49 more per ton than 125-RFV alfalfa. Because of the premium price paid for high-quality alfalfa, it needs to be targeted to high producing cows with the potential for a production response from the high quality. Average-quality alfalfa can be targeted to low-producing cows and replacement heifers.

Table 1. Impact of alfalfa quality on estimated milk per ton and per acre[1].

Alfalfa (%CP, %NDF, RFV)	Milk lb/ton DM	Milk $/ton DM[2]	Milk lb/acre	Milk $/acre[2]
(22, 40, 175)	2755	330	12398	1488
(19, 45, 150)	2549	306	12106	1453
(16, 50, 125)	2342	281	11710	1406

[1]Calculated using Milk2000 (http://www.uwex.edu/ces/forage/pubs/milk2000.xls).
[2]Calculated using a $12.00/cwt. milk price.

For the second scenario, alfalfa NDF content was set at either 40% or 50% while NDFD was varied from 40% to 60% of NDF within each concentration of NDF. The milk per ton results and gross milk returns are presented in Table 2. As NDFD decreased from 60% to 40% of NDF, milk per ton and $ per ton declined 671 lb and $80, respectively. This decline was greater than that observed with increasing NDF content from 40% to 50%, where milk per ton and $ per ton declined 413 lb and $50, respectively. Hay or hay-crop silage with low NDF content (40%) and low NDF digestibility (40%) shows lower predicted milk (lb or $) per ton than high NDF (50%), high NDFD (60% of NDF). The digestibility of NDF is a significant quality parameter that has been ignored in past forage evaluation schemes.

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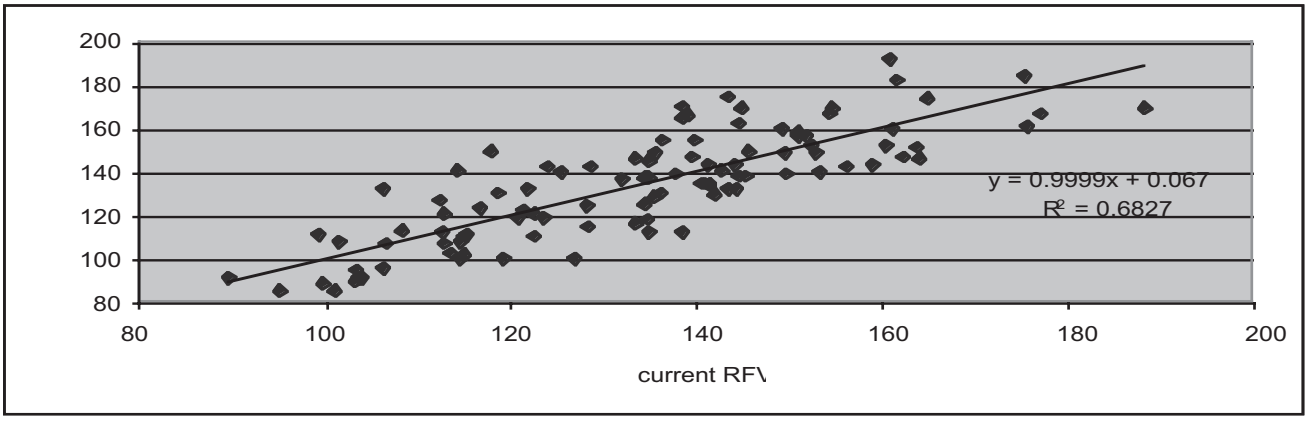
Table 2. Impact of alfalfa quality on estimated milk per ton and per acre[1].

CP%, NDF%	NDFD % of NDF	Milk lb/ton DM[2]	Milk $/ton DM
(22, 40)	60	3057	367
(22, 40)	50	2755	330
(22, 40)	40	2440	293
(16, 50)	60	2697	323
(16, 50)	50	2342	281
(16, 50)	40	1973	237

[1]Calculated using Milk2000 (http://www.uwex.edu/ces/forage/pubs/milk2000.xls).
[2]Calculated using a $12.00/cwt. milk price.

