# Dairy Split Session II

Feed Bunk Management
How to Get Good Nutrition in the Cow

**Dr. Ben Harrington,** *Presiding*

# Adjusted Corrected Milk

**Ken Nordlund,** *D.V.M.*
*Lake Region Veterinary Center, Ltd.*
*112 N. Cascade*
*Fergus Falls, MN*

### Introduction

Production medicine programs need a better yardstick. Production medicine programs need a basic unit of measurement. We need something precise, something as discrete as an inch, a fetal membrane slip, or a beta-hemolytic zone.

It isn't that we don't have numbers. No, our DHI reports have plenty of numbers. We have rolling herd averages, standardized mature equivalents, and income over feed costs. We have heat detection indexes. That isn't the problem. The problem is that some of these numbers seem to lack immediacy, directness, and sometimes accuracy.

My purpose here is not to belittle. Rather, I want to comment on using average milk production per day as a monitor of response to production medicine programs.

### Average Milk Production Per Cow Per Day

At first glance, average milk production per cow per day seems to be a simple matter. We should be able to generate this number daily on our dairy farms. I can look at my client's milk pickup slip and see 6,314 pounds, which would represent two days production. When I ask how many cows he is milking, he may say with confidence, "Fifty-two!" I will then ask if there are any corrections or additions to the report, and by the time we figure when the last fresh cow went on line, when the last mastitis treatment cow came off line, how much milk is going to the calf barn, and how much the neighbors purchased, the directness of this number takes on a new meaning. Yet even if we can determine the average pounds of milk per cow per day, we still lack certain information to make meaningful comparisons to herd performance at another time.

The DHI record reports average milk production per cow per day. It is important that we find the report that averages production of the MILKING COWS ONLY, and excludes dry cows from the averages.

Examination of a client's record produced the following table:

| Date | Avg. Days In Milk | Avg. Lbs. | Avg. % Fat | DHI-RHA |
|---|---|---|---|---|
| Sep. 84 | 201 | 49 | 3.7 | 15,784 |
| Oct. 84 | 167 | 52 | 3.6 | 15,869 |
| Nov. 84 | 129 | 53 | 3.9 | 15,716 |
| Dec. 84 | 111 | 60 | 3.4 | 15,684 |
| Jan. 85 | 104 | 62 | 3.3 | 15,891 |

This looks pretty easy.

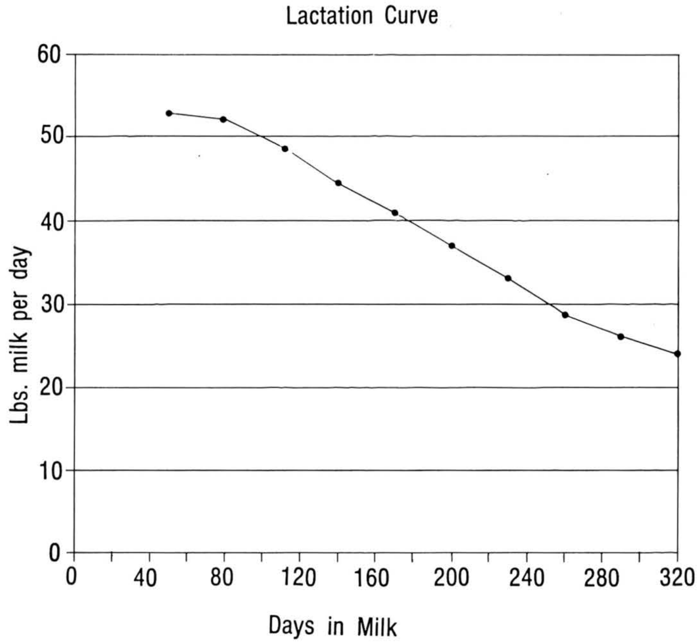
To all appearances, this herd is coming along nicely. The average production per cow per day has risen from 49 lbs. in September to 62 lbs. in January. The rolling herds average seems stable. If we have started a new ration or feedstuff or feeding management technique, can this average milk figure be used to evaluate progress?

The sad news is that by itself, it can't. The herd above is actually in a production decline. As veterinarians who deliver production medicine programs, we need to spot this trend when it begins, not six months later when the rolling herd average begins to reflect it.

