Editorial

Challenges: Sustainable Production for an Antibiotic-Free System

As the global population increases, a substantially higher demand for food is expected. The poultry industry, being among the fastest growing markets in terms of production, has the potential to become the principal food source for animal protein.

However, the industry will face challenges regarding how to sustain productivity and performance with the pressure of reducing antibiotic dependency. We all know that foods from animal origin are considered vehicles of food-borne diseases in humans. Antibiotics and AGPs were used to treat and prevent a disease, for growth promotion and to improve performance. Concerns over these practices have mounted. Antibiotic residues in meat. Potential threats to humans. Low level antibiotic resulting in microflora alteration or even causing disease. The possible emergence of resistant strains of bacteria (superbugs) undermining the efficacy of antibiotic therapies in human medicine.

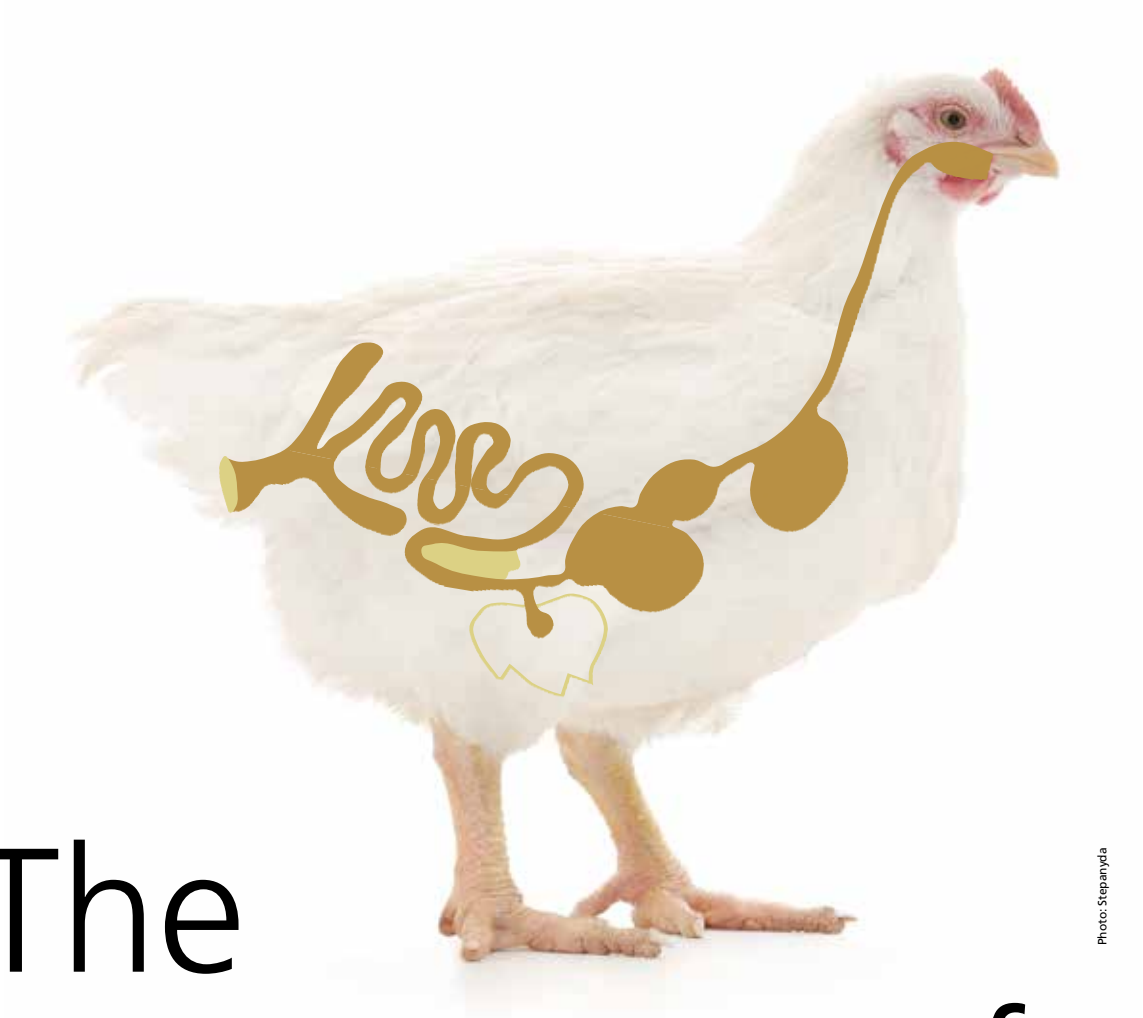
With the increasing consumer demand for antibiotic-free meat, timely natural approaches can be considered to replace antibiotics/AGP in the production. BIOMIN offers a range of innovative, natural feed additives, including synbiotic and phytogenic feed additives, that are proven to control enteric pathogens, support performance and maintain gut health.

