

**Life Cycle Feeding
(Dairy Section)**

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Life Cycle Feeding of Dairy Cattle

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The title of this paper, "Life Cycle Feeding of Dairy Cattle," implies that a total course or textbook on dairy feeding can be summarized in a few pages. Likewise, the time allotted on the program would indicate that the total subject of dairy feeding is going to be covered in less than one hour.

The major objective must be simply a summary of major points in feeding dairy animals of different ages and different stages of production and reproduction. Primarily then, this discussion could be called thumb rules for feeding. The discussion will largely be devoted to those thumb rules that are either changed, emphasized or developed because of new research or observations.

Thumb Rules Are Guides But Not Total Answer

Everyone recognizes that we are living in the age of very specialized, highly technical and generally complicated time. Yet, we are all faced with the need for easy, simple and uncomplicated answers. Veterinarians could give numerous examples of the dairyman who says "Doc, give me the simple answer, not the technical one." Obviously, you try, but you recognize that simplicity results in inadequate explanation and, to at least some degree, inaccuracies. You are also very familiar with the general statement, "All the vet does is give a shot of antibiotics." The implication, of course, is that no one really knows anything about "sick cows" thus, the thumb rule "give her antibiotics" is accepted by the untrained and many of the herdsmen as the total summary of veterinary medicine.

The trained and experienced, however, know that the antibiotic "thumb rule" is not the answer. In fact, the mere existence of the thumb rule can lead to disaster. The more training and experience you get, the more inaccurate or less confidence you have in the thumb rule. Soon you realize that the exceptions to a general rule become more numerous than the applications.

The change that occurs is another point that emphasizes the problem with any general thumb rule. A specific drug may be the

answer or rule of thumb treatment for a specific problem. However, a new drug may make the old one obsolete or a new variety of resistant "bugs" may make the old one obsolete even though a new one is not available.

The only reason for this discussion is to emphasize, by familiar examples, that thumb rules are not the total answer. Also, the more general or more simple a feeding thumb rule is, the more inadequate it will be when it is subjected to critical test. If, for example, a thumb rule states that "urea can be fed to a cow," there are numerous conditions that will prove the thumb rule is inadequate. If the thumb rule is made more accurate by stipulating conditions and restrictions for the use of urea, the thumb rule is complicated; then interpretation and use of the thumb rule become more difficult and, for some, even impossible. However, it should also be emphasized that making a general thumb rule that "urea cannot or should not be fed" can be proven just as wrong as a general positive rule that says it can be fed.

Feeding Calves

For many years colostrum has been designated as an essential feed for newborn calves. The development of good milk replacers and general use of antibiotics and other drugs both in the feed and as preventative treatment have led to some questions recently on the value of colostrum. At the same time, mounting calf losses in larger herds and in operations by specialized calf growers have resulted in recent rebirth of the necessity of colostrum feeding. The value of colostrum as a preventative medicine and as a source of nutrients has been re proven and even increased. It is now generally accepted that colostrum must be provided and the sooner the better. Although the calf can absorb antibiotics for several hours efficiently, the protection is needed much sooner. Thus, providing colostrum within the first half hour is now the "thumb rule" — this is especially applicable in an environment where calf raising is a known problem.

Another general "thumb rule" for calf feeding requires milk or milk products as the primary source of nutrients for the first few weeks. Saturated fats have successfully been used to replace milk fat. Likewise, other animal proteins and specially prepared plant proteins have been used by research workers to replace all or part of the milk protein. However, for practical use the general suggestion at this time is still milk or milk products such as dried skim milk, whey, dried buttermilk and casein for the first few weeks.

Once-per-day feeding has been proven as an alternative system for feeding milk or milk replacer. However, providing water and a good calf starter, as well as attention by the herdsman more frequently than once-per-day, are restrictions on this simple "thumb rule."

Feeding Heifers

The general suggestion most often heard in recent years on heifer feeding concerns overfeeding. The problems of decreased production

and possibly shorter lifetime due to overfattening, have been proven. However, the actual existence of overfeeding of heifers on many farms has not been established. Again, the general thumb rule of avoiding overfeeding has been interpreted by some to mean that underfeeding should be practiced. At the same time, practical economics has established the need for a thumb rule that requires freshening at an early age. Overcondition is harmful both to the heifer and the pocketbook. But delayed breeding and freshening after 24 to 26 months of age are also costly.

The summary statements by Schultz, *Journal of Dairy Science*, 52:139, summarizes heifer feeding.

