Indian Farmer
Volume 10, Issue 10, 2023, Pp. 436-439
Available online at: www.indianfarmer.net
ISSN: 2394-1227 (Online)

Original Article

Management of dairy cow during transition period

Ranjana Sinha[1]*, Ashish Ranjan[2], D.N Singh[1], Anandita Srivastava[3] and Manmohan Kumar[1]

[1]Department of Livestock Farm Complex, Bihar Veterinary College, BASU, Patna-14
[2]Touring Veterinary Officer, Koshila, Nawada, Bihar.
[3]Deartment of Veterinary Physiology, Bihar Veterinary College, BASU, Patna-14

**Corresponding author: ndriranjana@gmail.com*

Received:1/10/2023 *Published:17/10/2023*

Transition period

The transition period is 21 days before calving to 21 days after calving. The "transition" refers to dairy cows going from dry state to lactation state. During this period animal undergoes many significant changes for physiological, metabolic and nutritional basis. This period includes co-ordinated changes across multiple tissues growth and increase the demand of nutrients due to increasing demands of the foetus and the onset of mammary gland activity (Bell, 1995). During this period rapidly changing to a state of increased metabolic and nutrient demands required for the onset of lactation. It has been suggested that up to 80% of metabolic disorders or production diseases experienced by dairy cows occur during the transition period. The transition period is very important in determining future health, milk production, and reproductive status of the dairy cow.

Nutritional Status of cow during the transition period

During the transition period, dairy cows undergo large metabolic adaptations in glucose, fatty acid, and mineral metabolism to support lactation and avoid metabolic dysfunction. The practical goal of nutritional management during this timeframe is to support these metabolic adaptations. The dramatic increases in nutrient requirements occurs during last trimester of pregnancy but due to stress the cow tends to go off-feed particularly during last week prior to calving. Consequently, most of the cows will enter into a negative energy and protein balance during transition period due to rapid increase in foetus size causes pressure on rumen, thus decreasing dry matter (DM) intake. In heifer dry matter intake decreases more in comparison to multiparous cow.

Dry Matter Intake

There are suddenly, several-fold increases in the requirement of energy, protein and minerals occurs in cattle during transition period, so to maintain their requirement from pregnancy to lactation is an important metabolic challenge. Dry matter intake decreases about five percent per week, two to three weeks prior to calving, and by a total of 30-35 percent decreases in last week prior to calving. Increasing nutrient density ration during prepartum period may stimulate DMI helps in providing more energy. Achieving maximum DMI should be depending upon management intervention during the transition period. Objective of increasing DMI should not be to increase body weight, but is to improve health, stimulate rumen function and to prevent from disease (Drackley, 1999).

Body Condition Score (BCS)

Cows who do not retain a healthy body condition score throughout the period are a sign of inadequate management. Over conditioned cows are more prone to increased mobilization of fat from back region and occurrence of metabolic problems such fatty liver and ketosis. Cows with slightly lower BCS in a well managed transition management system tend to have better outcomes during the transition period compared to cows with higher BCS. They have tendency to get higher DMI and possibly higher milk yield during the early lactation stage. BCS should be around 3.0 at dry off as opposed to the typical 3.5-3.75 at dry period. Excess fat mobilization from the back in higher BCS scored cows is more likely to prone to metabolic disorders like fatty liver or ketosis. As a result of NEB, it causes suppression of the immune system resulting in decreased immunity and increased mastitis incidence. Supplying excessive energy to dairy cows during the early dry period may actually have detrimental carryover effects during the subsequent early lactation period (Contreras et al., 2011).