We hope that you find this issue of **Science&Solutions** informative to your thinking about strategies on how to produce meat in an antibiotic-free system, and how to overcome challenges and problems you face in the field.

Finally, this issue brings the sixth part of our series on differential diagnosis covering feathering.

Happy reading!

Randy PAYAWAL
Technical Manager, Poultry



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The Importance of Gut Health in Antibiotic-Free Production

By **Chasity Pender**, Poultry Technical Manager

Poultry producers face many challenges as they increase the number of flocks managed without antibiotics. Sound management practices and natural feed additives that support gut health will help producers manage the transition and protect flocks.

As consumer and regulatory opinions have evolved over the last several years, poultry producers are increasing the number of flocks raised without antibiotics. While dozens of countries have already banned the use of antibiotic growth promoters, many places where their use is not banned have seen a surge in demand for antibiotic-free products. The primary challenge that producers face in implementing antibiotic-free programs is to maintain intestinal health in order to prevent necrotic enteritis, one of the world's most common and financially crippling poultry diseases with mortality rates of up to 50%, without the use of in-feed medications.

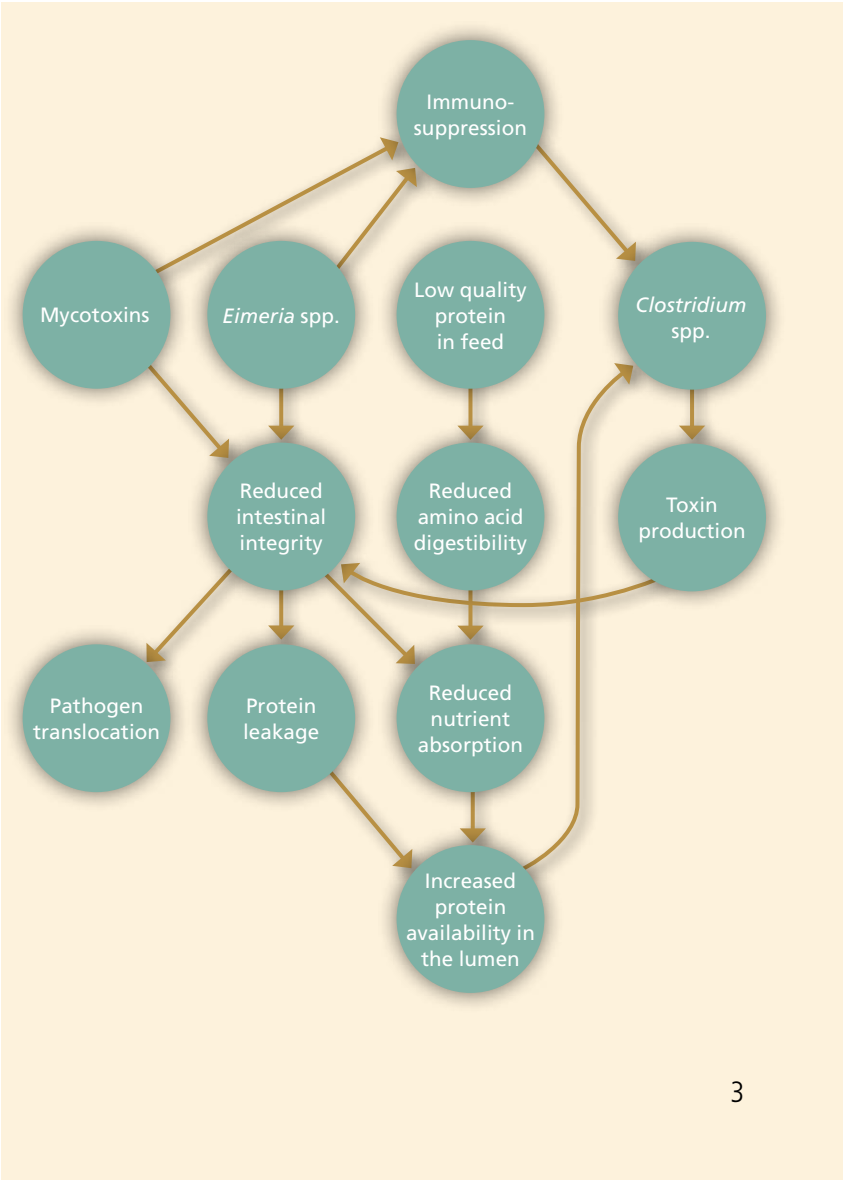
Less tools in the toolbox

Standard antibiotic-free (ABF) programs prohibit the use of several antibacterial agents, including antibiotic growth promoters, therapeutic antibiotics, and ionophores. **Antibiotic growth promoters**, or AGPs, are fed continuously at low (sub-therapeutic) levels to improve performance and flock uniformity, reduce bacterial infections and sub-clinical challenges, and improve flock health. **Therapeutic antibiotics** are used to treat bacterial diseases by impeding bacterial growth, provided they are used at recommended levels and the microorganism is not resistant. Treatment of clinical outbreaks shortens the duration of disease and reduces the spread of bacteria, resulting in reduced mortality. Lastly, **ionophores** are a class of antibiotics used solely for the purpose of preventing coccidiosis: a well-known predisposing factor for necrotic enteritis.

Making the shift

