

# Alternatives to the use of antibiotics in egg productions

## Abstract

The use of antibiotics to regulate the intestinal health of laying hens is widely used. However, there is a need to replace them. The research based on the direct and indirect effects of the prophylactic use of antibiotics on egg production. The search for alternatives such as essential oils, probiotics, prebiotics, organic acids, enzymes, among others been made. In this paper, the possibilities of non-use of antibiotics in laying hens will indicated in order to produce eggs without antibiotics.

**Keywords:** additives, eggs, poultry farm

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**Abbreviations:** MOS, mannan-oligo-saccharides; FOS, fructo oligo-saccharides; IP6, phytic acid phytate

## Introduction

The use of antibiotics in egg production may be, through in therapy, prophylactic use and to improve the performance of the hens. The latter is perhaps the most interesting for the defense of the use of antibiotics, however, its use promotes direct and indirect effects. Among the direct effects, the elimination of pathogens from the gastrointestinal tract, and indirectly effects, improvement in nutrient absorption, lower energy and protein expenditure, lower ammonia production, and a lower rate of food passage, and others. Among the harmful effects on production, besides eliminating pathogenic bacteria, they also eliminate all intestinal floras. Further, their use may mask certain problems from the poultry farm, such as biosecurity. In addition, and perhaps the most recently addressed, prophylactic use may promote bacterial resistance.<sup>1</sup>

## Aim

In this context, the search for alternatives to performance-enhancing antibiotics is necessary. There is a wide variety of viable alternatives for antibiotic substitution, and these alternatives may even promote improvements in product quality. However, some egg farmers ask themselves: "How to maintain the health of the hens, maintaining quality in production, without the use of antibiotics?" Our objective is to present some aspects related to the subject and to show results of substitutes for antibiotics.

## Alternatives to the use of antibiotic performance enhancers

### Essential oils

The essential oils are alternatives to the use of antibiotic growth promoters in poultry, due to their antimicrobial action, besides possessing antioxidant and immunomodulatory properties.<sup>2</sup> In addition

to the pharmacologically active principle, the essential oils consist of mixtures of volatile substances, usually lipophilic, whose components include terpene hydrocarbons, simple alcohols, aldehydes, ketones, phenols, esters, organic acids, etc.<sup>3</sup> A research<sup>4</sup> evaluating layers fed with colistin rations (100mg/kg), and doses of oregano essential oil (50, 100 and 150mg / kg of ration), observed a better egg laying rate and egg weight with 100mg/kg of oregano essential oil. Likewise, this treatment promoted a better mass conversion of eggs, with no losses in egg quality, considering Haugh units. In the case of beneficial microorganisms in the cecum, the 100mg/g dose of the essential oil promoted a significantly higher population of *Lactobacillus* and *Bifid* bacterium, and drastic reduction in the malefic flora of *Escherichia coli* and *Salmonella* spp. In this context, it is clearly perceived that essential oils have excellent affinities, thus allowing the complete elimination of antibiotics in poultry rations, since their functions are broad and benefit the entire system, as they act as antimicrobials, antioxidants, antivirals, promote mucus production, stimulate the immune response, are antifungal and antiparasitic. In short, they are excellent additives in the production of antibiotic-free eggs.<sup>5</sup>

### Probiotics

Probiotics constitute living microbial food supplements, capable of beneficially affecting the host, improving the balance of its intestinal micro flora.<sup>6</sup> Probiotics are living microorganisms whose main function is to stabilize the intestinal micro biota, so they inhibit the growth of pathogenic bacteria (*Escherichia coli*, *Clostridium* and *Salmonella*) and stimulate the growth of beneficial bacteria (*Lactobacillus* and *Bifido*-bacterium). Evaluating the histology of the intestine of laying hens fed with red yeast (*Sporidiobolus pararoseus*), as probiotic,<sup>7</sup> perceived that the height of the villi was significantly higher with the use of the probiotic in comparison to the control ration. This effect that occurred in a similar way in the three segments of the small intestine, duodenum, jejunum, and ileum. The authors further commented that there is a positive correlation of the inclusion of red yeast in the rations with jejunal villus height, growing linearly ( $y=1.417x+38.222$ ;  $r^2=0.90$ ). It concluded that the use of probiotic with

raised bowel villi promotes better intestinal health and efficiency of the functions of that organ. The number of villi and their size in each segment of the small intestine impart to them absorptive capacity, where it is directly proportional to the number of villi present, villi size and surface area available for absorption.<sup>8</sup>

