# 1999 Dairy Herd Improvement Herds in Arkansas

*J.A. Pennington*[1]


## Story in Brief

In December 1999, 107 of the 440 dairy cattle herds in Arkansas were enrolled in the Dairy Herd Improvement (DHI) program. Seventy-three herds completed at least eight DHI tests, with 97 cows/herd averaging 15,613 lb milk, 552 lb fat, and 517 lb protein and 82.5% days in milk. Raw somatic cell count averaged 464,000. The income over feed costs was $1,541/cow per year. The Arkansas average for milk/cow was 12,381 lb/yr on all cows in 1999. Herds not on DHI records averaged less than 12,000 lb milk/yr compared to the 15,613 lb milk/yr for herds on DHI. This difference of almost 4,000 lb/cow per year affected income per cow by over $600/cow, or approximately $60,000/herd per year. The quartile data of milk production for the Holsteins with DHI records also showed that income over feed costs increased as milk production increased. Other records for health, reproduction, genetics, and inventory as well as production contributed to this difference in income per cow. It was surprising that four times as many cattle left the herd because of death, injury, or disease as were culled for low production. Since less than 25% of the state's herds were enrolled in the DHI record-keeping program, opportunities exist for raising the level of milk production in Arkansas by encouraging more producers to use DHI records.


## Introduction

Successful dairy producers must have accurate and reliable records to make sound management decisions. The Dairy Herd Improvement (DHI) program provides a comprehensive herd analysis and management report that includes information concerning production, reproduction, genetics, herd health, animal and feed inventory, and finances. The data can be used to improve efficiency of milk production by 1) identifying least profitable cows for culling, 2) feeding for more efficient production, 3) selecting animals with the greatest genetic potential for production as replacements, and 4) utilizing summaries of the data to make precise management decisions that improve net income.

Typically, herds in the DHI program produce 3,500 to 4,500 lb more milk per year than herds not in the program. This difference in production has a significant effect on net income for the dairies, as greater income over feed costs is associated with greater milk production per cow. The herd summaries also allow a dairy producer to compare production, health, reproduction, and financial aspects of his/her dairy to those of other dairies, so areas of management that need improvement can be detected. Therefore, the purpose of this study was to summarize the production and management data for DHI herds in Arkansas.

## Experimental Procedures

Dairy cattle herds on test (n = 107) were used to report production and management data for DHI herds. The test milking (or day) for each cow included weighing milk, taking a sample of milk to be analyzed for percentage of fat and protein and to determine somatic cell count (SCC), plus recording of other management parameters as indicated in Table 1. Milk samples were analyzed at the Heart of America DHI Laboratory in Manhattan, KS. Records were processed at Dairy Records Management Systems (DRMS), Raleigh, NC.

## Results and Discussion

Rolling herd averages for all DHI herds with at least eight test dates are in Table 1. The weighted average milk/cow for the 73 herds was 15,613 lb/yr.

Table 2 shows the DHI averages for various quartile data of milk production for the Holstein breed. The quartile data for Holsteins illustrate the relationship of higher milk production to higher income over feed costs. However, the higher producing herds did tend to have more services per conception, but the improved management resulted in a greater percentage of cows detected in heat.

Table 3 shows that 27.4% of Holstein cows left the herd

[1] Animal Science Section, Cooperative Extension Service, Little Rock.

last year. Only 7.5% of the cows leaving the herd left because of low production. This compares to 20.2% of the cows leaving because they died and another 11.0% of cows left because of injury or disease. These data are similar to results from all states included in the Heart of America DHIA Summary for 1999.

The 73 dairy cattle herds reported here are less than the 107 cattle herds that have been reported on DHI through other summaries. The primary reason for the difference in numbers is that herds reported here have undergone at least eight test periods. Still, less than 25% of the 440 herds in 1999 were involved in the DHI program. Herds on DHI averaged 15,613 lb milk/cow per year compared to the Arkansas average of 12,381 lb/yr. Omitting DHI herds from the state average indicates that the non-DHI herds averaged less than 12,000 lb milk/yr. The difference of almost 4,000 lb/cow per year affects income by over $600/cow per year, or $60,000/yr in a 100-cow herd.

## Implications

DHI program participation affords dairy producers an opportunity to maintain milk production records on individual cows and other management practices. Because herds utilizing DHI records averaged substantially more milk/cow per year than herds not in DHI program, we should continue to encourage producers to enroll in the DHI testing program.