So when is the decline? Pounds of milk per cow has shown a very strong increase and the dairyman pleased. Yet there are two other numbers of importance here: average days in milk (ADIM) and %Fat.

The average days in milk tends to be a highly variable number in our relatively small midwestern dairy herds. It is common for ADIM to range from 100 to 200 days as in the example above, and this range needs to be adjusted for in our evaluation of sample day milk production.

We are all familiar with the typical milk production curve. Using data from Minnesota DHIM (1), a predicted curve is graphed below:




If we calculate the % decline from month to month throughout this lactation, the decline is quite variable.

| Average DIM | Predicted lb. milk | % Decline from prior month |
|---|---|---|
| 50 | 52.9 | |
| 80 | 52.2 | —1% |
| 110 | 49.0 | —6% |
| 140 | 44.5 | —9% |
| 170 | 41.0 | —8% |
| 200 | 37.0 | —10% |
| 230 | 33.1 | —11% |
| 260 | 28.7 | —13% |
| 290 | 26.1 | —9% |
| 320 | 24.0 | —8% |

Yet most of our herds will lie somewhere between 100 and 200 ADIM. If we average the decline throughout this period, we find a decline of about 8.7% per 30 days, or 0.29% per day. We can therefore manipulate the raw milk weights to reflect ADIM by adjusting them to a constant ADIM. I have arbitrarily chosen 150 days for my records, but any appropriate standard will do. The formula would be:

150-DAY ADJUSTED ADIM MILK = Sample Day Milk + ((ADIM - 150) x 0.0029) x Sample Day Milk)

However, our adjustments should not end here. The second factor concerns %fat. Frequently our nutrition programs have a goal of reducing health problems associated with inadequate fiber. Typically the herd will respond with small decreases in milk flow and large increase in percent butterfat. Four percent fat milk is worth more than 3% milk and these variations should be reflected in our adjustments. Formulas for adjustment of variable butterfat to constant percent fat standards are well known. Below is the formulas for conversion of raw milk to equivalent weights of 3.5% fat-corrected milk:

3.5% FCM = (.432 x lb. milk) + (16.23 x lb. fat)

If we combine the formulas to adjust for ADIM and 3.5%FCM, we can produce a number by which we can measure progress. While it might be called 150-day ADIM adjusted, 3.5% fat-corrected milk, it is probably simpler to call it Adjusted Corrected Milk (ACM).

ACM = (0.432 x lbs) + (16.23 x (lbs x %fat / 100))) + (((ADIM - 150) x .0029) x lbs)

After all that, let's take another look at the herd record with which we started this discussion, but with a new column containing average Adjusted Corrected Milk per cow per day.

| Date | ADIM | Lbs. | % Fat | ACM | DHI-RHA |
|---|---|---|---|---|---|
| Sep. 84 | 201 | 49 | 3.7 | 57.8 | 15784 |
| Oct. 84 | 167 | 52 | 3.6 | 55.4 | 15869 |
| Nov. 84 | 129 | 53 | 3.9 | 53.2 | 15716 |
| Dec. 84 | 111 | 60 | 3.4 | 52.2 | 16584 |
| Jan. 85 | 104 | 62 | 3.3 | 51.7 | 15891 |

If we again evaluate these figures, we see that this herd has not made progress. The increase in raw lbs. of milk is due entirely to reduced average days in milk. In fact, from the standpoint of a production medicine program, this herd is in a decline. Monitors such as the rolling herd average will not reflect this trend for several months, long after the damage is done and too late for timely intervention.

This number can be calculated rather easily on regular herd visits. Concerning only the days-in-milk adjustments, a figure of a 9% decline per month or 3% per 10 days can be used as a rule of thumb. The more complex formula adjusting both days-in-milk and fat content can easily be programmed into computer spreadsheets or programmable calculators, or it can also be calculated step by step with an ordinary calculator. It is a very dymanic number that allows us to measure responses, both positive and negative, to many of the changes initiated by production medicine programs.

The formula that is proposed needs refinement. It is based upon a standard milk production curve of raw milk weights. Standard milk production curves based upon fat-corrected milk should be established. As is, the formula probably lowers excessively production in situations of very low average days-in-milk. The formula should also be modified to adjust for the influence of changing proportions of first lactation heifers within the herd.