### Prebiotics

They are non-nutrient ingredients, not digestible by birds and that significantly affect the host. They selectively stimulate the growth and activity of one or more species of beneficial intestinal bacteria. Among them, there are several options, such as MOS - extracted from the cell wall of *Saccharomyces cerevisiae*, FOS - synthesized from *Aspergillus niger* or *Aureobasidium pullulans*, and others such as Glycoligosaccharides, Galactoligosaccharides. In the analysis of the doses of MOS in 0.5, 1, 1.5 and 2g/kg in the diets,<sup>9</sup> a greater digestibility of the crude protein verified in all the doses tested in relation to the control without use of the MOS. This effect was potentiated and improved in relation to the lower availability of nutrients to the harmful bacteria, so that their populations was reduced, especially with 1g / kg in *Escherichia coli* and with 1.5g / kg in *Salmonella* spp. beneficial effect, especially to the population of *Lactobacillus* spp. in 1g / kg. In the same study,<sup>10</sup> the authors observed significantly higher rates of egg laying and egg mass at rates of 1 and 1.5 g/kg. In addition, the authors observed a higher presence of Newcastle antibodies and avian bronchitis at doses greater than 1g/kg tested. Thus, as explained above, prebiotics possess important characteristics that promote beneficial bacterial flora and even stimulate the immune system of birds, enhancing the production system as a whole.

### Organic acids

Organic acids are natural constituents of plants and animals. The acidifiers most used in poultry diets are fumaric, benzoic, butyric, formic, propionic, lactic, malic and citric acids<sup>11</sup> These has a special function of reducing the pH, which makes it an antimicrobial additive, with the ability to regulate the intestinal micro biota and, consequently, to improve digestive efficiency. In summary, organic acids have functions, which, as already mentioned, extend to the stimulation of secretion and enzymatic action, and antifungal. In the case of laying hens fed diets containing butyric and fumaric acid, there was an increase in egg weight in relation to citric, butyric and fumaric acids in layer feedings. Posture rate also had a beneficial effect independent of the organic acid evaluated. The best mass conversion of eggs were observed in birds fed with butyric acid feed, although all acids presented positive results when compared to treatments without using them. In the study by,<sup>12</sup> the flora of *Lactobacillus* spp. in the ileum was significantly higher when there was use of the organic acids in relation to the control, with higher rates in the fumaric acid. This shows that organic acid promotes a better balance of intestinal flora, improving and stimulating the health and efficiency of the process of digestion and utilization of the nutrients contained in the ration, without prejudice to the animal performance. Organic acids, although widely used and evaluated, have some limitations that need to be considered, such as types and combinations of acidifiers used, dosages used, and forms of application, type of diet, environmental conditions, and buffer capacity of the ration ingredients.

### Enzymes

The use of exogenous enzymes (amylase, protease, lipase, xylanase, phytase, etc.) has emerged as an alternative to increase the nutritional value and digestibility of feed ingredients for birds.<sup>13</sup> The enzymes

promote a reduction of antinutritional factors of the diet as the viscosity of the digestive content and increase of the degradation of the protein complexes, besides, to help increase the digestibility and the use of food energy, improving the substrate of the commensal bacteria and thus modulating the micro biota. The enzyme xylanase, for example, is responsible for the degradation of non-amidic polysaccharides and is not produced by monogastric animals.<sup>13</sup> According to<sup>14</sup> the use of exogenous enzymes, such as phytase, allows alternative ingredients to be as efficient as corn and soy. In a study by,<sup>14</sup> exogenous phytase supplementation for chickens, over 70 weeks of age increased the use of dietary phosphorus, and the birds maintained egg laying. On the other hand, birds that did not receive exogenous phytase in the diet had low posture indexes.

### Conclusion

In the analysis of potentialities and possibilities for the substitution and elimination of antibiotics in rations, we can say that we have innumerable advantages, both for the bird, for the producer, for the consumer and for the environment. The advantages for birds are a better health thanks to a stronger immune system, a lower incidence of intestinal inflammations, promotion of an optimal intestinal flora and lower emissions of ammonia; the results open the possibility of minimizing the therapeutic use of antibiotics. The advantages to the farmer are better digestion of the animals, resulting in a better feed conversion and therefore a lower feed cost and a significant improvement in animal performance, resulting in greater profitability. Resulting to the consumer a guarantee of quality and safety of the food they will consume. In addition, efficient and sustainable use of natural resources thanks to the reduction of emissions of ammonia and methane (up to 50 percent less) and greenhouse gases. In conclusion, we can infer that it is entirely possible to produce eggs free of antibiotics, due to the availability of alternatives for replacing them in the feed of birds, besides not having deleterious effect on the quality and quantity of egg production.

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### Conflict of interest

The author declares that there is no conflict of interest.

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