

Science & Solutions



The Future of Farming

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**Next Generation
Feed Conversion**



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**Antibiotics
Reduction in
Modern Broilers**

Editorial

The Future of Intensive Animal Farming

These days, all production animals have been developed and selected to such an extent that their natural and normal physiology is challenged by their genetic potential. Their metabolism faces feed efficiency limitations and metabolic disorders can quickly become clinical issues. So, top quality feed additives are essential to help them improve their digestibility, and by improving feed efficiency, you can cover the additional needs to meet a higher metabolic demand.

These requisites are predisposing factors for digestibility disorders and gut integrity loss—and the later faces in a much higher risk of failure these days than in the past. This is where animal science and research require a more accurate and deeper understanding of the animal's physiology.

Phytogenics have been used in livestock for decades. Their application now benefits from sophisticated science that proves how a combination of scientifically selected and carefully formulated plant-based substances can support enhanced digestibility, improved feed intake, optimized feed conversion and more. In this issue of **Science & Solutions**, we look at the latest breakthrough in phytogenics from BIOMIN, the next generation Digestarom® DC.

Antibiotics were used therapeutically for several decades, but their misuse and the consequent resistances have made them lose some of their effectiveness—which poses a major threat to animal production therapy. In this issue of **Science & Solutions**, we also examine antibiotics reduction in modern broilers.

New tools like phytogenics, probiotics and acids should be used to enhance gut health and gut integrity. Antibiotics, on the other hand, should be used only for specific, efficient therapy. Good gut health is the best growth promoter.



Fernando Lima, DVM
Poultry Technical Manager



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Achieving Next Generation Feed Conversion

By **István Csutorás**, Product Manager PhytoGenics

A cutting-edge, proprietary encapsulation technology along with an advanced formulation makes Digestarom® DC a clear solution to optimize feed conversion and improve performance.

The key to addressing many of the current challenges facing the poultry industry is better feed efficiency. Feed conversion improvement is tied to a host of modern production issues, including profitability, improving the limited digestibility of alternative feed ingredients, reducing antibiotics, counteracting stressors, and overcoming environmental challenges. In further confirming its pivotal role, 1140 industry

respondents in 100 countries indicated that enhanced feed efficiency or a better feed conversion ratio (FCR) was the most important potential benefit of phytoGenics to their operation, as captured by the BIOMIN 2017 PhytoGenic Feed Additives Survey.

The next generation

At BIOMIN, improving feed efficiency has been the main thrust of our research and product development



Photo: iStockphoto.com, Renata Viani

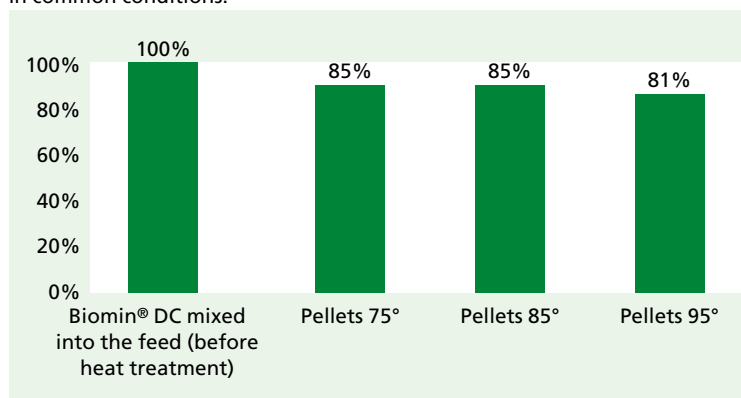
around phytonics in recent years. We have built upon the Digestarom® product line, which dates back to 1989, and recently introduced Digestarom® DC which is the next generation phytonic feed additive designed to deliver improved feed intake, better performance and optimized feed conversion.

What's new?

Digestarom® DC represents decades of achievement in research and development. BIOMIN has developed a special encapsulation technology for essential oils and phytonic active compounds: the Biomin® Duplex Capsule. As the first of its kind in the phytonics market, the Biomin® Duplex Capsule combines two encapsulation techniques: matrix and core-shell encapsulation. It offers four key advantages:

- 1 better thermostability,
 - 2 continuous delivery of active substances,
 - 3 targeted, controlled release and
 - 4 better handling.
- Customers already familiar with our species-specific Digestarom® solutions and the multi-species Digestarom® P.E.P. line will find that Digestarom® DC offers the best of both.