- a. Heifers within a breed tend to reach puberty at about the same size, regardless of feeding level.
- b. Conception rate is not markedly affected by feeding level or breeding age.
- c. Underfeeding results in calves only slightly smaller than normal at first calving and increases calving difficulties.
- d. Early-bred heifers fed well have calves about as large as those bred later and have more calving difficulties. This factor is the major deterrent to the unqualified recommendation of liberal feeding and early breeding. Although the dam has the major influence on calf size, some control over this problem may be accomplished by selection of sires. Angus bulls are not recommended except in special circumstances because of the loss of these heifers for replacement purposes.
- e. There is some evidence that sequence feeding involving high, followed by low, levels of nutrition during rearing has an undesirable effect on mature production.
- f. Feeding levels exceeding present standards and accompanied by delayed breeding are undesirable. Feed is wasted in maintenance of a large animal. Under certain conditions fatty infiltration of the mammary gland and impairment of production may occur. It is possible that the magnitude of this effect may be related to the genetic ability of the animal, with low-potential producers being more adversely affected. Longevity may also be adversely affected by overfeeding.
- g. Heifers moderately underfed according to present standards up to first calving will be smaller in size at first calving and will tend to produce somewhat less the first lactation, but will recover rapidly in size and production if fed well after calving.
- h. Holstein heifers of high genetic ability fed 114% of Morrison's standards and bred the first heat period after ten months of age weighed somewhat less and produced somewhat less the first two lactations, but eventually caught up in size and production with animals bred at

later ages. There was an advantage for early breeding in feed cost to first calving, earlier return on investment, and cumulative production per day of age.

- i. It is suggested that feeding and breeding recommendations for the modern dairy heifer can be broadened from present standards. This means earlier breeding for the well-fed heifer and less concern for the ultimate size and production of heifers fed somewhat below the standards in energy, providing all are well-fed after calving. It appears desirable for the heifer to have at least two or three heat periods before the first breeding, but to have Holstein heifers in calf by the time they reach 900 lbs. (408 kg.) in weight.

Roughage Requirement

Before summarizing feeding at specific stages of the lactation period, a brief summary of roughage requirement seems appropriate. For many years thumb rules for dairy feeding were concerned entirely with insuring adequate nutrients. That is, suggested levels of grain feeding, protein content of the grain mixture, mineral supplements, vitamin additions and, even the drugs or other special additives, were the purpose of thumb rules. The assumption and, in fact, reality of the feeding program was that plenty of roughage was fed. Replacing part of the roughage with grain and other supplements improved the ration. However, in recent years a new thumb rule or new restriction on conventional thumb rules has become essential. The ruminant needs roughage.

A specific definition of roughage is still not available. However, there is little doubt that both physical and chemical properties are important. Also, current evidence indicates that physical requirements are dependent on chemical composition. That is, specific chemical requirements may be different for various physical properties and vice versa.

Physical requirements or coarseness of the roughage can only be suggested at present. However, the need for some "scratch factor" to provide fill and rumination is essential. Providing minimum "chemical" roughage needs with ground hay or finely chopped high moisture feeds causes problems. Although specific requirements for coarseness are not established, there are some general guidelines that can be helpful. Research workers have maintained normal fat test and rumination when alfalfa hay is chopped at one-inch. However, field observations indicate that one-inch chopped hay may be too short. Thus, it appears that at least some of the forage materials should be more than one-inch long. Other physical properties, such as amount of moisture, amount of lignin, and general hardness of the material are modifying factors. On short-time trials, coarse materials such as corn cobs can provide physical properties to maintain rumination and fat test even though they are smaller than one-inch. In brief then, physical property of roughage is

needed but precise requirements are unknown.

Chemical requirements are also debated. Generally, crude fiber requirement has been suggested. In the 1971 N.R.C. tables for complete rations a minimum crude fiber of 15 percent for heifers and dry cows is suggested and a minimum of 13 percent is suggested for milking cows. These minimums will not be adequate unless the physical requirements are also provided. For example, using a total ration of ground alfalfa and grain will not be adequate even if chemical analysis shows 18 or 20 percent crude fiber. Likewise, the use of the old crude feed analysis system to determine crude fiber is not adequate when special feeds are used. Van Soest, formerly U.S.D.A. and now at Cornell, has discussed this in numerous publications. Briefly, the crude fiber, as determined by the Weende system, is a mixture of chemical compounds. Crude fiber from beet pulp is not the same as crude fiber from alfalfa hay. Also, crude fiber from early-maturing hay is not the same as crude fiber from mature hay.

Therefore, in suggesting general thumb rules for meeting minimum roughage needs, several inaccuracies can result if new kinds of roughages or new processes of storage and preparation of roughages are used. In other words, the assumption is that more conventional types of roughage, such as hay, silage and pasture is used.

