Virginia Cooperative Extension

PUBLICATION 404-285

Milk Production Evaluation in First Lactation Heifers

Tom Bailey, Extension Specialist, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech
John Currin, Clinical Instructor, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech

Introduction

A critical evaluation of production in first lactation heifers once they reach the milking herd is important to determine the effects of the heifer rearing program. This can easily be done by monitoring start-up milk (milk production 0 to 40 days in milk), start-up milk butterfat and protein, and peak milk, peak milk butterfat and protein (41 to 100 days in milk) because these are directly related to heifer development.

Heifers will not return on the producer's investment of approximately $1000.00 to $1300.00 per heifer at 24 months of age until they are lactating. Delay in age to first calving adds approximately $50.00 per heifer per month to the expenses incurred in raising heifers. Several specific reasons can be given as to why heifers don't perform once they reach the lactating herd: (1) when illnesses (pneumonia) occur during the early development period, the effects may linger and affect lactation, decreasing milk production, (2) rations should be specifically formulated for weight gains during strategic time periods of development, but overfeeding prior to puberty can be detrimental to milk production, (3) heifers should weigh 775 to 800 pounds at 14 to 15 months for breeding to calve at 24 to 25 months, (4) heifers should gain 1.8 pounds per day of age to calve at 24 months weighing 1350 pounds, (5) use superior AI sires on replacement heifers for breeding, as first calf heifers represent 33% of the contribution of calves to the replacement pool, (6) weight is more critical than age at calving in relation to milk production, (7) monitor weight, height, body condition score at calving to reflect heifer development, along with milk production at start-up, peak milk, and mature equivalents as an indicator of good heifer development. Heifers can be adequately developed to calve at 24 months, while decreasing expenses and increasing profits.

Milk Production in Heifers

Studies on the effect of weight and age at first calving on subsequent milk yields have been conducted. Essentially all studies demonstrate that weight at calving and not age played a more significant role in milk production and reproduction. Groups of heifers have been applied to an accelerated growth study gaining 2.4 pounds per day after puberty and freshening at 19.7 months of age. Compared to heifers calving at 26.9 months of age, the milk yields were significantly lower in the accelerated group, but there were no differences in the second lactation milk yield. Agreater cumulative yield was experienced at 36 months of age, on a milk yield per day of age, because the accelerated group was well into their second lactation. This would also significantly reduce the number of nonproductive months for replacement heifers. This is not to suggest calving at 19 months but to illustrate how earlier breeding can affect lifetime production and decrease the nonproductive months prior to calving.

Weight at calving has the most significant influence on increasing the first lactation milk yield. The only other time weight is more important is when she is sold as a cull cow. Keown's studies presented data showing an

www.ext.vt.edu

Virginia Tech 1872 Invent the Future

Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University, 2009

VIRGINIA STATE UNIVERSITY

increase in total first lactation milk yields between 1150 pound versus 1250 pound heifers after calving. The heavier heifers produced 527 pounds more milk than the lighter heifers. Whereas, heifers weighing 1300 pounds after calving produced only 41 pounds more milk than the 1250 pound heifers, hardly economically justifiable for the additional 50 pounds of weight. In fact, some studies indicate the larger, older (>30 months) 1300 pound post calving heifers produce less milk than the 1250 pound heifers calving at 24 months. The goal of 1250 pounds could be easily accomplished at a daily gain of 1.8 pounds per day during development.

Table 1: Milk Production versus HeiferWeight

Heifer Weight After Calving	Pounds Increase in Production Over the 1000 Pound Heifer
1050	200
1100	500
1150	500
1200	900
1250	1000
1300	1000
1350	1025
1400	1000

Heifers can calve at 24 months of age and have high milk production. Holstein herds in Wisconsin, producing in excess of 22,000 pounds, raise heifers that weigh 800 pounds at 13 months for breeding, calving at an average of 24 months weighing 1350 pounds. Furthermore, large heifers, weighing 1250 pounds after calving, are closer to their genetically determined mature size and need less energy to grow during their first lactation. This may help alleviate the syndrome known as “sophomore slump” or milk production depression after the second calving.