Figure 1. Biomin® Duplex Capsule demonstrates pelleting stability in common conditions.



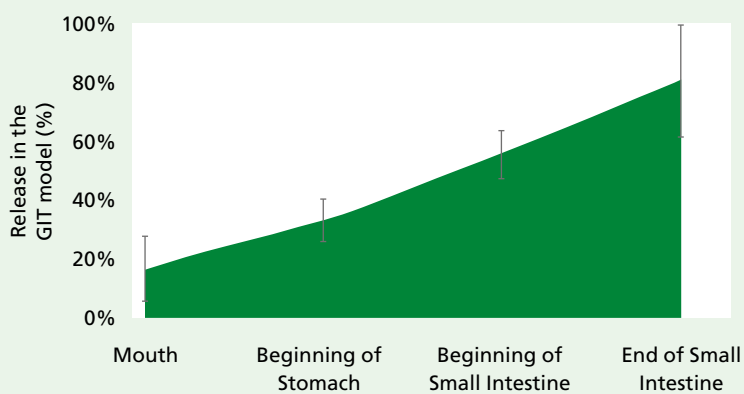
Source: BIOMIN

1 Better thermostability

Essential oils and their active compounds in particular are highly volatile and heat sensitive—less than ideal characteristics in the context of modern feed production and pelleting. The Biomin® Duplex Capsule structure gives Digestarom® DC enhanced pelleting stability over

BioMin® Duplex Capsule combines two encapsulation techniques: ① better thermostability, ② continuous delivery of active substan

Figure 2. *In vitro* simulated release of essential oil actives of Digestarom® DC.



Source: BIOMIN

90°C, as shown by the amount of product recovered after conditioning in a cascade mixer with steam addition followed by pelleting for another 20-30 seconds (Figure 1).

② Continuous delivery

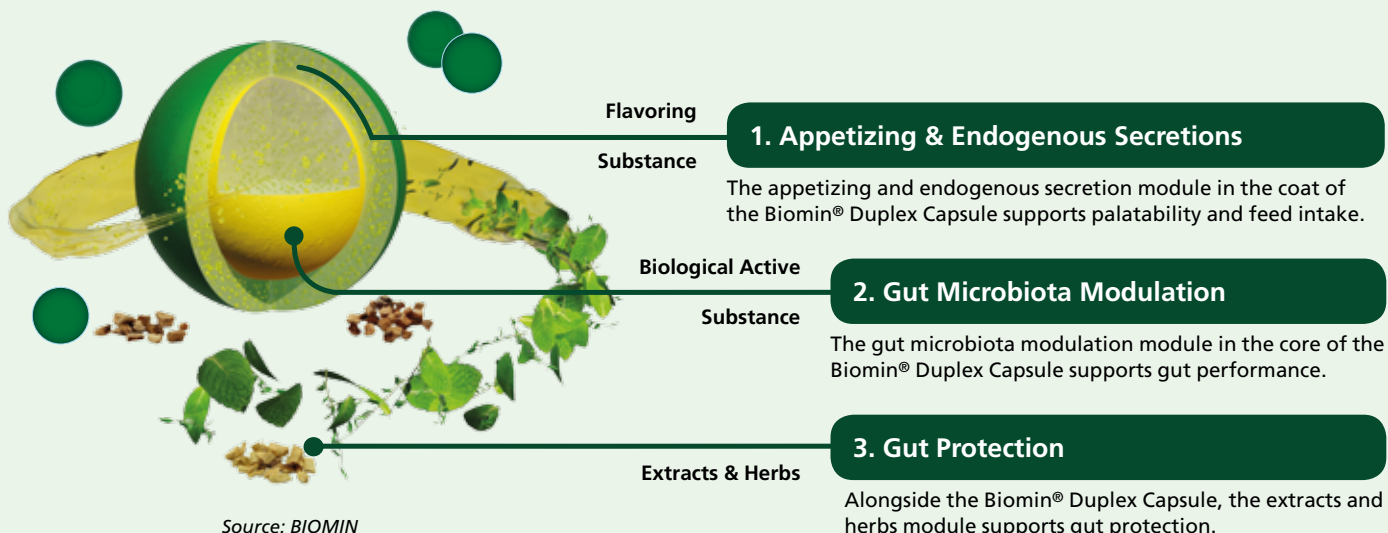
The new technology results in double capsules with a uniform and narrow size distribution ranging from 120 to 500 µm, allowing for more homogeneous distribution of active compounds in Digestarom® DC and in the feed—resulting in continuous delivery of active substances in the animals.