**Table 1. 1999 Dairy cow herds in DHI test in Arkansas.**

| Rolling herd averages | All herds (n = 73) | Standard deviation |
|---|---|---|
| Milk, lb | 15,613 | 320 |
| % Fat | 3.6 | 0.3 |
| Fat, lb | 552 | 109 |
| % Protein | 3.4 | 0.2 |
| Protein, lb | 517 | 101 |
| % in Milk | 82.5 | 7.1 |
| Number cows/herd | 97 | 61 |
| Days dry | 77 | 23 |
| 1st Lactation, lb | 54 | 17 |
| 2nd Lactation and over, lb | 72 | 15 |
| Projected calving interval, mon | 15.2 | 2.1 |
| Raw SCC (x 1,000) | 464 | 214 |
| Linear SCC | 3.5 | 0.7 |
| Services/conception - pregnant cows | 2.6 | 1.9 |
| Days to 1st service | 86.3 | 40.9 |
| Days open | 183.8 | 63.5 |
| AIPL - PTA $ | | |
| All cows | 38 | 28 |
| All sires | 65 | 42 |
| 1st Lactating cows | 75 | 59 |
| 2nd Lactating cows and over | 57 | 40 |
| Milk price/cwt, $ | $15.13 | $0.98 |
| Income over feed costs, $/cow | $1541.00 | $302.00 |

**Table 2. 1999 Arkansas DHI comparisons—Holstein herds.**

| | Rolling herd averages—Arkansas Holstein herds | | | |
|---|---|---|---|---|
| No./herd | 115 | 92 | 101 | 89 |
| | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 |
| Milk, lb | 19,991 | 17,561 | 15,256 | 12,002 |
| % Fat | 3.5 | 3.5 | 3.5 | 3.5 |
| Fat, lb | 694 | 617 | 534 | 423 |
| % Protein | 3.3 | 3.3 | 3.3 | 3.2 |
| % Protein, lb | 656 | 571 | 499 | 385 |
| Days in milk | 193 | 200 | 194 | 184 |
| % Cows in milk | 90.3 | 85.5 | 84.9 | 78.3 |
| Days dry | 67.9 | 83.7 | 74.3 | 93.1 |
| Standardized 150-d milk, lb | 68.2 | 62.5 | 54.5 | 45.0 |
| Peak milk - All, lb | 80.3 | 77.0 | 67.8 | 57.4 |
| 1st Lactation, lb | 69.0 | 62.9 | 56.0 | 57.8 |
| 2nd Lactation, lb | 83.4 | 80.4 | 69.6 | 47.9 |
| 3rd Lactation, lb | 89.0 | 86.2 | 74.6 | 61.9 |
| 305-d ME projected milk, lb | 21,393 | 19,478 | 17,122 | 13,938 |
| % Cows left herd | 33.0 | 26.2 | 32.7 | 24.2 |
| Raw SCC (x 1,000) | 405 | 383 | 523 | 492 |
| Days open | 174 | 181 | 183 | 185 |
| Freshening interval, mon | 15.0 | 15.2 | 15.2 | 15.3 |
| Services/conception - all cows | 3.5 | 2.6 | 2.8 | 2.4 |
| Services/conception - pregnant cows | 1.9 | 2.0 | 1.8 | 1.7 |
| % Heat observed | 37.8 | 32.5 | 31.0 | 22.6 |
| AIPL PTA $ - cows | $59 | $42 | $42 | $36 |
| AIPL PTA $ - sires | $94 | $85 | $84 | $70 |
| Income over feed costs, $/cow | $1947 | $1699 | $1598 | $1127 |

**Table 3. Cows leaving herds in last 12 mo, January 2000.[1]**

| Reason for leaving | %[2] |
|---|---|
| Udder | 1.4 |
| Injury | 7.0 |
| Disease | 4.0 |
| Low production | 7.5 |
| Mastitis | 12.0 |
| Reproductive problems | 16.5 |
| Feet and legs | 3.5 |
| Died | 20.2 |
| Sold for dairy reproduction | 6.5 |
| Other | 21.5 |

[1] Averages in Arkansas for Holstein herds on DHI from Dairy Records Management Systems.

