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# Managing the high producing dairy cow for maximum production and minimum disease

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## Introduction

Helping the high-producing dairy cow to produce the maximum amount of milk during a lactation (or a lifetime) requires the finely tuned management of nutrition, housing, and disease risk. These three management areas are tightly interrelated and need the greatest attention when the cow is transitioning from the non-lactating to lactating stage. For example, poor housing or a cow movement problem during parturition can magnify a minor nutritional imbalance. The magnification of a minor nutritional imbalance can then result in metabolic disease becoming subclinical or clinical. The subclinical or clinical impact of disease often has a negative feedback on the nutrition program which results in further nutritional stress on the cow and a greater degree of metabolic disease. This is called the “Drain-O-Effect,” where one small problem results in a larger problem, and the chain of events continues between multiple management areas with the result being the loss (culling or death) of the cow.

An area of equal importance for maintaining high production and longevity is the control of infectious disease. Three strategies are used in combination to control the impact of infectious disease:

- Traditional vaccination programs for various infectious agents
- The use of biosecurity principles to prevent and/or detect the introduction of specific infectious agents into a dairy operation or reduce transmission on a dairy
- A well-developed management program to minimize animal stress

This paper will focus on the major stresses on pre-fresh and fresh cows and management’s role in monitoring, controlling, and reducing the risk associated with various stresses.

## The major management areas

### Nutrition

Nutritional management at parturition is complicated by five factors:

- The complexity of the ruminal digestive system, with the ability of the rumen’s micro flora and the ruminal papillae to change and adapt to different rations
- The ration transition at parturition from a low protein/carbohydrate with high fiber ration to a high protein/carbohydrate with minimal fiber ration
- The 25% drop in dry matter intake during the week prior to parturition and then the 200% increase in dry matter intake in the three weeks after parturition
- The disproportional increase in lactation energy demands versus energy intake, which requires the rapid mobilization of protein and energy from body reserves
- The indirect complications of nutritional management which evolve around feed inventories, costs, quality variations, and delivery management

### Housing

The housing management at parturition is complicated by three factors:

- The requirement that cows be housed in different groups based on whether they are lactating, non-lactating, or soon to be lactating
- The fact that the number of animals within each group is often smaller than management is able to justify based on investment cost or feeding management
- The difficulty of justifying additional investments or expenses associated with the non-lactating (and, therefore, non-revenue generating) cow

### Pre-fresh and fresh cow diseases

Parturition is the highest risk period for disease, culling, and reducing potential milk production.

Diseases associated with the parturition event itself include the following:

- Difficult calving, e.g., uterine torsion, emphysematous calve, physical abnormalities, twins
- Nerve paralysis
- Retained placentas
- Metritis

Metabolic diseases include the following:

- Parturient paresis-hypocalcemia, hypomagnesemia, and hypophosphatemia
- Fatty liver disease/ketosis
- Subclinical acidosis
- Displaced abomasum
- Laminitis

Each of these metabolic diseases can be prevented with the proper management of nutrition, housing, and handling. The key is to have management strategies in place that both reduce the likelihood of metabolic diseases developing and detect the development of the metabolic disease at an early subclinical stage.

