

## Dairy Cows Transition Period Feeding and Management

Sayed Rahimullah Mushfiq<sup>1</sup>, Mohammad Hassan Aabidy<sup>2</sup> and Rizwanullah Rafed<sup>3</sup>

<sup>1</sup>Department of Animal Science, Faculty of Agriculture, Takhar University, AFGHANISTAN.

<sup>2</sup>Department of Animal Science, Faculty of Agriculture, Takhar University, AFGHANISTAN.

<sup>3</sup>Department of Animal Science, Faculty of Agriculture, Takhar University, AFGHANISTAN.

<sup>1</sup>Corresponding Author: srmushfiq@gmail.com



<https://orcid.org/0009-0005-0997-9803>



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### ABSTRACT

Proper feeding during the pregnancy and post-pregnancy period, determines the milk Production, ensuing lactation and as well as, the reproductive efficiency of the animal. 3 weeks before and 3 weeks after parturition are very important because a dramatic physiological and metabolic adaptation occurs during this period which is called the transition period. The Nutritional imbalances are caused by the low quality of desired nutritious rations, reduced appetite, and low ingestion which are responsible for depressed performance, specifically during the transition period. The absence of knowledge and skills of farmers in feeding management during the transition period exacerbates the situation. The metabolic changes, metabolic adaptations, Mechanism of a Transition period, transition period feeding management to prevent disorder, Decreased dry matter intake (DMI), Nutrient requirements, Infectious diseases and metabolic disorders, Nutritional management to Ease out the Transition Period, Management of the transition period, Feed additives supplementation and nutritional-management strategies to passage transition period are discussed by this review paper. Simultaneously, with the growth of the fetus, the nutrient requirements increase and are at their peak before parturition as well as immediately after parturition. The peak milk production reaches about 5–8 weeks postpartum, while the diet consumption peaks at 10–14 weeks postpartum. So, dairy cows will typically suffer a 6–8-week period of negative energy balance during the postpartum period. The requirement energy of the mammary at 4 days postpartum is more than three times than that of the uterus, with a simultaneous increase in the requirement of metabolizable protein, especially of methionine and lysine. The high metabolic incidence of infectious diseases is responsible for the high incidence of inflammatory conditions, mostly immediately after calving. To prevent mentioned diseases, pro-inflammatory cytokine release should be avoided postpartum. The body reserves mobilization, especially fat and protein; and hepatic gluconeogenesis takes place immediately after parturition leading to increased levels of  $\beta$ -hydroxy butyric acid and non-esterified fatty acids, which act as a gateway for several metabolic diseases. The phase of transition may eased by increasing DMI, feed conversion efficiency, density of ration, and protein supplements rich in rumen un-degradable protein; by using anionic mineral mixture, optimizing roughage to concentrate (R: C) ratio, optimum physically effective fiber length of forages/silage/hay, dietary buffers, feed additives such as inflammation modulators, protected nutrients, glucogenic precursors and direct-fed microbial/probiotics.

**Keywords-** management, parturition, postpartum, Transition period feeding.

### I. INTRODUCTION

Dairy cow's Transition period feeding is an animal management strategy that ensures a smooth and healthy progression from the late stages of pregnancy

through to lactation which this also known as lead feeding. The three weeks before calving, Cows should start a transition feeding program and ensure they have been provided calcium and the rumen is adapting to higher levels of grain. The transition feeding diet Ceases

at the point of calving and immediately moves to the lactation diet ([www.optimilk.com.au](http://www.optimilk.com.au)).

The absent knowledge and skill of farmers during the Transition period exacerbates the cow's situation and for that, this review research conducted. The metabolic adaptations, metabolic changes, and nutritional-management strategies can ease the Transition feeding period. The finding suggests that considerable improvement can be achieved in milk production by providing all the nutrients in the appropriate quantity, quality, and proportions. To get the maximum output from dairy cows, must attention to the feeding of a pregnant dry cow is necessary (Bakshi, 2017, p - 1).

The goal of transition period feeding management is to support the metabolic adaptations to glucose, fatty acid, and mineral metabolism to support lactation and avoid metabolic dysfunction (Overton, 2004, p-1).

### **1.1. Transition period and management**

The Transition period includes 60 days prior and 60 days after calving. The most critical mentioned time in this period is 14–21 days before and 14–21 days after calving. The mentioned physiological stage is specialized by dramatic physiological and metabolic adaptations (Bakshi, 2017, p - 1).

More studies focused on the transition period (TP) which explains that the transition period begins before three weeks of calving and spans to three weeks of lactation. Typically, mentioned physiological phase implies severe modification in the metabolic asset of dairy cows (Mezzetti, 2021, p-1).

