Holstein heifers in feedlot during trials at Davis. Four animals in foreground were in group I, four in background, control group II.

A comparison of HIGH *and for young*

FRANK D. MURRILL

Young dairy animals were grown in these tests on a free-choice, high energy, all-concentrate diet, over long periods of time, without roughage, and to date, without noticeable detrimental effects. There was no evidence of physiological disturbances due to overeating when any of the feeds were offered free choice. It appeared that the feeds must be pelleted to prevent sorting. There was no apparent abnormal behavior or delayed sexual development. All animals have been bred and are currently with calf. Certain portions of this work will be repeated and extended for verification of these preliminary conclusions. This program is on a continuing basis and further trials will also be carried out to determine influences on lactation performance.

RISING COSTS FOR REPLACEMENTS of young dairy heifers in larger commercial dairy enterprises in California have become an increasingly important consideration. In many cases these costs exceed labor costs and are second only to feed costs for the entire operation. Factors contributing to the high cost of raising replacements include the high rate of culling and the increasing emphasis on mechanization and labor-saving devices.

Commercial dairymen usually feed high levels of concentrates to increase energy intake for increased levels of production. However, the feeding of high levels of concentrates does not always produce desired results. There is evidence to indicate that long, severe periods of restricted energy intake during early life may have a retarding effect on growth—and may prolong the growing period. On the other hand, there is also evidence in dicating that heavy feeding at high energy levels of concentrates during early life of the heifers may have detrimental effects on sexual development, fertility, longevity, and lactation performance in later life.

With these factors in mind, an attempt was made to determine the acceptance of, and adaptation and response to, an all-concentrate, free-choice diet fed to young dairy heifers. Eight female, grade Holstein calves, averaging 27 days of age, were obtained for the experiment and were divided into two groups of four with comparable average live weights. The trial was conducted over a 66-week period and consisted of three distinct feeding stages: the milk stage, 63 days; the starter stage, 98 days; and the growing stage, 301 days (see table 1). At the beginning of each stage, average live weights were 126, 128; 249, 258; and 478, 493 lbs for groups I and II respectively. During the milk and starter stages, all animals were housed and fed individually, and during the growing stage the animals were managed in groups.

Both groups were fed two times daily, except for those given free choice feeds which were always available to the animals. Weight and samples of all feeds given, as well as feeds refused, were taken daily. Samples were obtained for proximate analyses each week. The analytical values and average digestion coefficients from Morrison's tables were used in all calculations. Individual measurements of body weight were made weekly and daily observations were recorded throughout the trial.

Starter mixture

The composition of the starter mixture for both groups during the milk and starter stages was the same, with the exception that vitamin A was included for the animals of group I that received the high energy diet, but no hay. The animals in group I, during the growing stage, received a concentrate mixture consisting mainly of barley. At first the grower concentrate was fed in meal form, but later, when it became apparent that the animals in group I were sorting the feed, this mixture was pelleted. The compositions of both the starter and grower concentrate mixtures are shown in table 2.

TABLE 1. FEEDING REGIME

Ration stage	Group I	Group II
Milk (9 weeks)		
While milk	Free choice	10% birth weight
Starter	Free choice	4-lb maximum
Alfalfa	—	Free choice
Starter (14 weeks)		
Starter	Free choice	4-lb maximum
Alfalfa	—	Free choice
Grower (43 weeks)		
Grower I	Free choice	—
Grower II	—	5-lb maximum
Alfalfa	—	Free choice

TABLE 2. COMPOSITION OF CONCENTRATE MIXTURES

Concentrate ingredients	Starter ration	Grower ration	
	Groups I and II	Group I	Group II
		Percent	
Steam rolled barley	39	80	45
Ground yellow corn	40	—	—
Steam rolled milo	—	—	30
Wheat mixed feed	—	—	14
Cottonseed meal, 41%, exp.	10	10	—
Molasses dried beet pulp	—	—	10
Cane molasses	—	8	—
Soybean meal, 44%, solvent	5	—	—
Fish meal, menhaden, 61%	5	—	—
Oyster shell flour	—	1	—
Salt	1	1	1
Vitamin A*	2750	2750	—

* (IU/Kg)

ENERGY NORMAL DIETS

dairy animals

MAGNAR RONNING

TABLE 3. AVERAGE PROXIMATE ANALYSES AND ESTIMATED DIGESTIBLE ENERGY OF FEEDS, DRY BASIS

	Ash	CP	EE	CF	NFE	EDE
	%	%	%	%	%	Kcal/lb
Milk						2578
Starter I & II	4.60	19.84	3.13	5.12	67.31	1753
Grower I	5.20	13.62	2.98	5.67	72.41	1680
Grower II	4.42	11.70	3.48	5.94	74.44	1722
Alfalfa pellet	9.44	20.10	2.22	25.22	43.10	1127
Alfalfa long	9.79	21.91	4.05	26.09	38.16	1189

TABLE 4. AVERAGE DAILY GAINS AND FEED INTAKE

Stage	Daily gain	Daily dry matter intake	Daily digestible energy intake	Digestible energy per pound of gain
	Lbs	Lbs	Megcal	Megcal
MILK				
Group I	1.9	2.9	8.6	4.3
Group II	2.1	4.0	7.7	3.7
STARTER				
Group I	2.0	7.7	13.6	7.6
Group II	2.3	10.4	13.7	5.9
GROWER				
Group I	1.6	13.0	22.2	13.4
Group II	1.8	19.2	25.9	14.7

The control animals of group II were fed in a normal manner, based on Morrison's standards. Roughage consisted of good quality pelleted alfalfa hay, and the grower concentrate mixture was the normal University herd-grain mixture. The average proximate analyses of the feeds are shown in table 3.