## Nutritional strategies for maximum production with minimum disease

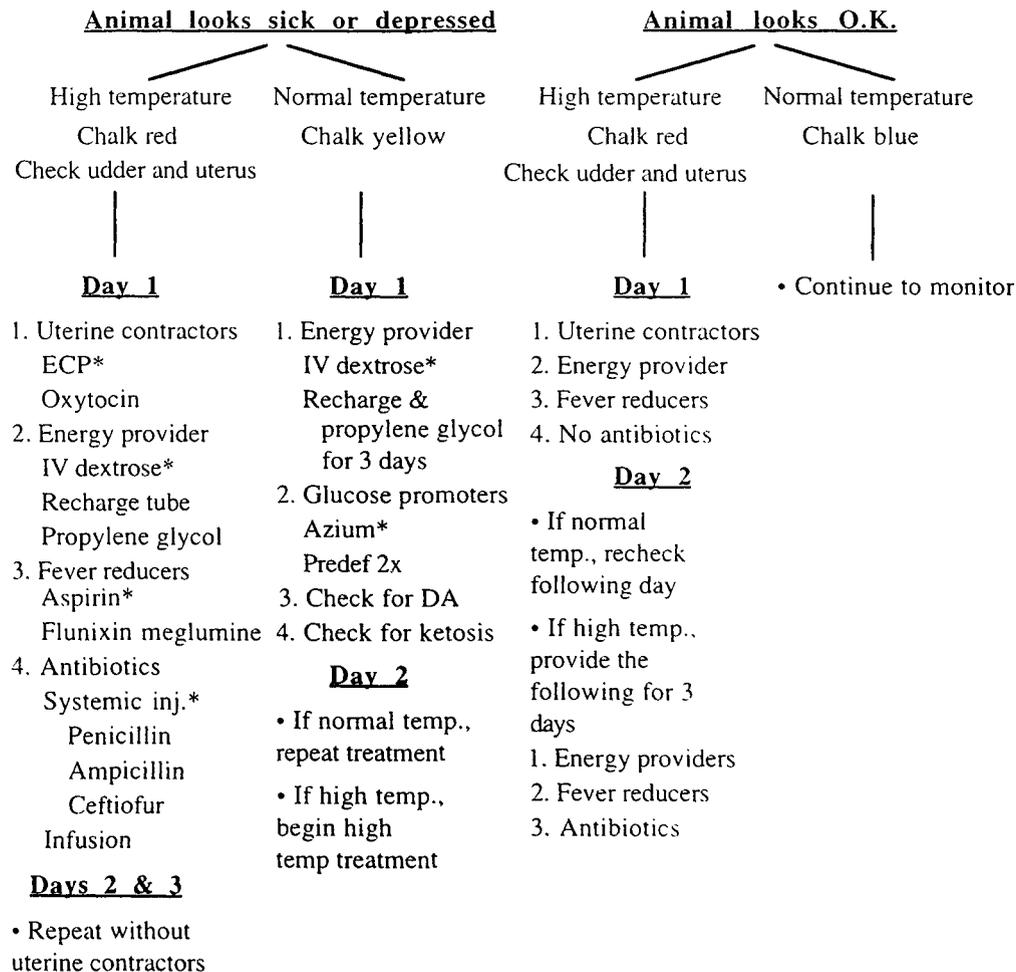
Peripartum nutrition is used to control all metabolic diseases and maximize milk production. The following underlying principles should be employed.

### **Anionic salt feeding**

Anionic salt feeding should be implemented for second and greater lactation animals in order to:

- Control parturient paresis
- Reduce the likelihood of indirect disease (i.e., retained placentas, metritis, displaced abomasum)

Figure 1: An example of a fresh cow observation and treatment program. Note that the temperature of all fresh cows should be monitored for the first 10 days after calving. High temperature  $\geq 103^{\circ}\text{F}$  for cows,  $\geq 102.5^{\circ}\text{F}$  for heifers. (Scheme adapted from Dr. G. Lynn Upham's program: *Example of a Fresh Cow Program: A Splendid Dairy.*)



\*Most commonly used choice within each class. Choose only one treatment option from each class of treatments, that is, *do not* administer both aspirin and Flunixin meglumine for fever reduction.

- Allow feeding of higher energy rations more closely resembling the fresh cow rations in both chemistry and feed ingredients

The anionic salt feeding program should be monitored weekly by checking urine pH for animals ready to freshen in the next two weeks. Dry matter intakes should be monitored daily to catch palatability problems.

