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Original Article**An extensive selection of nutritional approaches to prevent metabolic disorders in cattle: a beneficial technique**

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Introduction

An assortment of disorders referred to as metabolic abnormalities in domestic animals interfere with an animal's routine processes of metabolism. Both of producers and veterinarians throughout India face significant challenges as a result of metabolic abnormalities in crossbred dairy cattle. The psychological state of the farm animals as a whole, as well as their production and health, are significantly impacted by these ailments. In livestock metabolic problems are very typical, particularly in high-producing dairy cattle during the phase of transition prior to lactation. The incidence rates can change based on a number of variables, including breed, approaches to management, and nourishment.

Nutritional concerns and Indian dietary traditions :

The availability and quality of feeds are highly significant in the Indian context regarding the nutritional management of crossbred milk producing cows. India is an agricultural economy with a surplus of feed supplies, currently there are challenges with ensuring sustainable and high-quality feed availability throughout the year all around. Producers occasionally depend on feedstuffs that are easily accessible in their area, such as crop waste products, green fodder, and agro-industrial byproducts. These feeds, however, can be distinct in their nutritional composition and may be insufficient in important nutrients involving energy, protein, minerals, and vitamins. Veterinarians are obligated to educate producers about the economic importance of high-quality feed and assist them in finding dependable feed distributors. Numerous crossbred milk producers in India suffer inadequate nutrition and inconsistencies, which might result in metabolic disorders. Diets that are out of proportion and deficient in energy, protein, minerals, or vitamins might decrease milk production and make individuals more susceptible to metabolic disorders. In diets based on leftovers from agriculture or poor-quality forages, nutrient shortages tend to be prevalent. The significance of creating balanced feeds that satisfy the unique nutrient needs of crossbred dairy cattle should be emphasized by veterinarians. Nutrient imperfections can be fixed through performing routine feed evaluations and giving appropriate nutrients.

Feed management strategies:

In India, there are several abundances of feed management approaches, some of which are closely associated with the development of metabolic disorders. Regular challenges include irregular feeding schedules, sudden diet alterations, and a shortage of accessibility to fresh, clean water.

Furthermore, consuming high-concentrate diets without a proper adaptation could increase the risk of becoming ruminal acidosis and other metabolic disorders. To enhance rumen health and minimize metabolic risks, veterinarians ought to encourage regular feeding agendas, moderate dietary modifications, and the addition of feed additives including yeast and buffers. Socio-economic elements of Dietary Supplements in India, crossbred dairy cattle' nutritional management is impacted by socio-economic factors. Implementation of successful strategies can be limited by an abundance of funds, a lack of understanding of optimal nutrition, and traditional eating behaviors. In close communication with landowners, veterinarians ought to suggest feasible options that take economic constraints into consideration. They might help producers in developing unique feeding

schedules that are compatible with their unique under certain circumstances, identifying cost-effective feed alternatives, and improving utilization of resources.

Strategies for basic approaches:

In order prevent and deal with metabolic disorders in livestock adequate nutrition is absolutely essential. Significant interventions comprise of:

- **Feed additives** - Yeast, probiotics, and buffers are a few such modifications that can help rumen health and minimize the risk of metabolic disorders.
- Establishing appropriate dry cattle feeding strategies to support the health of the cattle while also making prepared for the future lactation is known as dry cow care.
- Frequent body condition assessment is employed to ensure sure cattle are not too skinny or excessively obese, as both scenarios enhance the risk of metabolic disorders.
- Management of the transition stage requires careful diet preparation to meet increasing requirements for energy without undertaking significant dietary changes.
- Providing an adequate meal with the right proportions of energy, protein, minerals, and vitamins.

