IN AIMS OF FOOD SAFETY

BY KIRSTY KEMMETT

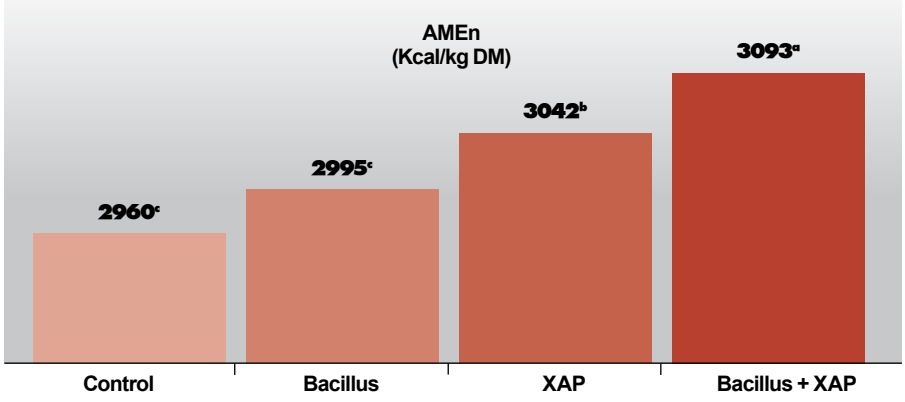
Sub-therapeutic use of antibiotic growth promoters (AGPs) has been practiced in the poultry industry since 1946 when Moore et al showed that their application resulted in weight gain in chickens. While their use has had a part to play in the 66% increase in broiler weight from 1960- 20101, research has shown that the regular low levels of antibiotics used in animal production has – as Fleming predicted in his Nobel prize winning speech in 1945 – allowed resistant microbes to survive and evolve. Even as early as the 1950s, researchers2 were reporting resistance in birds to antibiotics regularly used to treat humans. Further evidence of drug-resistant bacteria3 drug residues in the body of the birds4, an imbalance of normal micro flora5 and the transfer of antibiotic resistance genes from animal to human microbiota6 culminated in a total ban in AGP use in Sweden in 19867. This ban spread across the EU in 2006 and Korea followed in 2011.

REDUCED USE OF ANTIBIOTICS. Today, there is mounting evidence to suggest that antibiotic resistance can pass into the food chain through bacteria like Salmonella spp and Campylobacter spp, which are the most common causes of bacterial diarrhea in humans worldwide. Because of food safety concerns, four major US states have signed up for an infeed antibiotic bans in the last year. For countries such as the US, where it is estimated that over 80% of all the antibiotics sold a year (around 13,000 t in 2009) are used in livestock production and China, which feeds more than half of the 200,000 t of antibiotics produced to livestock, it has never been more important to look for other ways to improve performance and animal liveability.

HOW PROBIOTICS WORK. As early as 1974, Parker had established that probiotics contributed to intestinal microbial balance but it wasn't until 1989 that Fuller acknowledged that this contribution was beneficial to the host animal. Lee et al (2010) identified that the spore forming Bacillus spp made the gut environment less conducive to colonization by pathogenic bacteria, competing with them for mucosal attachment and nutrients and improving nutrient uptake through villi development. Bacillus spp have also been shown to lower the pH through acid fermentation, creating a positive environment for beneficial bacteria such as Lactobacilli which have been shown to reduce amounts of pathogenic bacteria such as Salmonella, E. coli, Campylobacter and Clostridium16. Unlike some other probiotics, Bacillus strains can also resist heat and high pressure17, helping them survive the hostile steam conditioning and pelleting process routinely used in the feed industry. There is also strong evidence to suggest that multi-strain Bacillus are more effective than single strain equivalents. FCR improvements of 4.4% average have been shown across multiple trials conducted with multi-strain Bacillus in the first few weeks post hatch. The application of a three strain Bacillus product reduces the negative impact necrotic enteritis challenge on performance from hatch to 28 days. An additional advantage of some Bacillus strains is their compatibility with other feed additives such as antibiotics18 and enzymes *(Figure)*.

SOLUTION HAS TO BE COST-EFFECTIVE. In trials with non-challenged broilers fed a corn/soy diet containing some fibrous cereal by-products, Romero et al (2013) observed significant incremental increases in nitrogen corrected apparent metabolisable energy (AMEn) with additions of a three strain Bacillus probiotic and xylanase, amylase and protease enzymes. The results from two further trials at Southern Poultry Research, Georgia, USA, (2013) showed that these benefits also extended to a specific necrotic enteritis (NE) challenge model, giving net benefits of 14% in relative cost per kg live weight gain versus the challenged control at current feed prices. Solutions to reduce AGP use in commercial operations need to be cost-effective and reliable. Trials have shown that adding phytase to a xylanase, amylase, and protease and Bacillus combination resulted in 2.5% higher gross profit in a cost comparison with an antibiotic growth promoter20. But it's the cost to human health and food safety that will prompt worldwide reductions in AGP use. ■

FIGURE - INCREASES IN APPARENT METABOLISABLE ENERGY RESULTING FROM THE COMBINATION OF A THREE STRAIN BACILLUS PROBIOTIC AND XYLANASE, AMYLASE AND PROTEASE ENZYMES. (ROMERO ET AL, 2013)



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