Calves more efficient at growth than heifers

Bottom Line

with
AL KERTZ*

FEED efficiency has traditionally been relegated to growing animals like pigs, chickens and feedlot cattle, but more recently, there has been some application to lactating dairy cows, which have more variables involved in calculating feed efficiency than for the aforementioned species (Hutjens, 2008; Linn, 2006).

These additional variables include: parity, stage of lactation, body condition gain or loss, bodyweight, dry matter intake (DMI), level of milk production, genetics, ration digestibility, nutrient imbalance, growth and reproduction. Above these factors are feed economics and milk price.

This should not imply that feed efficiency is that much simpler with dairy calves and heifers. Hoffman (2004) listed 17 factors affecting heifer performance other than nutrition: dystocia, twins, low birth weight, failure of passive transfer, pneumonia, hoof disease, bovine viral diarrhea, respiratory health, salmonella, parasites, hardware, inbreeding, breeding efficiency, bunk space, crowding, comfort and trauma/injury.

Furthermore, in a data set used in 2001 by the National Research Council dairy committee (provided by Jim Linn of the University of Minnesota in Figure 1) to evaluate dairy heifer DMI, note that predicted DMI was initially lower than observed at low levels of DMI but then increased to above observed DMI as DMI increased beyond about 6 kg per day.

Also, note that the variability of observed DMI increased as DMI increased. This is most likely due not only to non-nutritional factors but to larger/older dairy heifers having the genetic ability to eat more than previous generations, just like their dams being selected for greater milk production, which goes along with greater DMI.

These larger heifers are fed a wider range and variety of feedstuffs in their rations as their DMI increases. In fact, some will have to be either limit fed or have lower-nutrient density feedstuffs, such as straw, added to rations so that these heifers can be fed free choice and not get fat.

Let's look more closely at the young preweaned calf and feed efficiency. This is calculated in some published calf studies, but it is often confounded. A high-quality milk replacer, or milk solids, would be digested at 90%-plus. A well-texturized calf starter would be digested at more than 70% (Porter et al., 2007). Hay — which I do not recommend feeding at this young age and stage of rumen development — would have a digestibility of about 40-60%, depending on its nutritional quality.

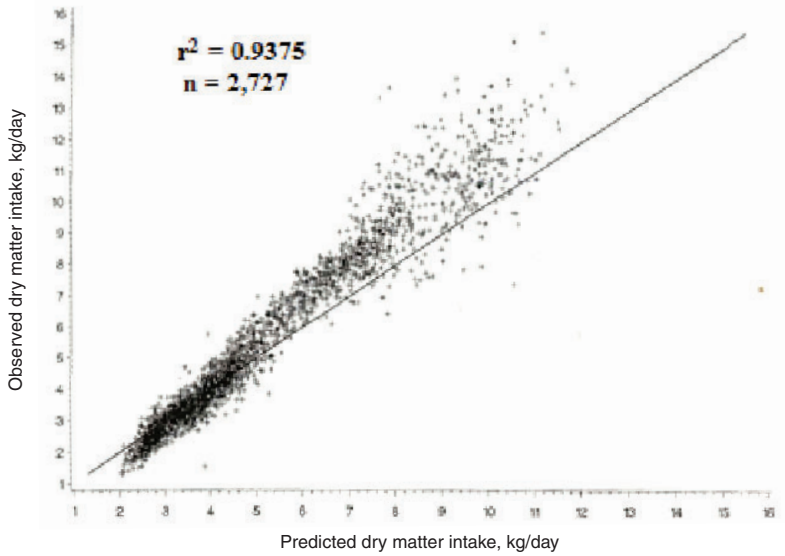
Here is the conundrum. If calves before weaning consumed daily 1.25 lb. of milk replacer or milk solids on a dry basis, 1 lb. of calf starter and no hay on one treatment, but then were given 0.2 lb. of hay in another treatment, which treatment has the better feed efficiency?

To confound this further, calves fed the hay likely will have greater rumen/gut fill, distorting true bodyweight gain. Only if calves are fed the same amounts and proportions of these three feed categories can a valid comparison be made within a study. Trying to compare feed efficiencies across various calf studies is much more problematic and confounded.

A greater rate of gain is also associated with more efficiency in converting nutrients to bodyweight (not considering excessive fattening) because the maintenance requirement is diluted per unit of gain at greater rates of gain (Figure 2).

After calves are weaned, as forage begins to be fed in their ration, feed efficiency will get poorer for two reasons: (1) digestibility of rations with forage decreases compared to what calves were fed before weaning, and (2) maintenance requirements increase with increasing body weight. This is illustrated (Figure 3) by data from a large calf/heifer ranch in Spain for which I have previously consulted. Since average daily gain (ADG) was similar after the first two months of life, feed efficiency numbers (DMI/ADG) are parallel to increasing DMI. Thus, the youngest animals converted more

1. Observed versus predicted dry matter intake for dairy heifers



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nutrients to gain as they grew larger.