Dietary modifications :

For the prevention and treatment of metabolic disorders in livestock in addition to an appropriate diet, there are a number of particular nutritional medications that can be employed-

- In order to preserve advancement, lactation, and reproduction, sufficient protein along with the required amino acids must be administered. Evaluating protein sources and improving the ratios of protein that have been denatured down and not. Using accurate techniques for feeding to enhance nitrogen utilization.
- **Water management** - For optimal hydration and rumen function, access to hygienic, fresh water is required. In order to prevent metabolic disorders associated to water, it is essential to monitor water availability and quality.
- **Vitamin supplementation** - Maintaining appropriate vitamin levels, particularly among the fat-soluble vitamins (A, D, E, and K), could improve immune system health and overall metabolic efficiency.
- **Mineral supplementation** - It's necessary to supply adequate of the minerals calcium, magnesium, phosphorus, and potassium to prevent disorders like milk fever and a low magnesium level by balancing the mineral composition of the food based on forage and water evaluations, deficiencies or imbalances can be prevented. Offering suitable supplementation strategies for trace elements like selenium, copper, and zinc.
- Managing dietary fiber is extremely important in preserving the health of the rumen while preventing ruminal acidosis. Ensuring a healthy rumen environment can be accomplished via consuming high-quality forage and avoiding sudden changes to diets that are highly fermentable.

Keeping the ratio of fiber to concentration in meals balanced. To improve rumen function and avoid acidosis, fodder quality, processing, and particle size should be maintained. Utilizing productive sources of fiber, like long-stem forages and high-fiber byproducts.

- **Energy management** - Preserving an adequate energy balance is important for preventing disorders like fatty liver syndrome and ketosis. The increased energy requirements of the cattle can be fulfilled by including enough energy in the diet, particularly during the transition period. Stabilizing the body condition score while avoiding dramatic alterations to weight. Diets should be carefully prepared depending on energy requirements during different phases of production.

Prevention measures :

For metabolic disorders in cattle, prophylaxis is usually preferred to treatment. The incidence of these disorders can be substantially reduced through establishing preventive measures in existence. Several critical methods for prevention involves-

Feeding management - Placing into consequence good feeding management strategies including making sure that livestock always have access to clean, fresh water and avoiding abrupt shifts in feed or feeding schedules. Water should always be accessible as drinking sufficient of it is important to healthy digestion and metabolic functions. Ensure that it observe correct feed handling and storage procedures so as to prevent contamination, spoilage, and nutrient degradation. Maintain a regular feeding schedule and steer clear of dramatic food changes that may affect the rumen's health and metabolism.

Ration composition and distribution that is well-balanced and involves each of the dietary requirements of the cows according to their stage of production. Providing Rations collaborate closely with a nutritionist to formulate diets that adapt to fulfill the requirements of different stages of production and individual animals, or utilize ration-balancing software. When monitoring nutrient levels, consider into factors like age, breed, physiological status, and environmental variables.

Ensuring cattle a gradual transition from the dry to the lactation stages while maintaining careful consideration to diet changes as well as keeping an eye toward indications of metabolic disorder is known as an appropriate transition time. Establishing regulated transition diets before and after giving birth. Minimizing abnormalities linked with a negative energy balance, such as ketosis. Ensuring that sufficient calcium and magnesium will prevent milk fever and hypomagnesemia.

Optimal nutrition, an ideal state of health, and a decline in stress are essential elements for effective prepartum care.

Silage and Forage Management - Employing appropriate ensiling procedures to stop the growth of mold and mycotoxin contamination. Sustaining fodder quality while maintaining nutrient composition during storage and feeding. Minimizing the danger of metabolic and respiratory conditions brought on by silage of poor quality.

Regular observation - Body condition score, metabolic profiling, and periodic herd health checks can all be used to identify and deal with any abnormalities as they emerge. To maintain adequate and consistent nutritional levels, conduct routine analyses of the feed ingredients and forage quality.

Management of the herd's overall health is essential for preventing and treating metabolic disorders. Following are some essential components of herd health management:

- ✓ **Environmental Considerations** - To prevent stress and respiratory challenges housing facilities should have appropriate ventilation, control of temperatures, and air quality. In order to optimize animal health overall, forage utilization, and nutritional intake, regulate grazing systems and pasture rotations.
- ✓ **Management of reproduction** - Ensuring appropriate reproduction techniques, which include timely breeding, will assist reduce metabolic difficulties all throughout the phase of transition.
- ✓ Environmental management because Providing a neat comfortable atmosphere with sufficient air and appropriate temperature control helps minimize stress and enhance the health of cattle.
- ✓ **Hoof care** - It's necessary for practicing regular hoof trimming and good foot hygiene to avoid lameness, which can exacerbate metabolic disorders.
- ✓ Maintaining an efficient parasite control program, such as deworming and pasture management, contributes to cattle's general health and efficiency to utilize nutrients.
- ✓ Prevention of illnesses and vaccination: Getting together a successful vaccination program for protection against infectious diseases will help minimize stress and reduce the likelihood of abnormalities in metabolism.

