Finding alternatives to antibiotics

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Since the 1940's antibiotic growth promoters (AGPs) are an integral part of livestock production. Although the precise mechanisms of growth promotion triggered by antimicrobial agents still remain unclear, their use as a supplement in feed has been a defining characteristic of modern livestock farming. Growing concerns about antibiotic resistant bacteria and their transfer from animals to humans has led to the ban of AGPs and the subsequent quest for alternatives.

The industrialisation of livestock farming first saw the introduction of antibiotics in animal feed for poultry in the 1940's. Reports of up to 20% growth improvement continued to fuel the use of antibiotics as a growth promoting agent over the next 2 decades.

The AGP controversy

Nevertheless, the rise to prominence of AGPs in the animal industry came with its own share of criticism and controversy. The use of feed antibiotics became increasingly contentious, especially following the release of the Swann committee report in United Kingdom in 1969. The committee was set up following reports of transferable oxy tetracycline resistance from food animals to humans. The intensive use of antibiotics in animal husbandry, suggested the Swann report, had led to a surge in the rates of antibiotic-resistant bacteria. It called for restrictions to be put in place to minimise the risk of resistance.

Tightening restrictions and continuing challenges

The growing awareness surrounding the risks of feed antibiotics, lead to the introduction of a range of new measures by the EU to ensure food safety. In 2006, Europe enacted a total ban on the use of AGPs in animal feed, and restricted the use of antibiotics in animals to health reasons with a veterinary prescription. Further restrictions on the use of antibiotics in farm animals are in the pipeline, following a vote by MEPs on new rules for veterinary medicines. This could be especially problematic for the poultry sector.

The drop in antibiotic sales volumes that followed the ban of AGPs in Europe, was matched by a reduction in actual exposure to antibiotics, which was measured by calculating the Animal Level of Exposure to Antimicrobials (ALEA) index. The ALEA index is obtained by examining factors such as the Population Correction Unit (PCU) to control for animal

demographics, the administered dose of antibiotics and the duration of treatment, to control for the fact that antibiotics today are far more efficient, thereby requiring a lower dose and shorter treatment time. Calculating the ALEA index illustrates an overall reduction in animal exposure to antimicrobials in Europe.

However, despite these improvements, the challenges associated with drug-resistant bacteria resulting from the use of antibiotics in animals persists, and continues to grow. Therefore, the AGP ban by itself is not a sustainable, long-term solution, and it needs to be accompanied by additional nutritional strategies and interventions, appropriate monitoring and disease control measures.

Alternative phytonutrient strategies

Nutritional strategies have the potential to overcome and alleviate the challenges posed by AGPs, and substitute feed antibiotics employed to improve animal growth rates. Studies evaluating various additives showed that a selected blend of phytonutrients consisting of carvacrol, found naturally in oregano and thyme; cinnamaldehyde, derived from cinnamon; and capsicum oleoresin, the active ingredient in chili peppers (CCC) has the potential to be an alternative solution. This carefully selected combination of phytomolecules was developed following the ban on AGPs in the European Union, and in September 2015 it was approved as the first 100% botanical zootechnical additive to increase growth in broilers in the EU.

Field results

Data gathered for over 20 years from field trials, have shown that the inclusion of CCC in poultry diets enables chickens to achieve similar levels of growth and performance compared to diets supplemented with antibiotics. Numerous trials were carried out to directly compare the effects of CCC to the antibiotics most often used in feed as growth promoters, avilamycin, bacitracin, flavophospholipol, or enramycin. These trials were performed in various parts of the world.
Trials conducted by Virginia Diversified Research, USA, in 900 broilers receiving either 50 ppm of zinc bacitracin or CCC, first given at a dose of 125 ppm in starter feed, followed by 100 ppm in the growing and finishing phases, showed that the phytonutrient containing diet significantly improved the final body weight, feed conversion ratio, and the overall survival rate (*see Figure 1*).

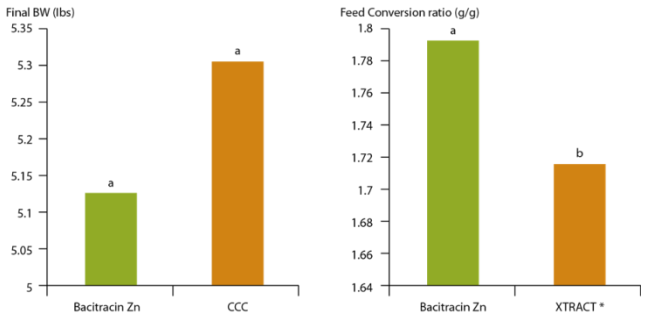

Figure 1- Effects of phytochemicals (100 ppm) compared to Bacitracin Zn (50 ppm) on performance at day 42 of 900 Cobb broilers.