That leads to the question of feed costs per unit of bodyweight gain. In one scenario, feed costs per unit of bodyweight and per unit of wither height were lowest during the first six months, when nutrients are converted most efficiently to weight and height. Increases in relative bodyweight and wither height were the most rapid and cost efficient during the first six months of life (Kertz et al., 1998).

In a Michigan State University study (Brown et al., 2005), purchased Holstein heifer calves were fed either 20% protein and 20% fat (conventional) or 28% protein and 15% fat (intensive) milk replacers and were weaned at 49 days on trial. At the end of eight weeks on trial, bodyweight, wither height, DMI, gain:feed and cost per kilogram of daily gain were all improved by the intensive feeding program.

Body composition analyses found no significant differences in proportions of protein, fat and ash between the two treatments. Thus, the additional growth on the intensive treatment was not fattening but true growth.

A similar study (Davis Rincker et al., 2011) with the same treatments was done at Michigan State, but with research herd heifer calves. After 152 days in their first lactation, net returns per treatment were $83 for conventional-fed and $170 for intensive-fed calves. The $53 added feed cost per calf for the intensive treatment returned an additional $97 through just the first 152 days in that heifer's first lactation.

In a detailed economic comparison of conventional versus intensive calf programs (Overton et al., 2013), the net return through first lactation (including the milk response determined by Soberon et al., 2012) was $205 more for the intensive milk replacer program compared to the conventional program.

In my next column (Nov. 10), data from several Wisconsin field studies will be summarized and reviewed. These rather detailed studies were done in 1999, 2007 and 2013 and are the only studies of this type and detail of which I am aware.

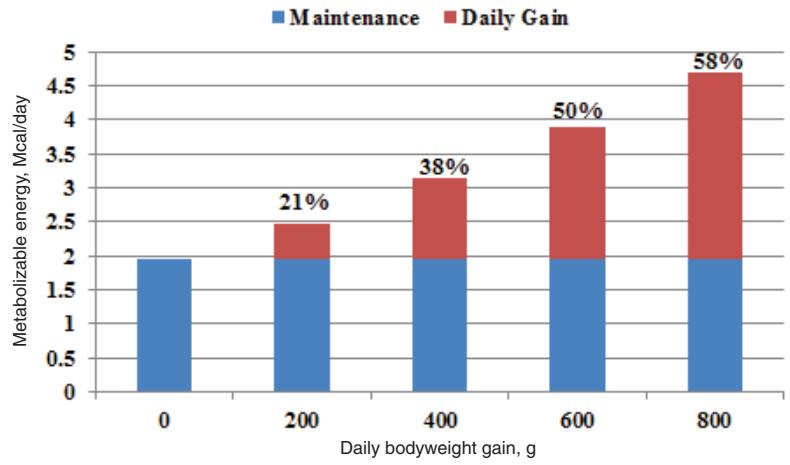
The Bottom Line

Calves are more efficient at converting dietary nutrients to true growth than heifers because they are fed more-digestible diets and because they have a smaller bodyweight and lower accompanying maintenance requirement.

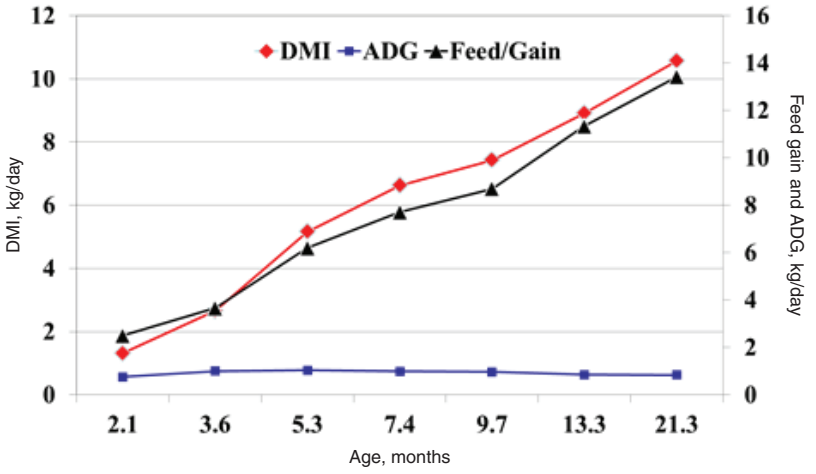
Even though calves are fed diets that cost more per pound than growing heifers, at times, they can still convert nutrients to bodyweight at a lower feed cost per unit of gain.

Besides, why would you short-change calves on feeding when how well they grow in their first two months results in more milk in their first several lactations — and at a greater net return?

2. Efficiency (%) of metabolizable energy utilization with increasing rates of daily gain by 50 kg calf (as calculated from 2001 Dairy NRC)



3. Feed efficiency DMI/ADG from Rancho Las Nieves in Spain



Source: A. Bach, 2011 (personal communication).

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