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Abstract

One hundred and one Holstein heifers from the KSU Dairy Unit were used in this experiment. They were assigned to two treatments in which they were fed either 100% or 115% of the 1988 NRC requirements of energy, protein, major minerals, and major vitamins. Body measurements (height, length, heart girth, weight, body condition scores, and backfat thickness) were recorded. Rations for each group were formulated using the average wt of the heifers. Results suggest that feeding 115% of NRC requirements produces larger frame heifers (without excess body condition), with potential for earlier calving, compared to feeding 100% of NRC requirements.; Dairy Day, 1989, Kansas State University, Manhattan, KS, 1989; The 1989 Annual KSU Dairy Day is known as Dairy Day, 1989

Keywords

Dairy Day, 1989; Kansas Agricultural Experiment Station contribution; no. 90-140-S; Report of progress (Kansas Agricultural Experiment Station); 580; Dairy; Growth; NRC Requirements; Expenses

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COMPARISON OF GROWTH OF HOLSTEIN HEIFERS FED 100% OR 115% OF NRC REQUIREMENTS

M. G. Daccarett and J. L. Morrill

Summary

One hundred and one Holstein heifers from the KSU Dairy Unit were used in this experiment. They were assigned to two treatments in which they were fed either 100% or 115% of the 1988 NRC requirements of energy, protein, major minerals, and major vitamins. Body measurements (height, length, heart girth, weight, body condition scores, and backfat thickness) were recorded. Rations for each group were formulated using the average wt of the heifers. Results suggest that feeding 115% of NRC requirements produces larger frame heifers (without excess body condition), with potential for earlier calving, compared to feeding 100% of NRC requirements.

Introduction

Cost of raising dairy heifers is a significant expense in any dairy operation. Lowering age at first calving offers a way to reduce this cost. This is possible if the heifer reaches the desired body wt and size for the first service at a young age. Current recommendations suggest that Holstein heifers should calve at 24 mo of age and weigh from 1200 to 1300 lb (ADG of about 1.6 lb/day). Heifers calving at less than 24 mo produce less milk in the first and later lactations than heifers calving at 24 mo of age. Recent research suggests that this reduction in milk yield is caused mostly by high energy intake during the prepubertal period (3 to 9 mo of age), causing infiltration of fat into the mammary gland, which inhibits the development of secretory tissue.

Body size (weight, height, and length) at first calving appears to be positively correlated with milk production, so larger heifers at first calving should be a goal. However, dairy producers should not confound body size with overconditioning. Overconditioned heifers are not necessarily larger heifers. Fat heifers are not desirable because they are more susceptible to diseases (dystocia, metabolic disorders, and reproductive problems after parturition), and produce less milk. Therefore, overconditioning to increase body size and lower age at first calving is not a good management practice. Instead, proper feeding is needed to get a high quality replacement that will be able to fully express her milk producing ability at a younger age.

The objective of this experiment was to compare results of feeding Holstein heifers 100% or 115% of NRC requirements, with the objective of development of larger, more productive heifers without excess conditioning.

Procedures

One hundred and one Holstein heifers from the KSU Dairy Unit were used from 6 mo until 18 mo of age. In treatment 1 (control), they were fed 100% of the 1988 NRC requirements of energy, protein, major minerals, and major vitamins for large breed, growing dairy heifers to gain about 1.6 lb/day. In treatment 2, the heifers were fed 115% of those requirements. Wither height, body length from point of shoulder to center of the pin bone, and heart girth measurements were taken to evaluate body size. Body condition of heifers was scored using a .5 scale from 1 (severely underconditioned) to 5 (severely overconditioned). Measurements of backfat thickness were taken using ultrasound equipment. Each week, individual body weights were recorded. Rations for each age-group (6-9, 9-12, 12-15, 15-18 mo) were formulated weekly based on the average wt of the heifers in the group. A total mixed ration with alfalfa and prairie hay, milo, trace mineralized salt, and calcium and phosphorus supplements was used. Breeding was begun when the heifers reached 750 lb.

Results and Discussion

Heifers fed 115% of the NRC requirements were younger at first service ($P < .01$) than those in the control group, $13.6 \pm .2$ mo vs. $14.6 \pm .3$. Expected age at first calving was also lower for the 115% group ($P < .004$), $22.8 \pm .2$ mo vs. $23.9 \pm .3$.

Body weight was greater for the 115% heifers ($P < .0005$). Figure 1 shows the average weights of the heifers from both treatments compared to the Beltsville and Waldo growth standards for Holstein heifers at different ages.

Heart girth and body length were also greater for the 115% heifers ($P < .0054$ and $P < .0238$, respectively). However, wither height was the same for both groups. These data and wither height from Waldo's growth standard are shown in Figure 2.

Body condition scores (Table 1) at 18 mo of age were slightly higher ($P < .062$) for heifers in the 115% (3.2) vs heifers in the 100% group (3.05); however, there was no significant difference in backfat thickness. This suggests that the heifers in the 115% group were getting larger and heavier without excess fat.

The results showed that to this point (18 mo of age), feeding 115% of the NRC requirements produced larger frame heifers without excess of flesh, with the ability to calve at younger ages, compared to feeding 100% of requirements. This experiment will continue through the first lactation to evaluate milk production, reproductive efficiency, calving difficulty, and other factors related to productivity.

