

One size doesn't fit all

A dairy's heifer management, plus their environment, should determine growth standards, nutrient requirements and age at first calving

By Mike Van Amburgh and Matt Meyer

Every dairy takes a different approach to most practices, whether it's employee management or milking procedures. So why should there be one standard for heifer growth and age at first calving (AFC)? There shouldn't be.

Targets for components of your heifer program should be herd specific. For instance:

- Base your heifers' nutrient requirements on their characteristics, environment and your management.
- Determine targets for breeding weight and post-calving body weight by the mature size of your dairy herd.
- Base AFC on your heifer management program and the age at which a heifer's lifetime productivity reaches its peak.

Herd-specific target growth doesn't mean you shouldn't work towards a younger AFC. But each dairy has its own set of management and environmental conditions that require it to set its own goals for age and weight at first calving. Here's how. Begin by knowing these factors:

- Herd's mature weight
- Desired AFC
- Current weight
- Current age
- The heifer diet's chemical composition and dry matter intake (DMI).

Once you know these, you can calculate breeding weight and pre-calving or post-calving body weight. Then compare them to your targets.

Role of mature body weight

Failing to account for the herd's mature size can lead to significant differences in the amount of energy required at a specific stage of growth. For example, if two groups of heifers weigh 400 pounds, the heifers that reach mature weight at 1,400 pounds are 28.6% of their mature size at that point. But the heifers that will grow to 1,800 pounds are only 22.2% of their mature size.

Not accounting for differences in mature body weight will change the daily metabolizable energy

Table 1. Target growth and diet for Holstein heifer

Growth Characteristics	
Mature body weight, lb.	1,400
Current weight, lb.	375
Current age, month	4
Target AFC, month	22
Target breeding weight, lb.	770
Target pregnant age, month	13
Target post-calving weight, lb.	1,190
Diet, Dry Matter Basis	
Corn silage, lb.	4
Alfalfa silage, lb.	4
Corn grain, rolled, lb.	1.50
Roasted soybean meal, lb.	1.25
Minerals, vitamins, lb	.35

This is based on a herd mature body weight of 1,400 pounds and a targeted 22-month AFC.

requirement by as much as 20%. If this is compounded over 100 days of growth, the smaller mature weight heifers are likely to become over-conditioned.

In this example, heifers with a mature weight of 1,400 pounds will deposit more fat and less protein per unit of gain at the same weight because they are closer to their mature weight. Because there is additional fat in the gain, the energy required for gain (NEg) will be higher at the same rate of gain.

Table 2. Effect of mature body weight on energy and protein allowable body weight gain

Mature weight, lb.	1,400	1,800
Energy allowable gain, lb/d	1.80	2.15
Protein allowable gain, lb/d	1.80	1.80

The diet was designed for the average heifer in Table 1. But the comparison is to a group of heifers from a herd with a larger mature body weight.

If the heifers are consuming the same amount of energy at the same body weight, those with the larger mature size will gain weight at a slightly higher rate because of depositing more protein per unit of gain. (See Tables 1 and 2.)

Muscle tissue weighs more than fat and will

FYI

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■ The paper "Target Growth and Nutrient Requirements of Post-weaned Dairy Heifers" is excerpted with permission of its authors, and "Dairy Calves and Heifers: Integrating Biology and Management" (NRAES-175). Natural Resource, Agriculture, and Engineering Service, Ithaca, NY. Tel: (607) 255-7654. Website: www.nraes.org

result in greater weight gain. So the larger heifer will use the extra energy to deposit body fat, and the expected weight gains will be a compromise between the energy and protein allowable gains.

As weight increases, energy content of the gain increases because more energy is deposited as fat. Protein and fat content of the gain and expected body fat depend on the rate of gain at a particular stage of growth.

A growing heifer's protein requirements are a function of the animal's stage of development, rate of gain and maintenance requirements. Protein supply is determined by the amount of crude protein intake, feed protein degradation in the rumen, carbohydrate fermentation in the rumen and microbial protein production. As with the energy values, the protein requirements should be scaled to account for mature size.

A "one size fits all" recommendation for both nutrient requirements and first lactation post-calving body weight will lead to heifers that are either over or under fed nutrients to make them fit a target inappropriate for their characteristics.

Setting targets

To implement this target growth approach, weigh or tape third lactation cattle and average the weights. That weight is a reasonable expectation for 96% of the mature size of the herd. We don't recommend putting cull cows into the equation since they don't represent the herd's average.

If you buy heifers and don't know the herd's mature size, you can use a bodyweight range for mature Holsteins offered by P.C. Hoffman: It is 1,441 to 1,558 pounds.

Over the last few years measurements of mature weight in New York herds have shown weights ranging from 1,375 to 1,800 pounds for fourth lactation cattle.

What actions should you take if heifers are off targets?

- Pre-pregnancy growth rates lower than the target indicates a diet change. Or increase intakes to achieve AFC goals.

- Pre-pregnant growth rates in excess of the current targets can be dealt with in two ways: Decrease the energy intake to reduce the growth rate to the target weight. Or change the targets for AFC, which will lower the age at pregnancy.

Environment and maintenance

Environmental factors – wind, cold, heat, water and mud – affect animals' maintenance requirements. For post-weaned cattle from 180

to 250 pounds, maintenance requirements start to increase at temperatures below 42°F. Mud becomes an issue if it's deeper than about 4 inches, or when heifers are covered in mud. If so, heat loss increases because hair has lost some of its insulation capacity, and diet energy density needs to be increased. Other factors affecting the maintenance requirement are parasites, disease, competition, transportation and feed availability. ■

Table 3. Target weight for dairy animals

Stage of dev. target % of mature weight

1 st Pregnancy	55
1 st Calving	85
2 nd Calving	92
3 rd Calving	96

Used in the 2001 NRC Nutrient Requirements for Dairy Cattle (Fox et al., 1999, NRC, 2001) and Cornell Net Carbohydrate and Protein System (Fox et al, 2003)

Table 4. Guidelines for diet formulation to optimize Holstein heifer gains

Weight, lb.	Expected DMI, lb/day	NEg, Mcals/day	Crude protein, %DM	RUP, % of CP
200-400	7-9	0.48 - 0.50	17 - 19	35 - 40
400 - 600	10 - 14	0.42 - 0.46	16 - 18	30 - 35
600 - 800	15 - 18	0.38 - 0.42	15 - 16	25 - 35
800 - 1,000	19 - 24	0.30 - 0.35	13 - 15	25 - 35
1,000 - 1,350	25 - 35	0.30 - 0.35	12 - 14	20 - 30

Based on 1,650 pounds mature body weight. Values allow for daily gains of 2 pounds per day, assuming maintenance requirements have been met. Evaluate these values against a system that uses size scaling and metabolizable protein approaches to more accurately account for variation in protein requirements.

For more info

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