[2] Total left herd = 27.4%.

# Growth of Calves Fed Milk Replacer Containing Dried Egg Product

*D.W. Kellogg, Z.B. Johnson, K.E. Lesmeister, and K.S. Anschutz*[1]

## Story in Brief

An experiment was conducted to use an egg protein product in a milk replacer for young dairy calves as a partial replacement for protein and fat from dried milk or whey products. Eighteen young Holstein calves were fed either a commercial milk replacer (control) or a milk replacer containing 30% spray-dried, feed-grade egg product for 28 d. There was no difference between BW gains of calves fed the control milk replacer and the replacer containing 30% egg protein. Average daily gains were approximately 0.5 lb for calves. Control calves tended to consume more grain during week 1 and did consume more grain during the second and fourth weeks than calves fed milk replacer containing 30% dried egg product.

## Introduction

The nutritional quality of egg protein has been recognized for years. However, this source of protein has not been tested extensively as a feed for dairy calves, partially because milk proteins are the accepted standard. However, a reasonably priced dry egg-protein product should serve as a high-quality protein source for young dairy calves. The price of dried skim milk has varied tremendously in recent years, and it at times has often been too expensive to purchase for inclusion in a milk replacer designed for young dairy calves. Dried whey can replace some of the dried skim milk, but it has only 14% protein compared to 35.8% in dried skim milk. The calf's requirement is 22% protein, and more important, specific amino acids must be provided in the correct proportions. Soy protein and other plant protein sources have been fed to calves but are generally inferior to milk protein for calves. Heat-treated, soy protein isolates have promise as a calf feed, but extensive processing is required. Therefore, the need exists to find economical, suitable products that will replace milk protein. The products must be soluble enough to mix with warm water, remain in solution to pass through a nipple bottle or bucket, support adequate growth of calves, and foster good health. Dried egg product appears to meet or surpass those concerns and might provide a replacement for at least part of the protein in dried skim milk. Whole milk contains about 25% fat on a dry basis. Specialty fat products must be purchased for combination with dried skim milk or dried whey. It would seem probable that the 33% fat in dried egg product would be a suitable replacement for at least part of the fat in milk. Dried egg product has been used successfully as an alternative protein and fat source in milk replacers designed with soy flour and a dextrin carbohydrate source for young dairy calves (Kellogg and Hatfield, 1992). In a preliminary experiment, the milk replacers mixed well, and calves consumed the milk replacers readily (Kellogg, 1999). Research is needed to determine whether the dried egg product results in calf performance that is equivalent to performance with dried skim milk and to decide upon the level of dried egg product that can be used to replace dried skim milk in formulation of a milk replacer.

For these reasons, it was proposed to use differing amounts of dried egg product to formulate milk replacers and to feed the milk replacer to young calves.

## Experimental Procedures

A milk replacer was prepared by replacing dried skim milk and dried whey with dried egg product (Table 1) for comparison with a commercially available milk replacer. Nutrient requirements (NRC, 1989) were met or exceeded, including protein and specific amino acid requirements. Fat content was formulated at 14.9%, but the actual analysis of a sample that was taken during mixing was 11.6% fat. The commercial milk replacer contained 20% fat.

The experiment was initiated by purchasing two groups of 10 male Holstein calves from cattle auctions in the Northwest Arkansas area. Calves were from 4 to 7 d old, and the second group arrived 2 wk after the first group. The buyer confirmed with previous owners, who owned local dairy farms, that each calf had received colostrum. All calves were weighed and housed in individual wooden hutches with an exercise area for the 4-wk trial. Hutches were enclosed except for a 2-ft vertical opening to the south. Calves had access to

[1] All authors are associated with the Department of Animal Science, Fayetteville.

an exercise area created by bending an 8-ft wire panel attached to front corners of each hutch. Straw was used as bedding material inside hutches, and new bedding was added as needed. Fresh water was offered daily in pails attached to the wire panels.

