

Transition period and associated metabolic disorder in dairy animals

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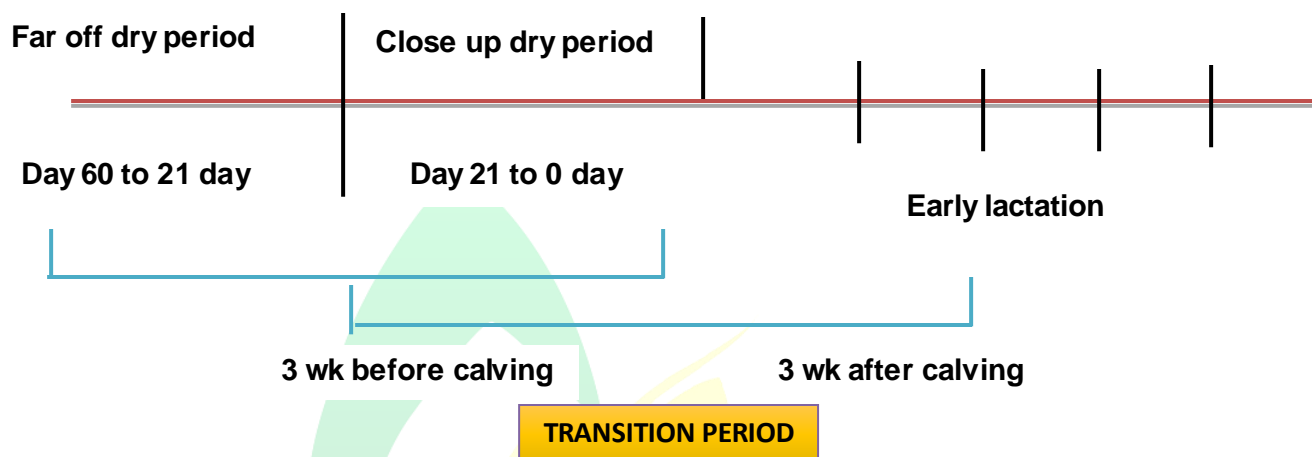
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Introduction

Dairying is well known to the agriculture system and forms an integral part of our rural economy and as a result India rank first in milk production in the world with about 198 million tonnes in 2019-20 with a per capita availability of 407 gm per day (Annual report, 2019-20). The sector is still a potential source of gainful employment creating additional income to rural poor, particularly landless farm labourers, small and marginal farmers who are resource deficit. But the farmers suffer more due to animal diseases, calf diseases, loss of fertility and productivity resulting in major economic losses, especially during the transition period. A transition period is one of the most challenging phases in the product life cycle of dairy animals. The transition period or periparturient period is defined as the three weeks before and three weeks after calving and is characterised by a greatly increased risk of disease. During the critical period of transition, the dairy animal has to undergo important physiological, metabolic and nutritional changes. Transition period act as a turning point from one lactation cycle to the next cycle. The physiological changes that occur include an increase in size and demands of the growing foetus, development of the mammary gland for initiating milk synthesis. The metabolic and nutritional changes occur due to the change in diet and due to the pouring of nutrients in milk.

PARTURITION



During this period animal suffers from these diseases due to the failure of the animal to adapt to the situation resulting in a shortage of nutrients for their existence. This condition makes the animal susceptible to the diseases like Parturient paresis, Hypomagnesaemia, Ketosis and fatty liver, downer cow, abomasal displacement, RFM/metritis; and Udder oedema. Dairy animals often fail to adapt to these metabolic and managemental changes, resulting in 75% of disease incidences during the first month after calving. Therefore special care should be given to the animal during the parturition and after the parturition to prevent the animals from these disorders.

Parturition is one of the important and fascinating processes which involves mechanical and neuroendocrine control. The process of parturition may involve various complications. The metabolic disorders that affect the periparturient stages include milk fever, ketosis, displaced abomasum, etc. To save the animal from these conditions, preparations are to be made right at the time of drying off period and are to be continued even during the early lactation period together with proper hygiene at the time of delivery. Reproductive problems occurring during the transition period affect the process of involution which results in delays in the waiting period. This result in delay resumption of oestrus cycle affecting the reproductive efficiency of animal pushing its calving interval to more than 13 or 14 months. Economically it is most beneficial if a cow calves at every 12-13 months and buffalo at every 13-14 months.

Why Transition period: A challenging phase

The dairy animal suffers from several possible stresses during this period. It includes calving, changes in feed, change in the group, change in housing, varying availability of feed, environmental stress, heat stress etc. It is also referred that the most notable change is that there is an increase in energy demands and a concurrent decrease in energy intake. The imbalance in energy status results in most dairy animals experiencing a period of negative energy balance (NEB) after calving, which increases the risk of both metabolic and infectious diseases (Duffield, 2000). Cows that fail to transition successfully into lactation are vulnerable to a host number of problems that occur just after the calving, during early lactation resulting in lower milk production and compromised reproductive performance. Therefore, it is important for the cows' productivity and her welfare that she not succumbs to production diseases. The variations that occur in animals during the transition periods include-

- 1. Inadequate feed intake during the transition period:** Dry matter intake starts to decrease a few weeks before parturition with the lowest level occurring at calving. During the dry period, energy and protein requirements are lower as there are no needs by the udder for milk production. As the parturition approaches, the Dry matter intake (DMI) of the animal reduces. This provides the possibility for getting in negative energy balance (NEB) which may occur before calving too. The reduction of the feed intake at the end of pregnancy may also be due to the presence of clinical or subclinical diseases.
- 2. Mobilization of body fat reserves to support lactation:** Negative energy balance and enhanced demand of glucose by animals substantially after calving leads to mobilize large amounts of body fat in support of lactation. The mobilization of body fat occurs through the release of mobilized non-esterified fatty acids (NEFA) into the bloodstream. NEFA is used for energy by body tissues and as precursors for the synthesis of milk fat. The rate of fat mobilization also depends upon the number of fat reserves available for mobilization, as well as insulin concentration, tissue sensitivity to insulin, and stress. This phenomenon is due to the marked energy deficit in postpartum and it is promoted by the increase in growth hormone (GH) and reduction in insulin.