Feeding Dry Cows

Two points on feeding dry cows are worthy of a brief discussion. First, recent work on energy metabolism at the U.S.D.A. laboratory shows that cows in late lactation are more efficient in gaining weight than dry cows. Thus, a general objective would be to recondition cows in late lactation and then maintain this condition during the dry period. Reconditioning or fattening during the dry period would be limited to only cows that were exceptionally high producers but were still thin after being fed liberally during late lactation.

The second point on feeding dry cows is how to provide supplements needed when grain feeding is limited. Or, even how to restrict intake of nutrients when the roughage contains an excess. For example, liberal feeding of alfalfa hay during the dry period provides an excess of calcium especially when phosphorus intake is low. Another possible problem is an excess of energy and thus overconditioning when corn silage is fed free choice during the dry period.

Feeding At Calving Time

Lead or challenge feeding has been widely accepted, promoted and utilized. Two basic ideas in the program are heavy grain feeding just before calving and essentially free choice feeding of grain just after calving. The important result of the challenge feeding program has been more liberal grain feeding. Total grain feeding during the lactation or year has increased. This has resulted in more energy, more production and helped decrease problems resulting from lack of energy. Ketosis, excessive weight loss and early drops in lactation have decreased

because of more grain feeding. Other problems have been increasing; especially displaced abomasum. Overdoing the basic concepts of challenge feeding has been suggested as a cause of the problem, especially when the heavy grain feeding and management practices result in a lack of "roughage." The roughage requirement in general is still not clearly defined; the specific requirement at calving time is even less definite. In lactation the drop in fat test is a good indicator of lack of roughage. But during the dry period and early lactation, a specific indicator of a lack of roughage is not available. But, displaced abomasum may be the indicator of too little "roughage."

Complete Ration

The general use of total rations or complete rations is increasing. The research worker and the teacher find this concept very useful in controlling research or in explaining nutrient needs. The general requirements of the complete ration have been given in several papers and are included in the 1971 N.R.C. publication "Nutrient Requirements for Dairy Cattle."

The reason for a brief mention of complete rations in this paper is to point out that total grain feeding, or more correctly total energy intake during the lactation, is the major reason for success of challenge feeding rather than when grain is fed. Continuous feeding of complete ration containing adequate energy to meet requirements for the lactation maintains production, as well as a ration that is designed to more closely follow a lactation curve. Appetite or intake of the cow varies during the lactation so that intake also varies. However, challenging with extra grain at calving does not seem essential.

Thumb Rules For Lactating Cows

Total Feed Consumption

Average feed consumption of good cows is about 3 pounds of a dry feed per 100 pounds of body weight.

- a. To maintain normal rumen function and fat test of milk, 1/3 of the total dry matter in the ration should be roughages.
- b. To provide adequate energy from the amount of feed usually consumed, about 1/3 of the total dry matter should be grain.
- c. The remaining 1/3 is determined by such factors as:
 - (1) Quality of roughage used to meet roughage requirement (a above).
 - (2) Level of milk production of the cow. Low producers (1.5 lb. of fat daily or less) have feed capacity to spare, so more low digestible roughages can be used.
 - (3) Comparative cost of nutrients in grain vs. roughages.
 - (4) Kind and cost of feeds available and, especially, produced on each farm.
 - (5) Comparative cost of feed in relation to other production costs, such as labor, as well as selling price of milk.

Amount of Grain to Feed with Good Roughages

When good roughages are fed liberally, the roughages provide about 15 pounds of TDN daily. This will provide for maintenance and about 20 pounds of 4 percent milk (.75 pound of fat).

The common thumb rule of 1 pound of grain for each 4 pounds of 3.5 percent to 4 percent fat milk should be modified as follows for high production.

Thumb rule for pounds of grain based on milk for cows receiving liberal feeding of good roughage.

Holstein & Swiss—

Up to 40 lb. of milk — 1 lb. grain for 4 lb. milk.

40 to 70 lb. of milk — 1 lb. grain for 3.0 lb. milk.

Over 70 lb. milk — 1 lb. grain for 2.5 lb. milk.

Guernsey, Jersey, and Ayrshire—

Up to 30 lb. milk — 1 lb. grain for 3 lb. milk.

30 to 60 lb. milk — 1 lb. grain for 2-1/2 lb. milk.

Over 60 lb. milk — 1 lb. grain for 2 lb. milk.

At highest levels of production, cows need all the grain they will eat. However, minimum roughage intake should be maintained.