Heifers in the Lactating Herd

A heifer should be considered as a herd replacement only if the milk production of the dam is above the herd average. Projected mature equivalent (ME) for heifers should be within 500 pounds of mature equivalents for second and later lactation cows. Despite this fact, data from the Raleigh Dairy Records Processing Center indicate that in 1997 the average heifer mature equivalent for milk is more than 1000 pounds below second and later lactation cows. If heifers were given the same opportunity to be fed equally, the same level of genetic application as mature cows, and the same culling pressure as for later lactations, then we would expect the projected ME 305-day milk production to be the same. While heifers should be genetically superior, the same culling procedures have not been applied as in later lactation cows. Since culling increases production faster than genetics, second and later lactation cows projected ME for milk production should be within 500 pounds of heifers. The disadvantage of using ME as a measure of genetic progress is the two to three year lag period between conception and projected production records of progeny. Even though ME is not a true measure of genetics, it does measure genetic potential if all other variables between parties are equal.

Another measure of potential genetic gain in the herd is the 305 day ME of this year’s first lactation heifers over that of the previous year. An average of greater than 200 pounds over that of last year’s heifers is reasonable genetic gain.

Evaluate first calf heifer start-up milk or milk production less than 40 days, check peak milk, and mature equivalents. All of these are a direct reflection of how well the heifer management program is doing. For example, with a 20,000 pound rolling herd average, start-up milk should be in the range of 65 to 68 pounds, with a milk fat of 3.8 to 4.0%, with milk protein within 85% of milk fat. Start-up milk is a direct reflection of heifer development and the first three week transition period after freshening. Start-up milk fat is an indicator of heifer body condition score, as 70% of the start-up milk fat will be derived from body stores of fat. When body condition scores are low at freshening, milk fat is also low. When start-up milk fat is 4.0%, then milk protein should be approximately 3.4%.

First calf heifer peak milk (milk 41 to 100 days on DHIA records) should also be evaluated as an indicator of replacement heifer management and genetic gain. Heifers should peak by 60 days in milk. The exception would be heifers calving in the hot summer months and not peaking until 90 days. The difference in start-up milk (0 to 40 days in milk) and peak milk (41 to 100 days in milk) should be approximately 6 to 7 pounds for first calf heifers. Therefore, if start-up milk is 68 pounds, then heifers should peak at 74

pounds. As a comparison, the goal for peak milk of first lactation heifers would be expected to be 75% of the third lactation and greater cows and 80% of peak milk production for second lactation cows. As an example, surveys of inadequately developed heifers on several farms show peak milk for heifers at 62 to 65 pounds, when second and greater lactation cows are reaching 90 pounds and 100 pounds, respectively. To meet optimal production and contribution to the herd, these heifers should have an additional 10 pounds of peak milk. These farms had first lactation heifer inventories in the lactating herd ranging from 35 to 47%. This type of production level is a direct result of inferior heifer development and a lack of heifer monitoring, resulting in decreased milk production when heifers entered the lactating herd.(Figure 1) For every additional pound of peak milk, an increase of 200 pounds of milk can be expected over the total lactation of first calf heifers. If these heifers were reaching this additional 10 pounds of peak, the potential exists for 2000 pounds more total lactation milk yield per heifer. In a 100 cow dairy, with 35 first calf heifers, this would equate to an increase over one year of 70,000 pounds of additional milk in the bulk tank.

When milk production is below the targets or goals, monitor heifers to detect where heifer management is weak.(Figure 2) In most cases, producers will need to initiate the program with the nursing calves and develop these heifers to 2 years old before progress can be noticed. This means that if emphasis is placed on a heifer development monitoring program today, it will be two years before a difference can be seen in the bulk tank. However, if heifers are currently weighing 775 to 800 pounds at 14 to 15 months, but are not calving until greater than 28 months, then breeding needs to start earlier. Heifers this age and weight are of adequate size for breeding. Reducing the age at first calving could reduce the time interval from 2 years to 1 year to demonstrate a real difference in the heifer rearing program.

