

A revised 'Nutrient Requirements of Dairy Cattle' publication was released by the US National Research Council in January 2001. In the next few issues of Western Dairy Digest, we'll highlight the significant changes made from the last release in 1989. This time we'll look at feed intake prediction for lactating cows.

Why is the estimation of feed intake important? Once nutrient requirements are defined, most nutritionists will use an estimate of feed dry matter intake (DMI) to determine the dietary concentrations of nutrients required. The 1989 NRC Dairy publication provided little help in doing this. The approach taken there was to determine net energy requirements for lactation (NE_l), specify a dietary energy concentration, then calculate what DMI would have to be to satisfy the animal's requirement:

$$\text{DMI (kg/day)} = \frac{NE_l \text{ required (Mcal/day)}}{\text{Dietary } NE_l \text{ conc (Mcal/kg)}}$$

The 2001 NRC revision returns to the approach taken in earlier versions, where production and body weight were used to predict DMI. Based on the observation that DMI peaks later than milk yield, this time a lag factor has been included in the prediction equation:

$$\text{DMI (kg/day)} = (0.372 \times \text{FCM}) + (0.0968 \times \text{BW}^{0.75}) \times (1 - e^{-(0.192 \times (\text{WOL} + 3.67))})$$

where FCM is 4% fat-corrected milk yield (kg/day), BW is body weight (kg) and WOL is week of lactation. The graphs on the right show typical changes in DMI, FCM and BW as lactation progresses.

Other factors affecting DMI

The intake equation above does not account for other factors affecting DMI, including the following:

- **Dietary moisture level.** Although it is commonly believed that high dietary moisture levels reduce intake, trials designed to test this belief have yielded conflicting results. When wet silages are fed, reduced DMI is likely due to fermentation acids rather than higher moisture levels.
- **Dietary fibre level.** DMI may be reduced as neutral detergent fibre (NDF) concentration rises above 25% of dietary DM, due to increased rumen fill. The magnitude of this effect also depends upon

NRC 2001 Feed Intake Prediction

particle size, digestibility and the rate at which feed residues pass out of the rumen. These factors also account for the observation that DMI increases with lower dietary forage to concentrate ratios.

- **Dietary fat.** DMI is often reduced when fat replaces carbohydrate as a dietary energy source. This may be due to a negative effect of fat on fibre digestion. Unsaturated fats appear to have a greater effect than saturated fats and calcium soaps of fatty acids.
- **Access to feed.** DMI may be restricted when fresh feed is unavailable at the specific times when cows want to eat.
- **Feeding frequency.** Increasing the frequency of offering fresh feed may increase DMI. Pushing up feed previously offered may have a similar effect.
- **Cow behaviour.** Time spent eating and DMI tend to be higher for dominant cows, particularly where there is competition for access to feed. First-lactation cows may have lower DMI when grouped with older, more dominant cows.
- **Temperature.** Cows eat less as the ambient temperature rises above 25°C, depending also on relative humidity. DMI increases as temperature falls below about 0°C.

source: Nutrient Requirements of Dairy Cattle, NRC (2001)

