TRANSITION PERIOD IN DAIRY CATTLE

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Abstract

The transition period in dairy cows, spanning three weeks before to three weeks after calving, represents one of the most physiologically demanding phases in the bovine life cycle. During this time, cows undergo significant metabolic, hormonal, and nutritional shifts that predispose them to a range of health disorders. The dramatic increase in nutrient requirements to support fetal growth and the onset of lactation, coupled with reduced feed intake and immune suppression, often leads to negative energy balance (NEB) and associated metabolic complications. Among the most prevalent metabolic disorders observed are ketosis, postparturient hypocalcemia (milk fever), and subacute ruminal acidosis (SARA). These conditions, if unmanaged, can result in decreased milk production, impaired reproductive performance, and increased morbidity and mortality. Additionally, disorders such as displaced abomasum, fatty liver syndrome, and laminitis often emerge as secondary complications, further affecting productivity and animal welfare. Effective transition management, emphasizing balanced nutrition, close monitoring, and preventive strategies, is crucial to maintaining optimal cow health and maximizing lactation outcomes.

Keywords: Transition period, dairy cows, negative energy balance (NEB), metabolic disorders, immune

Introduction

The transition period in dairy cows is a crucial phase that spans from approximately three weeks before to three weeks after calving. This short but intense period serves as a bridge between two lactations and is considered the most physiologically demanding stage in a cow's

life cycle. During this time, the cow undergoes dramatic changes in her metabolism, hormone levels, and nutritional needs. As calving

approaches, energy demands rise sharply due to the fetus's development and the mammary gland's preparation for milk production. After calving, the cow must begin producing large quantities of milk, which requires significantly more glucose and amino acids. However, her appetite and feed intake tend to decline, creating a nutritional imbalance. Dry matter intake can drop by nearly 40%, even as the demand for energy doubles or triples.

Because of this imbalance, cows often enter a state of negative energy balance, where the body cannot meet its energy needs through feed alone. As a result, the cow starts mobilizing fat and protein reserves from her own tissues to produce milk. This leads to weight loss, metabolic stress, and increased vulnerability to disease. The rumen, which plays a key role in digesting and absorbing nutrients, is not fully adapted during this period. Its smaller size and underdeveloped surface area limit its ability to process feed efficiently, further hindering nutrient absorption.

The immune system is also weakened during the transition period, reducing the cow's ability to fight off infections. The body's hormonal balance shifts dramatically—levels of hormones like estrogen, progesterone, and cortisol fluctuate sharply, affecting immune responses, metabolism, and reproductive functions. At the same time, the mammary gland undergoes intense cellular activity in preparation for sustained lactation, putting further pressure on the cow's body.

In the final stages of pregnancy, the growing uterus demands more nutrients, even as the cow's feed intake continues to decline. This combination of high demand and low intake makes it nearly impossible for the cow to maintain her energy balance. Consequently, the body begins breaking down fat stores, which leads to a buildup of by-products like ketone bodies and can result in conditions such as ketosis and fatty liver disease. The decline in feed intake and the stress of calving also reduces calcium levels in the blood, often leading to milk fever, a condition that affects muscle function and can become life-threatening if not addressed promptly. The sudden transition from a non-lactating to a lactating state also increases the cow's risk of digestive issues, such as displaced abomasum or acidosis. Additionally, changes in management practices like moving cows between different groups or environments, can introduce further stress and increase the likelihood of disease. When combined, these challenges create a perfect storm of metabolic, immune, and environmental stressors.

Major Metabolic Disorders in Dairy Cattle

Dairy cows, especially during the transition period, are prone to several metabolic disorders that compromise their health, productivity, and reproductive performance. The most significant among these are ketosis, hypocalcemia, and subacute ruminal acidosis (SARA). These disorders are closely linked to nutritional imbalances, hormonal fluctuations, and abrupt physiological changes around calving. Here's a detailed look at these conditions:

Ketosis

Ketosis typically develops two to four weeks after calving and is characterized by an excessive accumulation of ketone bodies—mainly beta-hydroxybutyrate (BHBA), acetoacetate, and acetone in the blood, urine, and milk. It results from an imbalance between energy intake and output, where cows are unable to meet the high energy demands of milk production, leading to a state of negative energy balance (NEB). To compensate, body fat is mobilized, and non-esterified fatty acids (NEFAs) are released into the bloodstream, converted by the liver into ketone bodies. Cows with clinical ketosis show signs such as loss of appetite, reduced milk yield, weight loss, nervous behaviors (licking, chewing), dullness and fatigue

