HOARD'S DAIRYMAN

A look at heifer intakes, growth, and efficiencies

by Al Kertz

PHENOTYPIC variables for heifers are many as the University of Wisconsin-Madison's Pat Hoffman has listed 17 factors affecting heifer performance other than nutrition. Nutrition itself is comprised of many variables, among which the largest is dry matter intake (DMI).

Figure 1 displays the heifer data used in the 2001 Dairy NRC (provided by Jim Linn, University of Minnesota) and the relationship between predicted versus observed DMI. Note that the grouping of data is much tighter at the lower DMI. Then it appears to widen further and is also much greater than predicted as DMI rose. This variability in DMI is greater than in cow data, and likely reflects the wide range of diets and conditions to which heifers are exposed to during their growing period.

The heifer diet

Up until around the 1970s, too often heifers were relegated to back pastures and out of sight. Then, as lactating cows were being fed higher corn silage diets, heifers were often fed ad libitum corn silage with protein, mineral, and vitamin supplementation. But, with excess energy intake, fattening resulted. That led to more mixed forage diets to prevent undue fattening. However, as cows were more specifically selected and bred for greater milk production, higher DMI also resulted. Consequently, heifers also had greater intakes.

With more emphasis on higher forage quality for cows, heifers were often fed the same higher quality forages. So, when heifers were fed a mixed forage total mixed ration (TMR) ad libitum, they could also undergo undue fattening. Unless poorer quality forages were available to feed to heifers, another option was to incorporate chopped straw into the TMR to still allow ad libitum intake with a reduced energy density diet.

A look at straw

The impact of including straw in TMR fed to heifers was evaluated in a study at the University of Guelph. Holstein heifers averaged 226 days of age and about 550 pounds at the start of a 21-day study. Heifers were fed a control TMR consisting of 17% corn silage, 52.1% grass silage, and 30.9% concentrate on a dry matter (DM) basis. Treatments were the control diet with no rye straw, 10% straw added to the control diet, and 20% straw added to the control diet. The addition of straw changed nutrient levels of protein, neutral detergent fiber (NDF), and energy.

Heifers exhibited sorting behavior by tending to sort against long particles with the control diet, the 10% straw diet, and the 20% straw diet. They sorted for medium length particles for both the 10% and 20% straw diets. There was a linear increase in sorting for medium particles when straw was added.

Heifers in the study sorted for short particles in all diets and in a linear manner. They also sorted for fine particles in the 20% straw diet, but not with the control and 10% straw diets. Like cows, heifers selectively consumed what they found more desirable in a TMR, which may result in an imbalanced diet.

Feeding with limits

Another method of feeding heifers has been to limit feed. Limit feeding has been shown to be useful to control growth in other livestock animals such as beef cows, feedlot steers, ewes, and beef heifers. Potential benefits are to reduce feed costs, reduce nutrient excretion, and reduce feedstuffs needed.

In various research trials that I have reviewed, limit feeding of heifers produced targeted daily gains if dietary protein and energy concentrations had been adjusted to provide the same amount of protein and energy for ad libitum-fed heifers. It also resulted in similar first lactation milk yields as ad libitum-fed heifers. Limit feeding reduced manure excretion, improved efficiency of nitrogen utilization and other nutrients, and was shown to work if adequate bunk space was provided for all heifers to eat at the same time. This is especially critical for heifers lower on the social dominance order.

Hoffman cautioned that there are some limitations to implementing a limit-feeding strategy. First is the expectation that heifers will vocalize to a minor extent for about one week after introduction with vocalization ending thereafter.

Second, if adequate bunk space is not available for all heifers to eat at the same time, DMI may be limited for some heifers. When heifers were fed to 80% of their intake potential, they consumed all the feed available within one hour. Data from a large commercial herd that tried limit feeding heifers are included in my book on calves and heifers and indicates why that practice was discontinued.