Soon after arrival, calves were fed a commercial milk replacer (Merrick's Gold Star, Merrick's Co., Madison, WI) that contained 20% crude protein, 20% fat, and Neo-terramycin (Table 2). Each group of calves was placed in the trial after a 4- to 5-d adjustment period. Fecal consistency (scours) was recorded on a scale of 1 to 9 (see description below). At onset of scours (fecal consistency score 7) each calf was given an electrolyte solution 1 h before feeding milk replacer. This continued until the scouring stopped (fecal score 6). Records were kept of the number of days that the electrolyte solution was fed and the number of times antibiotic treatment was necessary (fecal scores 8 and 9 or elevated body temperature). The scale of 1 to 9 used to measure fecal consistency was defined as follows:

1 = feces so firm the calf is constipated
2 = feces more firm than is typical for calves
3 = feces firm, but not as hard as scores 1 and 2
4 = feces clumpy with liquid present
5 = feces consistently loose and typical for young calves fed liquid feeds
6 = feces loose and some of the material is running on the ground
7 = feces definitely running on the ground (scours)
8 = feces very runny on the ground (severe scours)
9 = feces extremely liquid or bloody (extreme scours).

Calves were placed in a randomized block design with initial body weight as the block for both replications of 10 calves each. Dietary treatments were assigned randomly within pairs of calves with similar BWs. Initial (day 0) BWs were taken in the morning, and treatment calves received an egg-protein milk replacer for the evening feeding. One calf in each replication was ill with scours on day 0, and the illness persisted so both were removed before the data were analyzed. Calves were fed milk replacer twice daily. Milk replacers were reconstituted (1 lb/gal warm water) and mixed thoroughly. Two quarts of the mixture (0.5 lb of dry feed) were fed in a nipple bottle at each feeding.

All calves were offered 0.25 lb/d of a calf starter grain mixture in an enclosed bottle fitted with a specialized nipple. Remaining grain was weighed daily and recorded as orts. The amount of calf starter grain offered was increased to 0.50 lb/d on day 7, to 0.75 lb/d on day 14, and to 1.0 lb/d on day 21. Orts that were removed daily were weighed and subtracted from the amount of grain provided to determine actual intake.

Calves were weighed on days 7, 14, 21, and 28. The BWs were used to calculate ADG and feed efficiency.

## Results and Discussion

There was no difference ($P > 0.05$) between BW gains of calves fed the control (commercial) milk replacer and the milk replacer containing 30% egg protein (Table 3). Weight gains of calves were similar for both replications, so one mean per treatment is presented. This should be the case, since the second replication began only 2 wk later than the first and both were conducted under the similar conditions. Weather was mild with warm days and cool nights during the experimental period. The temperature remained warm during the single rainy day.

The pattern of growth was similar, and weekly BW gains did not vary ($P > 0.05$) by dietary treatment (Figure 1). Treatment groups were blocked by initial BW, which was very similar, so there was no need for an analysis of covariance in this trial. It is important to note that calves in an earlier experiment had difficulty competing with control calves when dried egg products were included in the milk replacer (Scott et al., 1999). That experiment tested a different source of dried egg product than this experiment, so that may explain the different results. However, in a preliminary trial that included this dried egg product, weight gains declined later in the trial compared to controls (Kellogg, 1999). For those reasons, the levels of vitamin A, zinc, and copper were increased in this trial. These dietary changes were designed to counter the high iron in egg yolk because that iron is probably very soluble for calves. There is no evidence that high iron is a problem; in fact, milk is low in both iron and copper. However, when there is a bacterial infection, part of the body's defense mechanism is to reduce iron in blood, apparently to prevent invading bacteria from using the iron. While speculative, it may be logical to infer that disease bacteria causing infectious scours in calves may benefit from highly soluble iron in egg products. It was thought that high vitamin A, zinc, and copper would help counter the iron levels, but this hypothesis was not tested in this experiment.

Calves in this experiment may have been older than in other trials, since the calves were purchased at sale barns and allowed a few days to adjust to the University farm. Calves in this trial were offered a grain mixture in bottles with a specialized nipple, which corresponds to the management on farms that raise heifers, whereas some researchers offer only the liquid feeds being tested, which is the typical management for veal calves. Control calves tended to consume more grain during week 1 (Figure 2) and did consume more grain ($P < 0.05$) during the second and fourth weeks than calves fed milk replacer containing 30% dried egg product. During the third week, the means were not different ($P = 0.13$). This effect was also noted in the preliminary experiment last spring (Kellogg, 1999). It does not seem reasonable that the milk replacer containing egg protein would have reduced appetite of calves for grain unless the level of protein fed satisfied the calves. The energy provided by fat content (20% vs. 15%) of the commercial replacer should have offset the lower protein (22% vs. 27%). Milk replacers in this experiment were formulated to demonstrate that it is possible to include 30% dried egg product. Another experiment is needed to compare milk replacers that are isocaloric and isonitrogenous. That formulation is possible if more ingredients are available. The lower voluntary feed intake associated with inclusion of 30% dried egg protein is of concern, since a major goal of dairy heifer growers is to establish grain intake to initiate development of the rumen and to permit early weaning of dairy heifer calves.