There are three types of ketosis:
Type I Ketosis (also known as "skinny cow syndrome") typically appears in underconditioned cows 2–4 weeks postpartum. It results from a lack of sufficient energy intake despite adequate feed availability. Blood insulin levels are low, similar to what is seen in type I diabetes in humans. Although glucose can be produced from ruminal propionate and intestinal amino acids, the cow's system lacks the necessary intermediates, restricting glucose production.
Type II Ketosis (often termed "fat cow syndrome") occurs in over conditioned cows around calving. These cows are prone to reduced feed intake and excessive fat mobilization. Large amounts of NEFAs accumulate in the liver, causing fatty liver degeneration and reduced liver function. Although the level of ketones is lower than in Type I, the metabolic disturbance is more severe due to insulin resistance and impaired glucose production. Affected cows often develop concurrent illnesses and are at a higher risk of complications or death.

Type III Ketosis is secondary ketosis, caused by an underlying health issue that disrupts the cow's energy balance, such as displaced abomasum, mastitis, or metritis. These illnesses trigger fat mobilization and result in ketone body accumulation, adding further stress to the already compromised animal.

Postparturient Hypocalcemia (Milk Fever)

Hypocalcemia is a calcium deficiency that usually strikes high-producing cows around or just after calving. It is caused by a sudden drop in blood calcium levels as the demand for calcium in milk production sharply rises.
The condition progresses in three distinct stages:
Initial Stage: The cow shows signs of restlessness, reduced appetite, muscle tremors, and sensitivity to touch. Although still standing, she may appear weak and unsteady.
Second Stage: The cow is usually down and unable to rise. She lies in a sternal position, with cold extremities, a dry muzzle, and reduced gut motility. Heart sounds become faint, and bloating may occur due to gastrointestinal atony. Retention of the placenta is common due to poor uterine muscle contractions.
Final Stage: The cow becomes comatose, breathing becomes slow and shallow, and the heartbeat is weak or irregular. Without immediate treatment, death can occur within a few hours due to cardiac and respiratory failure.

Prompt treatment with calcium supplements is critical, and prevention involves dietary management during the dry period to condition the cow's system to mobilize calcium effectively.

Subacute Ruminal Acidosis (SARA)

SARA is a digestive disorder caused by excessive fermentation of carbohydrates in the rumen, leading to a prolonged drop in rumen pH below 5.5. It typically occurs when cows consume large amounts of rapidly fermentable grains with insufficient fiber.

Symptoms of SARA include reduced rumination and cud chewing, Soft or pasty feces, decreased feed intake, mild diarrhea, signs of abdominal discomfort

SARA usually develops in early lactation due to abrupt dietary changes. It may not be immediately fatal but it causes long-term damage by impairing digestion, reducing milk fat content, and increasing the risk of lameness and liver abscesses.

Displaced Abomasum

DA is another common issue in early lactation cows, particularly those with reduced feed intake or digestive disturbances. It occurs when the abomasum (true stomach) fills with gas and shifts from its normal position. It can be left-displaced (LDA) or right-displaced (RDA). Symptoms include- decreased appetite, drop in milk production, bloating on one side, ping sound on auscultation. DA is associated with conditions like ketosis and

hypocalcemia and often requires surgical correction or rolling techniques for repositioning.

Fatty Liver Syndrome

Closely associated with ketosis, fatty liver syndrome occurs when excessive fat is mobilized and stored in the liver. This impairs liver function, reducing the cow's ability to metabolize nutrients and detoxify harmful substances. Affected cows show general weakness, poor appetite, weight loss, increased risk of infection, and poor reproductive performance. Management involves preventing obesity in late gestation and ensuring good energy intake post-calving.

Conclusion

Metabolic disorders in dairy cows are often interrelated and stem from common root causes such as inadequate nutrition, abrupt dietary changes, hormonal imbalances, and poor transition management. Proper feeding strategies, close monitoring of health parameters, and timely veterinary intervention are essential to prevent and manage these conditions effectively. A well-managed transition period is critical to ensuring high milk yield, reproductive efficiency, and long-term animal welfare.

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