Metabolic and hormonal changes in cow during the transition Period

During transition period, dairy animal undergo endocrine and metabolic changes to meet the demand for milk production during early lactation. Some of the hormonal changes include an increase in GH levels, which leads to more gluconeogenesis in the liver, which increases glucose supply and reduces glucose use in the liver, muscles and fat tissue. This also leads to an increase in lipolysis, which makes the fatty acids ready to be used for making milk fat. Lipolysis and increasing levels of non-esterified fatty acids (NEFA) in dairy cows' blood are commonly linked to the accumulation of triglycerides (TG) in hepatocytes, as well as impaired liver function leading to an increase in ketone production (Esposito et al., 2014). Furthermore, elevated NEFA levels may have a detrimental impact on oocyte growth and reproductive performance. Sordillo *et al.* (2013) suggested that a gradual rise in NEFA levels prior to calving could be a significant factor affecting inflammatory responses in transition cows. They also said that higher blood NEFA could lead to a higher risk of abomasal displacement, mastitis, metritis and reduced milk yield, as well as a risk of early lactation culling.

Other hormonal changes include increased blood estrogen levels at late pregnancy but reduced levels during calving, and changes in the progesterone-estrogen ratio, resulting in reduced DM intake.

Nutritional management during the transition period

Different nutritional strategies have been proposed to improve reproduction of the dairy cow with no detrimental effect on lactation performance. Reproduction of dairy cattle may benefit by maximizing nutrient intake during the transition period and minimizing the incidence of periparturient problems (Cardoso *et al*., 2013). The hallmark of the transition period of dairy cattle is the dramatic change in nutrient demands that necessitate exquisite coordination of metabolism to meet requirements for energy, glucose, AA, and Ca by the mammary gland following calving. Estimates of the demand for glucose, AA, fatty acids, and net energy by the gravid uterus at 250 d of gestation and the lactating mammary gland at 4 d postpartum indicate approximately a tripling of demand for glucose, a doubling of demand for AA, and approximately a fivefold increase in demand for fatty acids during this timeframe (Bell, 1995). In addition, the requirement for Ca increases approximately fourfold on the day of parturition. The cow relies on homeorhetic controls to enable these changes in nutrient partitioning to occur.

A) Increasing energy rich ration:

Feed intake decreases during peripartum but, at the same time, nutrient requirements are more. One way to compensate for reduced nutrient intake related to DM intake is by increasing nutrient density. Increased nutrient density in the diet (reduced forage:con) ratio increases DMI. Feeding more concentrate before calving will allow the rumen bacteria to adapt to the concentrates that can be used during early lactation.

Grain feeding stimulates the growth of the rumen papilla, which absorbs the acids produced during the grain feeding process. Papilla growth is essential to avoid acidosis caused by increased grain intake during postpartum. As papilla growth and development takes several weeks, concentrate feeding should be accelerated well prior to calving.

Concentrate feeding results in increased propionate production, which is converted to glucose, and increased insulin release (as a result of increased blood glucose levels). It also decreases fat mobilization from storage, resulting in a decrease in blood fatty acids. This is beneficial and will help to avoid post-calving conditions such as ketosis and fatty liver. Reducing the fibre percentage in a prepartum diet promotes the growth of the rumen papilla, enhances the ability of the rumen to absorb volatile fatty acids, reduces the risk of VFA accumulation, and prevents pH depression.

B) Increasing Protein rich ration:

Increasing pre-partum protein body tissue reserves reserves will enable the cattle to use these reserves more effectively after calving, thereby supporting lactation and reducing the risk of metabolic disorders. According to NRC (2003), 12% CP is recommended for the dry period. The dietary protein concentration of primiparous cows is 14-16% whereas that of multiparous cows is 12%. Feeding protein (including rumen-protective lysine and methionine) over 12% during the last three weeks of prepartum reduces the risk of retention of placenta, as well as uncomplicated ketosis.

C) Supplementation of fat:

Fat supplementation as a concentrated energy source will reduce plasma NEFA levels and liver triglycerides during the transition period. Supplementation of conjugated linoleic Acids (CLA) in the transition period and during early lactation is a promising way to reduce energy requirements during early lactation. Feeding bypass fat at a rate of 100-150 grams per day during the transition period may improve milk production and reproduction.

D) Supplementation with Glucogenic Precursors:

Propylene glycol and other glucose-enriching supplements can significantly inhibit fat mobilization and ketogenesis in the transitional period. Propylene glycol is metabolized by the liver to glucose, resulting in an increase in insulin levels in the bloodstream. Insulin acts on adipose tissue to reduce fat mobilization and occurrence of fatty liver.

