FEEDING DAIRY CALVES AND HEIFERS

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Good nutrition is of major importance in the success of any dairy replacement program. Balanced nutrition starts with the dry cow in order that the calf may have every opportunity to be born healthy and vigorous.

1. FIRST 24 TO 36 HOURS

Just prior to calving (parturition) a secretion starts to build in the mammary gland of the cow called colostrum. Unlike normal milk, the secretion contains several components of which one is termed antibodies or immunoglobulins.

Since the newborn calf is devoid of antibodies at birth, it has no mechanism of protection from any of the many diseases that may have at one time been present in the herd or any protection against exposures and stress. Therefore, the calf needs something immediately after birth that will give it some degree of protection from invading organisms and viruses. Colosturm is nature's answer to the problem.

The various types of specific antibodies which the mother has in her blood will reflect the variety of infectious agents with which she has come in contact. Thus, from colostrum the calf will receive a wide range of specific antibodies which will protect it from a variety of infectious bacteria and viruses. While colostrum feeding should be considered an absolute essential for the newborn calf, dairymen should be aware that feeding colostrum to the calf *will not always* guarantee that the young calf will be safe from infectious diseases. As pointed out above, the mother's specific antibodies will reflect her environment and not necessarily the environment in which the calf will be raised. Under certain types of housing situations, it is conceivable that the mother may never come in contact with the infectious agents present in the environment in which the young calf is raised. Under these conditions, colostrum will have limited protective ability, no matter how much is consumed by the calf.

The degree of protection the calf receives will be influenced by: 1) the amount of colostrum consumed, 2) how soon after birth the colostrum is consumed, 3) the antibody concentration of the colostrum ingested, and 4) the amount of ingested colostrum absorbed from the gut of the calf into the blood. Some protection may also result from the presence of unabsorbed antibodies in the intestinal tract.

While the high antibody content of colostrum makes it a unique mammary gland product, colostrum is also an excellent food source, being especially high in protein and energy. In addition, colostrum has a high content of vitamins and minerals required for the normal health and well-being of the young calf. Dairymen should not underestimate the benefits to good health and nutrition which can be derived from feeding all the colostrum.

2. MILK FEEDING PERIOD

The milk feeding period in most calf operations is 4-5 weeks for large breed calves and 6-8 weeks for small breed calves. Liquid feeds commonly used are whole milk, properly formulated milk replacers and colostrum. The choice of which to use depends on the availability, practicability and economics.

The milk feeding period is essentially the most critical period of the calf's life. It is a transition period for the calf -- simple stomach to ruminant. It is a period when sanitation and consistency in feeding are exceedingly important. Calves should receive milk at an established time each day whether it be once-a-day or twice-a-day. The temperature should be approximately the same and the rate of feeding similar each day. For good growth, calves should receive from 8 to 10% (7 to 10 lbs) their initial body weight in milk per day.

a) Fresh Colostrum - In many dairy operations, a surplus of colostrum is frequently available and cannot be fully utilized by the newborn calf. Rather than discard a valuable product, it can be preserved by freezing and fed as needed. Research at Florida and elsewhere shows improved weight gains of 20-30% during the first month when compared to other liquid feeds. The laxative properties coupled with the extra total solids in colostrum may increase the incidence of scours in calves unless diluted some with water.

b) Fermented Colostrum - A lot of interest has developed in recent months on using fermented colostrum (sometimes called pickled milk and sour colostrum) to feed dairy calves. The initial research indicated that colostrum could be successfully stored as a fermented product for a month or longer and was readily acceptable to calves. A number of Florida dairymen are presently using fermented colostrum. Fermented colostrum is higher in solids, protein and fat then whole milk. The pH of sour colostrum drops from 6.5 to about 4.5 or lower which preserves the material. The increased acidity is due primarily to the production of lactic acid which, in turn prevents the growth of harmful bacteria.

   A dilution rate of either two or three parts colostrum to one part water should be made prior to feeding. Regardless of the dilution, calves should receive at least 5 to 6 pounds of the fermented colostrum daily to ensure an adequate nutrient intake.

c) Whole Milk - The most common liquid for calves is whole milk. It is usually fed twice-a-day but in recent years has been fed once-a-day with good success.