Average fecal scores (Figure 3) and the number of days of treatment for scours was similar for both dietary treatments. The incidence of disease was low for all calves.

## Implications

This experiment demonstrated that 30% dried egg product was successfully used to raise dairy calves, and BW gains were similar to that of calves receiving an excellent commercial milk replacer.

## Acknowledgement

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## Literature Cited

Kellogg, D.W., and E.E. Hatfield. 1992. Report submitted to American Dehydrated Foods, Inc., Springfield, MO.
Kellogg, D.W. 1999. Report submitted to American Dehydrated Foods, Inc., Springfield, MO.
NRC. 1989. Natl. Res. Council, Natl. Acad. Sci., Washington, D.C.
Scott, T.A., et al. 1999. J. Dairy Sci. 82(Suppl. 1):47.

**Table 1. Components of milk replacer designed with 30% spray-dried, feed-grade egg product[a] to meet or exceed nutrient requirements.**

| Ingredient | Egg protein,%, as fed basis |
|---|---|
| Dried egg product | 30 |
| Dried whey | 36 |
| Dried skim milk | 20 |
| Lactose | 10.7 |
| Poultry fat | 3 |
| Artificial flavoring | 0.1 |
| Availa-Zn[b] | 0.075 |
| Availa-Cu[b] | 0.011 |
| Manganese oxide | 0.007 |
| Vitamin ADE premix[c] | 0.08 |
| Vitamin E premix[d] | 0.2 |
| Neo-Terra, 10/5[e] | 0.1 |
| Selenium premix[f] | 0.0005 |
| Analysis* | |
| Crude protein | 26.2 |
| Crude fat | 14.9 |
| Calcium | 0.75 |
| Phosphorus | 0.69 |
| Vitamin A, IU/lb | 121,284 |
| Vitamin D, IU/lb | 7999 |
| Vitamin E, IU/lb | 657 |

[a] Spray-dried, feed-grade egg product (American Dehydrated Foods, Inc., Springfield, MO) contained 49.07% protein, 37.82% fat, 6% ash, 0.63% calcium, 0.71% phosphorus, 0.61% sodium, 0.58% potassium, 0.08% magnesium, 98 mg/kg iron, 5 mg/kg copper, 5 mg/kg manganese, 46 mg/kg zinc, 0.85 mg/kg selenium, 1.56 mg/lb thiamine hydrochloride, 18.28 mg/kg riboflavin, 2.009 mg/kg vitamin $B_6$, 115 mcg/kg vitamin $B_{12}$, 72.4 mg/kg pantothenic acid, 22.4 mg/kg niacin, 0.865 mg/kg folic acid, 3.542 mg/kg biotin, 2,110 IU vitamin A, 15.2 IU/kg vitamin E, 2.16% threonine, 0.68% tryptophan, 2.61% phenylalanine, 1.12% histidine, 2.82% arginine, 4.40% lysine, 4.22% leucine, 2.54% isoleucine, 1.81% methionine, 3.39% valine, 3.13% alanine, 1.23% cystine, 3.90% serine, 2.41% proline, and 1.92% glycine.

[b] Zinpro Availa-Zn[7] contained 10% zinc; Zinpro Availa-Cu contained 10% Cu.

[c] Vitamin ADE premix contained 4,000,000 IU/lb of vitamin A, 800,000 IU/lb of vitamin D, and 500 IU/lb of vitamin E.

[d] Vitamin E premix contained 20,000 IU of vitamin E.

[e] Neo-Terra 10/5 contained oxytetracycline, 5 g/lb, and neomycin sulfate, 7g/lb.

[f] Selenium premix contained 0.06% selenium and 35 to 40% calcium.

* Calculated values, as fed basis.

