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Effective Strategies to Improve the Quality of Meat

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This review looks at the research on the impact of biotics on animal development, immunity, and productivity to address the expanding use of biotics in animal agriculture. Biotics have been shown to have some positive effects when administered to farm animals, including increased productivity, decreased mortality, and higher-quality end products. Although the precise mechanisms by which biotics produce their beneficial effects remain unclear, it is widely held that they do so by altering the composition of the microbiota in the digestive tract. Biotics have been shown to improve sensory qualities and decrease pathogenic and spoilage microorganisms in both fresh and fermented meat products. Biotics have been shown to have some positive effects, but there is a wide range in how well they work to enhance animal performance and final product quality. Factors that dictate such variability are dependent on the probiotic strain being utilized and its stability during storage and administration/inoculation, frequency and dosage, nutritional and health status as well as the age of the host animal. To find the most useful probiotic strains for a given application, as well as the optimal dose, administration time, delivery method, and mechanism of action for each strain/host, more investigation is needed.

Keywords: Meat Production, Preservation, Sustainable Development.

Introduction

Growing global demand for animal products has been a persistent difficulty for the animal production industry [1]. Improvements in genetic selection, health status, nutrition, and the use of antibiotics and growth promotants have all contributed greatly to this field's rapid development over the past half-century [2]. Both of these methods have been shown to increase overall growth performance by about 18% in commercial animal production by bettering animal health and feed efficiency. Concerns have been raised about the rise in antibiotic-resistant microorganisms, food allergies, and environmental damage from things like agricultural runoff as a result of antibiotic and growth-promoting use [3]. Antibiotics and growth promotants' effects on human health are still controversial, but consumers are growing increasingly wary of them [4][5]. To increase the productivity, consistency, and uniformity of farm animals and their products, scientists have been looking into various alternatives. Feeding farm animals biotics, either as individual strains or a combination, is one alternative.

Metchnikoff coined the term "probiotic" in 1908; it comes from the Greek "pro" (meaning "for") and "bios" (meaning "for life") [6]. Biotics are defined as living microbial supplements that advantageously influence the host by improving its intestinal microbial composition [7]. "mono or mixed strains of living microorganisms that confer a desirable

health benefit on the host when used adequately," reads a definition adopted by FAO/WHO in 2002 [8]. To regard a microorganism as a probiotic, it should be nonpathogenic, able to give a viable cell count, has a positive effect on the health of the host, and enhance the functions of the intestinal tract. The most commonly used biotics are Lactobacillus acidophilus, Lactobacillus lactis, Lactobacillus plantarum, Lactobacillus bulgaricus, Lactobacillus casei, Lactobacillus Helvetica, Lactobacillus salivary, Bifid bacterium spp., Enterococcus faecium, Enterococcus faecalis, Streptococcus thermophilus, Escherichia coli bacteria, and other probiotic fungi such as Saccharomyces cerevisiae and Saccharomyces boulardii [9]. Utilizing biotics in livestock is helpful for decades [10] due to the positive effects on feed utilization, growth, and immunity. The success of biotics depends on some variables, including the species and age of the host, the dosage, and the quality of the microbial strains used. [11] Therefore, adding biotics to the diet of livestock requires serious thought. This review aims to discuss the administration of biotics in animal feed, either as supplements or additives, and their effect on animal health, growth and productivity, and product quality. We'll also take a quick look back at how biotics have been used in both raw and aged cuts of meat.

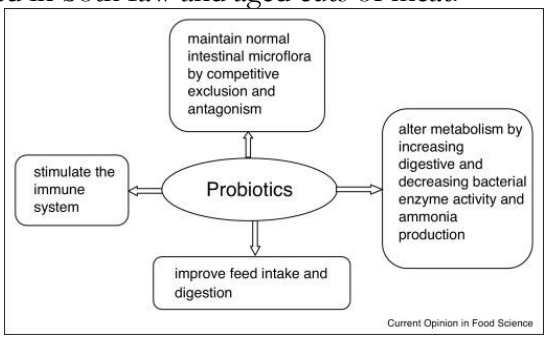

Figure 1: Effect of biotics in poultry for improving meat quality

The Microbiota of the Gut Animals hosts a microbiome that is both diverse and numerous within the GIT [12] [13]. The majority of biotics are bacteria, so that's what we'll be reviewing in this article.

About 98% of the total microbiota in the ovine rumen and 98% in the bovine rumen are Firmicutes and Bacteroidetes species. Firmicutes, however, predominate in the pig and chicken cecum, with only a negligible percentage (2%) of Bacteroidetes [14].

The welfare of the animal improves with the maintenance of a large and varied microbiota [15]. Depending on the specifics of the situation, any one of these three variables may play a more significant role than the others. Biotics have many potential benefits, but one of the difficulties lies in knowing at what point in an animal's lifecycle the change should be made.

Since the 1970s [16], probiotic supplementation has become increasingly popular for animal consumption. As a result of biotics' antimicrobial properties against environmental and dietary pathogens, they are increasingly being used in the food industry. [17].