References

1. Waldo, D. R., A. V. Capuco and C. E. Rexroad, Jr. 1988. Proceedings of Southwest Nutrition and Management Conference, University of Arizona.
2. Matthews, C. A. and M. H. Fohrman. 1954. Beltsville Growth Standards for Holstein Cattle. USDA Technical Bulletin No. 1099.

Table 1. Average Body Condition Scores of Holstein Heifers Fed 100% or 115% of NRC Requirements

Treatment	Age, mo				
	6	9	12	15	18
100%	2.94	2.97	2.97	3.0	3.05 ^{ab}
115%	3.0	2.97	3.06	3.1	3.21 ^c

^aDifferent from 115% (18 mo): $P < .062$.

^bStandard error = .058.

^cStandard error = .061.

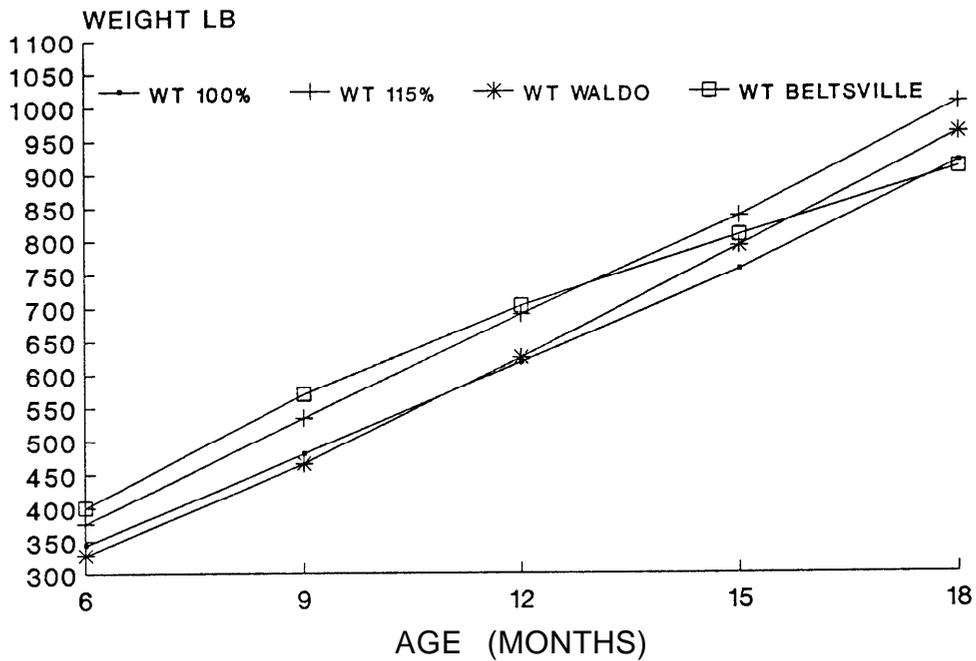


Figure 1. Avg weight (WT) of Holstein heifers fed 100% or 115% of the 1988 NRC requirements, compared to the Beltsville and Waldo growth standards for Holstein heifers.

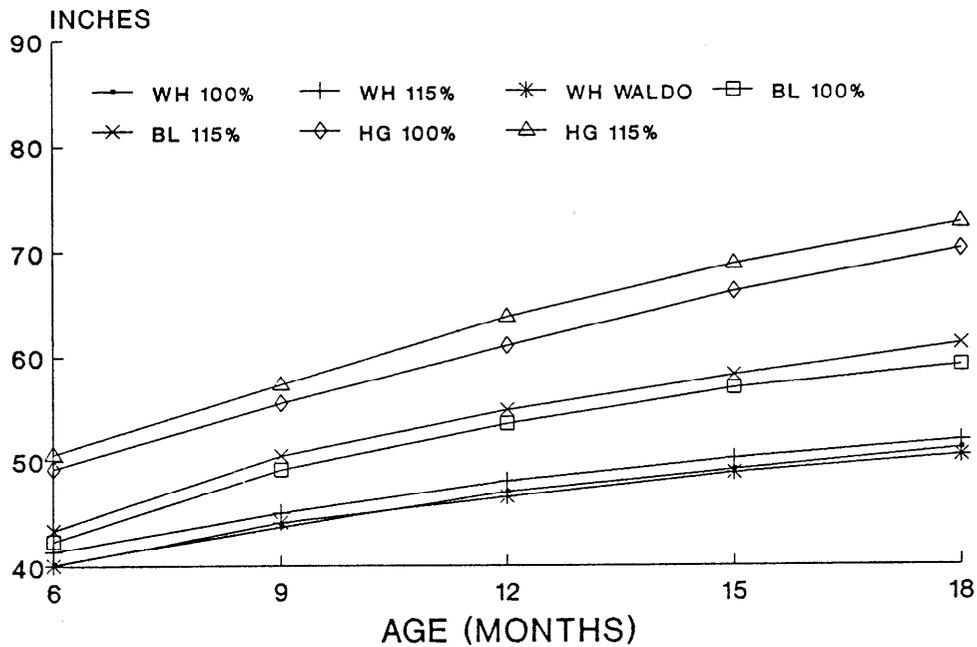


Figure 2. Heart girth (HG), body length (BL), and wither height (WH) measurements of Holstein heifers fed 100% or 115% of the 1988 NRC requirements, plus wither height standard from Waldo.