### **High protein and energy rations along with long particle size feed ingredients**

High protein and energy rations are fed the last 3–5 weeks before freshening in order to:

- Minimize mobilization of fat deposits prior to freshening in an effort to reduce the likelihood of developing fatty liver disease and ketosis
- Allow adaptation of the rumen microflora and rumen papillae to higher concentrate rations, thus reducing the likelihood of developing subclinical acidosis

The 3–5 week transition ration feeding period allows cows that calve early to have a higher likelihood of being on the transition ration. The long particle size helps to maintain a protective rumen fiber mat which can be maintained through the day of freshening when dry matter intakes may drop to less than 50% of the previous day's intake.

The program is monitored by taking the following measures:

- Checking rumen pH as needed
- Evaluating health and culling of early lactation animals
- Checking days in pre-fresh pen
- Evaluating early lactation production data

### **The fresh cow ration**

High protein and energy ration with a slight excess fiber level and long particle size is fed post-freshening in order to:

- Continue the transition of first lactation cows for a 2–4 week period
- Continue the transition of second and greater lactation cows for a two week period
- Allow cows that freshen with problems the ability to recover prior to being placed on the high cow ration
- Allow the ability to feed additional buffers and high cost ingredients to a minimum number of animals

The program is monitored by taking the following measures:

- Checking rumen pH as needed

- Evaluating health and culling of early lactation animals
- Evaluating early lactation production data

### **Higher vitamin and mineral levels**

Higher vitamin and mineral levels are fed to the pre- and post-freshening animal in order to:

- Maintain adequate serum levels due to predictable drops near calving
- Reduce the herd levels of retained placentas, metritis, hypomagnesemia, and mastitis

Serum levels of vitamin E and selenium should be monitored.

### **Housing and handling strategies for maximum production with minimum disease**

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Peripartum housing and handling strategies are used to control all metabolic diseases and maximize milk production. The following underlying principles should be employed:

#### **Minimize the movement and regrouping of animals prior to freshening**

- Heifers should be moved to the close-up pen 4–5 weeks prior to freshening.
- Cows should be moved to the close-up pen 3–4 weeks prior to freshening.
- Animals should be allowed to freshen in the pre-fresh pen; they should not be moved to individual pens.
- At freshening, animals should be moved to the fresh pen for 2–5 weeks.
- After the fresh pen, cows and first lactation heifers are placed in separate high production pens to minimize competition and deliver different rations.

#### **Minimize crowding in pens pre- and post-calving**

- Pre-fresh cows should be stocked at 100% for 2.5 foot headlocks, 90% for 2 foot headlocks.
- Fresh pens should never be stocked over 100%.

#### **Vaccinations**

All vaccinations and injections should be performed at least 2–4 weeks pre-freshening or 2–5 weeks post-freshening.

**Observations**

The pre-fresh pen should be observed every 1–2 hours to determine if an animal needs assistance. The post fresh animals (1–4 weeks fresh) should be evaluated as follows:

- Twice daily for milk production and mastitis
- Daily for rectal temperature, consumption, appearance, and attitude (until marked OK)
- Weekly rectal palpation (until marked OK)

**Monitoring**

Monitoring is used to prevent problems, detect problems, and gauge the success, deficiencies, and failures of management strategies. Numerous monitoring programs have been mentioned in the above discussions, the following are two examples of many possible.

**Monitoring of early lactation culling: An example**

Monitoring early lactation disease between dairies is a difficult program to design because each dairy's ability to detect and define a disease is different. For example, two dairies may have an observed ketosis rate of 5%. However, one dairy is finding 100% of their cases of ketosis while the second dairy is only detecting 30% of their ketosis cows. Comparisons between dairies becomes pointless.

