

# Feedstuffs

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## 2001 NRC recommendations for heifers must be used carefully

By AL KERTZ

The 2001 National Research Council (NRC) document on *Nutrient Requirements of Dairy Cattle* contains a 10-page section on growth.

This may well have been the most difficult section in the whole document to write. There are several reasons for this.

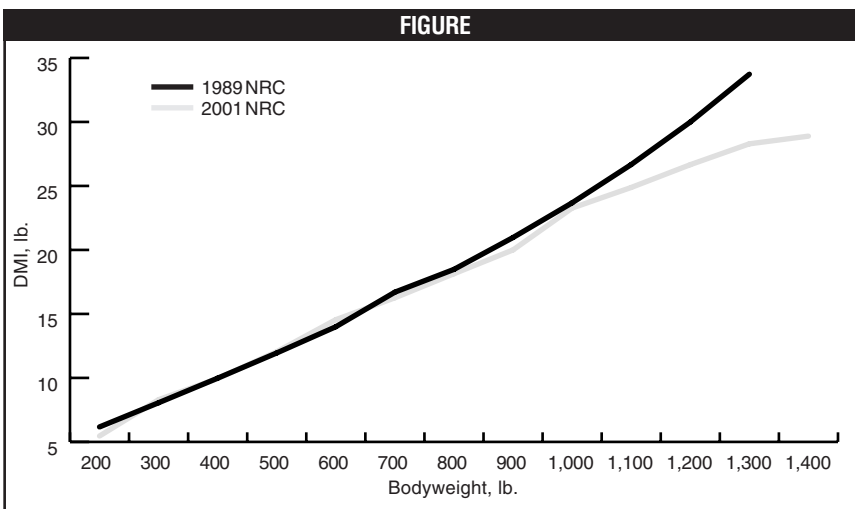
First, using a modeling approach based largely on beef and sheep compositional data primarily from the 1950s and '60s is limiting in itself. There are some comprehensive data on Holsteins from a project in the early 1970s in which I was involved as a graduate student.

There are limitations with those data because the diet and feeding/management were atypical and skewed for research purposes. Additionally, many subsequent generations have changed the genetics of Holsteins and other dairy breeds. To get a visual idea of this, place side by side the Purina collages of North American dairy breeds from 1963 and 1994. It is striking how similar in conformation all the dairy breeds had become by 1994, due largely to more refinement in bone structure, angularity and classical "dairy character."

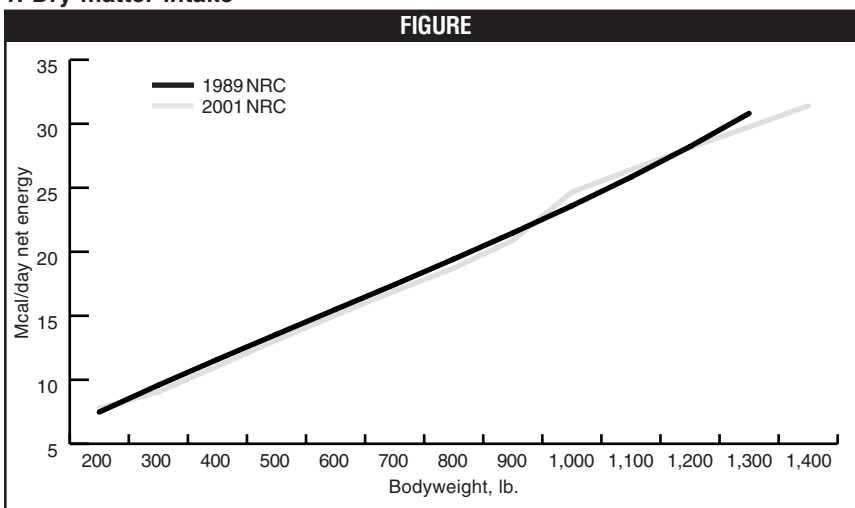
We know dairy cows have changed considerably during this period, as exemplified in increased dry matter intake (DMI) and milk production, so why would we expect that dairy heifers have not also changed similarly?

The main difficulty in this area is the paucity of compositional and growth/development data for dairy heifers. For-

■ *Dr. Al Kertz is an independent dairy nutrition consultant based out of St. Louis, Mo. His area of specialty is dairy calf and heifer nutrition and management. To expedite answers to questions concerning this article, please direct inquiries to Feedstuffs, Bottom Line of Nutrition, 12400 Whitewater Dr., Suite 160, Minnetonka, Minn. 55343.*



1. Dry matter intake



2. Energy requirements

unately, within the last 10 years, there has been a resurgence of research into growth and development of dairy heifers.

### Energy, protein

There is a replacement heifer model as part of the NRC document. It has a variety of inputs. The management/environment component of the model may be the most useful to determine the effect these factors may have on performance. You can get a wide range of solutions at any set age and weight dependent on what the other variables

are.

This may be good from a reference and instructional viewpoint, which is the main value of NRC documents, but be wary if you want a simple field application.

To get an idea of how some nutritional parameters may have changed since the 1989 NRC, tabular nutrient requirement data were taken from Tables 14-13 and 14-15 in the 2001 NRC for non-bred and bred heifers, respectively. In the 1989 NRC, DMI was skewed too high above about 900 lb. bodyweight, as seen in Figure 1.

## ■ 2 — FEEDSTUFFS, January 14, 2002

This was due to an assumption that dietary energy concentration would decrease at higher bodyweight, and then this is the DMI that would have had to occur to meet total energy needs. Few heifers would have been able to eat this much.