3. Immunosuppression: The immune response is the organism's reaction to the presence and multiplication of pathogens or antigenic substances. It has been reported that the function of neutrophils is impaired in transition dairy cows leading to a state of immune suppression; neutrophil function declines before calving. Dairy animals with high immune suppression are more vulnerable to transition diseases that have a substantial economic impact.

Associated complications around and after parturition

The transition period is of economical importance because most metabolic and infectious diseases occur during this time. Failure to achieve a smooth transition from the dry period to lactating phase results in poor milk productivity, metabolic diseases, & impaired fertility. Major metabolic diseases occurring during the transition period

- Milk fever
- Ketosis
- Retention of placenta
- Metritis
- Displaced abomasum

A) Milk fever

It is a metabolic disorder caused due to insufficient blood calcium levels in dairy animals. Generally, it occurs within 24 hours after calving but may occur after 2-8 days of calving. When lactation or milk let down starts, the need for calcium suddenly doubles as a high amount of calcium is required for the production of colostrum. The calcium is drawn from the feed or through mobilization from bones. When the supplementation of calcium from bones or feed is less than the loss of calcium through the body, milk fever occurs.

Symptoms

- Muscle tremors
- Restlessness
- Stiff gait & slightly elevated temperature
- Fast pulse

- Cold extremities as well as body surface
- Dilated pupils
- Flatulence

Prevention

- To stimulate the mechanism of calcium mobilization, the calcium content of the feed should be reduced three-four weeks before calving.
- Energy & protein oversupply during the dry period should be avoided.
- Supplementation of vitamin D₃ at the end of pregnancy helps in preventing the condition.
- Oral administration of calcium salts 2-3 weeks before calving also help to protect the animal from getting milk fever.

B) Ketosis

It is a metabolic disorder occurring when energy demands exceed its production & result in a negative energy balance. Cows have low blood glucose concentrations due to reduced feed intake during the last few days of gestation as a result of which fat is utilized as a source of energy. The mobilization of fat exceeds the capacity of the liver to metabolize it. This results in ketone production which exceeds ketone utilization by the cow & ketosis results. The condition usually occurs in the first few weeks of lactation, as the cow is not able to eat enough to match the energy lost in the milk.

Symptoms

- Reduced milk yield
- Weight loss
- Reduced appetite
- Acetonemic smell of breath/ milk
- High temperature
- Nervous signs such as excess salivation. Aggression, licking etc.

Prevention

- After calving, the feed requirements for high production are greater than the voluntary feed intake by the cows. Therefore, supplement like good quality hay, cereal grains should be provided.
- Supplements should be fed until the peak lactation is reached.
- In the case of susceptible dams, drenching of propylene glycol immediately after calving helps to prevent ketosis.

C) Retention of placenta

Retention of the placenta or fetal membranes is the failure to expel the placenta within 24 hours after parturition. Normally, expulsion occurs within 3-8 hours after the delivery of the calf. The incidence occurs as a result of hypocalcemia (milk fever) in the periparturient period. Other causes of ROP are brucellosis, mycotic abortions, dystocia, twin birth, stillbirth, advanced age, placentitis etc.

Symptoms

- Degenerating, discoloured & fetid membranes hanging from the vulva.
- Foul-smelling discharge from the vulva.

Prevention

- Provide calcium supplements 2-3 weeks before parturition.
- Calf hood vaccination in female calves at 05 months of age for prevention of brucellosis
- Supplementation of other nutrients like vitamin D₃, magnesium also helps to prevent ROP.

D) Metritis

It is the inflammation of the uterus occurring mostly during the postpartum period. It generally occurs following the infection through retained fetal membranes or dystocia.

Symptoms

- Abnormal or foul smelled uterine discharge
- Fever
- Drop-in milk production
- Dullness & loss of appetite

Prevention

- Prevention of brucellosis through vaccination to reduce the chance of ROP.
- Avoiding over fattening of the cows during the last trimester of pregnancy to reduce the chances of dystocia.

E) Displaced abomasum

The abomasum (true stomach) of ruminants normally lies on the floor of the abdomen but during pregnancy, the uterus displaces the abomasum. After calving, the abomasum has to move back to its normal position, increasing the risk of displacement. Another cause of displaced abomasum is an accumulation of gas in it due to atony.

Symptoms

- Loss of appetite
- Reduced rumination
- Drop-in milk yield
- Milk diarrhoea

Prevention

- Avoid over fattening of cows during pregnancy (ideal BCS 3)
- Changes between the late dry & early lactation should be minimum
- Prevention of diseases such as milk fever, metritis, mastitis & ROP which result in a reduction in feed intake
- Feeding good quality forage to avoid indigestion

Conclusion:

The proper management during the transition period is required to maintain homeostasis in animals from the dry period onwards. It is necessary to prevent ruminal disturbance which leads to reduce dry matter intake, a mineral deficiency that causes metabolic disorder and to enhance the immunity of the animal. It will help not only prevent reproductive and metabolic disorders but also help enhance productivity as well as reduce the calving interval in dairy animals.

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