

# The heifer in transition

Heifers account for 30 to 50% of calvings on most dairies, making their care and feeding pre- and post-partum critical to future performance

By *Tom Overton*

**Specific aspects of transition cow** biology and management are critical for the well-being of newborn calves and freshening heifers. These include management factors that affect colostrum quality and quantity. Also, differences in nutrient and metabolic status between first-calf heifers and cows entering second or greater lactations might influence management decisions to mitigate metabolic disorders.

## Colostrum quality and quantity

Research has shown that neither energy nor protein nutrition within the range found on commercial dairies is likely to influence colostrum quality. But they both may influence colostrum quantity. Other nutrients related to normal immune response, such as selenium and possibly other trace minerals and vitamins, likely are related to colostrum quality.

Olson et al. (1981) reported that restricted metabolizable energy (72% of NRC requirements) and crude protein (33% of NRC requirements) slightly affected immunoglobulin (Ig) concentrations in maternal serum but didn't have any consistent effect on IgG concentrations or other immunoglobulins in colostrum whey.

More severe restriction of the protein supply during the last two-thirds of gestation actually resulted in increased concentrations of IgG in colostrum.

Calves from protein-restricted dams had decreased capacity to absorb IgG from colostrum. Other studies report that protein restriction during the last 150 days of gestation didn't affect IgG concentrations in newborns (Olson et al., 1981).

Research with gestating beef cattle that grazed selenium-deficient pastures (0.02 mg/kg of dry matter) but allowed free access to a salt and mineral mix containing selenium selenite (estimated intake 0.6 mg/kg of total dry matter intake) had twice the whole blood selenium concentrations of the controls at calving. They also produced colostrum with significantly higher concentrations of IgG. And calves from selenium-supplemented dams had higher whole blood selenium concentrations at birth.

Though nutritional factors don't seem to have much effect on colostrum quality, research shows that stress may affect both its quality and a newborn's ability to absorb immunoglobulin.

Nardone et al. (1997) subjected heifers to either a comfortable environment or heat stress and 72% humidity during the last three weeks of pregnancy and first 36 hours after calving. Conditions didn't affect colostrum volume, but heifers subjected to heat stress produced colostrum with lower protein content and markedly lower IgG concentrations.

What about the influence of a shortened dry period on colostrum? Annen et al. (2004) reported that varying or eliminating the dry period didn't affect colostrum IgG content in mature cows but decreased its content in first-calf heifers.

## Calving's impact

Even though heifers account for 30 to 50% of calvings on most dairies, relatively few studies have focused on how calving affects their nutrient and metabolic status. In general, prefresh heifers have lower dry matter intakes (DMI) than prefresh cows (Hayirli et al., 2002) when fed the same diet.

Results of Rabelo et al. (2003) suggest that prefresh heifers and cows increase their DMI and energy balance in response to increased energy density of the prefresh diet. Dairies must strike a balance between balancing the different DMI of prefresh heifers and cows with nutrient densities to meet their nutrient requirements without greatly exceeding those of mature prefresh cows (Overton and Waldron, 2004).

Research and on-farm observations show two points about the differences between first-calf heifers and mature cows that influence metabolic disorders after calving:

- Cows have greater acceleration of milk yield during early lactation and produce more milk overall than first-calf heifers.
- Though cows have higher DMI after calving



## FYI

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than first-calf heifers, the differences are typically smaller than expected based upon their relative intakes during the precalving period.

Consequently, first-calf heifers should have much lower incidences of metabolic disorders than mature cows. And for the most part that's the case. Gillund et al. (2001) reported that multi-lactation cows were 3.4 times as likely as first-lactation heifers to develop ketosis. But the incidence of retained placentas and metritis wasn't markedly different for calvings one through three in another large dataset (Rajala and Grohn, 1998).

Heifers' body condition makes the difference. Dairies that grow heifers following target growth guidelines outlined by Mike Van Amburgh and the National Research Council 2001 (NRC) and typically keep body condition score at 3.0 to 3.5 don't see elevated incidence of metabolic disorders in that group of animals compared to cows.

But fat heifers – those with body condition scores of 3.75 or greater – will be more susceptible to low dry matter intakes pre- and post-calving, excessive loss of body condition score, and increased incidence of energy-related disorders such as ketosis and displaced abomasum.

### Transition cow management

Research indicates that cows' metabolism and milk production during the next lactation are virtually unaffected by decreasing the length of the dry period to 30 to 40 days.

First-calf heifers may have a different response when managed for 30 days dry. In research, they produced less milk during the subsequent lactation than those managed for 60 days dry (Annen et al. 2004). We're conducting a study to evaluate the effects on subsequent performance of managing first-calf heifers for 40 days dry.

For all mature cows that continue to produce sufficient amounts of milk, I recommend a 40-day dry period. First-calf heifers should perhaps go 48 to 50 days.

There will always be a population of cows that don't yield enough to justify shortening their dry periods. These cows should be fed a diet allowing for maintenance of body condition score (~ 0.59 to 0.63 Mcal of NEL/lb diet DM).

Cows managed for a 40-day dry period can be fed the recommended close-up diet (Table 1) for their entire dry period. Cows managed for longer days dry should be moved into the close-up group approximately 21 days prior to expected calving. Data support the idea that 14 to 21 days in the close-up group maximizes productivity and minimizes metabolic disorders during the subsequent lactation (Corbett, 2002).

## For more info

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Managing for hypocalcemia is the only aspect of prefresh heifer diet formulation that under some circumstances should be different from that for mature cows. Data from Moore et al. (2000) suggest that anionic formulations of the prefresh diet may decrease DMI of heifers more than cows and result in other complications related to energy metabolism in heifers.

Therefore, although cows and heifers should both be fed diets lower in potassium (partial anionic strategy in Table 1) during the close-up period, use caution when trying to feed heifers large amounts of anionic supplements (full anionic strategy in

Table 1).

If heifers are to be commingled with cows during the immediate post-fresh period, they should be moved into the close-up group at least 21 days prior to calving. Earlier is even better to facilitate socialization of heifers with cows. ■

**Table 1. General goals for diet formulation for close-up heifers and cows**

	Partial anionic	Full anionic
NEL, Mcal/lb	0.68 - 0.70	
Metabolizable protein, g/d	1,100 - 1,200	
NFC, %	34 - 36	
Starch, %	18 - 20	
Dietary Ca, g/d	100	140
Dietary Ca, %	0.90	1.20
Dietary P, %	0.30 - 0.35	
Mg, %	0.40 - 0.42	
Cl, %	0.3	0.8 - 1.2
K, %	<1.3	<1.3
Na, %	0.10 - 0.15	
S, %	0.20	0.3 - 0.4
Vitamin A, IU/d	100,000	
Vitamin D, IU/d	30,000	
Vitamin E, IU/d	1,800	

\*Based on 25 pounds of DMI average in close-up group.