Milk stage

During the milk stage, the animals of group I were fed both whole milk and pelleted starter, free choice, until weaning. The control animals of group II received whole milk daily during this same period at the rate of 10% of their body weight and a maximum of 4 lbs of the pelleted starter plus alfalfa hay pellets free choice. All calves were weaned at 90 days of age.

For 14 weeks after weaning, the animals of group I received only the pelleted starter, free choice. The animals in group II, during the same period, received a maximum of 5 lbs of the grower concentrate mixture daily and alfalfa hay free choice—at first baled, and later chopped.

Individual animals in group I, during the milk stage, consumed as much as 48 lbs of milk on certain days. The animals were brought to free choice milk within about two days: each was given one pound of milk on a regular hourly schedule until milk was refused. Following this, milk was made available, free choice, in pails. Weaning was accomplished over a week's time by decreasing the amount of milk daily. These procedures resulted in minimum digestive disturbances.

Dry matter

Average individual dry matter intakes for group I were 2.9, 7.7, and 13.0 lbs daily during the milk, starter, and growing stages, respectively. The average intakes of group II during the same periods were 4.0, 10.4 and 19.2 lbs. Results are summarized in table 4.

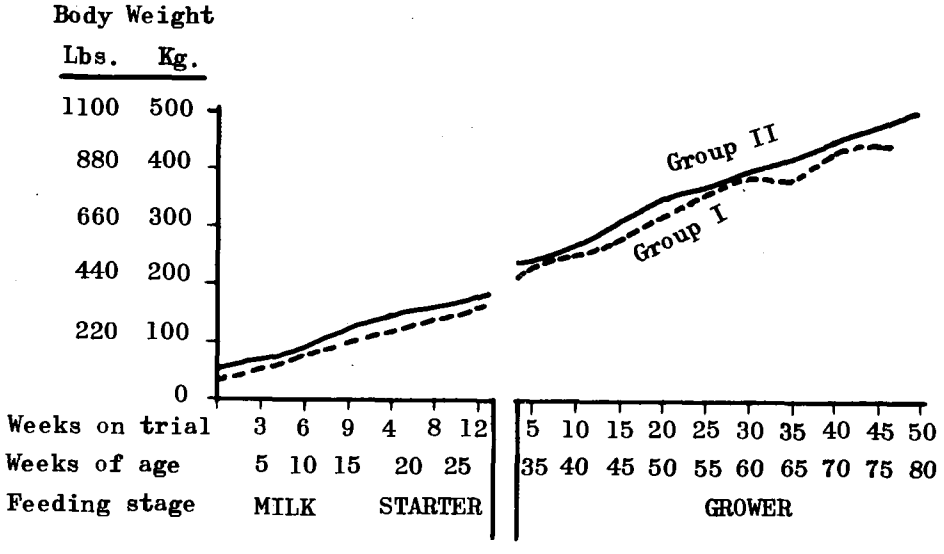
Average individual daily gains in group I were 1.9, 2.0 and 1.6 lbs during the milk, starter, and growing stages, respectively, as compared with 2.1, 2.3 and 1.8 lbs in group II during the same periods.

The average estimated digestible energy consumed daily per animal in group I was 8.6, 13.6, and 22.2 megcal during the milk, starter, and growing stages, respectively, and 7.7, 13.7, and 25.9 megcal for group II in the same periods. The average estimated digestible energy per pound of gain in groups I and II during the milk, starter, and growing stages was 4.3, 3.7; 7.6, 5.9; and 13.4, 14.7 megcal, respectively.

Results from this study do not permit full assessment of the performance of growing heifers when fed all-concentrate diets. Of particular concern was the feed sorting by group I, which became obvious in the grower stage. The animals selected mainly the steam-rolled barley, the coarsest portion of the mixture. Total feed consumption was decreased, but of still more concern was the nutritional imbalance caused by refusal to eat the finer ingredients that included the protein, mineral, and vitamin supplements. Obviously, this affected the performance of the animals and the problem may have existed for some time before it became acute and was detected.

The control animals in group II consumed more dry matter and digestible energy, and gained more during the starter and growing stages, than did those in group I. However, during the milk stage, group I had a greater intake of digestible energy even though less dry matter was consumed than by group II. This indicates that the animals of group II, on the normal diet, made more efficient gains during the milk and starter

AVERAGE LIVE WEIGHTS OF DAIRY HEIFERS DURING FEEDING TRIALS AT DAVIS



stages than did the animals of group I on the high-energy diet—while the reverse was true during the growing stage. The average live weights, by weeks, for the two groups during the milk, starter, and growing stages are shown in the graph.

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