



## Improving the Animal Health Using Alternative Approaches in Farm Animals Feeding

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### Editorial

The sustainable human food production is based on well-established farming policies to ensure a healthy food source for both animals and humans. Therefore, sustainability is of major interest in food biosecurity steps, from farm to table. The reduction of the problems affecting the public health like zoonoses is a crucial approach to prevent these hazards. It was demonstrated that some pathogens could persist in the environment or in multiple hosts, contaminating the human and animal food. According to EFSA, increased attention has been paid in the last century in order to increase the food security and to control the animal diseases, reducing significantly the incidence of food-borne related diseases. The reduction of pathogenic contamination of food requires, beside others, the maintenance of the biosecurity in the farm or ranch where animals are raised. In the context of globalization and industrialization era, the rapid growth of the population needed to fulfill an increased nutritional demand. Farming activities changed to improve the animal performances, corroborated with important changes in the management of animal production. Modern farms use new systems to increase the growth performance. In this context, the antibiotics were included in animal feed, at sub-therapeutic doses, as growth promoters. Their use was implemented in the 1950s as a way to meet the increasing demand for food. Concurrent with antibiotic use, the development of resistant pathogens associated with animal and human diseases, as well as increases in the antibiotic resistance gene pool in commensally bacteria increases over the time. In addition to improving feed efficiency, antibiotics are used to improve animal welfare. There must be a balance between antibiotic use and preserving antibiotic efficacy for both human and animal health. Worldwide concern about the negative effects of antibiotics (development of antimicrobial resistance and transference of antibiotic resistance genes from animal to human microbiota) led to banning the use of antibiotics as growth promoters in the European Union since January 1, 2006. In the USA the practice of antibiotics used as growth promoters in farming animals is under increasing regulatory and political scrutiny. In this context, there is the need to look for viable alternatives that could enhance the natural defense mechanisms of animals and reduce the massive use of antibiotics.

Nutrition could be an alternative modality used in veterinary medicine. There has been a lot of advancements and research in the last 30 years regarding nutritional requirements for animals. This has led to the prevention of a number of nutritional diseases and to the formulation of specifically diets for the prevention/attenuation of pathologic conditions. Also, to favorably affect animal performance and health, can be used specific feed additives or dietary raw materials which could modulate the gut microbiota which plays a critical role in maintaining host health. The modulation of gut microbiota as host-associated microbial system could contribute to the reduction of the number of antibiotic-resistance genes in this population, decreasing the spread of resistance genes across species barriers through diverse microbial communities and from animals to humans. Also, a balanced gut microbiota could be an efficient barrier against pathogen

colonization and could produce metabolic substrates (vitamins, short-chain fatty acids).

Nutritional solutions such as probiotics, prebiotics, synbiotics and organic acids could be used as components of animal feed. These dietary supplements could also adjust to optimize the effects on animal health and growth while being largely dependent on feed input costs. The main effects of these feed additives are the improved resistance to pathogenic bacteria colonization and enhanced host mucosa immunity; thus resulting in a reduced pathogen load, an improved health status of the animals and a reduced risk of food-borne pathogens in foods. Prebiotics are selectively fermented components that modulate the gut microbiota to benefit host health, such as the selective stimulation of the indigenous beneficial microflora and increasing the defense and resistance potential of the animal and human organism. Like prebiotics, in-feed organic acids can be inherent or added, and they function by decreasing the pH of an environment, resulting in lower pathogen survival in the gut. Probiotics confer benefits analogous to prebiotics but are living cells such as *Lactobacillus*, *Streptococcus*, *Bifidobacterium*, *Bacillus*, and yeasts. Synbiotics may be defined as a mixture of probiotics and prebiotics that beneficially affects the host by improving the survival and implantation of live microbial dietary supplements in the gastrointestinal tract. Until now, several studies in farm animals demonstrated the effects of these feed additives in pigs, poultry and ruminants, by improving the number of beneficial bacteria and the reduction of the potential pathogen load. Because the results of these studies are contrasting, more research is needed to establish the doses, time and way of administration, animal condition, etc. Future research should be aimed to study the interaction between the host microbiota and these supplements, the probiotic and prebiotic interaction, and to elucidate how the genetic and bacterial profiles of the host can influence treatment responsiveness. Also, it is need to increase the volume of the genomic information on the activities of these supplements in order to improve the understanding of the interactions with specific intestinal conditions.

The finding of a low-cost alternative to cover the spectra of the antibiotics used in farm animals is a current challenge. Many alternatives have been proposed and future research and a good collaboration between nutritionists, veterinarians, animal scientists, farm managers will contribute to the finding of effective solutions.

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