Eliminating these tools in ABF programs brings legitimate concerns for producers regarding performance, flock uniformity, and disease incidence –particularly necrotic enteritis and other bacterial pathogens. Furthermore, since flocks treated with an antibiotic must be removed from the program, hesitance to treat birds and compromise their antibiotic-free status could lead to health and welfare issues and increased mortality due to disease. Several factors can have a considerable impact on the proliferation of *Clostridium perfringens* and the successful shift to antibiotic-free production, including management practices, nutritional factors, coccidiosis, and mycotoxin contamination (*Figure 1*).

Figure 1. Factors influencing the development of necrotic enteritis.



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Management practices

The biggest aspect to consider is the environmental bacterial load. A number of factors are known to increase the risk of bacterial challenges, including attenuated breeder health, improper hatchery and egg sanitation, reduced house down-time, increased stocking density, poor litter management, and contamination through service personnel, visitors, and vehicle traffic.

Nutritional factors

Diet constitutes a key risk factor having a strong impact on the incidence of necrotic enteritis in broiler chickens. Indigestible dietary protein, such as that found in animal proteins like meat and bone meal or fish meal, cannot be digested and absorbed in the upper part of the intestinal tract.

Instead, protein builds up in the lower portion of the intestinal tract which can then act as a substrate for the gut microbiota. The fermentation of protein produces unfavorable by-products such as amines and ammonia, increasing intestinal pH and encouraging the proliferation of pathogenic bacteria.

Coccidiosis control

Coccidial infection, resulting either from natural disease outbreak or from introduction at low levels through live coccidiosis vaccination, can damage the intestinal epithelium, allowing the leakage of plasma proteins into the intestinal lumen –a rich nutrient substrate that *C. perfringens* can exploit for proliferation and toxin production. This can reduce performance and predispose birds to necrotic enteritis.

By removing ionophores, coccidiosis management must rely on non-antibiotic coccidiostats, or live coccidiosis vaccines, or more likely, a rotation between the two. Unfortunately, many coccidiostats can build coccidial resistance and, unlike ionophores, coccidiostats do not have antibiotic properties.