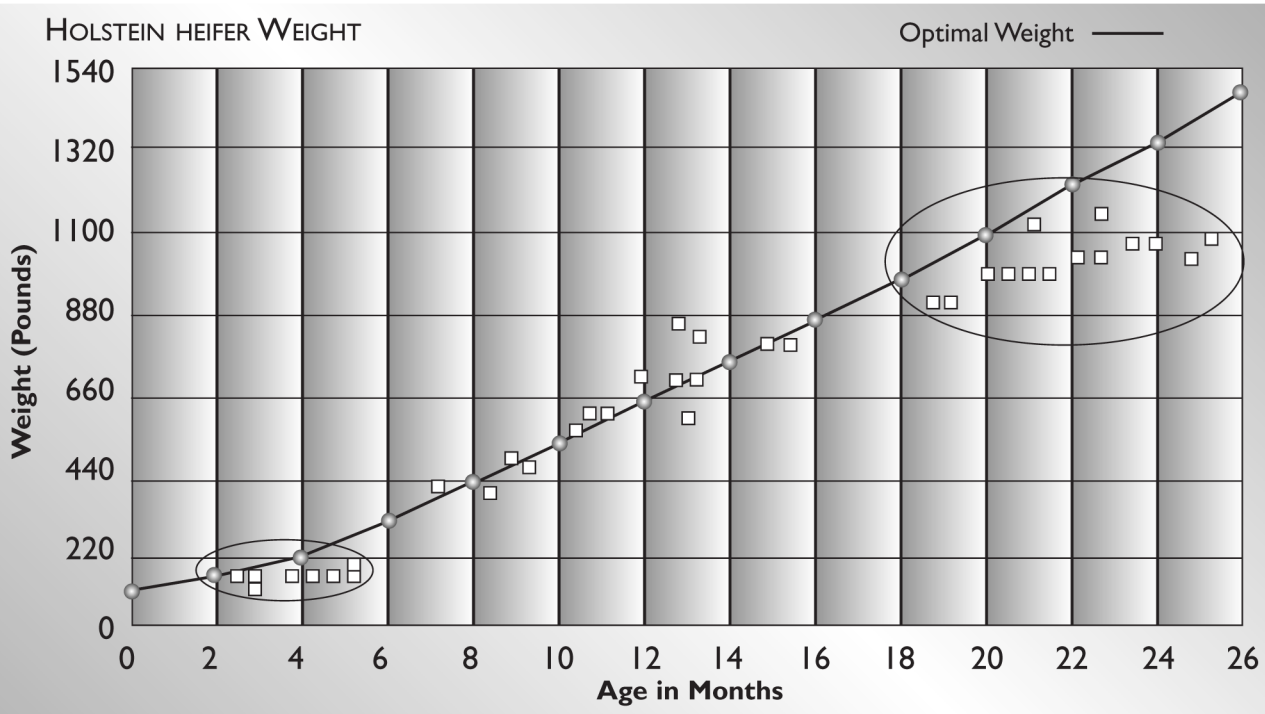

Figure 1: Chart with heifers plotted (□) based on weight in relation to months of age.
Chart indicates period of poor heifer development during the early prepubertal period. Heifers are also falling below our optimal development after breeding. Heifers are often bred, pregnancy checked, and neglected until freshening.