The cow is at the highest risk of health disorders during this time. The rumen microbiota, nutrition-induced changes during the transition period, plays a vital role in providing optimal amounts of short-chain fatty acids (SCFAs), propionate in particular, to alleviate the demands of the mammary gland for glucose and energy. For better management or to decrease the abrupt changes in nutrient supply and immune responses, take must look beyond the 6-week critical period in the transition period. Changing a shorter dry period, and reducing postpartum energy demands and flow in circulating metabolites is the first management step in offering a practical process. It is linked with the feeding of a ratio formulated for a more favorable ratio between glucogenic and lipogenic precursors, which improves metabolism and overall health status (Bakshi, 2017, p - 1). Important cows Transition feeding and management is that provide the right balance of nutrients needed by a dairy cow in late pregnancy. So this reduces the difficulty of the transition to lactation and complication during calving, minimizing the loss of body condition before and after giving birth. It is very important that avoid the debilitating and costly occurrence of milk fever and its many resultant complications including ketosis, metritis, and displaced abomasum ([www.optimilk.com.au](http://www.optimilk.com.au)).

## **II. LITERATURE REVIEW**

Cows' Transition feeding period management is discussed by a lot of research as follows: for the first time (2001) nutritional management of transition period cows reported. Meanwhile, a lot of research (Overton, 2004, p-1) has been done before this publication was reported. One internet site ([www.optimilk.com.au](http://www.optimilk.com.au)) says that the three weeks before calving is an important period of change and adjustment for a dairy cow. Another research says the Milk product of a dairy cow depends on four main factors: genetic potential, feeding regimen, herd management, and health. When the cows continue to improve genetically, the nutritional and management practices should also be improved simultaneously to allow the cow to produce according to its potential (Bakshi, 2017, p - 2). Other research and resources are mentioned at the end of this article. As seen, no research in this aspect operated in Afghanistan country, so conducting this research is needed.

## **III. METHODOLOGY**

For writing this review, a lot of documents critically were reviewed. The research papers included from Journals; original research papers, Review articles, Journals home page documents, and [www.optimilk.com.au](http://www.optimilk.com.au).

## **IV. RESULTS AND DISCUSSION**

### **4.1. Nutritional Science behind Transition Period Feeding and Management.**

The fetus is rapidly growing, with major shifts in metabolic change and hormones occurring during the transition period. So, by management Feeding can provide optimal dietary requirements and dairy cows farmers can maintain good conditions throughout important periods. [www.optimilk.com.au](http://www.optimilk.com.au). During the transition period, dairy cows go through large metabolic adaptations in glucose, fatty acid, and mineral metabolism. If they are provided, the lactation is supported and avoids metabolic dysfunction (Overton, 2004, p-1). The handling of mineral metabolism with anionic salts is an important aspect of transition period feeding. The mobilization and utilization of calcium reduce the risk of milk fever. By optimizing the balance of potassium, sodium, and magnesium relative to chloride and sulfate and also maximizing the phosphorous and calcium available to the animal, mentioned goals can achieve. The feed of supplementary grain to help prepare the cow's rumen for the high level of grain in the post-calving ration is also important. As well as, for the critical phase of late pregnancy and fetal development, the feed bypass protein to help increased demand for protein is also important. During the transition period feeding, Restricting access to lush green pasture is vital, because it will avoid high levels of potassium in the diet which can

enhance the risk of milk fever. Providing ad-lib cereal hay during the transition period is also important because it promotes rumination and gut fill and displays a mineral profile which that reduces milk fever risk and promotes milk production in the ensuing lactation. As well as, the reproductive efficiency of the animal determines by the appropriate feeding during the pregnancy and post-pregnancy period. Before 3 weeks and 3 weeks after parturition is very important, because dramatic physiological and metabolic adaptations take place during the transition period. The low quality of desired nutritious rations, Nutritional imbalances occurred and it is caused by reduced appetite and ingestion and it is responsible for depressed performance specifically during the transition period. (Bakshi, 2017, p- 1, and. [www.optimilk.com.au](http://www.optimilk.com.au)).

