THE EFFECT OF NUTRIENT INTAKE AND PROTEIN DEGRADABILITY ON THE GROWTH AND DEVELOPMENT OF HOLSTEIN HEIFERS

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Summary

One hundred and twelve Holstein heifers were used from 10 wk until 26 wk of age. They were assigned to receive either 100% or 115% of NRC (1978) recommended nutrients and to be fed either control or extruded SBM. There were no interaction effects between the nutrient amount and type of SBM. Heifers on the higher nutrient amounts gained 205 lb vs 168 lb for the heifers on the lower nutrient amounts. Those on the higher nutrient amounts also had greater increases in height (8.7 vs 7.5 in), length (10.2 vs 8.7 in), and heart girth (12.6 vs 10.6 in). There were no differences in body scores. There were no statistical differences or apparent trends between the extruded and control SBM-fed heifers.

Introduction

Dairy heifers should calve at 24 mo of age, which means they will need to be bred at 15 mo of age. Increasing the energy concentration of their ration will increase the heifers' rate of gain and allow puberty to be reached at an earlier age. Unfortunately, this often leads to excessive fattening of the heifers, which impairs their future milk production. However, if all of the major nutrients were simultaneously increased, it might be possible for heifers to reach breeding and freshening size at an earlier age and/or reach larger mature weights without getting too fat.

Increasing the amount of protein that escapes ruminal degradation could result in improved protein nutrition or allow decrease of total dietary protein. Information is needed concerning the effect of increasing ruminal protein bypass at different dietary protein concentrations for growing replacement heifers.

This study was designed to provide information concerning these points.

Procedure

One hundred and twelve Holstein heifers were used from 10 to 26 wk of age. Heifers were assigned to a block of four by age, then heifers within a block were assigned randomly to each of four treatments. Brome hay was fed free choice. Amount of grain and hay, at estimated intake, was formulated to provide either 100% or 115% of NRC (1978) recommendations for protein, energy, Ca, P, and vitamins A, D, and E. The supplemental protein source was either control or extruded SBM.

Each week, individual body weights were taken, and average daily hay consumption was determined. At 18 and 26 wk of age, body measurements (wither height, length, heart girth) were taken. At 26 wk of age, body scores (1.0, thin to 5.0, fat) were recorded.

Results and Discussion

Because the heifers ate more hay than was estimated, they consumed more nutrients than was originally planned. Heifers on the higher nutrient amount receiving control SBM (HC) or extruded SBM (HE) actually consumed 127% and 125%, respectively, of NRC recommended nutrients. Heifers on the lower nutrient amount receiving control SBM (LC) or extruded SBM (LE) actually consumed 108% and 107%, respectively, of NRC recommendations.

The growth measurements of the heifers are shown in Table 1. Heifers on HC and HE gained more weight than heifers on LC and LE. The weights of HC and HE heifers were higher than current recommendations for replacement heifers. Suggested rates of gain are lower than those previously recommended because of the belief that high rates of gain in the prepubertal period will have a negative effect on mammary development. However, it may be possible to increase rates of gain without fattening the heifers. HC and HE heifers also had a greater increase in height, length, and heart girth. Ending body scores were 3.0 for HC and HE heifers and 2.95 for heifers on LC and LE. It remains to be seen what effect increasing the rate of gain along with increasing skeletal growth, and thereby not overconditioning the heifers, has on mammary development.

There were no statistical differences or any definite pattern between the control and extruded SBM-fed heifers.

Table 1. Growth Measurements of Heifers

Item	Treatment[1] LC	LE	HC	HE
Weight, lb				
10 wk	168	172	173	170
18 wk	253[a]	260[a]	275[b]	275[b]
26 wk	338[a]	342[a]	374[b]	375[b]
ADG[2]	1.52[a]	1.52[a]	1.80[b]	1.83[b]
Wither height, in				
10 wk	32.5	32.8	32.6	32.4
18 wk	35.7[a]	36.1[a]	36.3[ab]	36.8[b]
26 wk	40.1[a]	40.4[a]	41.1[b]	41.3[b]
Increase	7.6[a]	7.6[a]	8.5[b]	8.9[b]
Length, in				
10 wk	33.2	33.4	32.6	33.2
18 wk	37.7[a]	38.4[ab]	38.7[b]	38.4[ab]
26 wk	41.6[a]	42.7[b]	43.5[b]	43.1[b]
Increase	8.4[a]	9.3[a]	10.9[b]	9.9[b]
Hearth girth, in				
10 wk	38.0	38.7	38.2	37.8
18 wk	44.7[a]	45.3[ab]	46.1[b]	45.8[ab]
26 wk	48.9[a]	49.8[ab]	50.9[b]	50.5[b]
Increase	10.9[a]	11.1[a]	12.7[b]	12.7[b]

[1]For description of treatments see text.
[2]Average daily gain, lb.
[ab]Means in the same row with different superscripts differ (P<.05).