Data analysis and record-keeping - Establishing comprehensive records while frequently analyzing herd data can give significant insights into the appearance and treatment of metabolic disorders. Trends, risk factors, and opportunities for improvement can be identified by tracking each dairy cow's performance, ailments, feed consumption, and production characteristics. This data-driven approach enables focused interventions and modifications to organizational and nutritional practices.

Cattle are more predisposed to metabolic disorders because of genetic selection. relevant issues with metabolism may be more common in specific breeds and genetic lines. Breed organizations and genetic specialists are able to assist producers choose livestock with better genetics that are less likely to develop problems with metabolism. Producers might reduce the prevalence of these ailments within their herds through taking hereditary factors into consideration.

In order to successfully manage metabolic disorders, continuous surveillance and assessment of the herd's condition are essential. This involves paying ideal focus on the behavior and lack of the cows, doing prevalent physical inspections and routinely monitoring significant indicators including body condition score, production of milk, and reproductive performance. Any potential issues can be quickly detected by tracking these indicators, permitting immediate action and modifications to management methods. Seek a veterinarian for routine health checks and take into consideration diagnostic procedures to find out probable abnormalities or irregularities.

Milk Fever :

A metabolic disorder termed milk fever, also referred to as hypocalcemia or parturient paresis, is frequently experienced by dairy cattle in the first few weeks of lactation. It happens when blood calcium levels suddenly decline, which may lead to paralysis or muscle weakness. The primary cause of milk fever is an imbalance between the cow's ability to mobilize calcium from body stores or absorb calcium from the food it consumes and the calcium requirements of the cow during early lactation. Dairy animals with high milk production require more calcium at the initial stage of lactation as they must generate and secrete a lot of milk.

Hypocalcemia might occur if the dairy cow's dietary calcium intake is minimal to meet these requirements. In order to recover from milk fever, an infected dairy cow's blood calcium levels must be increased. This is commonly accomplished by giving intravenous calcium solutions, like calcium gluconate or calcium borogluconate. To deliver these medications successfully, veterinary assistance must be obtained. In extreme circumstances, extra supportive treatment may be required, such as hydration management and anti-inflammatory medications.

Various nutritional approaches could encompass the following –

- ✓ Keeping a close watch on body condition: Milk fever risk can be decreased by maintaining ideal body condition scores during the dry period.
- ✓ Supplementing with anionic salts can assist cattle's blood become more acidic, which lowers their risk of developing milk fever in the weeks following calving.
- ✓ Milk fever can be controlled with proper nutritional management, which involves balancing the prepartum diet to give enough calcium without getting excessively, and managing the Dietary Cation-Anion Balance (DCAB). A diet with an optimal DCAB comprises lowering potassium and sodium intake while enhancing the quantity of calcium in the dietary regimen.

Ketosis :

An imbalance between the dairy cow's energy intake and expenditure, leading to a negative energy balance, is the primary factor that leads to ketosis in dairy cattle. Early lactation encourages cattle to produce more milk than regular, which enhances their calorie requirements. The dairy cow starts to mobilize body fat reserves to make up the difference if it is unable to fulfill this need through feed intake. Ketone substances like beta-hydroxybutyrate (BHB), acetoacetate, and acetone build up in the bloodstream as a result of excessive fat breakdown. Possible approach to treatment involves-

- ✓ Administration of intravenous glucose: This is helpful in providing a readily available energy source to offset the negative energy balance.
- ✓ Propylene glycol taken ingested can help boost the level of sugar in the blood as it is metabolized to carbohydrate in the liver.
- ✓ Intravenous glucocorticoids: In extreme situations, steroid hormones may be given to encourage the liver's production of glucose.
- ✓ Supportive treatment: To relieve hydration and sustain electrolyte balance, supportive care may be essential. This might involve fluid therapy, vitamins, and minerals.
- ✓ Management modifications: It may be recommended to increase energy-dense meals, improve ration composition, and make feedstuffs more palatable as improvements in feeding maintenance.