The RFV estimates used for forage evaluation and hay marketing are based on NDF and ADF concentrations, and have not considered differences in NDF digestibility. We (Shaver and co-workers., 2002) proposed incorporating NDF digestibility measurements into the RFV calculations, where forage NE$_L$ and DM intake would be estimated in a manner similar to that described for estimating milk per ton. The regression of current versus proposed RFV estimates is presented in Figure 1. The graph and its low R-square value (0.68) show that the proposed RFV varies above and below its line of equality with the current RFV. For example, samples with a current RFV of 140 have proposed RFV ranging from 110 to 170. The use of NDF digestibility measurements in forage evaluation schemes may detect variation in forage quality not previously detected in schemes based solely on fiber concentrations. The foregoing discussion may partially explain why dairy producers often report widely different animal performance from lots of hay with the same RFV under the current system. Factors that cause NDFD to vary include plant species, varieties within a species, stage of maturity at harvest, climatic condition that the crop was grown under, and interactions between these factors. We are hopeful that the proposed system, which incorporates NDFD into the calculation of RFV, will yield a better relationship with animal performance, but this has yet to be confirmed in feeding experiments.

Figure 1. Current versus proposed relative feed value comparisons



For more on this topic and a complete set of references, Dr Shaver will be speaking at the Western Dairy Management Conference in Reno this March:

Mertens, D. R. 1987. J. Anim. Sci. 64:1548-1558.
National Research Council. 2001. Nutrient requirements of dairy cattle. 7th rev. ed. Natl. Acad. Sci., Washington
Nelson, W. F., and L. D. Satter. 1990. J. Dairy Sci. 73:1800-1811.
Oba, M. and M. S. Allen. 1999. J. Dairy Sci. 82:589-596.
Schwab, E., R. Shaver, P. Hoffman, et al. 2001. Milk 2001 http://www.uwex.edu/ces/forage/pubs/milk2000.xls.
Shaver RD, DJ Undersander, EC Scwab, et al, 2002. Proc Intermoountain Nutr Conf. Salt Lake City, Utah.
Undersander, D. J. 2002. Wisconsin tested hay auctions. http://www.uwex.edu/ces/forage/pubs/auction.htm.
Undersander, D.J., W.T. Howard, and R.D. Shaver. 1993. J. Prod. Ag. 6:231-235.
Undersander, D. J. 2002. Wisconsin tested hay auctions. http://www.uwex.edu/ces/forage/pubs/auction.htm.

(Colostrum, continued from page 1)

Figure 2. Percent of dairy heifers versus amount of colostrum normally fed by hand in the first 24 hrs.

