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# Comparison of growth and production of holstein heifers raised on 100% or 115% of the NRC requirements

## **Abstract**

One hundred and ten Holstein heifers from the KSU Dairy Research Unit were used in this experiment. They were fed either 100% (control) or 115% (enhanced) of NRC requirements for energy, protein, major minerals, and vitamins from 6 mo of age to shortly before calving. Heifers in the enhanced group calved at an earlier age, had larger heart girths, and were heavier than controls. At this time, 46 of the heifers have completed at least 50 days in lactation. Based on their projected 305-2X-ME records, the heifers in the enhanced group have produced slightly, but not significantly, more milk and milk fat.; Dairy Day, 1990, Kansas State University, Manhattan, KS, 1990; The 1990 Annual KSU Dairy Day is known as Dairy Day, 1990

## **Keywords**

Dairy Day, 1990; Kansas Agricultural Experiment Station contribution; no. 91-148-S; Report of progress (Kansas Agricultural Experiment Station); 608; Dairy; NRC requirements; Holstein heifers; Growth and production

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# **COMPARISON OF GROWTH AND PRODUCTION OF HOLSTEIN HEIFERS RAISED ON 100% OR 115% OF THE NRC REQUIREMENTS**

**E. J. Bortone, M. G. Daccarett,  
J. L. Morrill, A. M. Feyerherm<sup>1</sup>, and J. E. Shirley**

## **Summary**

One hundred and ten Holstein heifers from the KSU Dairy Research Unit were used in this experiment. They were fed either 100% (control) or 115% (enhanced) of NRC requirements for energy, protein, major minerals, and vitamins from 6 mo of age to shortly before calving. Heifers in the enhanced group calved at an earlier age, had larger heart girths, and were heavier than controls. At this time, 46 of the heifers have completed at least 50 days in lactation. Based on their projected 305-2X-ME records, the heifers in the enhanced group have produced slightly, but not significantly, more milk and milk fat.

## **Introduction**

Some studies have shown that optimum age at first calving should be between 22.5 and 23.5 mo. It has been demonstrated that, after milk yield, age at first calving was the most important variable affecting lifetime profitability. Current recommendations suggest that replacement heifers should weigh from 1,200 to 1,300 lb at freshening. To achieve this weight, they must gain approximately 1.6 lb per day. Other studies show the importance of body size (weight, height, girth, and body length), which is positively correlated with milk production.

Body size must not be confounded with condition or degree of fatness. Fat heifers are not desirable because they will produce less and also will be more susceptible to metabolic and reproductive disorders, such as ketosis and dystocia. One of the major problems with overconditioned heifers is reflected later when high energy intake during the prepuberal period (3 to 9 mo of age) increases fat deposition in the mammary gland, inhibiting the proper development of secretory tissue. Therefore, overfeeding high energy can cause overconditioning. This research was conducted to compare the performance of Holstein heifers reared on a diet that was not only high in energy but also high in protein, major minerals, and vitamins.

## **Procedures**

Holstein heifers from the KSU Dairy Research Unit were assigned to one of two treatments at 6 mo of age. Heifers in the control group were fed 100% of the 1988 NRC requirements of energy, protein, major minerals, and vitamins for large breed, growing, dairy heifers to gain about 1.6 lb/day. Heifers in the enhanced group were fed 115% of those same requirements. Body size measurements

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(height, girth, and body length) were recorded. Body condition scores were recorded using a .5 scale from 1 (severely underconditioned) to 5 (severely overconditioned). Individual body weights were recorded each week. Rations were formulated weekly based on the average body weight of the heifers in each group. The total mixed ration (TMR) consisted of alfalfa hay, brome hay, milo, trace mineralized salt, and calcium and phosphorous supplements.

Approximately 3 wk before the expected date of calving, all heifers were moved to the maternity pen of the KSU Dairy Research Unit and were fed a ration consisting of 10 lb of concentrate, 10 lb of alfalfa, 10 lb of forage sorghum silage, and free choice prairie hay until parturition. After freshening, they were moved to the production facilities and were fed a TMR consisting of chopped alfalfa hay, forage sorghum silage, and corn-based concentrate mix, balanced for production of 70 lb of 4% fat-corrected milk.

Projected DHIA 305-2X-ME records for milk and milk fat from the 46 heifers with more than 50 days in lactation were used.

### **Results and Conclusions**

Results of growth and production are shown in Table 1. Enhanced heifers were younger at time of calving, 23.85 vs 22.65 mo ( $P=.0087$ ).

Differences in height and body length were not significant ( $P=.29$  and  $P=.11$ , respectively).

Body condition scores were higher and heart girth and body weight were also greater for enhanced heifers ( $P=.008$ ,  $P=.006$  and  $P=.0373$ , respectively).

The heifers in the enhanced group produced slightly, but not significantly, more milk and milk fat ( $P=.82$  and  $P=.67$ , respectively).

In conclusion, the group fed 115% of the NRC requirements calved at an earlier age, had higher body condition scores, and were heavier at calving. Heifers in the enhanced diet produced slightly more than the control group. However, this higher production was not statistically significant.

This experiment will continue through the first and second lactation. The data gathered will allow a better understanding of the effect that nutrition of replacement heifers has on subsequent milk production and, hence, total lifetime performance.

**Table 1. Growth and Production of Heifers Fed 100% or 115% of the NRC Requirements**

Variables	Treatments		SE
	Control (100%)	Enhanced (115%)	
Age at calving <sup>a</sup> , mo	23.8	22.6	.3
Body condition score	3.3	3.5	.1
Height, in	54.0	54.7	.7
Heart girth <sup>a</sup> , in	77.5	80.2	.6
Body length, in	64.0	66.2	.7
Body weight <sup>a</sup> , in	1289	1355	18
Fat, lb	652	665	32
Milk, lb	17796	17973	848

<sup>a</sup>Significant treatment effect (P<.05).