**Table 2. Composition of commercial milk replacer[a] used as control treatment.**

| Analysis | Milk protein, %, as fed basis |
|---|---|
| Crude protein | ≥20.0 |
| Crude fat | ≥20.0 |
| Calcium | ≥0.5 |
| Calcium | ≥1.0 |
| Phosphorus | ≥0.6 |
| Vitamin A, IU/lb | ≥35,000 |
| Vitamin $D_3$, IU/lb | ≥7,500 |
| Vitamin E, IU/lb | ≥150 |

[a] Merrrick's medicated calf milk replacer lists ingredients as follows: dried skimmed milk, dried whey, dried whey product, dried milk protein, animal fat (preserved with BHT), lecithin, dicalcium phosphate, vitamin A acetate, D-activated animal sterol (source of vitamin D3), vitamin E supplement, riboflavin, calcium pantothenate, niacin supplement, vitamin $B_{12}$ supplement, biotin, folic acid, ascorbic acid, magnesium sulfate, manganese sulfate, sodium selenite, ferrous sulfate, zinc sulfate, cobalt sulfate, copper sulfate, calcium iodate, sodium silico aluminate, and natural & artificial flavors. Active drug ingredients are oxytetracycline, 200 g/ton, and neomycin base (from neomycin sulfate), 400 g/ton.

**Table 3. Mean body weights and accumulative weight gains (losses) of calves by week of trial.**

| | Day | | | | |
|---|---|---|---|---|---|
| Replacer | 0 | 7 | 14 | 21 | 28 |
| Control[a] | | | | | |
| Body weight, lb | 94.4 | 93.2 | 96.1 | 102.3 | 108.1 |
| Egg protein[a] | | | | | |
| Body weight, lb | 93.2 | 93.4 | 95.4 | 102.8 | 106.7 |

[a] Means from control and egg-protein treatments did not differ (P > 0.10).

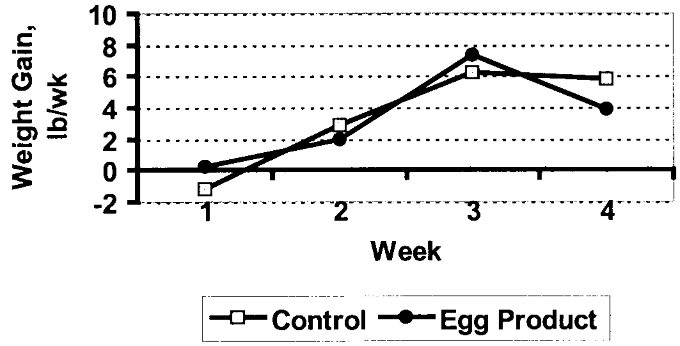


Figure 1. Weekly weight gains of calves.

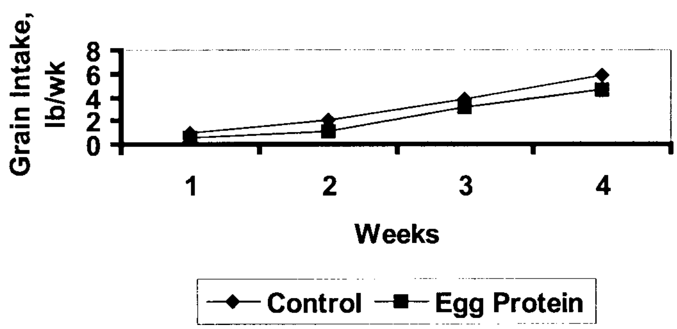


Figure 2. Weekly grain intake by calves.

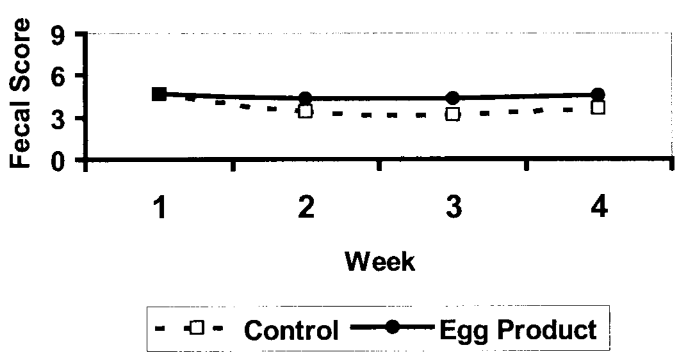


Figure 3. Fecal consistency scores.