An indirect method we use to evaluate early lactation management and metabolic disease is the death and culling rates for cows 30, 60, 90, and 120 days in milk. Because cows in early lactation are typically the most

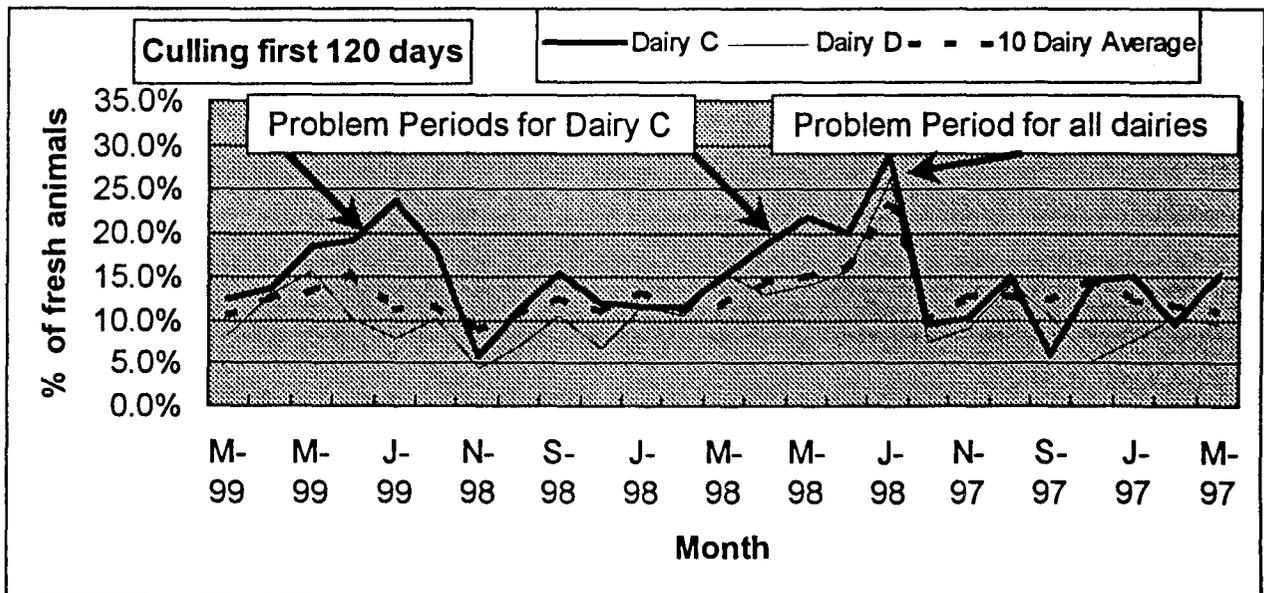
profitable, cows are seldom culled in early lactation voluntarily. Rather, culling of cows in early lactation is often a forced decision because of health issues. Therefore, monitoring of early lactation culling becomes a proxy for determining how well the non-lactating to lactating transition is being managed. It does not determine the specific problem or cause, but it indicates an investigation of the transition management is needed.

The history pertinent to the culling information is shown in **Figure 2**, beginning with May, 1999 and moving back in time to May, 1997.

- During January 1998, the region received two 12-inch snow falls; the snow remained in the open corrals for five weeks. Several dairies lost electrical power for 36 hours. Dairy C's electrical generator did not work and they were unable to milk for 36 hours. Animals most sensitive to higher concentrate/lower forage feeding were the recent fresh animals.
- Dairy C fed cows with a partial total mixed ration (TMR) (i.e., grain and forage was placed in the TMR and additional hay was feed outside the TMR). In January 1998, based on monthly inventory measurements, only 65–70% of the hay that should have been fed was actually fed.
- From November 1998 to March 1999, dairy C calved an excessive number of first lactation animals. Because of the large number of first lactation animals calving, the animals were placed on the pre-fresh transition ration for variable periods of time (0–14 days).

The information in **Figure 2** indicated that a problem in early lactation was present; utilizing additional informa-

Figure 2. A graph of the first 120 days in milks culling for 2 dairies and the average of 10 dairies.



tion from the dairy helped determine the cause. The problems were not prevented, but management gained a greater understanding of the issues and financial costs. This understanding has helped to motivate changes to prevent similar problems.

