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Fatty Acid Glycerides: A New Approach to Gut Health in Poultry

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Poultry farming has changed dramatically over the past few decades. Modern broilers can reach market weight in a remarkably short period, but achieving this level of performance requires excellent nutrition, disease prevention and careful management. For many years, antibiotic growth promoters (AGPs) were an important part of this system. They helped improve growth and feed efficiency and supported birds under intensive production conditions. Because of the extensive and inappropriate use of antimicrobials has contributed to the growing problem of antimicrobial resistance (AMR). This has created a new challenge for the poultry industry: *How can we maintain bird health and production efficiency while reducing our dependence on antibiotics?* The answer is unlikely to be a single replacement product. Instead, the future lies in combining better management, biosecurity, nutrition and innovative feed additives. Among the promising nutritional tools, short-chain fatty acids (SCFAs), medium-chain fatty acids (MCFAs) and their glyceride forms are attracting considerable attention.

The intestine: the centre of poultry health

When we think about poultry production, we usually think about feed, growth and egg or meat production. But behind all of these is one critical organ- **the intestine**. The intestine does much more than digest feed. It absorbs nutrients, provides energy to intestinal cells, houses a complex microbial community and acts as a barrier against harmful microorganisms. A healthy intestine therefore means more than good digestion. It means better nutrient utilization, stronger disease resistance and more consistent production. When the intestinal microbial balance is disturbed, harmful bacteria may increase, inflammation may develop and nutrient utilization can decline. This condition, commonly described as gut dysbiosis, can negatively affect bird performance. This is one reason why modern poultry nutrition is increasingly focused on gut health rather than simply growth promotion.

Why Are Antibiotics Being Reduced?

Antibiotics helped poultry production become more efficient, but their repeated use can promote antimicrobial resistance. This has led to tighter regulations, including the European Union's 2006 ban on antibiotic growth promoters and increasing restrictions in many countries, including India. The aim is not simply to remove antibiotics, but to keep birds healthy with less dependence on them.

What Happens After AGP Withdrawal?

Removing AGPs can sometimes lead to poorer feed efficiency, gut imbalance and greater risk of enteric diseases such as necrotic enteritis. So antibiotic reduction must go hand in hand with good biosecurity, vaccination, clean water, proper litter and ventilation, suitable stocking density and balanced nutrition. Probiotics, prebiotics, enzymes, phytogenics, essential oils and organic acids can support this approach. Among these, SCFAs and MCFAs offer promising benefits for both gut health and production efficiency.

SCFAs and MCFAs: small molecules, big possibilities

SCFAs include **acetate, propionate and butyrate**, while important MCFAs include **caproic, caprylic, capric and lauric acids**. Butyrate is particularly important for intestinal health because it can provide energy to intestinal cells and support the gut barrier. SCFAs can also influence immune and metabolic signalling through receptors such as GPR41, GPR43 and GPR109A. MCFAs have a different advantage. They are absorbed rapidly and can reach the liver through the portal circulation, providing a readily available energy source. They also show antimicrobial activity against important poultry pathogens such as *Salmonella*, *E. coli*, *Campylobacter* and *Clostridium perfringens*.

Scientific studies provide encouraging evidence for the use of SCFAs and MCFAs in poultry

Sodium butyrate at 0.5 g/kg feed was associated with approximately 8% higher weight gain and 5% better FCR in one broiler study.

Butyric acid glyceride at 3 g/kg feed reduced cecal *Salmonella* counts by approximately 2 log₁₀ CFU/g in a challenge study.

Protected sodium butyrate at 1 g/kg increased villus height and reduced crypt depth in young broilers.

A propionic acid treatment was associated with approximately 4% improvement in FCR in one study.

Combinations of SCFAs have also shown beneficial effects under heat stress and pathogen-challenge conditions.

But there is a problem

Free form of SCFAs and MCFAs can be absorbed quickly in the upper digestive tract, meaning that only a limited amount may reach the lower intestine. Their antimicrobial activity also changes with intestinal pH and some have strong odours, unpleasant tastes, which can create palatability and feed-manufacturing problems. So, adding more is not necessarily the solution.

“How can we deliver the active compound to the right place at the right time?”

One promising answer is **esterification of Fatty Acids**. In this process, a fatty acid is linked with glycerol to produce a glyceride. Depending on the structure, the result can be a monoglyceride, diglyceride or triglyceride. **Tributylin**, for example, is a triglyceride containing three butyrate molecules. This change can improve handling, stability and release characteristics. Glyceride forms can also reduce the strong odour associated with some free acids and provide useful antimicrobial activity.

A new way of thinking about gut health

The poultry industry is gradually moving away from the idea that gut health depends on one antimicrobial product. Instead, the focus is shifting towards creating a **healthy intestinal environment**. SCFAs can support intestinal cells and barrier function, while MCFAs can contribute to antimicrobial defence and rapid energy utilization. Glyceride and protected forms may help overcome some of the limitations associated with direct supplementation. **Healthy chicks + balanced nutrition + clean water + vaccination + biosecurity + proper housing + effective gut-health nutrition** form the foundation of successful antibiotic-reduced production.

Looking ahead

The future of poultry nutrition is likely to be more precise. The important questions will not simply be *which compound to use*, but also **how much to use, in what form, and where it should act**. Combination products are therefore opening new possibilities for targeted gut-health management. The goal is simple: **keep the gut healthy, improve nutrient use and reduce the need for routine antibiotics**.

Conclusion

The poultry industry is entering a new era of gut-health management. The future of antibiotic-reduced production will depend on more than simply removing antibiotics from feed. It will require better management, stronger biosecurity, balanced nutrition and scientifically designed alternatives. SCFAs and MCFAs are promising because they can contribute to antimicrobial defence, intestinal integrity, microbial balance and nutrient utilization. However, free fatty acids have important limitations. Glycerides, esterified forms, encapsulation and targeted delivery technologies may help overcome some of these challenges.

“The real opportunity is not to find another antibiotic. It is to develop nutritional strategies that help the bird’s own intestinal system work better.”