Certain nutritional approaches are as follows –

- **Rumen-protected choline:** It has been established that supplementing with rumen-protected choline during the transition period enhances liver function and minimizes the likelihood of ketosis.
- **Bypass proteins:** It may minimize the danger of excessive fat mobilization and increase the effectiveness of protein utilization.
- **Fiber management:** Ensure enough fiber intake by providing excellent forages and avoiding diets that include an abnormally low amount of essential fiber. Enough fiber determines rumen activity and supports rumen health.
- **Energy-dense diets:** Establish rations that will cover the early lactation animals' rising requirements for energy. Grains, oilseeds, and other stuff high in energy can be introduced to a dairy cow's diet to help it fulfill its requirements for energy.
- **Managing stress:** During the transition a period of time minimize stressors through offering a pleasant atmosphere, ensuring enough ventilation, and eliminating social disruptions.
- **Progressive nutritional alterations:** To assist cattle adjust to dietary modifications, avoid making abrupt dietary changes and gradually introduce new feeds.
- **Body state management:** Throughout the lactation cycle, maintain appropriate body condition scores (BCS) to prevent over-conditioned cattle at calving.
- **Appropriate dry matter ingestion:** Promote maximum intake of dry matter by providing high-quality forages, reducing feed sorting, and improving method of feeding.
- **Provide palatability: To encourage cattle to consume their entire ration, assure that diets are pleasant and appealing. Important factors to take into account include proper mixing, reducing feed deterioration, and preventing moldy or undesirable feeds.**
- **Comprehensive dietary requirements: To fulfill the rising energy needs of early lactation dairy cows, provide a well-balanced diet, particularly through the transition stage.**

RUMEN ACIDOSIS :

It refers to a disorder of metabolism that affects dairy cattle, specifically the largest section of their stomachs, the rumen. It occurred when the rumen's pH drops too low, establishing an unbalanced microbial population and disrupting regular digestion functions. An imbalance in the rumen's microbial population based on by consuming an excessive amount of highly fermentable carbohydrates is the primary culprit of rumen acidosis.

This frequently occurs when cattle are fed a diet substantial in concentrated ingredients, which include grains, starches, and easily fermentable sugars. These carbohydrates rapidly ferment, yielding significant amounts of volatile fatty acids (VFAs), especially lactic acid. Acidosis results from the accumulation of VFAs, particularly lactic acid, which lowers the pH of the rumen. Elimination of an abundance of fermentable carbohydrates, regulating the pH of the rumen, and supportive care are some of the methods applied to treat rumen acidosis.

Certain nutritional approaches are as follows

- ✓ Adequate levels of physically efficient fiber (such as forages and high-quality roughage) should be present in the diet to promote rumination and to maintain the pH of the rumen steady.
- ✓ **Carbohydrates that ferment slowly:** Replace out some rapidly fermentable carbohydrates for slower-release fuel sources like fats or fibrous feed.
- ✓ **Buffering elements:** Include buffering substances in the diet, such as sodium bicarbonate, to assist maintain the rumen's pH and resist off acidosis.
- ✓ **Progressive diet adjustments:** When introducing new feed ingredients or altering the ration, give the cows time to adjust and avoid making abrupt dietary changes.
- ✓ **Healthy ration:** Prepare a diet that satisfies the livestock's dietary requirements while taking into account the rumen's capability for fermentation. To encourage rumen health, incorporate fiber in the right amount.

Feed management because assure that feed is delivered consistently, and stay away from overfeeding grains or concentrates. To determine how well the diet is performing, keep a close eye on feed refusal.

Financial constraints :

For producers, metabolic disorders in livestock can have a significant financial impact. Indirect costs include decreased milk production, decreased fertility, higher culling rates, and decreased overall herd profitability, in addition to the initial costs of veterinarian care and medications. Therefore, adopting into practice appropriate preventive measures and management approaches to reduce the occurrence of metabolic ailments can benefit the process's financial viability. To determine the economic viability of implementing complete nutritional management measures, perform a detailed cost-benefit analysis. Consider about things as feed costs, labor requirements, potential veterinarian cost savings, and improvements in production performance and efficiency.

In summary, dealing with metabolic disorders in cattle effectively involves an integrated approach encompassing preventive measures, appropriate feeding, periodic surveillance, collaboration with professionals, and regular training.

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