#### **4.2. Mechanism of the Transition Period.**

With the sign of gestation, the dry matter intake (DMI) of dairy cows decreases and it is near parturition, at its lowest (1.7–2.0% of body weight). The score of body condition (BCS) parallels the DMI, but the aim should be not to lose more than one BCS (on a scale of 1–5) after calving (Bakshi, 2017, p-1). The Higher demand for energy and nutrients for the synthesis of colostrum and milk coupled with the decline in feed intake, force the transition cows to undergo negative energy balance (NEB) and micronutrient deficiencies. The NEB stimulates cows to mobilize body fat in the form of non-esterified fatty acids (NEFA) and subsequent accumulation of beta-hydroxybutyric acid (BHBA) in the blood (Wankhade. 2017. P- 2). At the same instant, with the growth of the fetus, the nutrient requirement increases and is at their peak before parturition, as well as immediately after parturition. The peak milk production reaches it's in about 5–8 weeks postpartum, while the diet consumption peaks at 10–14 weeks postpartum. So, dairy cows will typically suffer in a 6–8-week period of negative energy balance during the postpartum period. Concurrently, mammary energy requirements at 4 days postpartum are more than three times that of the uterus, by a simultaneous increase in requirement of metabolizable protein, particularly of methionine and lysine. The High metabolic and infectious diseases incidence is mostly immediately after calving responsible for the high occurrence of inflammatory conditions. To prevent the mentioned problem, pro-inflammatory cytokine release should be Avoided in postpartum. The body reserves mobilization, especially fat and protein; and hepatic gluconeogenesis takes Empty immediately after parturition leading to increased levels of  $\beta$ -hydroxy butyric acid and non-esterified fatty acids, which act as a gateway for several metabolic diseases (Bakshi, 2017, p - 1).

#### **4.3. Transition period feeding management to prevent disorder**

The transition period can be eased by increasing DMI, feed efficiency conversion, ration density, and protein supplements rich in rumen un-degradable protein;

using the anionic mineral mixture, optimizing roughage to concentrate (R: C) ratio, optimum physically effective fiber length of forages/silage/hay, dietary buffers, feed additives such as inflammation modulators, protected nutrients, glucogenic precursors and direct-fed microbial/probiotics; and by follows the transition period feeding management program (Bakshi, 2017, p - 1).

The nutritional strategies for dry cows are minimizing overfeeding of nutrients during the early dry period, but increasing nutrient supply to facilitate metabolic adaptation to lactation during the late dry period. The Increasing amount of energy supplied through dietary carbohydrates during the Pre partum period, results in positive effects on metabolism and performance of transition cows (Overton, 2004, p-1).

#### **4.4. Metabolic Changes**

The 3 weeks before and 3 weeks after the Calving is a critical period that occurs in major physiological changes. The dry matter intake decreases (DMI) around parturition and the body condition score changes. Nutrients requirement is suddenly increased for the growth of the fetus and the beginning of milk production and metabolic adaptations required for meeting the nutrient requirements (Bakshi, 2017, p – 1).

#### **4.5. Decreased dry matter intake (DMI)**

During the 3 weeks of prepartum, dry matter intake (DMI) of dairy cows start declining and the fetus rapidly grows also different stresses adversely affect hormone secretion. The prepartum transition period Average DMI is between 1.7 and 2.0% of body weight (BW). anyway, this is not a constant value and varies with breed, productive period, quality of the ration fed, the stage of the transition period, and body condition score (BCS) and parity (Bakshi, 2017, p – 1,2).

#### **4.6. Body condition score**

The lactation cycle, The BCS is the most important aspect of dairy cow management which facilitates a healthy transition from gestation to lactation. The catabolism of body tissue induces by negative energy balance (NEB) during late gestation and early lactation to meet energy requirements, which results to diminish BCS, rumen fermentation, and milk production, and even worse, the possibility of triggering metabolic syndrome (Bakshi, 2017, p – 3).

According to the studies, it resulted that in comparison to normal-conditioned cows, over-conditioned cows before calving have higher amounts of deposited fat containing higher adipocytes (Pascottini, 2020).

#### **4.7. Energy requirements**

The energy requirement of the mammary is estimated three times higher than the uterus at 4-day postpartum. After calving, feed intake immediately not reached its maximum, and the demand for glucose to lactose synthesis increases rapidly to increase milk production. The peak milk production is at 5–8 weeks postpartum, while the consumption peak diet is at 10–14 weeks postpartum. So, cows typically suffer in the 6–8-

week period of NEB during the postpartum. The big gluconeogenic precursor of glucose is propionate which is produced in the rumen during the fermentation of dietary carbohydrates and consequently, it is converted to glucose in the liver. About 46% of maternal glucose taken by the uterus in the last weeks to fetal development (Bakshi, 2017, p – 3).

For optimal productive efficiency and health, Some research proposed that the mixture of fuels constituting ME should consist of about 16% amino genic compounds, 5% absorbed glucose, 24% propionate, 39% acetate plus butyrate and their derivatives, and 16% exogenous long-chain FA (James, 1999, p- 2269).

The decreased amount of time the cow spends in a negative energy balance is the main goal of transition cow management. A fresh cow spends more time in a negative energy balance and has a higher probability will have a health challenge (Armstrong. 2019. P-2).

