Cow fertility linked to transition period health

Kilbs N. Galvao for Progressive Dairyman

Calving and the subsequent transition into lactation are the greatest challenges in the productive life of a dairy cow. Cows must deal with a high demand for energy and nutrients to make colostrum and milk. But this demand cannot be met by feed intake alone – which leads to negative energy balance (NEB) and nutrient deficiencies. These physiological challenges that occur at and after calving set off a chain of events. For instance, NEB stimulates cows to mobilize body fat in the form of nonesterified fatty acids (NEFA). This leads to accumulation of beta-hydroxybutyrate (BHBA) in the blood. This is a normal process in all high-producing dairy cows; however, when a cow fails to adapt to this metabolic challenge, several inter-related metabolic and infectious disorders may occur such as:

- Milk fever
- Ketosis
- Retained placenta (RP)
- Metritis
- Endometritis
- Mastitis
- Displaced abomasum (DA)

These maladies lead to reduced fertility, increased involuntary culling and economic losses.

Direct effects
An estimated 75 percent of production-related diseases in dairy cattle occur within the first month after calving. Direct inter-relationships exist between these diseases, leading to a cascade of health effects, all of which reduce fertility and milk production. For example, subclinical hypocalcemia and subclinical ketosis remain highly prevalent in dairy herds. Both disorders affect cows directly by reducing their productivity and health and indirectly by predisposing them to experience other health disorders such as DA, uterine disease, mastitis and decreased fertility. All of these factors ultimately lead to greater risk of a cow’s removal from the herd.

Two metabolic diseases in particular – hypocalcemia and ketosis – and their subclinical counterparts are of significant concern due to their link to cow underperformance and potentially diminished fertility.

Hypocalcemia impact
In lactating dairy cows, the normal concentration of total blood calcium ranges from 8.5 to 11 mg per dL of serum, and the entire circulatory system of dairy cows contains only 3.5 to 5 grams of calcium. When cows synthesize colostrum for the first milking, 20 to 30 grams of calcium can be used, which represents six to eight times the entire vascular pool. This results in differing degrees of hypocalcemia. Incidence of milk fever (clinical hypocalcemia) in U.S. dairy herds averaged 5.2 percent based on a survey conducted in 2002. More recent data from 55 dairy herds in 10 different U.S. states and Canada indicate that milk fever incidence decreased to an average of 2.4 percent. This decrease is likely due to increased feeding of anionic salts in prepartum diets.

Despite this practice, the prevalence of subclinical hypocalcemia is still 25 percent in first-lactation animals and 47 percent in cows of second lactation and higher.

Hypocalcemic cows have higher plasma concentrations of cortisol, reduced proportion of white blood cells with killing activities and reduced concentrations of cytosolic calcium in leukocytes, all of which are measures of immune function. The reduction in immune cell function combined with reduced smooth muscle contraction and reduced dry matter intake induced by hypocalcemia lead cows to develop other disorders such as dystocia, uterine prolapse, RP, ketosis, metritis, mastitis and DA.

Ketosis influence
Prevalence of subclinical ketosis exceeds 40 percent in high-producing, early lactation dairy cows. Cows with subclinical ketosis have decreased milk yields, increased risk of developing a DA, metritis and mastitis, as well as decreased reproductive performance. Signs of clinical ketosis also include lethargy, reduced appetite and lack of coordination. Ketosis is usually diagnosed by measuring blood concentrations of BHBA. The threshold to classify cows with subclinical ketosis ranges from 1 mmol per L to 1.4 mmol per L or more, with most using 1.2 mmol per L or more. At the farm, ketosis can be diagnosed using urine or milk ketone strips or by measuring BHBA using a portable BHBA meter.

Researchers at Cornell University established that when ketosis...
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prevalence exceeds 15 percent of the cows within 14 days in milk, there is a negative effect on health, milk yield and long-term fertility.

Meanwhile, dairy producers must also pay attention to subclinical forms of these conditions since the combined increase in nutrient needs for synthesis of colostrum and milk with the decline in feed intake also leads to subclinical hypocalcemia and subclinical ketosis.

Both subclinical hypocalcemia and subclinical ketosis affect the immune function and lead to increased susceptibility to metabolic and infectious diseases which lead to decreased fertility, increased culling and economic loss.

What to do?
To date, the best strategy to prevent clinical hypocalcemia and reduce the incidence of subclinical hypocalcemia is to include anionic salts in prepartum diets. If you are feeding prepartum diets that contain anionic salts, then it becomes really important to monitor if they are doing what they are supposed to.

A practical method for monitoring is by measuring urine pH in a group of prepartum cows that have been on that diet for at least two days. It is suggested that 10 cows should be sampled, and most of them should have urinary pH between 5.8 and 6.5.

If more than two out of the 10 cows have urinary pH of 5.5 or less, then you should reduce the amount of anionic salts fed. Similarly, if more than two cows have urinary pH of more than 6.8, you should consider small increments in the amount of salts fed.

Calcium supplementation postpartum has been found to improve milk yield in some cows, but it has not been found to decrease the incidence of health disorders. In general, administering 40 to 80 grams of oral calcium will only increase blood calcium by 1 mg per dl for approximately four hours, which does not seem to be sufficient to improve health outcomes.

Strategies to prevent subclinical ketosis should be focused on maximizing cow comfort and dry matter intake. Treatment of cows with subclinical ketosis postpartum with 300 mL of propylene glycol until subclinical ketosis was resolved was found to decrease the incidence of health disorders, increase milk yield and fertility and decrease the risk of culling.

Your goal should be to develop a holistic approach to prevent metabolic and infectious diseases from stealing cow productivity and reproductive efficiency. Prevention strategies should focus on maximizing cow comfort and dry matter intake. PD

To learn more about improving dairy reproduction, visit www.dcrcouncil.org

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References omitted due to space but are available upon request.