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REDUCING DEPENDENCY ON ANTIMICROBIALS NATURALLY, FOR PROFITABILITY AND SUSTAINABILITY IN MODERN BROILER PRODUCTION

Ajay Awati

EW Nutrition GmBH, Hogenbogen 1, 49429 Visbek, Germany

ABSTRACT

With an ever increasing world population, increasing demand for higher quality protein has driven growth in all sectors of agriculture and animal production. Animal production in general and poultry production in particular have grown substantially over the last few decades. However, growth comes with its challenges to sustain and remain profitable. In recent years, consumer pressure on reduction of the use of antibiotics, quality of meat products, higher welfare requirements and environmental impact has challenged sustainability and profitability of the overall poultry business. New and upcoming feed additive technologies help mitigate gut health related challenges and thus help reduce dependency on anti- microbials. One such technology is phytogenic gut health additives. This article discusses the anti-microbial resistance challenge the world is facing, why it is important to reduce the use of antimicrobials in poultry production, and how new feed additive technologies can help.

Introduction

Achieving food security for the growing population of the world, especially in developing countries, has been a constant challenge for all agricultural and animal production systems. Since the Second World War, the world population has grown tremendously, and so have the needs for healthy and nutritious protein-rich food. In the last few decades, achieving higher production performance was the main and only success parameter for animal production. This particular objective has led to a constant focus on zoo-technical parameters such as average daily gain, slaughter body weight, and feed conversion ratio. One can describe this era as an "era of increased and efficient production".

Looking back, the poultry industry has achieved immense success in securing the increasing needs of the human population. According to data on world hunger and the undernourished population, in the 1970s more than one out of three global citizens were facing hunger. This number has dramatically come down to one in eleven. If you consider poultry production, the performance parameters of modern poultry have dramatically improved during the same period. In the 1960s, the slaughter bodyweight of a broiler chicken was in the range of 1.7 kg at 42 days of age. This has now gone up to about 2.8 kg, which is an improvement of about 66%.

Modern poultry production is not only achieving higher body weight, but it is also better in production efficiency. In the 1960s, the average FCR (feed conversion ratio) was about 2.5; it is now at an average of 1.65 for a 42-day old broiler chicken. FAO data during the period of 1995 to 2005 clearly shows that the farm poultry population grew at twice the rate of the human population. Furthermore, poultry meat production and international trade of poultry meat grew about 4 to 5 times the rate of human population growth.

This clearly shows that the poultry industry has managed to not only farm more birds and produce more meat, but also to improve production efficiency and poultry meat availability across the globe, outpacing the human population growth. This is a very important feat in terms of the growth of the industry.

Changing scenarios

As described above, for the last few decades, the poultry industry has gone through a period of immense growth. However, increasing consumer awareness and the impact of industry on the environment and public health in general have shifted the success paradigm towards more sustainable and responsible production. This has resulted in increasingly more focus on other success parameters beyond production efficiency, such as animal welfare, variation in slaughter bodyweight, animal health, quality of the animal product, reduced use of antibiotics, public health, and environmental concerns. This clearly shows that the industry is entering an "era of responsible production". Today and in the near future, the industry will have to look at poultry farming in a holistic way to see that all of these additional parameters are met for successful, profitable, and sustainable poultry production. Taking a deeper dive into understanding sustainability and profitability parameters reveals that gut health and gut microbial activity have a vital role in achieving success.

Gut health and production performance

The intestinal tract is the most important part of the digestion process, which helps the animal digest and absorb essential nutrients. These are important for the maintenance and growth of the animal. Therefore, the functioning of the intestinal tract and the microbial community that resides inside have a huge impact on growth performance and the overall profitability of animal production. Pathogenic challenges such as necrotic enteritis caused by *Clostridium* spp. infection are estimated to cost the industry 5-6 billion US dollars per year (Wade and Keyburn, 2015).

Besides the energy contribution through VFA, gastrointestinal microbes and their activity can positively contribute to nutrient availability for the animal by the production of nutrients such as vitamin K, vitamin B and some essential amino acids (Savage, 1986). Short-chain fatty acids produced by microbial activity also have a positive effect on reabsorption of water from the large intestine, maintaining the fluid balance of the host body (Ruppin et al., 1980).