#### 4.8. Protein requirements

Numerous studies show the effect of quality and quantity of protein requirements before and after parturition on health and production. The Requirements of metabolizable methionine and lysine also should consider during the transition period feeding which determines the yield of milk/milk protein. Corn and barley have more protein which contained methionine, cysteine, Lysine, and tryptophan. The barley ingredient highlights the potential contribution of that to meeting the protein requirements of high-producing ruminants. So, quality protein supplements should be selected to meet the requirements (Bakshi, 2017, p – 4).

A lot of research revealed that Cows experience a significant negative protein balance during the first 30 d of lactation. Given higher levels of protein and specific AA in the diet, may act to improve health and feed intake, and also AA has functional effects on health, especially in challenging periods such as calving (Cardoso., 2017., p – 1).

#### 4.9. Mineral and Vitamins requirements

Vitamins and Minerals are nutrients that are essential for mammary gland development, growth and developing calf and immune function support. The optimal amounts of them by Nutritional programs deliver the minerals and vitamins to the animal which promotes good health and productivity. The amount of mammary requirement calcium to produce 10 kg of colostrum on the day of parturition is more than double that for fetal growth in late gestation. The peak of lactation places such a large demand on mechanisms of calcium homeostasis that most cows develop some degree of hypocalcaemia at calving. In some cases, concentrations of plasma calcium resulting too low to support nerve and muscle function, which become to parturient paresis or milk fever. The adaptations for increasing the blood supply of calcium very soon after calving include increased intestinal active transport, increased reabsorption of bone stores, and decreased urinary excretion of calcium. Other vitamins

and minerals Besides Ca are associated with a variety of metabolic conditions (Bakshi, 2017, p – 4).

The Adaptation of calcium metabolism to lactation is facilitated by nutritional strategies to decline the cation-anion difference (DCAD) of the diet fed prepartum, although the degree to which the DCAD must be decreased to sufficiently prevent hypocalcaemia remains controversial (Overton, 2004, p-1).

One increase in dietary magnesium percentage has been associated with a lower risk of milk fever. Magnesium intake should exceed 0.45% of the diet dry matter. (Lean.2021. p-24).

#### 4.10. Infectious diseases and metabolic disorders

The Nutrient deficiencies and excesses of that are responsible for metabolic and infectious diseases, and thus for animal welfare impairment, and overall may result in poor efficiency and income for the farm. The high incidence of metabolic and infectious diseases is responsible for the high occurrence of inflammatory conditions in the transition period (mostly after calving). In particular, in high-yielding cows, this occurs during the transition period and the inadequate increase of DMI can be an important causal factor to the Retained placenta, metritis, and endometritis (Bakshi, 2017, p– 4).

The diseases of immune function in the transition period, starting at least 2 weeks before calving. However, low DMI also is a consequence of health disorders that induce inflammatory conditions (such as metritis, mastitis, lameness, etc.) through the release of pro-inflammatory cytokines. Dairy Cows with the worst inflammatory index, appear affected by a NEB and increased levels of  $\beta$ -hydroxy butyric acid (BHBA). Some research on the transition period of dairy cows showed a relatively high frequency of inflammations, mostly subclinical, which besides infections could be attributed to tissue damage, oxidative stress, digestive upsets, heat stress, placenta–uterus interactions, dystocia, excess of energy supply, among others (Bakshi, 2017, p –4).

If animals are not fed properly during the transition period, they face to negative energy balance (NEB). The NEB makes the animal, particularly the high-yielding dairy cows, susceptible to various metabolic and infectious diseases like clinical ketosis, milk fever, mastitis, and metritis. This leads to a great economic loss for the dairy industry (Nain. 2021. P- 53).

To avoid inflammatory phenomena in the greatest possible, that is recommended to take advantage of the dry period to prevent infectious and metabolic diseases, as well as, any other cause of pro-inflammatory cytokine release in the postpartum. A high incidence of lameness is more indicative of rumen acidosis. At the same time, a high rate of displaced abomasum is due to subclinical ketosis (SCK) or hypocalcaemia. The key to monitoring NEB, BCS is rumen health, and calcium status, trace elements, and antioxidant status in blood. The shortfall in glucose availability after parturition is one key driver of ketosis, a potentially deadly metabolic disorder. Milk fever, ketosis, retained fetal membranes, metritis,



and displaced abomasum primarily affect cows within the first 2 weeks of lactation. Physical and metabolic stresses of pregnancy, calving, and lactation contribute to the decrease in host resistance during the parturient period. Several studies revealed that higher levels of non-esterified fatty acids (NEFAs) and BHBA caused immune suppression around calving. Important physiological

events will happen during the transition period which includes adaptation of the rumen to the higher energy diet that will be fed in early lactation, maintenance of normal blood calcium concentration, a strong immune system throughout the parturition period, and maintenance of a slight positive energy balance up to the time of calving (Bakshi, 2017, p – 5).



