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Growth and Body Frame Development of Dairy Calves On a Commercial California Dairy Ranch

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Dairy bull calves are known to be capable of sustaining higher rates of growth and frame development than dairy heifer calves. However the actual rates attained on commercial dairy ranches in California have not been determined in controlled studies.

The objective of this study was to record the performance of dairy heifers and bulls on a commercial California dairy under excellent management and feeding conditions.

PROTOCOL

All available calves were weighed on a platform scale, recorded for height at the withers with a measuring stick manufactured for the purpose, and recorded for length with a flex ruler, on February 18, 1999. A total of 81 bull calves and 79 heifer calves from a total of two pens were measured.

Calves had been born between October 11 and December 4 (1998) and averaged 103 days of age at the outset of the study.

Calves were allocated an index relative to their weight, height and length, within sex. Three bull calves were rejected prior to assignment to treatments (2 for high indices and 1 for a low index) and one heifer was rejected for a high index. The remaining calves were then allocated to either a heavy or light block of paired pens. Calves were sorted and allocated to one of four pens of 80 calves (39 or 40 heifers and 40 or 41 bulls) on February 19, 1999, at which time the feeding of the different rations commenced. The final assignment of calves to pens was:

	Heifers	Bulls
Light Blocks	39	41
Heavy Blocks	40	40

Calves were subsequently measured for the same growth parameters, by the same persons for each parameter (except length at day 35), at 14, 35, 56, and 78 days on test.

Calves were assigned to a ration based upon alfalfa hay, corn grain, molasses, distillers dried grains, and a vitamin/mineral pellet at the initiation of the study (Table 1). Rations were changed at regular intervals by personnel from the dairy as the study progressed. The ration was balanced by the professional consulting nutritionist.

Calves were fed the ration, as a totally mixed ration, twice daily at approximately 7:30 h and 15:00 h. An attempt was made to capture feed delivery information by pen. However, due the partial nature of the data, it is not presented.

The study was completed in the Maddox Dairy near Carruthers, California.

Table 1. Rations fed to the calves at the start of the study (% as mixed).

Ingredient Composition (% as mixed)	
Alfalfa hay	33.1
Corn grain	43.8
Molasses	10.6
Calf pellet (minerals & vitamins)	6.3
Distillers dried grains	6.3
Chemical Composition (calculated from analysis of the ingredients)	
DM (%)	85.0
CP (% of DM)	17.0
Undegraded CP (% of CP)	34.9
Fat (% of DM)	3.5
NDF (% of DM)	21.4
eNDF (% of NDF)	62.1
NSC (% of DM)	54.8

STATISTICAL ANALYSIS

No bull calves were lost to the study during the 77 day measurement period. However two heifers (two each from the light-weight block) were removed from the study as they were found, on a calf measurement day, to be in the wrong pen. Thus the number of calves completing the study were:

	Heifers	Bulls
Light Blocks	37	41
Heavy Blocks	40	40

Data was analyzed using the General Linear Means (GLM) procedure of the Statistical Analysis System (SAS) as a randomized block experiments with sex (heifer or bull), block (light-weight or heavy-weight), and the treatment by block interaction as factors.

Table 2. Performance of the calves.

	Heifers	Bulls	SEM ¹	Probability ²
Weight				
Start (lbs)	250.2	249.8	15.5	.93
End (lbs)	436.3	448.6	26.5	.04
Gain (lbs)	186.1	198.7	16.7	<.01
(lb/d)	2.39	2.55	.21	<.01
Height				
Start (in)	35.81	35.49	1.07	.19
End (in)	40.09	40.80	1.10	<.01
Gain (in)	4.29	5.31	1.09	<.01
(in/d)	.055	.068	.014	<.01
Length				
Start (in)	19.82	19.86	.59	.77
End (in)	25.01	24.85	.69	.30
Gain (in)	5.19	4.99	.63	.16
(in/d)	.067	.064	.008	.16

¹ - SEM (standard error of the mean) is a measure of variation in the data.

² - Probability measures the chances of the numerical difference between the means being truly different. Values below .05 are generally accepted to indicate a real difference.

RESULTS

Calves of both sexes gained weight, height and length at a rapid rates (Figures), although the curves were not visually linear. Commonly accepted recommendations suggest that the heifers should have averaged about 205 lbs and 35.3 inches in height at the start of the study, versus observed values of 250 lbs and 35.9 inches. Based upon these same guidelines, heifers should have averaged 377 lbs and 40.5 inches at the end of the study, versus observed values of 435 lbs and 40.2 inches. Clearly the weight:height ratios obtained in these heifers are well above those commonly recommended.

Bulls had higher final weights and heights, as well as higher weight and height gains than did the heifers (Table 2). In contrast, the bulls increased in length less rapidly than heifers, although these numerical differences failed to reach statistical significance.

SUMMARY

The excellent performance of the calves may have been sustained by high delivery of absorbable protein to the intestinal absorptive site due, at least partly, to inclusion of dried distillers grains in the ration.

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Figures. Height, weight, and length gains of heifers and bulls over the study.

