Supplement energy to calves in cold weather

Bottom Line

with
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QUITE frankly, I have been remiss in not recognizing the negative impact of cold weather on calves, but my experiences over the last five years, along with seeing data that indicate the impact of cold stress in calves, prompted this column.

The National Research Council's (NRC) 2001 Dairy Young Calf Model works well to illustrate scenarios related to the thermoneutral zone for calves, which is the temperature range in which a calf does not need to expend appreciable energy to either keep warm or stay cool.

The thermoneutral zone can vary due to factors such as calf age, feed intake, amount of body fat and hair coat thickness. Typically, it ranges from about 60°F to 75°F. The lower end of this temperature range is particularly critical for calves younger than two to three weeks of age because they consume limited calf starter intake, which means they have little heat from rumen fermentation to help keep them warm in colder weather.

There are three options to address this situation: feed more milk replacer or pasteurized waste milk, feed a higher-fat milk replacer or add a fat supplement to the liquid feeding program. Simply feeding more may seem like the most straightforward approach, but that means protein will be overfed since its requirement does not increase much at all with colder weather (NRC, 2001).

A higher-fat milk replacer could be used, but that means carrying another product to feed and maybe overfeeding energy, depending on the weather, age and calf starter intake of the calves.

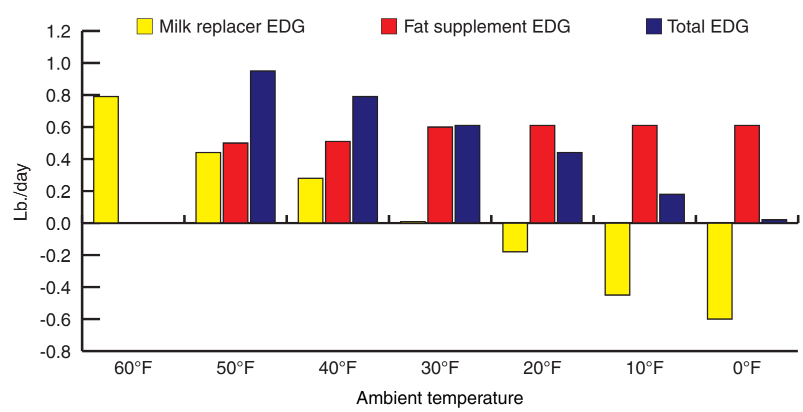
The last option of using a fat supplement may provide flexibility but still requires some management decisions and practices. That option was explored using a commercial supplement that contains 7% protein and 60% fat in dry form (disclosure: I now work for a company that makes such a product).

Briefly, a 20% protein/20% fat milk replacer was used in temperature iterations at 10 oz. per two quarts fed twice daily for a baseline in depiction of cold stress. That equates to feeding 1.25 lb. of dry milk replacer daily. The fat supplement was fed at 2 oz. per milk replacer feeding, which resulted in feeding 0.25 lb. daily. This would increase the solids level in the milk replacer from 12.5% to 15.0%, which is still a reasonable level, especially since fat has little osmolarity effect.

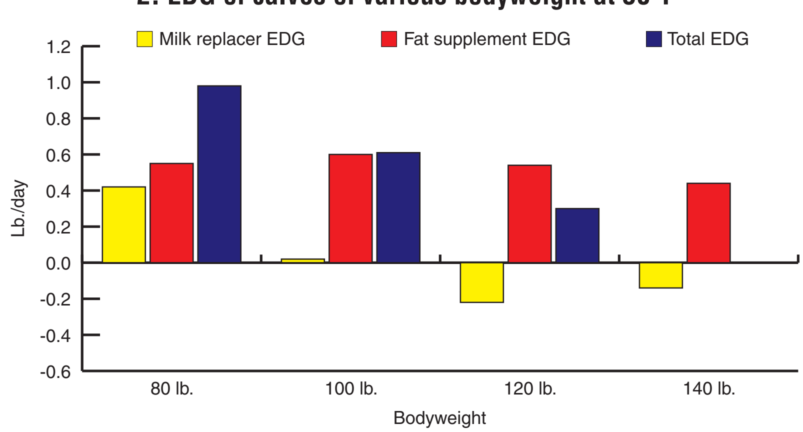
Figure 1 shows the effect of 10°F average daily temperature intervals on energy-available daily gains (EDG) for a 100 lb. calf. Note that each 10°F decrease in average daily temperature decreased EDG by about 0.2 lb. That is a very significant decrease in calf performance for just a 10°F change.