Fig 1: Milk fever



Fig 2: Ketosis

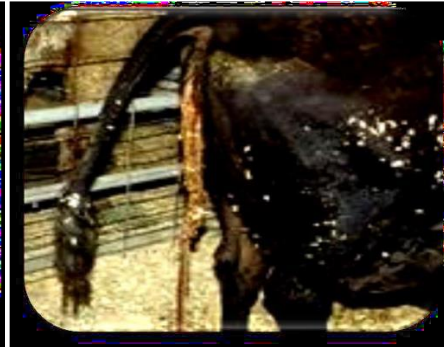


Fig 3: Retention of placenta

#### 4.11. Metabolic Adaptations

When the transition period passed successfully, the cow must undergo several metabolic adaptations. Around 1 week prepartum and 1 week postpartum, the DMI increased by only 30–50% in contrast to abruptly increased requirements for different nutrients. Mentioned coordinated processes allow for increased nutrient usage by the mammary gland ((Bakshi, 2017, p – 5).

The glucose demand for AA, fatty acids, and net energy by the gravid uterus at 250 days of gestation, and the lactating mammary gland at 4 days 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 mentioned time (Overton, 2004, p-2).

#### 4.12. Dietary energy

There is an increased demand for energy for the growth of the fetus and uterus, parturition, and onset of lactation during the transition period. The energy-increased requirements were partly met by increased hepatic gluconeogenesis, decreased glucose usage by peripheral tissues, increased FA production from adipose tissues, and increased AA mobilization from muscle in Cows. For these changes, the cow goes into NEB.

The mobilization massive of body fat is achieved by a combination of increased lipolysis and decreased rates of lipogenesis and FA re-esterification in adipose tissue, Leading to the net release of NEFAs and glycerol into the bloodstream (Bakshi, 2017, p – 6).

The fat Adding to transition diets has been proposed that dietary fat may help to decrease concentrations of NEFA and help to prevent the occurrence of ketosis. The Dietary long-chain fatty acids are absorbed into the lymphatic system and do not pass first through the liver. Mentioned fat can provide energy for peripheral tissues and the mammary gland. the increases in energy availability would in turn decrease the

mobilization of body fat and decrease NEFA concentrations (Overton, 2004, p-10).

#### 4.13. Dietary protein

During the transition period is an increased demand for protein for fetus growth and uterus, parturition, and the onset of lactation. One cow cans store 20 kg of mobilizable protein in the body as against 100–200 kg of fat. so, the animal can mobilize more fat than protein which indicates that it is the protein content that limits production sustained by mobilized reserves. One kg of Loss of body weight can provide enough energy for about 6–7 liters of milk, but will only provide protein enough for 3–7 letters of milk. For that reason, a high-protein diet should be fed for compensating the gap of three liters of milk. So, the energy during this period comes from body reserves, therefore, there will be a shortage of energy in the rumen and the microbes will not be able to utilize any additional RDP. Hence, in the first few weeks after parturition, the diet should contain high UDP, which should range from 35 to 40% for early lactation and high milk production (Bakshi, 2017, p – 6).

It has been suggested that by increasing prepartum protein body tissue reserves, the transition period of cow will be better able to utilize mentioned reserves after calving to support lactation and minimize metabolic disorders. The Low milk protein percentage in early lactation is a warning that reproductive performance will Be reduced (Lean.2021. p-34).

Close attention to the AA profile of bypass sources of protein will help supply the essential AAs in the diet. However, alone balancing UDP is not recommended. Also, Adequate RDP is necessary, and sufficient ammonia is produced in the rumen to meet the N needs of the microbes. In normal feeding practices, the complete feed should contain RDP and UDP in 65:35 ratios and 50% of RDP should be soluble protein. An excessive intake of dietary soluble N can result in high

levels of BUN and in turn high MUN. MUN above 18 mg/dl reflects excessive dietary CP or low rumen degradable non-structural carbohydrates (NSC) such as starch and soluble sugars, etc. which result in low reproductive performance, higher feed cost, poor milk yield, and health problems. MUN below 12mg/dl reflects low dietary CP and high NSC. (Bakshi, 2017, p – 6).