E) Supplementation of Feed Additives

Niacin, a feed additive (6-12 g/day), has been found to be effective in preventing ketosis, likely due to its ability to reduce adipose tissue mobilization. Monensin, an inophore, increases propionate production and decreases BHBA production. If it administered as a 200 mg/day controlled-release capsule during the transition period and early lactation in dairy cows, it has been shown to reduce subclinical ketosis by up to 50%. Additionally, yeast culture can be used to maintain the pH and rumen environment while stimulating the digestion of fibre digesting bacteria, thereby improving digestibility and absorption of P, mg, Ca, and Zn (Kinal *et al.,* 2005).

F) Macro Minerals:

Recent studies suggest that dietary cation-anion difference (DCAD) may play a significant role in controlling milk fever than calcium intake. Diets with high DCAD, i.e., high dietary cations (Na+ and K+), are alkaline. These foods are associated with the development of milk fever. On the other hand, negative DCAD diets (i.e., high dietary anions (Cl- and S--) are acidic. These foods reduce the chance of milk fever. The most commonly used equation to calculate DCAD is MEQ (meq = [K + Na]-[Cl + S] / 100 g dietary DM). The two most effective ways to reduce DCAD (without supplementation of anions) are to avoid high-potassium (K) forages and buffers in the prepartum diet. A good example of a low-potassium forage is corn silage and alfalfa, which has been cultivated with low-potassium supplementation.

Micro Minerals:

Chromium supplementation during the transition period may provide metabolic & production benefits by increasing insulin sensitivity of tissues. Copper supplementation of a diet reduced the peak clinical response during experimental Escherichia coli mastitis. Selenium & Vitamin E are involved in antioxidant system.

Housing management:-

The pregnant animals should be housed separately to protect them from injury, abortion, torsion, dystocia, and other issues. They should be transferred to a calving pen, with a calf box, two to three weeks before the anticipated date of calving. The house should have good ventilation, a dry comfortable resting area, soft bedding material and water facilities, good access to feed and confident footing. The house should be ventilated and protect from extreme climatic condition. Ample clean, fresh, and dry bedding material should be provided on a well-designed, comfortable laying surface. The dimension of each calving box should be 3×4 meters^2 with partition of at least 1.2 meter high between the two calving boxes. A manger and water trough, each 0.5 meter wide should be constructed at the rear end of calving box.

Conclusion

The transition period is a critical period for health, production and reproduction of dairy animals. Nutrional management programs during this phase minimie the incidence of post calving disorders. The degree of NEB following can be reduced by designin and delivering suitable feed with supplementation. Such diets often have good impacts on metabolic health, reduce the effects of peripartum illness, and improve productivity.

References

Bell, A. 1995. Regulation of organic nutrient metabolism during transition from late pregnancy to early lactation. J. Anim. Sci. 73: 2804-2819.

Cardoso, F.C, Leblanc, S.J. Murphy, M.R. and Drackley J.K. 2013.Prepartum nutritional strategy affects reproductive performance in dairy cows J. Dairy Sci., 96: 5859-5871.

Contreras, G. A. and Sordillo, L. M. 2011. Lipid mobilization and inflammatory responses during the transition period of dairy cows. Comp. Immu., Micro. and Infec. Dis. 34: 281-289.

Drackley, J. K. 1999. ADSA Foundation Scholar Award. Biology of dairy cows during the transition period: the final frontier? J. Dairy Sci. 82: 2259-2273.

Esposito G, Irons PC, Webb EC, Chapwanya A. 2014. Interactions between negative energy balance, metabolic diseases, uterine health and immune response in transition dairy cows. Anim Reprod Sci;**144**:60–71

Kinal, S. Korniewicz, A. Jamroz, D. Zieminski, R. and Slupczynska, M. Dietary effects of zinc, copper and manganese chelates and sulphates on dairy cows. J. Food Agric. Environ., 3 (2005), pp. 168-172

Sordillo LM, Raphael W. Significance of metabolic stress, lipid mobilization, and inflammation on transition cow disorders. Vet Clin North Am Food Anim Pract. 2013;29:267–78.