   Ohio research demonstrated a need for supplemental water during the milk feeding period, especially in the warmer months. Free-choice fresh water in the diet of calves fed milk replacer once daily resulted in greater efficiency of growth and increased body weight gain. Even though calves may be only fed once daily, they should be carefully observed at least twice daily for health and general management problems.

d) Milk Replacer - Some of the primary concerns in the selection of a milk replacer is economics, physical properties and the nutritional value of the product. Milk replacers should mix easily, not settle out to any objectional degree on standing and have milk-like appearance in dry and liquid form. In fact, the product should be formulated to give results similar to that obtained from feeding whole milk. The major changes in different milk replacers are usually the kind of protein -- casein, soy flour, etc. The composition of good milk replacers in the past has been 20-25% protein (minimum amount from vegetable protein) and 10-15% fat (from a saturated source). Research in recent years has shown that various acid treatments improve the utilization of soy flour protein by dairy calves and that higher fat in the replacer may be beneficial to the calf.

3. EARLY USE OF CALF STARTER

The calf's appetite increases as it grows. The offering of a good starter ration to the calf at 2-3 days of age is an excellent way to meet this increasing need. Also, unlike milk a starter ration will stimulate early rumen function and the establishment of the rumen microbial population and growth of the rumen papillae. The grain starter is more effective than hay in encouraging rumen development. Early rumen development allows early weaning and helps the calf overcome many of the stresses associated with the milk feeding period.

A good calf starter must be palatable and chewy. Some of the grain should be in the cracked, rolled or whole form. Add 7-10% molasses since calves like a sweet-tasting feed. Variety is more important in a calf starter than in the milking herd or older heifer ration. Pelleting is another method of increasing palatability when the ingredients are finely ground.

A calf starter ration should be high in energy and low in fiber. Ideally, it should contain 16-19% crude protein, 68% TDN or more, a minimum of .6% calcium, .4% phosphorus and vitamins A (2000 units), D (1000 units), and E (20 units) per pound. Also, it should contain 1% trace mineralized salt. Work at Florida shows an advantage in adding 5% cottonseed hulls to certain calf starter rations, especially where some bulk is needed. After the calf reaches three months of age, the herd ration or a more simple ration is acceptable.

The calf starter should be supplied in an amount the calf will eat in one day. As the calf increases its consumption and up to about 1.5 lbs per day for a few days, the milk replacer may be discontinued. It is frequently advisable to reduce the milk by one-half 2-3 days prior to weaning. This will encourage an increased consumption of calf starter.

4. FEEDING ROUGHAGE

The feeding of roughage is usually started at, or soon after the time the calf is weaned. Quality of hay for young calves is more important than quantity. As the calf reaches 3-5 months of age, green chop, pasture or silage may be fed as a source of roughage. The total nutrient requirements are given in Table I.

TABLE I: DAILY NUTRIENT REQUIREMENTS FOR GROWING HEIFERS

(Large Breeds)*

Body Wt. (lbs)	Daily Gain (lbs)	DP (lbs)	NE (Mcal)	TDN (lbs)	Ca (grams)	Phos. (grams)
88	0.44	0.22	1.30	1.10	2.2	1.7
99	0.66	0.26	1.60	1.32	3.2	2.5
121	0.88	0.32	1.90	1.98	4.5	3.5
165	1.65	0.54	2.40	3.30	9.1	7.0
220	1.65	0.57	3.10	4.40	10.9	8.4
330	1.65	0.65	4.60	5.94	15.0	12.0
440	1.65	0.73	5.90	7.48	18.0	14.0
550	1.65	0.80	7.00	8.80	21.0	16.0
660	1.65	0.87	8.10	9.90	24.0	18.0
770	1.65	0.95	9.00	10.78	25.9	19.0
880	1.65	1.02	10.00	11.44	26.0	20.0
990	1.54	1.09	10.60	11.66	27.0	21.0
1100	1.32	1.11	11.00	11.66	27.0	21.0

(Small Breeds)

Body Wt. (lbs)	Daily Gain (lbs)	DP (lbs)	NE (Mcal)	TDN (lbs)	Ca (grams)	Phos. (grams)
44	.22	.13	0.80	0.66	1.1	0.8
55	.33	.18	1.10	0.88	1.5	1.1
77	.66	.24	1.40	1.32	3.2	2.5
110	1.10	.35	1.90	1.98	4.9	3.8
165	1.21	.42	2.50	2.64	7.0	5.4
220	1.21	.46	3.20	3.52	9.0	7.0
330	1.21	.54	5.00	5.06	12.0	9.0
440	1.21	.62	5.70	6.38	15.0	11.0
550	1.21	.70	5.70	7.70	17.0	13.0
660	1.10	.73	7.60	8.36	19.0	14.0
770	.78	.69	7.70	8.14	19.0	14.0
880	.33	.64	7.80	7.92	19.0	14.0

