CRIMSON PUBLISHERS
Wings to the Research

Approaches in Poultry, Dairy & Veterinary Sciences

ISSN: 2576-9162

Mini Review

A Review on the Consumption of Probiotics in Feeding Young Ruminants

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Submission: August 15, 2017; **Published:** September 22, 2017

Abstract

Probiotics, live cells with different beneficial characteristics have been extensively studied and explored commercially in many different products in the world. Their benefits to young ruminants have been supported in hundreds of scientific papers. Enhance the development of the adult rumen microflora, improve digestion and nitrogen flow towards lower digestive tract, and improve meat and milk production. Because of higher profit margin in intensive small ruminant production, farmers are shifting from tradition to high input feeding systems. In order to harvest, real benefits from small ruminants which are raised on nutrient rich diet, feed additives like probiotics are used to enhance the efficiency of nutrient utilization in growing ruminants. The more feed an animal consumes each day, the greater will be the opportunity for increasing its daily production. Probiotic supplementation has been found to increase feed intake and is known to influence the performance of ruminants. Probiotics in a healthy animal stimulate non-specific immune response and enhance the system of immune protection. The probiotics that enhance immunoglobulin levels have more positive effect on growth performance, production and ability to resist disease. Therefore, this review briefly elaborates the effects of probiotics feeding on health and growth performance of young ruminants.

Keywords: Probiotics; Growth performance; Rumen development; Ruminant

Introduction

In recent years, producers worldwide have been looking for management techniques and products to improve the performance as well as the health of weanling piglets, calves and lambs. With the EU ban on the use of antibiotic feed additives, substitutes such as antibiotic growth promoters, (e.g. probi¬otics) must be found for the entire field of animal husbandry in general, and particularly for young animals, such as weaned piglets, lambs and calves Choct [1]. Probiotics are microbial food supplements that apply beneficial effects on the host through improving the intestinal microbial balance. During the last decades, various feed additives have been used in pre ruminant and young ruminant nutrition. Production benefits, together with lower incidence of digestive disorders, better body condition of the animals, and reduced feed cost are sought after Huber [2].

For the last 10 years, increasing consumer concern about the long-term effects of antibiotics has led to a more focused interest in probiotics. Lactic acid bacteria have shown growth promoting effects by stimulating feed intake or increasing body weight gain, and health promoting effects by reducing the incidence of diarrhea Wallace, et al. [3]. The health benefits of probiotics can be mentioned as improved calcium absorption, vitamins and proteins synthesis, stimulations and enhancement the immune system Cross [4], improved feed conversion ratio in small ruminants Robinson [5] and stimulating role on DMI and degradation of fiber Chadmana & Uffer [6]. Common probiotics include different species of bacteria, including *Bifidobacterium* and *Lactobacilous* as well as yeast species that adding such common will lead to the development of rumen and improved gastrointestinal tract health status.

The effect of applying *Lactobacillusacidophilus* and *Bifidobacterium* on calves caused the increased weight gain per day, better conversion ratio and reduced diarrhea Fumiyaki, et al. [7]. Usually, newborn lambs and calves lack advanced immune system to fight the external pathogens and are born with low concentrations of blood immunoglobulin Mccoy, et al. [8]. Adding probiotics to the alternative milk and its consumption by animals as well as commercial products such as probiotics containing immunoglobulin may be useful to increase the quality of colostrum and increased amount of immunoglobulin A Garry, et al, [9].

Effects of probiotics on growth performance

Probiotics are one of the best antibiotic alternatives Callaway, et al. [10], avoiding the presence of E. coliin intestine, and in turn, they can control or treat diarrhoea in human Sazawal, et al. [11] and animals Reid & Friendship [12]. Probiotics have beneficial impacts such as the improvements in intestinal microbial balance and calf enteric environment Kaur, et al. [13], production of inhibitory

metabolites against pathogenic bacterial growth Voravuthikunchai, et al. [14] and protection against infectious factors due to enhanced immunological responses Schiffrin & Blum [15]. Supplementation of probiotics resulted in an improvement in microbial ecosystem, increase in nutrient bioavailability and improvement of growth performance in lambs Khalid, et al. [16]. Probiotics can increase the development of the rumen flora and can enhance the immunity Aattour, et al. [17], with this these can reduced the incidence of intestinal infections and can restore intestinal micro-flora which have positive effect in management of diarrhea Musa, et al. [18].

