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# FEEDING AND MANAGEMENT OF DAIRY CATTLE IN PERI-PARTURIENT PERIOD

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The dairy cows go through a number of metabolic changes during the peri-parturient/transition period. The peri-parturient period means 3 weeks before and 3 weeks after calving. Many of the production diseases in transition cows, which mostly occur in the first 10 days in milk, are influenced by the nutrition and health management of dairy cows. With even minor changes in dietary habits, cows become prone to several metabolic disorders such as milk fever during the transition period. These metabolic diseases reduce the milk production, affect the fertility and have a negative impact on economics of a dairy farm. Therefore, special attention should be given on feeding and health of animals during the transition period. The transition period is marked by dramatic changes in nutrient requirements like energy, glucose, fatty acids and calcium by the mammary gland following calving. The demand for glucose, amino acids (AA), fatty acids, and net energy by the gravid uterus at 250 days of gestation and the lactating mammary gland at 4 days postpartum is 3 times more for glucose, 2 times more for AA and 5 times more for fatty acids (Bell, 1995). On the day of parturition, the calcium demand increases approximately 4 times to meet the milk production requirement.

## Metabolic Adaptations in Transition Cows

During early lactation, cows cannot consume sufficient energy-yielding nutrients from voluntary dry matter intake (DMI), leading to energy deficits in urge of high milk production. This leads to negative energy balance (NEB) for a period of days to weeks after calving making the animal susceptible to ketosis. To sustain the milk production, the cow undergoes various metabolic adaptations during lactation. The primary adaptation of glucose metabolism to lactation is the simultaneous increase in hepatic gluconeogenesis (Reynolds *et al*., 2003) and a decrease in oxidation of glucose by peripheral tissues to direct glucose to the mammary gland for lactose synthesis. The lipid metabolism adapts by mobilizing body fat

stores in the form of non-esterified fatty acids (NEFA) to meet the overall energy requirements of the cow during a period of negative energy balance. The NEFA are utilized to make 40% of milk fat during the first days of lactation. Due to the sudden onset of lactation, there is a huge demand for calcium. As a result, calcium levels in the blood drop dramatically during calving, causing milk fever. Subclinical hypocalcaemia is more common, affecting more than 40% of cows in their second or third lactation. Subclinical hypocalcaemia contributes to disorders like displaced abomasum and ketosis by lowering smooth muscle function, which is necessary for normal digestive tract function and can lead to lower DMI.

## Nutritional Management during Peri-Parturient Period

Dry cows, transition cows, and fresh cows should be fed and managed in a way that meets their nutritional demands while also promoting appetite and a balanced DMI following calving. In total mixed ration (TMR) systems, rather than allocating amounts of concentrate based on milk production, a diet must be formulated to meet the nutrient needs of the majority of cows within the group. To ensure that the supply of all nutrients is balanced, proper nutritional formulation of the diet is required. Some important factors to promote high DMI after calving and better management of transition cows are:

1) Minimizing environmental stressors and keeping cows comfortable- Environmental stressors may decrease DMI and predispose cows to postpartum health problem. Although not directly demonstrated in dairy cows, disruption of the gastrointestinal epithelia's barrier function is a common feature of environmental or behavioural stress in other animals, which can allow endotoxins to translocate and cause systemic inflammation.

2) Optimizing body condition score(BCS)- Cows with greater BCS (>3.5) mobilize more of the lipid reserves around calving, have poorer appetites and DMI before and after calving, have impaired immune function and may be more prone to oxidative stress. Cows should achieve a BCS of around 3.0 at dry off, rather than the usual 3.5 to 3.75 BCS. Cows with a BCS of 2 to 2.5 at calving have higher DMI and milk yield than cows with a BCS of 3.5 to 4 on a 4-point scale (Garnsworthy and Jones, 1987).

3) Managing feeding during dry period- Earlier, it was widely held concept that higher DMI during the prepartum period predicts higher DMI during the postpartum period and better transition period management. However, several reports have suggested that it is preferable to limit nutrient intakes to the requirements of the cows rather than

overconsumption of energy. Cows fed balanced restricted diets (restricted to about 80% of predicted requirements) showed increased postpartum DMI and milk yield at faster rates than cows consuming the same diets for ad libitum intake (Agenas *et al*., 2003). More importantly, allowing cows to overconsume energy during the transition period may predispose them to health problems if they face stressors or challenges that limit DMI. Controlling energy intake during the dry period improved neutrophil function postpartum, potentially resulting in improved immune function. If dry cows consume more energy than required, it must be either dissipated as heat or stored as fat in form of adipose tissue deposits. Mostly excess energy consumption in dry cows leads to greater deposition of fat in abdominal adipose tissues (omental, mesenteric, and perirenal). The NEFA released by visceral adipose tissues travel directly to the liver, causing fatty liver, subclinical ketosis and secondary problems with liver function (Drackley *et al*., 2014). On the contrary, dry cows on controlled-energy rations face less health problems. Therefore, controlled limit-feeding of moderate energy diets or ad libitum feeding of high-bulk, low-energy rations during dry period will be better than overfeeding of high energy diets.

4) Postpartum (fresh cow) dietary considerations- A major topic of concern in the fresh cow period is sudden increase in dietary energy density leading to subacute ruminal acidosis (SARA), which can decrease DMI and digestibility of nutrients. For fresh cows, a moderate starch content (approximately 23 percent to 25 percent of DM) with moderate fermentability (e.g. ground dry corn rather than high-moisture corn or ground barley) and adequate, effective forage fibre may be the best strategy for dietary management. Feeding a glucogenic (higher in starch) diet until the cows' ovarian cyclicity gets restored, then a higher fat (lipogenic) diet during the breeding period may improve reproductive performance. Fat supplementation also tends to increase dietary energy intake and improve reproduction. Dietary fat may contribute in lowering NEFA levels and preventing ketosis.

## Peripartal Health Problems

During the peripartal period and early lactation, dairy cows are vulnerable to production diseases and other disorders. The time of maximum NEB, the peak in blood concentrations of non-esterified fatty acids (NEFA), and the greatest increase in milk yield all coincide with highest disease incidence shortly after parturition. Disorders like fatty liver, ketosis and impaired reproductive performance are associated with postpartum NEB. Studies showed that cows that lost >1 body condition score (BCS)unit (1 to 5 scale) had a greater

incidence of metritis, retained placenta, and metabolic disorders (displaced abomasum,milk fever, ketosis) as well as a longer interval to first breeding than cows that lost <1 BCS unit during the transition. In transition cows, inflammatory responses may also decrease DMI, cause metabolic changes, and predispose cows to higher NEB or disease. Cows that successfully adjust to lactation and prevent metabolic or physiological imbalance can maintain both high milk production and successful reproduction while being healthy. Reduced fertility despite higher milk supply might be due to a more severe case of postpartal NEB caused by poor transition management or higher disease rates.

## Conclusion

Before calving, feeding a total mixed ration that limits total energy intake to requirements while simultaneously providing adequate intakes of all other nutrients can help lessen the extent of negative energy balance. Diet formulation should be such as to improve dry matter intake, maintain proper BCS and lessen the negative energy balance of fresh cows.Dry cows must not be permitted to eat too high-energy diets in order to avoid fatty liver and other metabolic diseases. Such feeding practices have the potential to lessen the impact of the transition period on the overall health and productivity of the animal.

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