#### 4.14. Rumen microbiota

Furthermore, the CP requirement varies with DMI and Rumen microbiota. The diversity, richness, and composition of ruminal microbiota are specific to diet, the fibro lytic or amylolytic bacteria can be manipulated by changing the roughage to concentrate in the ration. One common approach to managing high-producing pregnant dairy cows during the last 3 weeks of the non-lactating period is to shift from a high-forage, low-energy diet to a high-concentrate, high-energy diet. It will increase the population of microorganisms of fermenting starch and sugars (NSCs), and hence, produce more SCFAs and propionate (Bakshi, 2017, p – 6).

When cows will take normally a week or longer to reach appropriate levels of feed intake, it can enhance the development of ruminal epithelium in general and rumen papillae specifically and potentially increase the SCFAs absorptive capacity after parturition. A decrease in fibro lytic bacteria such as *Ruminococcus flavefaciens*, *Fibrobacter succinogenes*, and *Butyrivibrio fibrisolvens* also was detected after parturition. As responses were primarily driven by the feeding of a high-grain, high-energy diet after parturition, which is a common management practice in the field.

In to changes in bacterial populations, a decrease in fungi after parturition when a high-grain, high-energy diet was fed suggested that the fungi may play an important role in fiber degradation. Litostomatea, a ruminal protozoal taxa, was more abundant with the high-energy Diet, but the biological role of this change could not be ascertained (Bakshi, 2017, p- 6).

#### 4.15. Nutritional Management to Ease out the Transition Period

The Nutritional Strategies for Ease out the Transition period is increasing feed intake; it is essential to keep DMI as high as possible during the close-up period and for several weeks post-calving. An increase in microbial population results in improved feed digestibility and increased production of acetate, propionate, and butyrate, leading to a better energy balance and higher beef or milk production. A selected phytogenic feed additive and a selected autolysis yeast product support overcoming challenges in feed intake, as well as support, feed efficiency towards improving animal performance, resulting in more efficient production and greater economic benefit for producers. Transition period by providing the desired nutrients, when these are needed the most. (Bakshi, 2017, p – 6).

Nutritional strategies to avoid over-conditioning (obesity) during the dry period (prepartum) should prevent clinical hypocalcaemia. In some cases, obese

cows develop “fat cow syndrome,”. To prevent obesity, recommendations suggest using low-energy diets during the dry period. Also, when low-energy diets are fed prepartum cows have lower DMI, Up to this point, some have argued that higher-energy diets should be used prepartum to compensate that and prevent the detrimental effects of a long period of NEB (Daros. 2021. P- 4736).

Low-energy and high-fiber diet during the dry period decreases the size of the rumen papillae which are responsible for the absorption of end products of digestion in the rumen. With the introduction of a high-energy diet after calving, the size of rumen papillae increases, resulting in higher and faster absorption of nutrients. while, if a diet rich in soluble carbohydrates and low in fiber is offered four weeks before calving, the desired papillae size can be achieved immediately after calving as compared to 6–8 weeks after calving, if the diet offered is low-energy and fibrous. The diet of such cows must provide the required 10 MJ ME/kg DMI with 16% CP. (Bakshi, 2017, p – 6).

According to one research, a checklist for help to implement a successful transition period is needed. The checklist includes will use of a low DCAD approach (recommended) or a low calcium (zeolite A) approach, Feeding the transition diet for as close to 21 days (low DCAD approach) or 14 days (low calcium zeolite A approach) as possible, Sourcing and testing forage, Balancing the diet, Choosing your springer paddock, Staff, Feeding out, Monitor the success of your program (Lean.2021. p-58).

An additional energy requirement for support Grain has to be introduced to the cow’s ration for at least 3 weeks before the due date and for heifers, this should be 5 weeks. It concluded that increasing the energy and protein density up to 1.6 Mcal of NEL/kg and 16% CP in diets during the last month before parturition improves the nutrient balance of cattle prepartum and decreases hepatic TG content at parturition. Generally, the roughage to concentrate ratio recommended for high yielders is 50:50, but even if the best quality silage (11 MJ ME/kg DM) and concentrate (13 MJ ME/kg DM) is offered in above ratio, even then the mixture of these two (12 MJ ME/kg DM) can meet energy requirement up to 55 liters milk/day provided DMI of such feed is as high as 4.3% of BW (Bakshi, 2017, p – 6).

Attention to the effect of nutraceuticals (active compounds) at a critical phase of the transition period should be paid. The Supplementation of essential fatty acids throughout 2 months (a month before and a month after calving) successfully decreases the inflammatory status with a quicker resolution of the phenomenon. The inflammatory and immune response script has been recognized to be targeted by the beneficial effect of methyl donors, such as methionine and choline, directly and indirectly modulating such response with the increase of antioxidants GSH and Taurine. Indirectly by the establishment of a healthy gastrointestinal tract, yeast, and yeast-based products showed to modulate the immune

response, mitigating negative effects associated with parturition stress and consequent disorders. The photoproducts use has garnered high interest because of their wide range of actions on multiple tissue targets encompassing a series of antimicrobial, antiviral, antioxidant, immune-stimulating, rumen fermentation, and microbial modulation effects (Lopreiato. 2020. P-1).

