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PROBIOTICS: A BOON FOR MANAGEMENT OF CALF DIARRHEA

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ABSTRACT

Calf diarrhea is a major health and economic challenge in pre-weaned calves, particularly in India, leading to poor growth, high morbidity, and mortality. The first two weeks of life are critical due to environmental stress, dietary transitions, and immature immunity, increasing susceptibility to enteric pathogens such as Escherichia coli and Salmonella spp. Probiotics, especially Lactobacilli, play a vital role in stabilizing gut microbiota, suppressing pathogens, and enhancing immune function. Early probiotic supplementation offers a safe and effective strategy for preventing calf diarrhea and improving overall calf health and productivity.

KEYWORDS: Calf diarrhea, gut microbiota, lactobacillus, pre-weaned calves, probiotics

INTRODUCTION

The calf represents the foundation of the future dairy herd, and its health is a critical determinant of productivity, profitability, and animal welfare. At birth, the gastrointestinal tract (GIT) of the calf is sterile and is rapidly colonized by microorganisms from the dam and surrounding environment. During the first month of life, the intestinal microbiota remains highly unstable, making calves particularly susceptible to pathogenic colonization and gastrointestinal disorders such as diarrhea. These disorders reduce nutrient absorption and digestion efficiency, leading to growth retardation and increased mortality.

Calf diarrhea (scours) is a multifactorial disease with serious economic and welfare implications. It is estimated that nearly 50% of pre-weaning calf mortality is attributable to acute diarrhea. Although several infectious agents—including rotavirus, coronavirus, and *Cryptosporidium*—may be present in healthy calves without causing disease, pathogens such as enterotoxigenic *E. coli* and *Salmonella* spp. often trigger outbreaks when introduced into susceptible environments. In this context, probiotics offer a biologically safe and effective approach for controlling diarrhea and improving gut health in calves.

PROBIOTICS: CONCEPT AND SIGNIFICANCE

The term *probiotic* was introduced by Lilly and Stillwell in 1965 to describe growth-promoting substances produced by microorganisms. Probiotics are defined by FAO/WHO and ISAPP as "live microorganisms which, when administered in adequate amounts, confer a health benefit on the host." These organisms help maintain microbial balance in the GIT, secrete antimicrobial compounds, modulate immune responses, and enhance nutrient utilization. Probiotics are generally recognized as safe (GRAS); however, their efficacy must be validated under practical farm conditions.

BENEFITS OF PROBIOTICS IN CALVES

Probiotic supplementation in calves provides multiple benefits: -

- ❖ Improved gut health and immunity by enhancing intestinal barrier integrity and pathogen resistance.
- ❖ Reduced incidence and duration of diarrhea, thereby lowering mortality and antibiotic dependence.
- ❖ Enhanced growth performance and feed efficiency, reflected in improved average daily gain and nutrient utilization.
- ❖ Improved stress tolerance during weaning, dietary transitions, and transport.
- ❖ Better rumen fermentation, leading to increased production of beneficial volatile fatty acids.

CURRENT STATUS OF CALF DIARRHEA

Calf diarrhea remains a major cause of morbidity and mortality worldwide. Digestive disorders affect approximately 38.5% of pre-weaning dairy calves. According to the National Animal Health Monitoring System (USA), diarrhea accounts for nearly 39% of calf deaths within the first three weeks of life. In India, calf mortality rates range from 12.5% to 30% under field conditions, far exceeding the economically acceptable level of 3–5% observed in developed dairy systems.

CALF DIARRHEA AND INFECTIOUS AGENTS

Calf diarrhea is commonly caused by mixed infections involving *Rotavirus*, *Coronavirus*, *Escherichia coli*, *Salmonella* spp., and *Cryptosporidium parvum*. Infection with one pathogen often predisposes calves to secondary infections. Rotavirus is the most frequently detected pathogen, followed by *Cryptosporidium* and coronavirus. *Salmonella*, particularly *S. dublin*, is often associated with outbreaks in calf-rearing units sourcing animals from multiple origins.

MICROBIOTA MANIPULATION STRATEGIES

The calf GIT is highly vulnerable to dysbiosis during early life. Preventive strategies focus on early microbiota modulation through probiotic supplementation, fecal microbiota transplantation (FMT), and rumen microbiota transplantation (RMT). Common probiotic genera include *Lactobacillus* and *Bifidobacterium*, while marker bacteria for gut normalization include *Selenomonas*, *Prevotella*, *Succinivibrionaceae*, and *Porphyromonadaceae*.

FEEDING OF PROBIOTICS

A daily intake of 10^9–10^{10} CFU of viable probiotic cells has been shown to positively influence calf health. Effective strains for diarrhea control include *Lactobacillus plantarum* CDR2, *L. rhamnosus* CRD9, *L. acidophilus* 27SC, *Bifidobacterium pseudolongum*, and *Bacillus subtilis*, administered singly or in combination.

TIMING OF PROBIOTIC ADMINISTRATION

Probiotics can be administered from day one of life to promote early microbial establishment. Optimal use includes daily supplementation in milk or milk replacer, targeted use during stressful periods such as weaning or heat stress, and supportive therapy during early signs of digestive disturbances.

MECHANISM OF ACTION OF PROBIOTICS

Probiotics alleviate diarrhea through multiple mechanisms, including competitive exclusion of pathogens, production of antimicrobial compounds, strengthening of intestinal epithelial barriers, immunomodulation, production of short-chain fatty acids, and regulation of gut motility.

CONCLUSION

Probiotics represent an effective, safe, and sustainable strategy for the prevention and management of calf diarrhea. By stabilizing intestinal microbiota, enhancing immune responses, and improving nutrient utilization, probiotics significantly reduce disease incidence and improve growth performance in pre-weaned calves. Early-life supplementation is particularly critical, as it supports the development of a resilient gastrointestinal ecosystem during a highly vulnerable period. Incorporating probiotics into calf-rearing programs can reduce reliance on antibiotics, lower mortality rates, and improve overall herd productivity. Consequently, probiotics should be considered an integral component of modern, health-oriented dairy management systems.

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