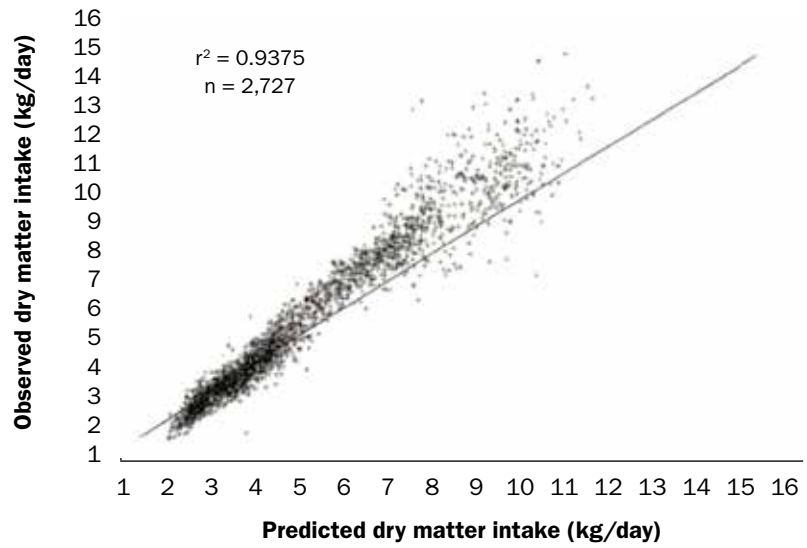
Water is the most essential nutrient needed in the greatest quantity by dairy heifers. Yet, it is often ignored or marginalized. In studies I have done or reviewed, calves consumed water at about four times the rate of DMI, as is also true for heifers and for cows. However, factors such as ambient temperature and humidity, moisture content of feed, and water quality do impact this ratio.

Already discussed in a previous article was the impact of grouping on intake and daily gain. In many other species, feed efficiency is com-

Table 1: Feed efficiency of different heifer groups

Group	Age at end (days)	DMI, lbs./day	ADG, lbs./day	DMI/ADG
1	65	2.91	1.67	1.74
2	111	5.86	2.20	2.66
3	162	11.36	2.26	5.01
4	226	14.60	2.18	6.72
5	295	18.56	2.11	7.74
6	406	19.62	1.87	10.48
7	650	23.28	1.85	12.58

Figure 1. Observed vs. predicted DM intake of growing dairy heifers



Source: NRC 2001

monly measured and assessed, including in beef feedlot operations. But there are limited data on growing dairy heifers. The most extensive data available (provided by Alex Bach in 2011) are from the Rancho Las Nieves Spanish calf and heifer ranch, found in Table 1. (Read more in the article "Spanish calf ranch researches growing strategies," that appeared in the April 10, 2008, issue of *Hoard's Dairyman*).

Note that in Group 1, with calves at 65 days of age, their feed efficiency is less than 2:1, which is similar to young growing nonruminants and is essentially what preweaned calves are. Succeeding groups averaged about 2.1 pounds of daily gain (ADG). But with increasing growth and body weight, energy requirements for maintenance expands, which results in falling feed efficiency. This is also a reflection of greater forage level in TMR fed and elevated gut fill.

While those feedstuffs cost less per pound than milk replacer and starter fed to Group 1, the cost per pound of body weight gain can be less for Group 1 because conversions of nutrients to growth are most efficient. Cost per pound of body weight gain can vary as feedstuffs' cost varies.

Questions remain

There are two major questions related to heifers not yet addressed with good data:

1. What is the impact of age at first calving on first and subsequent lactations?

2. What is the impact of calving difficulty on first and subsequent lactations?

I am involved in a major project to help address those questions by the end of 2024. In the meantime, periodically, if not more often, review data from your heifers as to their intakes, daily gains, and feed efficiencies and adjust as needed.

The author is the executive vice president for the American Registry of Professional Animal Scientists (ARPAS). Learn more at www.arpas.org.