The common feedstuffs used for providing energy to the animal are wheat, maize, sorghum, and pearl millet. The hard coat cereal grains particle size plays a very important role in the efficiency of utilization of nutrients. To the best utilization of nutrients with minimum excretion in feces, the grains would be crushed and passed through the screen of 1.5–2.0 mm pore size. The starch contents total in the diet of high Yielder should be between 20–25%.

Molasses is an easy source fermentable of energy, potassium, and sulfur. It is included to increase the palatability as well as the level of soluble sugars in the diet. The recommended level of sugars in high-yielders is 8–10%. Molasses incorporated up to 6% in the diet have a positive effect on the digestibility of nutrients. The higher levels increase the relative proportion of butyrate and that decreases the propionate in the rumen, which depresses the utilization of nutrients and causes ketosis. A level of sugar and starch beyond 35% in the diet can suppress NDF digestibility. The efficiency of rumen fermentation depends upon the amount of microbial biomass synthesized, which in turn depends on the synchronization of protein and carbohydrate breakdown. The level of UDP has a profound effect on the availability of N for rumen microbes. Low UDP will not only hamper the performance of the animal but also lead to the loss of ammonia from the rumen. milk of Cow is a good source of calcium, chloride, potassium, magnesium, and sodium. Most of the B-complex vitamins are present in milk. A marginal deficiency of vitamins and minerals may not have a significant impact on milk quantity and quality. However, calcium is one of the crucial elements in the ration to be considered more carefully in transition cows. At the beginning of lactation, the sudden demand for calcium for milk production increases dramatically, leading to a fall in blood calcium levels, and this condition is called hypocalcemia.

The parathyroid hormone (PTH) secretion is stimulated which stimulates bone reabsorption. the full function of the PTH cycle takes 2–3 days and It also activates vitamin D3, which increases the absorption of Ca from the intestine and mobilized bone Ca. mention process requires 24–48 h, and cannot prevent animals' milk fever/parturient paresis, and more than 60% of cases of milk fever incidence at 24 h of parturition. To avoid incidences of milk fever, the best feeding management practice is to provide a low Ca (<50 g/day) diet during the last 2–3 weeks of gestation, which should be increased to ~100 g/d at least two days before parturition. The diet, after parturition, should have sufficient Mg, an essential activator of vitamin D3 in the liver. The anionic diet (–12

meq/100 g DM) resulted in zero incidences of mastitis and milk fever as compared with 14.3% in the cationic diet (15 meq/100 g DM) fed cows. The incidence of metritis was also zero against 71.4% in cows fed cationic diets. In animals fed a diet containing an anionic mineral mixture (calcium chloride 33.4, magnesium chloride 33.3, sodium chloride 18.3, magnesium sulfate 8.3, and calcium hydrogen phosphate 6.7%), the 4% fat-corrected milk (FCM) production was increased by 1.13 kg during the 90 days postpartum period. About 90g of anionic mixture is recommended per day for 3 weeks prepartum (Bakshi, 2017, p – 6).

For every event of milk fever, there may be eight or more cases of subclinical hypocalcemia. Calcium is critical for bone, Blood clotting, heart function, smooth and skeletal muscle function, but also as a signaling agent in the body. The Changes in the calcium of blood or tissues can have a profound effect on tissue function (Lean. 2021. p-14).

The Metabolic acidosis caused by a negative dietary cation–anion difference (DCAD) favors the mobilization of calcium from bone, while high dietary potassium concentrations and positive DCAD suppress this process. It is believed that subclinical hypocalcemia is a contributing factor in disorders such as displaced abomasum and ketosis. Also, Hypocalcaemia leads to increased secretion of cortisol, which is considered to be a factor in an increased incidence of retained placenta. The Manipulating dietary fiber level and particle size for optimal animal production, the rumen should operate to its maximal efficiency in terms of mixing, rumination, and emptying. The Continuous mixing of rumen contents improves the intimacy between ingested feed particles and the microbial population, essential for optimal fiber digestion (Bakshi, 2017, p – 6).