5. FEEDING HEIFERS AFTER 3-4 MONTHS

Calves should be raised in groups as soon as they are completely weaned. The size should be very similar with perhaps no more than 2 months spread in age. Group feeding calves will help to assure that each calf is eating their fair share and gaining at a rate similar to the standards in Table I. Large breed calves should gain at least 1 lb per day for the first six weeks and average 1.6 to 1.8 lbs thereafter. A more rapid rate of gain over a period of time will result in fatty tissue in the mammary gland, thereby damaging their lifetime productivity. In addition to decreased milk yields, poorer conception rates and more calving problems have been associated with fat heifers.

Heifers can grow at an adequate rate on high quality forage but under most Florida conditions some grain is needed to assure proper growth. Where good pasture is available, heifers supplemented with 3-5 lbs of grain per day make good growth.

Calves on pasture and receiving very little grain should be supplemented with minerals. A complete mineral mixture containing about 30% salt, 8-10% phosphorus and 14-18% calcium may be used. Also, one part trace mineral salt mixed with one part defluorinated phosphate will furnish all the extra minerals needed. The minerals should be provided free choice in some type of container or trough so the calves will have access.

A feeding program should be planned for the dairy heifer that will give her every opportunity to develop a healthy and strong body. It is quite apparent that a well developed heifer has a far better chance of becoming a good producer than a heifer that is poorly fed and cared for. Also, the heifer that is grown at a rapid rate (not allowed to become fat) will have an advantage in the show ring and can be bred at an earlier age. Varying amounts of roughage and grain may be fed during the growing period with the amount of grain being based on the rate of growth desired. Actually, a great deal of flexibility is possible during this period and equally good results can be obtained by following any one of several different feeding plans.

TABLE 2: RECOMMENDED GROWTH RATES FOR DAIRY HEIFERS

	AYRSHIRE & GUERNSEY			BROWN SWISS & HOLSTEIN			JERSEY		
Age (Mo)	Heart Girth	Wt.	Height at Withers	Heart Girth	Wt.	Height at Withers	Heart Girth	Wt.	Height at Withers
Birth	24	65	27	29	93	29	23	56	26
1	26	80	30	32	115	31	25	70	27
2	32	120	32	36	160	34	31	110	30
4	40	200	36	44	270	39	38	180	34
6	45	300	39	50	390	42	44	280	38
8	50	400	41	55	510	44	48	360	40
10	55	490	43	59	610	46	52	440	42
12	58	570	45	62	700	48	55	410	43
14	60	640	46	64	780	49	58	570	44

Clean, fresh water should be readily available at all times since young heifers will consume 10-15 gallons of water per day. Allow one foot of water space for each 10 heifers.

Feed bunk space should be 12-18 inches for grain and if silage or green chop is fed, an additional 18-24 inches should be provided. Adequate eating space is essential for all heifers where a large quantity of roughage is daily fed to the heifers.

Good heifer growth on corn silage systems (plus protein and mineral) has been shown. Table 3 contains the requirements for feed for four feeding systems.

TABLE 3: APPROXIMATE FEED REQUIREMENTS FOR HOLSTEIN HEIFERS TO ONE YEAR OF AGE ON FOUR FEEDING SYSTEMS

Months of Age	Milk	Starter	System 1 Grain	System 1 Hay	System 2 Grain	System 2 Silage	System 3 Grain	System 3 Pasture	System 4 Complete Feed
	lb	lb	lb	lb	lb	lb	lb	lb	lb
1 & 2	300	90	---	--	---	---	---	----	---
3 & 4	0	0	362	90	231	600	240	1200	448
5 & 6	0	0	441	180	274	900	240	1800	590
7 & 8	0	0	529	300	257	1500	240	3000	765
9 & 10	0	0	565	420	189	2100	240	4200	867
11 & 12	0	0	582	540	189	2400	240	4800	970
Total to 1 yr	300	90	2479	1530	1140	7500	1200	15000	3640

Silage = Corn Silage (20% TDN)
Hay = Bermuda, Pangola or Bahia (40% TDN)
Grain = System 1, 12% CP; System 2, 18% CP; System 3, 15% CP; and System 4, 12% CP.

The key to low mortality and economy in raising dairy calves is a sound program of feeding and management carried out by an individual who is both experienced and interested in the dairy animals under his care. There is no good substitute for the "eye of the master" in raising dairy replacements.