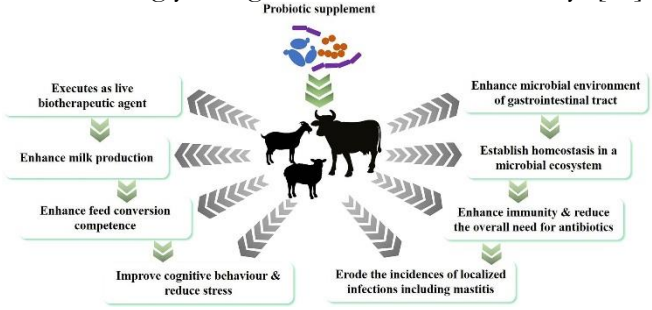

Figure 2: Importance of biotics on dairy production efficiency

Genetics, age, diet, and sexual orientation are just a few of the variables that can affect an animal's size and development [18]. Among these factors, providing an animal with a healthy diet is crucial to its development and growth [19]. Maximizing growth requires not only providing the right amount of feed but also making sure that the feed is easily absorbed by the animal [20]. The probiotic-supplemented pigs outperformed the control group in terms of growth because they digested their food more efficiently. Similarly, pigs fed a Bacillus culture strain showed improved nutrient absorption. A 10% improvement in protein utilization was observed between supplemented and non-supplemented pigs after four to five months in this study [21]. Researchers [22] found that when turkeys were fed Bacillus amyloquefaciens, they ate more frequently and for longer periods of time [23][24].

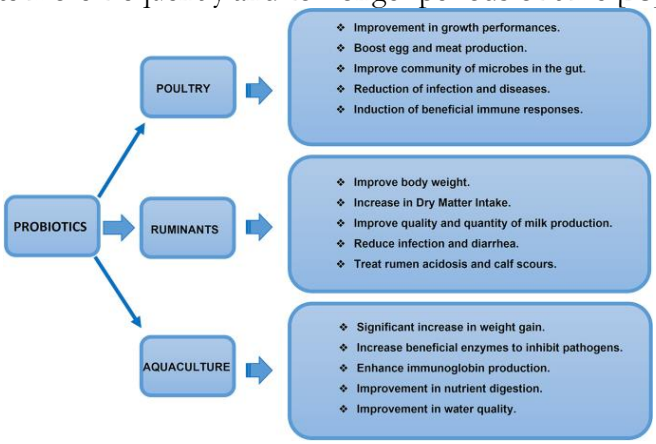

Figure 3 The role of proiotic on animal health and nutrition

Other studies [25] corroborate the authors' hypothesis that the lack of disease in the calves used in the study reduced the biotics' effectiveness [26]. In addition, more eggs were laid, more feed was consumed, and a better immune response was seen when laying hens were given 107 CFU/g of the probiotic Bacillus licheniformis.

Results

A consumer's perception of the quality of meat has a significant impact on both their purchasing decisions and their dining experiences. Meat color, texture, and WHC (water-holding capacity) are all examples of such characteristics [27]. Color is the single most influential factor in determining whether or not consumers will buy a particular cut of meat. In this scenario, water and water-soluble proteins like myoglobin are released from the meat, leaving behind a pale, unpleasant product. Biotics have been the subject of investigation as a means to enhance the consistency of meat color and pH in recent years. Supplementing broilers with Enterococcus faecium led to a higher pH in the pectoralis major muscle at 45 min postmortem [28]. Pectoral meat turned a deeper red as the pH rose. Pigs-fed biotics were also found to have darker and redder meat [29]. Postmortem pH decline may be related to probiotic supplementation, but the exact connection has not been determined. However, it appears that the type of microorganism and administration method have an effect on the resulting pH [30]. In sum, biotics have the potential to alleviate this problem for the pork and poultry industries by slowing or stopping the pH from falling too quickly soon after death.

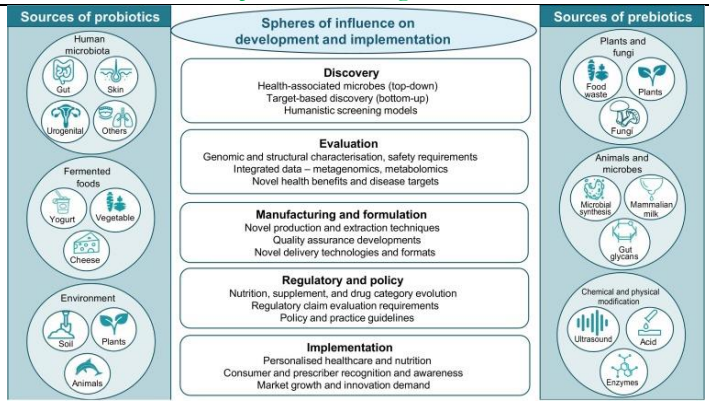

Figure 4: Future of biotics and trend in microbiology

The ultimate pH of meat affects its ability to retain water, and a higher pH allows meat to do so more effectively. Biotics have been shown to enhance WHC and meat tenderness [31]. Along with an increase in tenderness[32] found that probiotic supplementation can reduce oxidative stress-related defects in meat. Evidence for this hypothesis comes from studies showing an improvement in antioxidant capacity, a decrease in lipid oxidation, and a decrease in reactive oxygen species in products derived from probiotic-fed animals[33]. Now that there's more proof than ever that biotics can boost meat quality, scientists are looking into new ways to incorporate these microbes into the meat supply.

Conclusions

This review synthesizes data from numerous studies, leading us to the conclusion that including biotics in animal diets and fresh and processed meat products has many advantages. Intestinal microbiota, immune response, nutrient digestibility and absorption, animal growth, and meat quality all appear to be enhanced by the use of biotics. In addition, numerous studies have demonstrated that the addition of biotics to fermented meat products enhances both their nutritional value and their flavor. This highlights the complexities of using biotics, as there were instances where their use in animal feeds and meat products had no discernible effect. Consequently, more research into the characteristics of individual strains, the determination of an optimal dosage, and an appreciation of the web of interactions between biotics and the gut microbiota could lead to the development of more potent probiotic mixtures for use in animal feed and meat products.

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