In fact, if the diets were that low in energy, heifers would have eaten less than normal because of lower digestibility and more gut fill. This error appears to have been corrected in the 2001 NRC.

Energy requirements are similar in 1989 and 2001, as seen in Figure 2, but with a different pattern. The 1989 requirements are essentially a straight line, but 2001 tends lower from 300 to 900 lb., increases after pregnancy above 900 lb., goes below at 1,200 lb. and then extends beyond the 1989 data for 1,300 lb.

Protein requirements in 1989 and 2001 have different patterns (Figure 3). In 1989, there is a curvilinear effect from 200 to about 750 lb., but then this becomes more of a straight line at somewhat of an increasing rate above 750 lb.

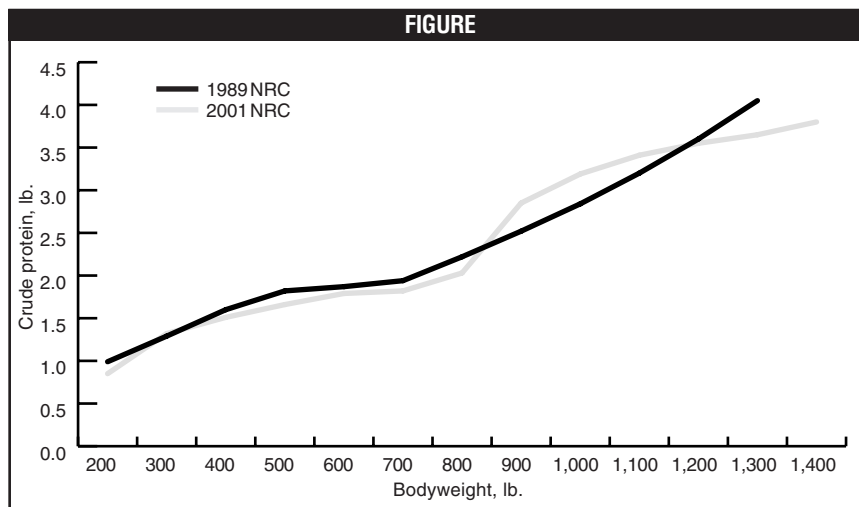
For 2001, protein required is below 1989 from about 450 to 650 lb., goes below until pregnancy at 900 lb., after which it shows a curvilinear effect going below 1989 requirements above 1,200 lb. bodyweight.

Keep in mind that in the 2001 NRC, crude protein is defined as “required only if ration is perfectly balanced for RDP (rumen degraded protein) and RUP (rumen undegraded protein).” I question if we know how to perfectly balance a ration for RDP and RUP.

### Size, scale

It can be deceptive to simply use bodyweight of heifers as the reference point because a heifer of the same bodyweight could be on a spectrum from taller and thinner to shorter and fatter. This section in the 2001 NRC attempted to address that issue by looking at target weights and mature bodyweight.

However, there is an error in the text that must have occurred after review and before publication. The statement on page 239 reads, “The data of Kertz et al. (1997, 1998) indicated that post-



### 3. Protein requirements

partum weight of replacement heifers should be 77% of mature bodyweight compared to 83% in the study of Van Amburgh et al. (1998a) and the target of 82% in this model.” The correct numbers are 82% from an actual five-year database (Kertz et al., 1997) and 87% from a more idealized scenario (Kertz et al., 1998).

This compares similarly to that of Van Amburgh et al. (1998), the 2001 NRC model and the report of Hoffman (1997).

Actually, wither or hip height can be a better single indicator than bodyweight because they are often simpler to measure. Also, by looking at heifers, you can determine their relative body condition.

### Average daily gain

In the 1989 NRC, average daily gains (ADG) were 1.3, 1.5 and 1.7 lb. for large-breed heifers from 200 to 1,300 lb. bodyweight. In the 2001 NRC, ADGs were 1.1-2.2 lb. at 0.22 lb. intervals for large-breed, non-bred heifers of 330-880 lb. bodyweight.

The ADGs and intervals were the same for bred heifers from 880 to 1,431 lb. bodyweight for the non-bred heifers, but the values in parentheses in Table 14-15 (p. 279) for pounds versus kilograms appear to be in error. For instance, ADG values in kg (lb.) for the various bodyweights were as follows: 0.5 (1.1), 0.6 (1.2), 0.7 (1.3), 0.8 (1.4), 0.9 (1.5), 1.0 (1.6) and 1.1 (1.7). The first number of 0.5 (1.1) is correct as 0.5

kg is 1.1 lb. However, the remaining numbers should be: 0.6 (1.32), 0.7 (1.54), 0.8 (1.76), 0.9 (1.98), 1.0 (2.2) and 1.1 (2.42), respectively.

Clearly, in the 2001 NRC, a more extensive range of ADGs was provided for than in the 1989 NRC. This raises the issue of what appropriate ADGs are, what the age at first calving should be, and what the pre-calving bodyweight should be. This necessitates addressing the issue of accelerated growth rates for heifers, which will be the subject of the next column.

### The Bottom Line

The 2001 Dairy NRC heifer model must be used carefully and tempered with reference points. DMI prediction has been improved compared to the 1989 edition, while energy and protein requirements are similar. Size measurements should include height as well as weight. Appropriate ADGs will be addressed in the next column.

### REFERENCES

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