Tackling antimicrobial resistance today

Safeguarding Future Animal Health

Insights from global experts inspire sustainable AMR solutions at the 2025 Ecolex Innovative Nutrition Forum

by Edward Manchester, Global Commercial Director, Ecolex Animal Nutrition, Singapore

The global appetite for animal protein continues to grow, driven by population growth, rising incomes, and shifting dietary preferences. While animal agriculture plays a vital role in feeding billions, this growth, however, comes with complex challenges, with antimicrobial resistance (AMR) emerging as a critical concern shaping consumer expectations and regulatory policies.

Understanding the complexity of AMR

In animal agriculture, antibiotics have historically been used not only to treat infections but also for disease prevention and growth promotion. While these practices have helped boost productivity, they have also been linked to the emergence and spread of antibiotic-resistant bacteria. These resistant strains can transfer to humans through direct contact, consumption of animal products, or environmental pathways, posing significant public health risks.

It is critical to recognise that animal agriculture is only one part of the complex global AMR challenge. Human medical use, inadequate sanitation, and environmental factors all play significant roles.

This interconnectedness highlights the urgent need for a unified, comprehensive One Health strategy to effectively address AMR, to protect public health, and ensure sustainable food production.

Why anti-inflammation matters

Since the 1950s, antibiotic growth promoters (AGPs) have been a fundamental tool in animal agriculture, valued primarily for their ability to control pathogenic bacteria and enhance growth performance. Traditionally, their benefits were attributed to their antimicrobial properties. However, research is now challenging this long-held view, suggesting that the growth-promoting effects of AGPs may be largely attributable to their anti-inflammatory properties rather than direct antimicrobial action.

Further evidence that AGPs 'masked' inflammation has been shown by the increased incidence of *Clostridium perfringens*-mediated necrotic worldwide since the removal of AGPs from poultry diets. *Clostridium perfringens* is a normal commensal of the chicken intestine even in diets provided in-feed AGPs.

Chronic low-grade inflammation in the gut can impair nutrient absorption, divert energy from growth to immune responses, and compromise the integrity of gut barrier. By reducing this inflammation, AGPs help preserve intestinal health and function, enabling animals to allocate more energy toward growth and production rather than immune defense.

For example, commonly used AGPs such as virginiamycin, chlortetracycline (CTC), and Bacitracin Methylene Disalicylate (BMD) demonstrate strong anti-inflammatory effects despite having relatively modest antimicrobial activity. Conversely, penicillin - a potent antibiotic effective against certain gram-positive bacteria through inhibition of bacterial cell wall synthesis - is not employed as an AGP and exhibits limited anti-inflammatory properties.

These findings have significant implications for the future of sustainable animal agriculture. By focusing on gut inflammation control rather than antimicrobial activity, we can maintain animal health and productivity while reducing reliance on antibiotics, thereby contributing to the global fight against AMR.

Innovating livestock nutrition

Leveraging this new knowledge can guide innovation in feed additives, nutrition, and management practices to support gut health and optimise growth naturally. As an example, 'monolaurin', a natural medium-chain fatty acid which has

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strong broad-spectrum antimicrobial properties against bacteria, fungi, and lipid-coated viruses without promoting resistance development. By decreasing pathogen populations, monolaurin helps not only prevent infections, but reduces intestinal inflammation, which also improves nutrient absorption for improved feed efficiency.

Furthermore, plant-derived compounds, or phytogenics or essential oils, such as oregano, garlic, thyme, rosemary, and red pepper oils also show promise as AGP replacements, as they not only have anti-inflammatory properties, but often anti-oxidant and antimicrobial properties as well. These natural additives can positively modify gut microbiota composition, reduce pathogenic bacteria, and enhance growth performance.

Reducing protein fermentation

When dietary proteins are not fully digested in the upper gastrointestinal tract of pigs and poultry and subsequently reach the large intestine, proteolytic bacteria such as *Clostridium*, *Enterococcus*, and *Staphylococcus* ferment these proteins. This microbial fermentation produces various metabolites including ammonia, biogenic amines like putrescine and histamine, indolic and phenolic compounds such as skatole and p-cresol, and hydrogen sulfide. Several of these metabolites are potentially toxic and can increase gut permeability, and trigger inflammation, creating an environment conducive to bacterial infections which often require antibiotics.