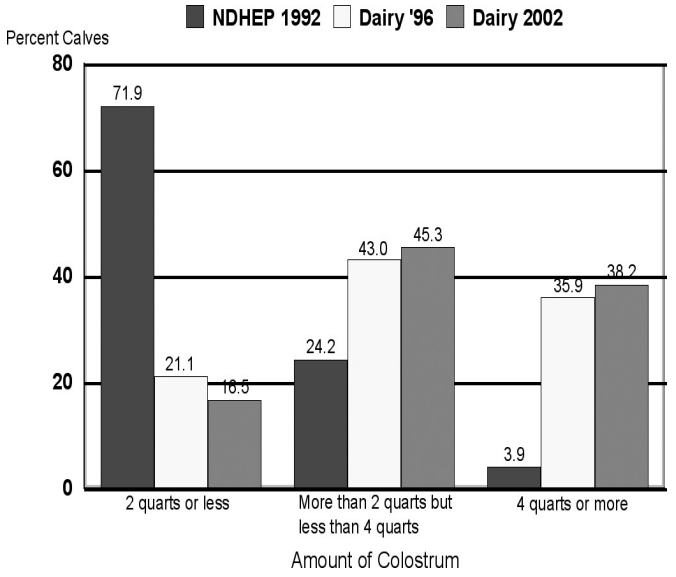
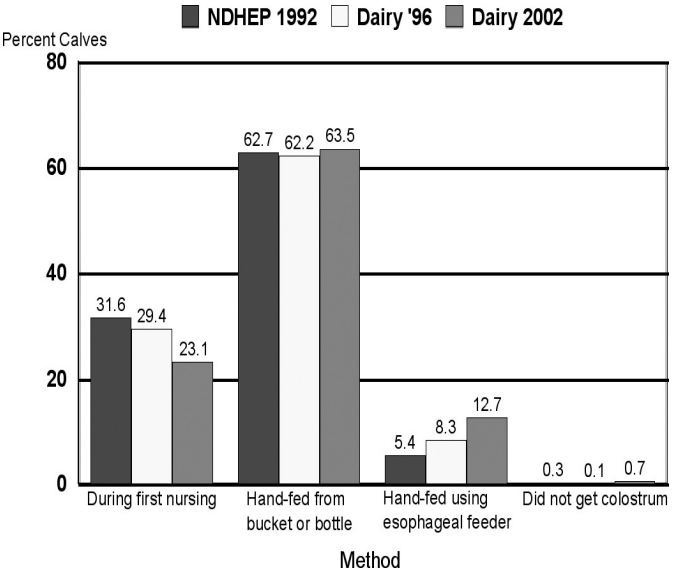


Figure 3. Percent of dairy heifer calves, by method of first colostrum feeding.



of calves. Figure 3 shows that about two-thirds of dairy heifer calves were fed their first dose of colostrum from a bucket or bottle in each of the three studies. Use of an esophageal feeder increased over each of the study periods. Dairy '96 showed a tremendous increase in the amount of colostrum given to calves in the first 24 hours, compared to the 1992 NDHEP study where 71.9 percent of calves received 2 quarts or less; 24.2 percent received 2 to 4 quarts; and only 3.9 percent were fed more than 4 quarts. In Dairy 2002, the reported amounts of colostrum fed were similar to those reported in Dairy '96. About 1 out of five operations (21.4 percent) fed calves 2 quarts or less of colostrum in both Dairy '96 and Dairy 2002. For both studies, about 1 out of 2 operations fed calves 2 to 4 quarts of colostrum, while 1 out of 5 fed 4 quarts or more.

Colostrum quality is based on several factors: the concentration of immunoglobulin in the colostrum; the age, disease history, and pathogen exposure of the cow; and prepartum milking and leaking of milk from the udder prior to calving, which can reduce the concentration of antibodies in colostrum. Only 3.9 percent of operations in the 2002 study measured immunoglobulin levels in colostrum they fed to calves. Colostrum from an infected cow (for example a cow with Johne's disease) should not be fed to newborn calves. This is especially important if the infected colostrum is pooled, because of the risk of infecting many calves. Although pooling colostrums is not recommended, 27.0 percent of the operations in Dairy 2002 that reported hand-feeding colostrum pooled their colostrum.

The method of colostrum storage also affects colostrum quality. Forty-percent of operations participating in Dairy 2002 stored excess colostrum. The Bovine Alliance on Management & Nutrition's guide on colostrum recommends either refrigerating colostrum at 40 degrees Fahrenheit in 2-quart containers or pre-chilled nipple bottles for less than 24 hours, or freezing it in double plastic freezer bags for storage longer than 24 hours. A freezer was the primary method of colostrum storage (68.6 percent of operations), followed by refrigeration (19.3 percent of operations); no refrigeration (10.9 percent of operations); and other methods (1.2 percent of operations). *For more information on Dairy 2002 or these results in particular, please visit www.aphis.usda.gov/vs/ceah/cahm.*

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