Chadmana & Uffer [6] concluded that probiotics play a simulating role on dry matter intake and fiber degradation. The reasons for increased DMI due to probiotic supplements intake can be mentioned as improve dcellulolytic bacteria number and the positive effect of probiotics on rumen pH rate, which will lead to improved animal performance Umberger & Notter [19]. Probiotics containing *Lactobacilous plantarum* can produce energy by breaking down simple carbohydrates such as glucose. *Aspergillus oryzae* also helps to produce enzymes that are involved in the digestion of carbohydrates and fiber, which will lead to improved animal performance. Robinson [5] reported that probiotics can improve feed conversion ratio in small ruminants. Using probiotics containing yeast caused improved feed conversion ratio in lambs, which is due to the effect of probiotics on the rise of cellulose degrading bacteria amount in the rumen of lambs fed with probiotics Abdelrahman & Hunaiti [20]. The use of probiotic supplements in lambs feeding during the test done by Baranovski, et al. [21] revealed no difference in daily weight gain between control treatment and other treatments. Similar research in this field shows that the use of probiotic supplements containing yeast had no effect on increasing the lambs' weight gain Titi et al, [22].

Urea is converted to ammonia by urease enzyme within the rumen, which is involved in the synthesis of microbial protein in the rumen. The reason for elevated blood urea nitrogen concentration in ruminant animals can be due to the rumen micro-flora inability to keep appropriate amount of ammonia Butler [23]. Other researchers also observed no differences in the concentration of blood urea nitrogen between diets containing probiotics and the control treatment Bruno, et al. [24] and Masek, et al. [25]. Abu Elnour & Kholiof [26] reported that the elevated levels of blood urea nitrogen in ruminants are caused due to feeding by probiotics. Also, the use of *Saccharomycescerevisiae* yeast in the diet of suckling calves will increase the total protein levels in blood serum compared to the control treatment. As mentioned, it can be due to improved rumen microbial protein synthesis Monika, et al. [27].

Effects of probiotics on rumen development

Bacteria-based probiotics are comprised of a variable number of species and strains of beneficial bacteria known to have positive implications on animal health and performance. Bacterial probiotic has shown to improve the rumen-predominant microorganisms Chiquette, et al. [28] and ruminal performance Nocek, et al. [29]. Probiotic consisting lactic-acid-producing bacteria promote the stability of the rumen flora Beauchemin, et al. [30] and Weinberg, et al. [31], which result in increased dry matter intake and weight gain and improved health in animal. Nocek, et al. [29] reported the decreased risk of acidosis for dairy cows receiving a combination of probiotic including *Lactobacillus and Enterococcus*. A common theory is that probiotic may prevent a decline in rumen pH by decreasing lactic acid production and increasing the utilization of lactic acid by some microbes Beauchemin, et al. [30].

At birth the young ruminants acquire microflora rapidly from his mother's saliva, feces and that of other animals Chaucheyras-Durand, et al. [32]. The prolonged contact between the mother and her young is more frequent in small size farming systems. In more intensive dairy systems the calf is rapidly separated from them other and is often introduced to solid feed before the succession of all microbial populations is completed Fonty, et al. [33]. This situation leads to an imbalanced microbial flora making the young ruminant more prone to suffer from various infections. Gastrointestinal disorders are one of the most important sources of economic loss in pre-ruminant animals. In a study with lambs, Chaucheyras-Durand & Fonty [32] reported that the rate of cellulolytic establishment was greater in lambs receiving S. cerevisiae daily compared with controllambs.

Conclusion

Probiotics have a positive effect in ruminant animal production by improving their performance and health. Probiotics may improve the ecology of ruminal microflora increase the ruminal pH, and decrease clinical and sub acute acidosis. Probiotics enhance the growth of many domestic animals improve the efficacy of for age digestion and quantity and quality of milk and meat. Probiotics also may protect animals against pathogens, enhance immune response, reduce antibiotic use and morbidity or mortality and increase benefits for the consumer through improved product quality. A combination of probiotics with different mechanisms of action could provide better result and the potentiated probiotics are more effective than their components separately. Undesirable microorganisms are thus reduced and protection is given against colonization or attachment of harmful microorganisms. However, their mode of action, their environment, their biological requirement and their interactions and competition needs more knowledge to identify new and more efficient probiotics.

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