Trials carried out in Korea, comparing the effects of including 5 ppm avilamycin (AV) in poultry feed to a diet supplemented only with CCC, in 2520 broilers showed that the poultry diet supplemented with the botanical blend elicited an enhanced feed conversion ratio, and lower mortality rates at the time of slaughter. As a result, the final performance index also improved (*see Figure 2*).

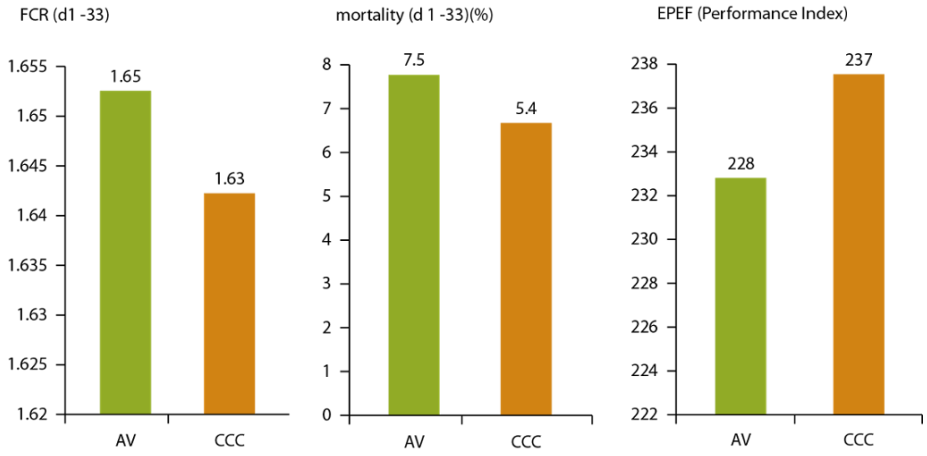

Figure 2 - Effects of 100 ppm CCC compared to 5 ppm avilamycin (AV) on performance at day 33 in Ross broilers.

Furthermore, in trials conducted at the Nagpur Veterinary College at the Maharashtra Animal University in India, the use of 100 ppm enramycin compared to supplementation with 75 ppm CCC or a negative control (non-supplemented feed) in 225 broilers, showed that CCC led to a higher final weight and carcass yield, and a similar rate of feed conversion ratio compared to enramycin, at the time of slaughter.

Meta-analysis of trial results

In order to have a comprehensive overview of the effects of CCC, a meta-analysis taking into account 38 broiler trials carried out between 2004 and 2008, comparing negative controls or AGP-supplemented poultry feed (mainly bacitracin or avilamycin), with CCC, was released at the Poultry Science Association's annual meeting in 2009. The meta-analysis showed that CCC-supplemented feed had comparable effects with AGP treatment in improving feed intake, average daily gain, and feed conversion ratio (*see Table 1*).

Table 1 - Summary of meta-analysis of 38 broilers trials comparing CCC, to negative and AGP treatments.

	Negative control	AGP treatment	XTRACT® 6930	P-value
Feed intake (g/d)	81.99	84.04	84.09	0.40
Average daily gain (g/d)	48.9b	50.4a	51.3a	0.001
FCR (g/g)	1.73a	1.71ab	1.68b	0.01

Toxicology studies conducted to satisfy EU requirements for evaluating CCC as a zootechnical additive, showed that CCC, even when used at 10 times its recommended dose at 1 kg per tonne of feed, had no negative impact on broiler health, and left no chemical residues in breast, liver or fat tissues. Beyond the effects of CCC on animal growth and safety parameters, the blend of phytonutrients also showed significantly improved return on investment, with lower feeding costs per bird, and a comparable net income per bird.

Looking to the future

Although AGPs are still considered to be the most efficient solution to minimise production costs in poultry farming, their detrimental effects on the development of antibiotic-resistant strains of bacteria have tremendous implications for human health, and are particularly worrisome. The European experience has shown that a simple ban on AGPs is not enough to solve these challenges. In light of the total AGP ban in Europe, the potential of phytonutrients to provide an alternative solution to AGPs in promoting growth and improving feed conversion ratios, while remaining a viable economical alternative, are promising.

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