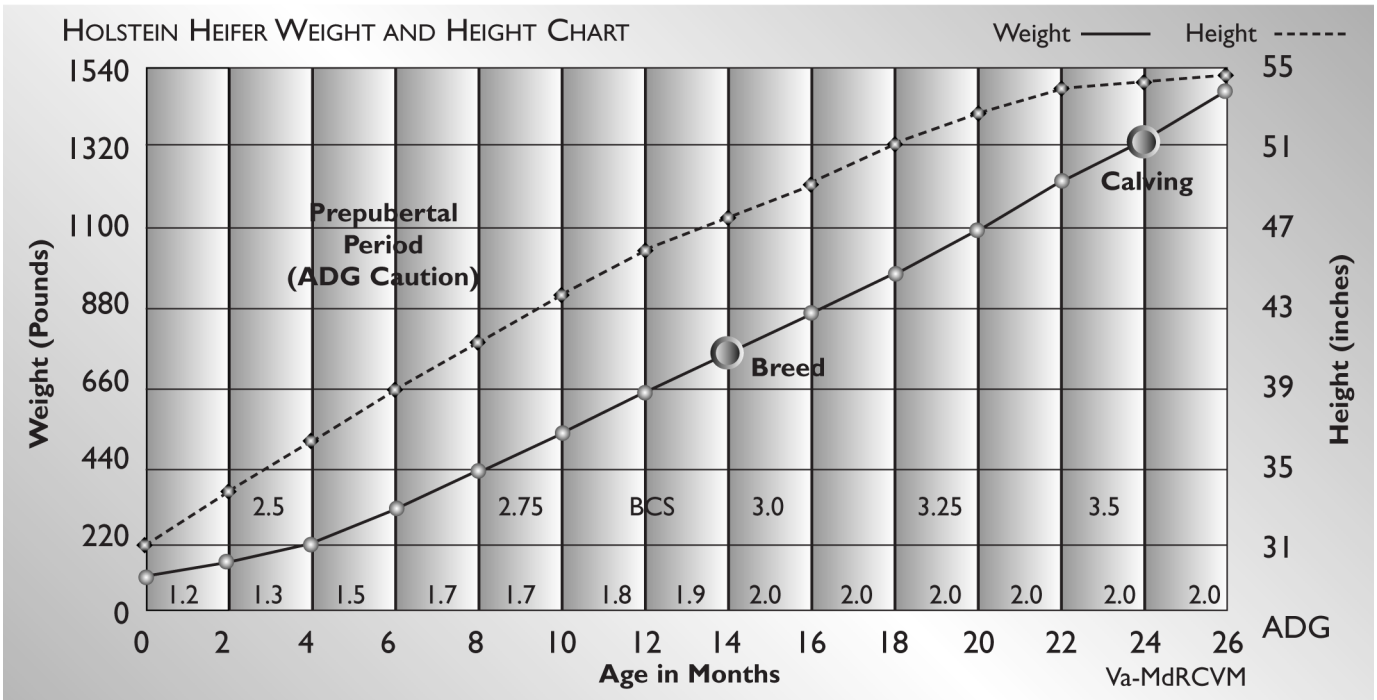

Figure 2: Heifer chart demonstrating optimal weight, height, ADG, and BCS by months of age.
*ADG (average daily gain) stratified by months of age.
^BCS (body condition score) stratified by growth periods.

BIBLIOGRAPHY

Bailey TL: Economic considerations of dairy heifers. Proc of the Society for Therio. San Antonio, Tx., pp 56-59, 1992.

Day JD: Optimizing heifer growth rates in high producing dairy herds. Comp on Cont Ed Vol 13 No 4:693-700, 1991.

Donovan GA, et al: Evaluation of dairy heifer replacement- rearing programs. Comp on Cont Ed Pract Vet Vol 9 No 4:F133-F138. 1987.

Fetrow J: Dairy production medicine software. University of Minnesota, St. Paul, Minn.

Fetrow J, et al: Dairy herd health monitoring. Part II. A computer spreadsheet for dairy herd monitoring. Comp Cont Ed Pract Vet 10:75-80, 1988.

Fisher LJ, Hall JW, Jones SE. Weight and age at calving and weight change related to first lactation milk yield. J Dairy Sci. 66:2167-2172, 1983.

Gardner CE: Dairy practice management. Vet Clin North Am [Food Anim Pract] 5, 1989.

Gardner RW, et al: Accelerated growth and early breeding of Holstein heifers. J Dairy Sci 60:1941-1948, 1977.

Head HH. Heifer Performance Standards: Rearing Systems, Growth Rates and Lactation. In H. Van Horn and C. Wilcox, (eds.): In Large Dairy Herd Management. American Dairy Science Association, Champaign, Ill., 1992, pp. 422-433.

Heinrichs AJ. Opportunities in replacement heifer growth. Dairy Session III. Proc Am Assoc Bov Pract. pp 73-75, 1991.

Heinrichs AJ, et al: Standards of weight and height for Holstein heifers. J Dairy Sci. 70:653-660, 1987.

Hoffman, PC, et al: Growth rate of Holstein replacement heifers in selected Wisconsin herds. Univ. WI Coll. Ag. and Life Sci Res. Rept. R3551. 1992.

Keown JF. Freshen heifers at 1200 lbs. Dairy Herd Management, August, p. 18, 1986.

Reid JT, et al: Effect of plane of nutrition during early life on growth, reproduction, production, health and longevity of Holstein cows. 1. Birth to fifth calving. Cornell Univ. Agr. Exp. Sta. Bull. No. 987. 1964.

Serjsen K, et al: Influence of Nutrition on mammary development in pre and postpubertal heifers. J Dairy Sci. 65:793-800, 1982.

Van Der Leek, ML, et al: Dairy Replacement Rearing Programs. In J. L. Howard and M. F. Spire (eds): Current Veterinary Therapy, 3rd. Philadelphia, W. B. Saunders, 1993, pp 147-153.