Clostridium perfringens

Mycotoxin contamination

Mycotoxins—toxic fungal metabolites produced by common molds found in many components of poultry diets—can directly reduce gut integrity, thus leading to decreased absorption and digestion of dietary nutrients and increased intestinal barrier permeability. Reduced nutrient uptake and leakage of plasma proteins into the lumen due to this breach results in increased protein concentration in the intestinal lumen, providing a substrate for *C. perfringens* proliferation. Mycotoxins also adversely affect immunity and have a strong correlation with enteric infections.

Gut health management solutions

Sound management practices will help limit exposing birds to conditions where *C. perfringens* can easily gain a foothold (*Table 1*). Breeder health and proper hatchery and egg sanitation needs to be monitored and sustained to prevent bacterial contamination in the hatchery. Increased down-time allows bacterial populations to diminish between flocks and prevent carryover of bacteria from flock to flock. Proper litter management and reduced stocking density will also help alleviate the risk of bacterial challenges and decrease shedding of coccidial oocysts by reducing litter moisture. Furthermore, establishing and maintaining effective biosecurity measures regarding personnel sanitation, visitors, and vehicle traffic are essential in preventing contamination from outside sources.

The immediate post-hatch period is a critical time for the development of a chick's intestinal tract. The changes

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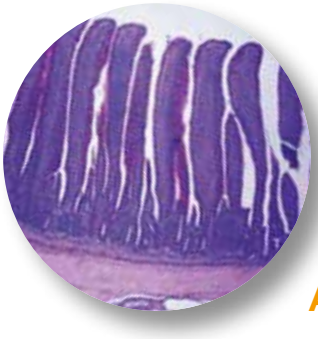

Achieving good gut health will help producers manage the transition to ABF production and protect flocks

Table 1. Gut health checklist.

	Factor	Corrective action
Management	Hatchery contamination	Maintain breeder health and proper hatchery and egg sanitation
	Reduced house down-time	Increase down-time between flocks
	Increased stocking density	Reduce stocking density and establish an adequate litter management strategy
	Poor litter management	
	Contamination from outside sources	Implement effective biosecurity plan regarding personnel sanitation, farm access, and traffic control
Development	Insufficient microbial gut colonization	Apply PoultryStar® at correct dosage level starting in the hatchery
Nutrition	Indigestible (animal) protein	Switch to an all-vegetable diet
		Apply Digestarom® at correct dosage level
		Supplement with exogenous proteolytic enzymes
Pathogens	Coccidiosis	Rotation of non-antibiotic coccidiostats and live coccidiosis vaccines Apply PoultryStar® and/or Digestarom® at correct dosage level
Mycotoxins	Mycotoxin contamination of feed	Monitor feed and apply Mycofix® at correct dosage level

occurring during this period depend entirely upon appropriate microbial colonization. Application of probiotics in the hatchery provides an ideal opportunity for beneficial bacteria to colonize the digestive tract before chicks are exposed to potentially pathogenic bacteria and fungi in the broiler house, aiding the development of the digestive tract and helping to protect against enteric infections. One solution to reduce bacterial growth and activity is to limit their access to protein, a key nutrient source. Many producers switch to an all-vegetable diet, for example. Increasing digestibility of nutrients so they are absorbed and utilized by the bird instead of the microbiota is another option. Some phytogenic feed additives are capable of increasing endogenous digestive enzyme activity so the bird is better able to break down and absorb protein and other nutrients making them unavailable to the microbiota. Supplementation of exogenous proteolytic enzymes is another method that can help break down excess protein.

Probiotics and phytogenic feed additives, with or without the use of coccidiostats or vaccines, can help alleviate the negative effects of coccidial infection. They have been shown to reduce oocyst shedding, severity of intestinal lesions, and adverse effects on performance, demonstrating their status as a promising 'anticoccidial.'

Mycotoxin contamination also poses a serious threat to livestock and poultry production globally. Given the numerous harmful effects of mycotoxins, a proper mycotoxin management program is essential to protect intestinal integrity.

Conclusion

The main challenges producers face as they transition to ABF systems hinge upon intestinal health and prevention of coccidiosis and necrotic enteritis. Switching to an ABF program requires a paradigm shift: there is no single solution that can act as a substitute for antibiotics. Numerous adjustments are necessary to succeed and a solid gut health program needs to be an essential component.