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# Nutritional Management of the High-Producing Dairy Cow in the 21st Century

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This NebGuide discusses important aspects of grouping and feeding systems, body conditioning and nutritional requirements for high-producing dairy cows.

An effective feeding system allows maximum intake of a nutritionally balanced ration. The use of production-enhancing compounds, such as Bovine Somatropin (BST), makes proper nutritional management of high-producing dairy cows even more critical. This NebGuide discusses important aspects of grouping and feeding systems, body conditioning and nutritional requirements for high-producing dairy cows.

As herd production levels continue to improve along with herd size, meeting the nutritional needs of the lactating dairy cow is an increasing challenge for modern dairy producers. Within a given herd a producer usually has cows at varying levels of production within different stages of lactation. Both of these factors result in differences in nutrient requirements. In addition to milk production, it is also important to supply nutrients needed for reproductive purposes - most notably conception and pregnancy. Proper nutrition is also required to ensure cows can properly ward infections such as mastitis and prevent metabolic problems such as milk fever and ketosis. A cow nourished properly will be in better physical condition and best suited to handle the stresses of high milk production. Therefore, the feeding system must undergo examination as production levels increase, not only for maximum milk production but also for the physical well-being of the animal.

## Grouping Strategies

Several management and physical changes may be needed in the dairy operation to adequately feed the high-producing cow. One of the most effective ways to feed cattle to meet their production potential is to house, feed and manage them in groups.

*Dry Cows*

Over the past several years considerable research has been conducted on dry cows, in particular transition cows (i.e. the first three weeks before calving). Clearly the most common grouping strategy is to group cows based upon time before calving. Prepartum cows are usually grouped in a far off dry and a close-up transition group. The Transition group includes cows at approximately 21 days before expected calving. This division allows the use of higher ration energy and protein levels during a time when they are needed and intake begins to decrease. In addition this division accommodates the targeting of some feed additives to a high risk group of animals and may include yeast, b-vitamins or anionic salts.

*Lactating Cows*

Currently there are several criteria used to group lactating dairy cows. These include:

1. level of milk production
2. age or lactation number
3. days in milk or stage of lactation
4. reproductive status

Although the choice of the most appropriate grouping strategy may be farm specific, the most commonly recommended strategy is grouping by level of production. If employed, rations can be formulated and delivered to the group currently producing the specified level of milk production. The practice may allow efficient use of the feed inventory since top quality higher-priced feeds may be targeted for the top producing cows whereas poorer quality lower-priced feeds may be fed to lower producing cows. Grouping by production level also offers the advantage of being able to better manage feed allocation so as to not underfeed top producing cows or overfeed low producing cows. Of course, increasing the number of groups and associated rations also increases the time needed to formulate and mix rations; however, the

increases in milk yield and persistency should outweigh these disadvantages.

Younger animals usually have a lower intake and are faced with the social challenged of integrating into the herd. When producers decide to separate first calvers from the larger more mature animals they are able to provide younger animals a higher nutrient dense ration in a less threatening environment. By employing this practice first calvers may be more willing to visit the feedbunk and avoid an environment where they may be bullied by larger more mature animals. Providing a unique diet to this group allows the producer to provide a greater nutrient density that may also compensate for maternal growth requirements.

An additional strategy is to group cattle in quartiles. Specifically, this is grouping cattle into the top 25 percent of the herd for production in one group, the second 25 percent in a second group and so on. Many producers also choose to separate the first lactation cows so that they may be monitored more closely during early lactation and may regroup them as they near the end of lactation. Grouping herds by level of production also may result in efficient use of milking parlor since groups should be milked out more uniformly and at similar times. In addition, the reproduction checks, breedings and pregnancy checks will tend to be concentrated in the higher producing groups, thereby increasing the efficiency of both veterinarian herd health checks and routine reproductive checks.

There is increasing interest in grouping based upon reproductive status, either open or bred cows. Again this division may accommodate the targeting of some feed additives or ingredients.

## Body Condition Scoring

An important component of any feeding system is to properly monitor the body condition score (BCS) of cows. Body condition should be recorded during the first month of freshening. Routine recording of BSC is a valuable aid in monitoring the nutrition and management program. The BCS during the first two months of lactation is critical and milk production peaks may be lower in poorly conditioned cows. In contrast, over conditioned cows may be susceptible to metabolic disorders, mastitis or reproductive problems. In most cases, a trained unbiased observer will objectively assess your herd's body condition. Perhaps your DHI supervisor, veterinarian or another dairy producer in your area would be willing to review your herds' BCS. Lastly, scoring cows in late lactation will allow you to assess your nutrition and management practices, which may need to be adjusted if cows are either under or over conditioned.