Figure 2 shows that an additional 20 lb. of bodyweight would decrease EDG by about 0.3 lb. at 30°F or at any other 10°F interval. The fat supplement provided for about 0.5-0.6 lb. of EDG when added for any 10°F decrease in temperature, but the contribution of the milk replacer was lower simply because maintenance needs

1. EDG of a 100 lb. calf



2. EDG of calves of various bodyweight at 30°F



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increased due to cold stress of another 20 lb. of bodyweight.

The combined energy contribution from both milk replacer and fat supplement barely maintained any EDG at 0°F. For the 120 lb. calf (Figure 2) at 30°F, milk replacer alone would result in a negative EDG, while the 140 lb. calf netted out zero EDG (absence of the blue bar) even with 0.25 lb. of the fat supplement.

Both 120 lb. and 140 lb. calves should have significant calf starter intake. The effect of that is considerable. For instance, 0.25 lb. of calf starter intake for the 120 lb. calf would increase EDG by about 0.3 lb., while an intake of 0.5 lb. of calf starter would increase EDG to 0.5 lb. at 20°F. Naturally, this EDG would be somewhat less, maybe 0.1 lb., with a 140 lb. calf due to its greater bodyweight and maintenance energy requirements.

Remember, calves need about four times as much water intake as dry feed intake, as do heifers (Lascano and Heinrichs, 2011) and cows (Kramer et al., 2009). This means calves must be given warm water in the winter, and up to three times daily.

How critical is warm water? A South Dakota State University study (Dracy and Kurtenbach, 1968) showed that calves reduced rumen content temperature by an average of 20°F when they drank 46°F water, by 5°F when they drank 63°F water, and by 2-3°F when they drank 80-99°F water. It could take up to 30 minutes for rumen temperatures to return to normal.

Calves — and cows (Wilks et al., 1990) — like warm water. In colder weather, drinking warm water also saves the calves' the need to expend additional energy to warm the cold water to their rumen temperature. Adding a third feeding of two quarts during cold weather would provide enough water for an additional 1 lb. of starter intake, which provides enough energy and protein for about 0.5 lb. of daily gain.

In a recent summary of 10 years of calf data from the Cornell University research herd (Soberon et al., 2011), researchers found that a difference of 1 lb. in daily gain prior to weaning resulted in about 850 lb. more milk in the calf's subsequent first lactation and a combined 2,280 lb. over their first three lactations.

When trying to understand why there was a wide range of 0.29-2.70 lb. in daily gain before weaning in the database, the researchers found that it was mostly related to colder weather. Calves born during winter months (average outside temperature of 32°F) consumed about 1.43 Mcal per day less energy above maintenance than calves born during warmer months (average outside temperature of 67°F).

For each megacalorie of additional energy calves consumed above maintenance each day in colder weather, they produced 517 lb. more milk in first lactation and 2,000 lb. over their first three lactations. These are astonishing results, but they are just being left on the table unless the calf feeding program is adjusted for colder weather.

In southern climates, the rejoinder is that they do not have very cold weather. However, if wintertime daily temperatures average just 50°F with a daily range of 40-60°F, calves could lose 0.2 lb. of daily gain, which could result in 170 lb. less milk in the first lactation and 400 lb. less milk over the first three lactations.

I have been in northern Florida during January over the last several years, and up to 10 consecutive nights got down to freezing temperatures. Also, Texas had two weeks of some of the worst cold and windy weather ever last February. which decreased daily gains by 0.4 lb. at 90 days of age for calves born at one ranch during those two weeks.

Cold stress is happening, but unless we measure bodyweight gains regularly, we may not "see" it in the calves.

As I indicated, there are options to address this situation. The best implementable approach needs to be developed for a given operation to adjust the liquid feeding program for calves in colder weather.

While I hesitate to use "rules of thumb," they can often be more readily understood and remembered. So, for each 10°F decrease in average daily temperature below 60°F, calves will lose about 0.2 lb. of daily gain. For younger calves, adjustments need to come from the liquid feeding program. For larger calves, that may require some additional energy through the liquid feeding program, but it also requires greater attention to fostering starter intake that, in turn, requires more attention to feeding warm water.

The Bottom Line

Take a critical look at average ambient winter temperatures in your region. It can be 60°F during the day but 40°F at night. If the average for a 24-hour period is 50°F, calves could have lost 0.2 lb. of daily gain. Now, multiply that by each 10°F interval daily decrease below 60°F, and at an average of 30°F, calves could have lost 0.6 lb. of daily gain.

It does increase costs to make these feeding adjustments, but not doing it also increases costs in the form of less daily gain and, most likely, less milk production down the road.

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