Although less studied in chickens, there is increasing evidence that when microbial fermentation is improved in the large intestine, mineral absorption and bone mineralisation are improved (Perez – Conesa et al., 2007; Scholz-Ahrens et al. 2007; Bosscher, et.al 2006 and Franck, A. 2005). Interestingly, as indicated by Williams et al. 2001, 70% of the energy needed by the intestinal epithelium is provided by volatile fatty acids produced by the gut microbiota, such as butyric acid. The intestinal tract is one of the most energy-demanding organs in the body, and this contribution can be significant in overall energy metabolism.

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production and optimum gut health. There is abundant literature on gut health feed additives which have a direct effect on gut microbiota and gut function. One such very well studied and proven gut health additive is the phytogenic based feed additive.

An ideal phytogenic gut health additive must:

1) Have a great mixability:
2) One of the most important practical aspects that leads to inconsistent results is reach of active ingredients to the specific site of activity. At dosages that are at about 100-200 g /MT of complete feed, flowability and mixability become even more important. It is always advisable to look at different indices which are industry standards such as Carr Index, Hausner ratio and angle of repose.
3) Have a great pelleting stability:
4) Even if the product is well mixed in mash diet, it is very important that it sustains the harsh pelleting process. Thermostability in pelleting is entering into next generation. Previously, pelleting stability was all about sustaining high temperatures. Now, sustaining longer conditioning times is a need for the future. Many integrators across the world are applying feed hygiene protocols which include longer exposure to steam under pressure to reduce salmonella threats. But this has become a challenge for earlier-generation coating technologies.
5) Reach specific site in the gastro-intestinal tract for maximum efficacy:
6) To reduce pathogen pressure and exert antimicrobial, antioxidant and anti-inflammatory effects, it is of paramount importance that the active ingredients of phytogenic gut health additive reach the desired site in the gastrointestinal tract.
7) With advanced formulation technologies available, it is possible to ensure that.
8) Have the right combination of phytomolecules to exert desired effects:
9) This is the most valuable part of phytogenic feed additive development. One must scan hundreds if not thousands of available phytomolecules to create a unique combination that delivers the desired effects. Recently, anti-microbial effects of the phytomolecules have become much appreciated in scientific literature. The challenge that was raised concerned their effect on beneficial microbes. With selecting phytomolecule combinations for this differential antimicrobial effect more effective against pathogens and sparing beneficial microbes is possible. One such product was very well developed by EWN Innovations called "Ventar D".
10) Work consistently in various production conditions:
11) An ideal phytogenic gut health additive must exert performance improvement effects in various conditions such as different breeds, different climates, different diet formulations, more challenging and stressful conditions but also in optimal conditions, to make itself an economically viable solution to reduce dependency on antibiotics. Figure 1, summarises effectiveness of innovative phytogenic feed additive under various performance conditions around the world.

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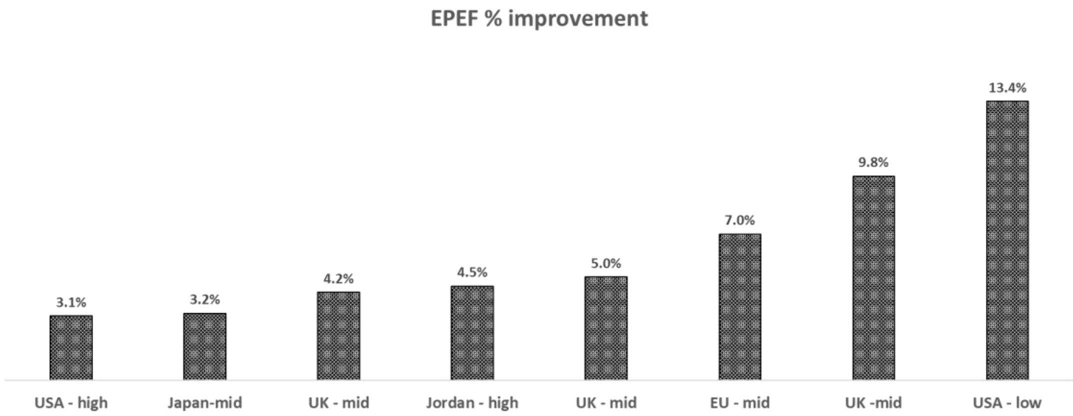
Figure 1: Improvement in European Production Efficiency Factor (EPEF) with inclusion of Phytogenic Feed Additive in various conditions.



EPEF level: high > 400; mid 300- 400; low <300

Reducing dependency on antimicrobials is quite possible in era of responsible production. Well-researched, innovative phytogenic feed additives can lead the way naturally!

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