## Production Records

An effective assessment of a nutrition program requires accurate routine production records that include milk yield, fat and protein production. The composition of milk produced is influenced by the amount of energy supplied as well as amount and type of protein and amino acids supplied. As a consequence estimated of herd performance is needed to match the nutrients supplied in the ration with the expected level of fat and protein production. Accurate body weight data also may be useful in balancing rations and may be monitored to evaluate changes in body tissue reserves.

## Nutritional Strategies For Feeding the High-Producing Cow

Dairy cows in early lactation will be in negative energy balance. That is, the cow does not consume enough nutrients to meet the energy demands of lactation. Feed intake typically lags behind peak milk production by eight to 10 weeks, resulting in a net loss of body condition. As a consequence, factors that act to increase feed intake usually elicit a milk production response.

There are an array of factors that enhance feeding activity and increase intake. One of the most critical factors affecting feed intake is the availability and timing of feeding. Clean feed and water should always be available to lactating cows. Feedbunks should be kept clean to avoid spoilage that may reduce feed intakes. Shading of the feedbunk may also be useful by reducing heating and spoiling of silage contained in the ration.

## Nutrition Requirements For High Milk Production

Suggested nutrient requirements for a 1,300 pound dairy cow producing 4 percent milk fat milk is outlined in *Table I*. Considerations specific to the high-producer are discussed below.

### *Energy*

High quality forage is necessary for a proper lactating cow's ration. In general this means using alfalfa forage of no more than 40 percent NDF and at least 20 percent crude protein. If high quality forage is unavailable in the necessary quantities many byproducts such as dried distillers grains, whole cottonseed, citrus pulp or beet pulp may prove to be valuable alternatives. Diets containing high levels of grain may cause metabolic disturbances such as rumen acidosis, and may ultimately result in lameness and low milk fat production. To avoid these problems, energy may also be added to the diet by feeding fat. Details of feeding added fat sources to dairy cattle are given in the NebGuide G1581, Supplemental Fat for High Producing Dairy Cows.

### *Protein*

The crude protein content of the total diets that is required for high levels of milk production (i.e.>90 lbs/d) may exceed 16 percent (DM basis). Of this usually 30 to 35 percent should be undegradable in the rumen to maximize protein utilization and amino acid supply to the animal. Common sources in bypass protein include heat treated soybeans of soybean meal, distiller's grains, feathermeal and bloodmeal.

**Table I. Complete ration nutrient requirements for cows at various levels of production.**

| *Nutrient* | *High (93 lb)* | *Medium (70 lb)* | *Low (47 lb)* |
|---|---|---|---|
| $NE_L$, Mcal/lb | 0.78 | 0.73 | 0.69 |
| Crude protein,% | 17.0 | 16.0 | 15.0 |
| Acid detergent fiber,% (minimum) | 19.0 | 21.0 | 21.0 |
| Neutral detergent fiber,% (minimum) | 26.0 | 28.0 | 28.0 |
| Ether extract (fat), % | 3.0 | 3.0 | 3.0 |
| Calcium, % | .7-1.2 | 6-1.2 | .53-1.2 |
| Phosphorus, % | .45-.65 | .40- .60 | .35-.55 |

Source: Nutrient Requirements of Dairy Cattle. NRC. 2001.

*Fiber*

The fiber levels given in *Table I* are suggested minimum levels for a total mixed ration. When diets contain less than recommended fiber level, metabolic disturbances that result in low milk fat levels may result. Meeting the fiber requirement for high milk production is not only a matter of level, but of particle size as well. Forage which has been ground too fine will not maintain normal rumen function and milk fat tests. When evaluating a TMR, the proportion of material retained on the top screen, of the Penn State Particle Separator (PSPS), or particles> 19.0-mm, is often considered. This is because the intake of dry matter from this portion of the diet is known to be positively correlated with ruminating activity has been demonstrated to be negatively correlated with rumen pH. The current recommendations indicate the amount of TMR retained on the top screen of the PSPS should be 2 to 8 percent.

Specific nutrient requirements for all production levels are given in the National Research Council's publication *Nutrient Requirements of Dairy Cattle 2001*. This information is available through extension offices and some feed companies.

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