To mitigate these negative effects, nutritionists and animal health experts recommend strategies that reduce the amount of undigested protein reaching the hindgut. Approaches include lowering dietary protein levels while ensuring animals receive all essential amino acids through supplemental amino acids and formulating diets based on ideal protein ratios. Additionally, enhancing protein digestibility by supplementing feeds with exogenous protease enzymes can further limit proteolytic fermentation.

Managing mycotoxins

Mycotoxins - harmful compounds produced by certain fungi that commonly contaminate animal feed - have long been known to damage the gut and cause inflammation. However, recent research from Chinese scientists reveals a new impact of these toxins on AMR.

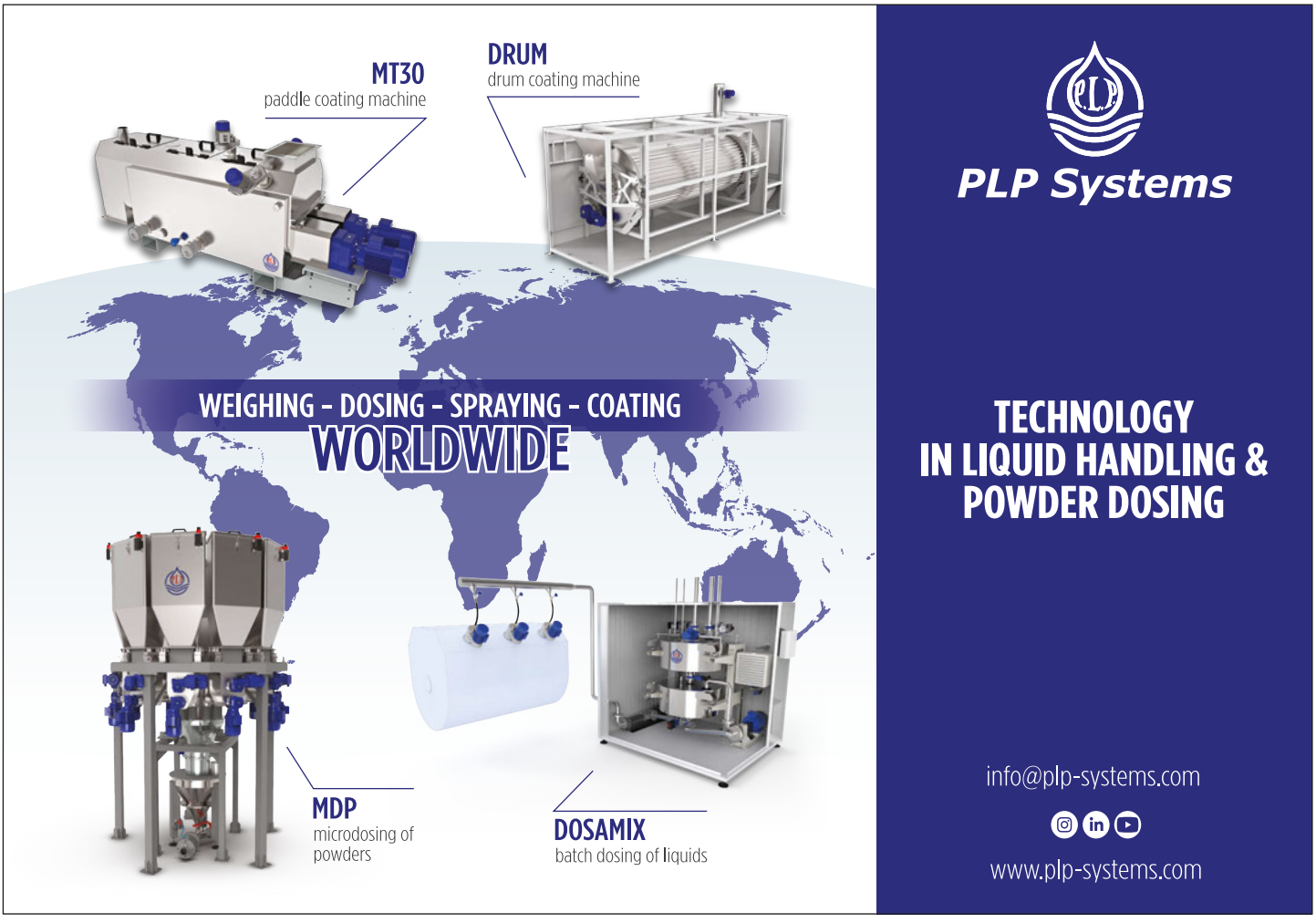
The study found that deoxynivalenol (DON), a prevalent mycotoxin, disrupts the intestinal microbiota of broiler chickens by enriching antibiotic resistance genes within the gut microbial community. Additionally, DON enhances the expression of virulence factors in gram-positive bacteria, increasing their pathogenic potential. Perhaps most concerning, DON appears to promote horizontal gene transfer among bacteria, accelerating the spread of antibiotic-resistant strains.

