HOARD'S DAIRYMAN

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Holsteins mobilize more energy

ALTHOUGH some studies have reported genetic variability in feed efficiency between Holstein and Jersey cows, results are inconsistent. It has been suggested that average feed efficiency in dairy herds should range from 1.4 to 1.6 pounds of 3.5 percent fat-corrected milk per pound of dry matter intake (DMI).

When feed efficiency is calculated this way, it does not differentiate between the energy used for separate bodily functions, such as maintenance, lactation and body tissue accretion. Therefore, it is not possible to distinguish if the energy used for milk production is originating from the diet or from the mobilization of body reserves. As a result, cows that mobilize more body tissue might appear more efficient.

Jerseys better balance

Early in lactation, cows mobilize body fat to support their energy requirements for milk production. Tissue reserves are replenished during late lactation or the dry period. Energy balance reflects the difference between dietary energy uptake and its use by the body to support maintenance, growth, production and reproduction. Maintenance requirements consist of the energy needed to maintain the basal metabolism, conduct voluntary body activities and maintain body temperature.

Therefore, when the animal is in negative energy balance, stored body fat and tissues are mobilized to meet additional needs. There is a large amount of literature available describing the energy status of Holsteins during lactation. However, information regarding energy metabolism of Jersey cows is lacking. In a review of 26 experiments using Holstein cows, the period of negative energy balance lasted approximately 50 days with the maximum negative energy balance observed at 11 days postcalving.

Prolonged periods of negative energy balance have been unfavorably associated with health and reproductive problems. The amount of tissue energy used during early lactation for milk production depends on body fat reserves at the time of parturition, the genetic potential for milk production and feed intake during early lactation.

Body condition scoring (BCS) has been widely accepted as the most practical method for assessing changes in energy reserves. Penn State researchers found a negative genetic correlation (-0.37) between feed efficiency and BCS. Their results, obtained from 970 Holstein cows in Pennsylvania, indicated that fatter cows were less feed efficient than thinner cows. However, when feed efficiency was adjusted for maintenance needs according to body weight (BW), the genetic correlations of those two traits were essentially neutral (-0.08). The authors suggested the convenience for measures of efficiency adjusted for body maintenance.

A study from the University of Connecticut dairy herd was conducted to determine whether there were breed differences in gross efficiency between Jersey and Holstein cows during early lactation. Cows were fed total mixed rations from Week 4 before calving to 120 days in milk. Feed efficiency of milk energy production (milk energy/net energy intake) for Holsteins and Jerseys was 0.86 and 0.74, respectively.

However, Jerseys remained in negative energy balance for a shorter period and to a lesser extent than Holsteins. The lowest energy balance was -6.19 Mcal/d for Jerseys in the first week of lactation. Comparatively, Holsteins bottomed out at -12.9 Mcal/d at Week 2. When BW changes between Week 4 prepartum and Week 17 of lactation were compared, Holsteins and Jerseys lost 10.6 percent and 4.6 percent of BW, respectively.

In time, these BW changes resulted in BCS losses, which also differed by breed. Loss in BCS occurred until Week 11 and 7 of lactation for Holsteins and Jerseys, respectively. The energy loss reported from the estimated negative energy balance during those 17 weeks of lactation was 498.8 Mcal for Holsteins and 114.5 Mcal for Jerseys. Since 1 pound of 4 percent fat-corrected milk contains 0.33 Mcal of energy, Holstein cows produced 1,500 pounds of milk with energy from body tissue mobilization versus 350 pounds for Jersey cows.

The interbreed difference in energy balance is in agreement with results published from two European experiments. English researchers estimated the energy balance between Week 2 and 14 of lactation in Holstein and Jersey cows. Although there was no overall difference in estimated energy balance, it was more negative in Holsteins than Jerseys during Weeks 2 and 3. The energy balance improved for both breeds as the lactation progressed, although they were estimated to be in negative energy balance for the duration of the study.

Danish researchers also found significant differences in energy balance between Holstein and Jersey cows. Early-lactation Holstein cows mobilized more body energy than Jerseys. In addition, primiparous cows mobilized less tissue than second- and third-lactation cows.

As lactation progressed, the differences between parities and breeds were reduced. These experiments prove that body tissue mobilization in early lactation may inflate feed efficiency if the energy contribution from body tissue mobilization is not accounted for.

Efficiency of mobilizing body fat for milk production and then depositing it during late lactation is very similar to that of converting dietary energy directly to milk. However, the energy efficiency drops 25 percent when the fat is replaced during the dry period. Body tissue lost during early lactation can be more efficiently replaced during late lactation than during the dry period.

Less energy for growth

Based on a Cornell University publication, the minimum BW of first-lactation (primiparous) cows necessary to optimize milk yield is at least 82 percent of their mature BW. But it is known that Jerseys reach their mature BW sooner than larger dairy breeds. Therefore, if Jersey heifers are more physiologically mature at calving, they do not need as much energy to support growth during their first lactation.

A Dutch experiment evaluated the energy efficiency of primiparous Jersey cows with a control group composed of Holstein Friesians, Dutch Friesians, and Dutch Red and Whites. During the first 39 weeks of lactation, cows were fed a complete diet of 50 percent concentrate and 50 percent forage. The author estimated the energy partition for milk production, maintenance and body gain.

The efficiency for milk production was 59 percent for Jerseys and 55 percent for the larger dairy breeds. However, Jersey cows had relatively less energy available for gain.

In a subsequent experiment, the researcher measured the energy efficiency of Jersey cows in their third lactation, and a control group of the larger dairy cows. In this case, there were no differences on energy efficiencies for milk production.

A recent study carried out in Virginia also investigated the energy partition in primiparous Jersey and Holstein cows. Both were housed together and fed a TMR. The results agree with those of the Dutch experiment; primiparous Jersey cows were more efficient than their Holstein counterparts. Jersey cows allocated proportionally more energy to production (66.2 versus 60.8 percent) and less to growth (4.9 versus 6.9 percent) than Holsteins.

The energy value of body tissue accretion depends upon the relative proportions of fat and protein in it. The studies reviewed show that both body tissue gain during first lactation and body tissue losses during early lactation may affect feed efficiency for milk production.

These factors could explain some of the interbreed differences observed. Jersey cows appear to be more efficient during the first lactation because they do not need as much energy in support of growth. On the other hand, Holsteins may be more energetically efficient than Jerseys during early lactation because they mobilize more body tissue.

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