**Terms:**

Lbs = average lbs. milk per cow per day (milking cows only)

ADIM = average days in milk (milking cows only)
%BF = herd average butterfat percent

### Assumptions:

Milk production will decline at a rate of 8.7% per 30 days (1), or 0.0029% per additional day in milk. It is assumed that the formula will be applied only to herds where the average days in milk is between 100 and 220 days.

### Summary of Formulas Used

3.5% Fat-corrected milk

3.5% FCM = (.432 x lb. milk) + (16.23 x lb. fat)

150-Day Adjusted ADIM Milk

150-DAY ADJUSTED ADIM MILK =

Sample Day Milk +

((ADIM - 150) x 0.0029) x Sample Day Milk)

Adjusted Corrected Milk (2)

ACM = (0.432 x lbs) + (16.23 x (lbs x %BF / 100))) + (((ADIM - 150) x .0029) x lbs)

### References

1. "Predicting Next Month's Milk Yield", Steuernagel, G.R., and C.W. Young. 1980 Minnesota Dairy Report, Agricultural Extension Service, University of Minnesota, St. Paul, MN. 2. The idea emerged in conversations with Tom Sawyer, Animal Nutrition, Inc., 6608 West Main St., Belleville, Illinois 62223 and Dr. Chester Rawson, Box 247, Hazel Green, WI 53811.

# Abstracts

## Effect of heat treatment on the surface antigens of *Haemophilus pleuropneumoniae*

K. R. Mittal, R. Higgins, S. Larivière, G. P. Martineau

Veterinary Record (1987) **120**, 62-65

**Coagglutination and ring precipitation tests were used to study the effect of heat on the surface antigens of *Haemophilus pleuropneumoniae* strains employing the reference strains belonging to serotypes 1 to 7 and field isolates belonging to serotypes 1, 2, 3, 5, 6 and 7. By immunising rabbits with formalin-fixed whole-cell suspension, antibodies were obtained which sensitised Cowan I *Staphylococcus aureus* to coagglutinate antigen preparations which had not been heated, or heated at 56°C, or boiled or autoclaved. Similar positive reactions were obtained with the ring precipitation test. Heating the cultures at 56°C for one hour was best for exposing the most potent serotype-specific antigens in all the strains studied. All the reference strains and most of the field isolates possessed the thermostable type specific antigens which could withstand autoclaving for one hour. However, many field isolates belonging to serotype 1 did not possess this antigen. The apparent antigenic heterogeneity of serotype 1 strains based on the presence or absence of these thermostable antigens could be valuable in epidemiological investigations. It was shown that most potent serotype-specific antigens are present as freely diffusible material on the surface layer of the bacterial cells, which could easily be removed by washing in saline solution. Well washed bacterial cells devoid of surface materials are poor antigens. It is recommended that test strains should not be heated above 56°C for serotyping because higher temperatures are liable to destroy the capsular antigen of some strains and render the culture untypeable.**

## Preliminary results of treatment and endocrinology of chronic endometritis in the dairy cow

R. T. Pepper, H. Dobson

*Veterinary Record* (1987) **120**, 53-56

**Cows with chronic endometritis were treated by using uterine irrigation, prostaglandin or oestradiol benzoate. An attempt was made to relate the success of treatment to the nature of the discharge. No statistically significant differences were demonstrated between the different treatments, nor did the severity of the disease as judged by the amount of pus in the discharge affect the success of treatment. Progesterone and in some cases a metabolite of prostaglandin were measured in a milk sample taken at the time of treatment. Increased prostaglandin concentrations were found in 69 of 71 samples examined but they were not correlated with the progesterone concentrations. These measurements from cases of endometritis were higher than those from normal cows in the immediate post partum period and during established oestrous cycles. Treatment with prostaglandin when the concentration of progesterone was high was not more effective than when progesterone concentrations were low. Treatment had less influence on the subsequent fertility of the cow than other factors investigated; in particular, the sooner after calving the cow was treated the greater was the chance of success. This was thought to be due, at least in part, to the high rate of spontaneous recovery. Before treatment can be evaluated effectively a method must be found to identify persistent cases.**