**Monitoring early lactation production: An example**

A second indirect method we use to evaluate peripartem management of heifer and cow groups is the milk production at first test (19 days in milk, on average). A healthy, well transitioned cow in early lactation is expected to produce milk near its genetic potential. Monitoring the first test for first, second, and subsequent lactation animals allows us to evaluate the transition for groups of animals which are managed. **Table 1** shows the first test production numbers for five dairies.

- Dairies D and E fed the same transition ration to pre-fresh cows and heifers; the pre-fresh heifers were housed at the same location, and pre-fresh heifers were moved to the pre-fresh cow pen 3–7 days prior to calving. However, to move the heifers to dairy D required a walk down a lane while moving the heifer to dairy E required being loaded on a trailer and being hauled one mile.
- Dairies D and E changed their ration for the pre-fresh heifers in mid-April to a higher energy ration.
- Dairy F increased herd size (20%) and was crowding their pre-fresh pen along with not having adequate time for the pre-fresh heifers and cows to spend on the pre-fresh ration. In mid-April, the dairy started another pre-fresh pen which allowed the cows and heifers to spend 3–5 weeks on the pre-fresh ration before freshening.
- Dairies A and J changed their pre-fresh rations to a lower energy ration. Dairy A changed the ration in mid-April; Dairy J changed the ration in mid-January. In March, rumen pHs were taken in the fresh pen of Dairy J which showed subacute acidosis was occurring; the fresh cow ration was changed.

The information in **Table 1**, along with knowing the individual dairy management changes over this period, helps us build our overall knowledge base on managing the transition dairy cows. Dairies D, E, and F saw an increase in the first test for the first lactation group when the pre-fresh ration was increased in energy and/or the ration was fed for a longer period of time. Dairy F showed an increase in first test for all lactation groups, with the increase time spent on the pre-fresh ration. Dairies A and J saw a decrease in first test, with a decrease in energy of the pre-fresh ration. Dairy J saw an increase in subclinical acidosis in the fresh pen associated with the decreased energy of the pre-fresh ration. Also, note the impact of loading and hauling pre-fresh heifers near calving seems to have on first test (dairy D versus dairy E). Having this

**Table 1. First test milk averages for five dairies, by lactation groups.**

Dairy D	May	April	March	February	January	December	November
Lact = 1	70		56	61	56	55	51
Lact = 2	87		99	87	90	65	80
Lact > 2	91		93	96	96	78	85
Dairy E	May	April	March	February	January	December	November
Lact = 1	61		54	54	50	46	49
Lact = 2	94		85	89	83	78	74
Lact > 2	86		89	88	88	74	77
Dairy F	May	April	March	February	January	December	November
Lact = 1	57	53	46	50	47	48	49
Lact = 2	93	92	85	86	84	86	75
Lact > 2	98	95	87	90	85	91	78
Dairy A	May	April	March	February	January	December	November
Lact = 1	48	59	59	61	58	55	56
Lact = 2	71	95	79	73	82	78	82
Lact > 2	69	93	86	82	82	86	79
Dairy J	May	April	March	February	January	December	November
Lact = 1	54	56	50	53	60	59	58
Lact = 2	88	93	85	88	84	90	85
Lact > 2	88	95	89	92	90	92	89

information from all the dairies greatly increases our understanding and confidence in what we learn when compared to only seeing the numbers from individual dairies.

## **Conclusion**

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The focus of management is to maximize profit, both short- and long-term. On a dairy, managing a cow for maximum production with minimum disease is one of the keys to high profits. Nutrition and housing are key factors for managing production and disease. It is apparent we do not always succeed in managing well, but when we don't succeed, we do expect to learn why we failed. We learn this through monitoring performance parameters on individual dairies and comparing between dairies. This increased knowledge base from both failures and successes allows us to modify management strategies to improve future performance.