This finding highlights a critical and previously underappreciated link between mycotoxin contamination and the rise of AMR.

Biosecurity: Protecting animal health

Biosecurity is widely recognised as the foundation of sustainable animal protein production. It involves implementation of comprehensive measures to minimise the risk of introducing and spreading pathogens within and between farms, between humans and animals, and within the environment.

AGPs have often been used not only to enhance growth and feed efficiency in livestock but also to compensate for poor management conditions such as inadequate sanitation and



suboptimal housing. This reliance on AGPs to prevent illness highlights the urgent need to improve biosecurity and farm management practices.

Numerous studies have demonstrated that farms with high biosecurity compliance achieve significantly better outcomes compared to those with lower standards. Enhanced biosecurity protocols not only improve animal health and productivity but also contribute to reducing antibiotic use and combating AMR.

Enhancing vaccine efficacy

Maintaining robust biosecurity minimises pathogen exposure, creating an optimal environment for a strong immune response to vaccination which means the immune system can allocate resources to generating high-quality antibodies in response to vaccination to induce specific immunity, thereby enhancing disease protection.

If the pathogen load in the environment is excessively high (e.g., during disease outbreaks or in settings with poor biosecurity), it can overwhelm the immunity provided by vaccines, particularly in cases where herd or flock immunity has not been fully established or pathogen exposure is extreme.

Responsible antibiotic use

It's important to unequivocally acknowledge our industries fundamental duty of care to ensure that animals experiencing bacterial infections receive prompt, and effective antibiotic treatment. At the same time, you should recognise the critical importance of safeguarding public health by minimising the development and spread of AMR. To this end, I recommend the responsible and judicious use of antibiotics to minimise unnecessary use for growth promotion, or disease prevention, while ensuring animal health, including:

Use antibiotics only when necessary - antibiotics should be prescribed only for confirmed or strongly suspected bacterial infections, avoiding use for viral or non-infectious conditions. Prophylactic (preventive) use should be avoided.

Perform diagnostic testing - whenever possible, use diagnostic tools such as bacterial culture and antimicrobial susceptibility testing to identify the causative agent and select the most appropriate antibiotic. This helps avoid broad-spectrum or inappropriate antibiotic use.

Select appropriate antibiotics - choose narrow-spectrum antibiotics targeted to the identified pathogen. Avoid critically important antimicrobials for human medicine, such as colisitn, tigecycline, vancomycin, and amoxicillin-clavulanic acid, to preserve their efficacy.

Collaboration from farm to fork

The growing threat of AMR, not just in animal agriculture is a pressing global concern that demands a united effort from all stakeholders involved in the food production system. From input manufacturers, suppliers, producers to processors, retailers, consumers, and policy makers, collaboration across the entire value chain is essential to effectively combat AMR and ensure sustainable, nutritious protein supply.

The challenge of AMR is complex and multifaceted, but by collaboration and innovation across the value chain, we can safeguard the effectiveness of antimicrobials for future generations while ensuring a stable supply of nutritious animal protein. We can't afford to wait.

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