The Cereal straw forage or mature grass hay is used for “diluting” dietary energy provided from other more energy-dense ingredients. Its diet is typically based on maize silage. The Use of lactation diet feed ingredients can be achieved by dilution allowing for easy adaptation to post-partum diets. The straw of Wheat is preferred due to its consistency and better neutral detergent fiber (NDF) digestibility compared to other straw products. The bulking ingredient is used to allow for ad libitum intake rather than management attempting restricted intake. To be successful, the bulking ingredient should be properly incorporated into the diet and not fed separately. To ensure intake and to minimize sorting; the hay or straw should be chopped to achieve a consistent particle size of 4 to 6cm. The straw or hay should be of high quality and palatable (Lean. 2021. p-55).

The Active bouts of rumination support feed breakdown and Promote saliva secretion, which assists in the control of the rumen ph. however, for effective rumen mixing and rumination care must be taken to ensure sufficient fiber level with optimum physically effective fiber (PEF) length in the total mixed ration (TMR). A complete feed of high-yielding cows should not contain



less than 21% ADF or 28% NDF. The forage DMI as a percent of BW should be 1.4–2.4%. The Maximum individual intake of NDF by high-yielding cows reaches up to 1.3–1.4% of BW. The forage NDF intake as a percent of bodyweight should be about 0.8–0.9 or it should not constitute more than 17–18% of total the DMI, But it can be increased to 30–34% by using wheat bran, orange peel, or citrus pulp, rich in soluble fiber, i.e. pectin. The Citrus pectins are easily and extensively degraded, producing acetic acid, which is less likely than lactic acid to cause a pH drop and result in acidosis. Due to the high fiber content in citrus pulp, the long rumination of citrus pulp produces large quantities of saliva that has a buffering effect on rumen pH. Citrus pulp is therefore considered as a safer feed than cereals for animals fed high-concentrate, low-roughage diets in high-yielding dairy cows. Straws and Stover are not incorporated into the diet of high-yielders. (Bakshi, 2017, p – 6).

#### 4.16. Management of the transition period

The management of the transition period is involved to Monitor dry matter intake, Three weeks close-up period, Minimizing stress on the animal, Care of postpartum cow, Balanced diet during the transition period,  $DCAD = \text{meq} (\text{Na} + \text{K}) - (\text{Cl} + \text{S}) / 100\text{g DM}$ , Importance of body condition score, Mineral's homeostasis, Care in case of any complication (Nain. 2021. P-54).

The offer of diet should be as TMR to avoid the selective intake of feedstuffs, effective utilization of nutrients, and saving labor and thereby economizing production. The ambient temperature affects the feed intake. The peaks of heat associated with digestion of feed, about 3–4 h after feeding. By feeding cows in the early morning (5–6 a.m.), the heat of digestion peaks at 8–9 a.m., and allows the cow to dissipate some of that heat before the day gets hot. A cow fed at 8 a.m. will have her peak of heat production at 11 a.m. to noon when the day is hotter, which is undesirable. In the evening, milk yield depends on free access to fresh, clean, and cool water (Bakshi, 2017, p – 10).

Production will occur during the night when the environmental temperature is low. Furthermore, frequent small meals (3–4 times a day) result in less heat generation than fewer, but larger meals. Water is an important nutrient for the cow. The DMI and Prevent the detrimental effects of a long period of NEB (Daros, 2021, p- 4736).

Some research discussed that higher energy diets should use prepartum to compensate for the negative energy after parturition. The Management of transition cows is the most important aspect of farm management that will set up dairy cows for success during the lactation period. The main goals of mentioned practices must be maximizing dry matter intake and modulating stress and inflammation. Excellent diet formulation and feed bunk management are critical for decreasing the drop in dry matter intake; however, if cows do not have access to the diet, these practices will be meaningless. Calving

monitoring and proper assistance, along with mild anti-inflammatory treatment, can be beneficial to modulate stress and inflammation after calving and decrease the losses associated with this period (Barragan. 2021).

#### 4.17. Feed additives supplementation

To maximize profitability from dairy farming, farmers are increasingly focused on improving the efficiency of feed conversion. One method is the use of feed additives to optimize health and well-being. Many feed additives have now become routine components of transition cow rations, even though each one inflammation modulator, protected nutrients, glucogenic precursor, and directly fed microbial/ probiotics and phased feeding program.

## V. CONCLUSION

Nutritional management plays an important role during the transition period (3 weeks on either side of the parturition) in the high-yielding cows. The imbalances in ration and Nutrition, like the low quality of desired nutritious rations, reduced appetite, and low intake are responsible for depressed performance, specifically during the transition period. Also, factors such as the lack of knowledge and skill of farmers at feeding management during the transition period exacerbate the situation in most of the developing countries. The greater of the farmers boost up the feeding of animals only after parturition, but they should be advocated to use the proper type of feeding management required during the transition period.

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