③ Targeted, controlled release

With core-shell encapsulation, a protective coat surrounds a core comprising essential oils and active compounds. In Digestarom® DC, the coat and the core contain different essential oils for appetizing and gut modulation modules.

Both layers are matrix encapsulated—meaning that the active compounds are finely dispersed in a solidified matrix—providing a targeted, controlled release along the gastrointestinal tract. The particles in Digestarom® DC have a very high essential oil content compared to other commercially available products. Figure 2 illustrates

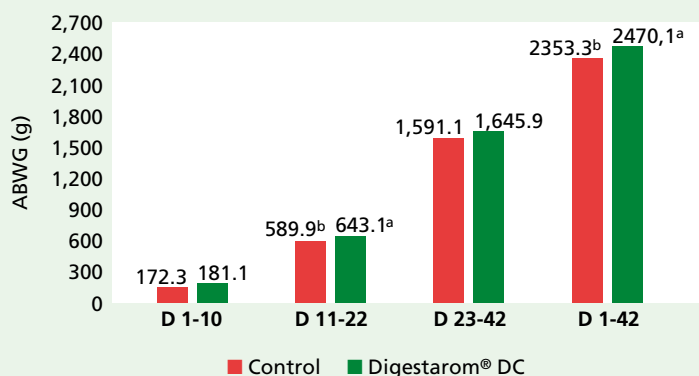
Figure 3. The BioMin® Duplex Capsule and triple action formulation of Digestarom® DC.



Source: BIOMIN

matrix and core-shell encapsulation. It offers four key advantages: **1** **2** **3** **4** **targeted, controlled release and 4 better handling.**

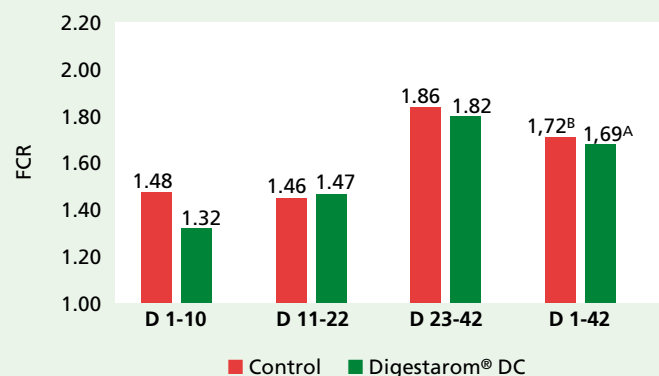
Figure 4. Digestarom® DC improves average body weight gain in broilers.



^{a,b} Different superscripts represent statistically significant differences ($p < 0.05$)

Source: University trial in broilers, Southern Europe, Summer 2016

Figure 5. Digestarom® DC improves feed conversion ratio (FCR) in broilers.



^{A,B} Different superscripts represent tendency towards statistical difference ($p < 0.1$); Note: Cobb 500 Standard at 42d: 1.675 kg/kg

Source: University trial in broilers, Southern Europe, Summer 2016

how the Biomin® Duplex Capsule permits the targeted delivery of essential oils in an in vitro gastrointestinal model.

4 Better handling

Thanks to the Biomin® Duplex Capsule, Digestarom® DC has a shelf life of 18 months, reduced dustiness and improved handling. While certain commercially available phytogenic feed additives have a high dusting potential of up to 20 g/m³ according to the Stauber-Heubach test, an acknowledged and official method for testing dusting potential, the corresponding value for Digestarom® DC is 1.6-2.4 g/m³.

Triple action formulation


The triple action formulation of Digestarom® DC exploits the advantages of the Biomin® Duplex Capsule to optimize feed conversion. The three modules – **1** appetizing and endogenous secretions, **2** gut micro-

biota modulation, **3** gut protection – are formulated to optimize feed conversion (Figure 3).

Trial results

Recent results in Cobb 500 Standard broilers demonstrate the ability of Digestarom® DC to improve performance. Over 42 days, birds fed Digestarom® DC supplemented diets showed a statistically significant improvement in body weight gain (2.470 kg) versus birds fed the control diet (2.353 kg), as shown in Figure 4.

Similarly, a difference was observed in the feed conversion ratios (FCR) of the two groups: 1.72 for control versus 1.69 for the Digestarom® DC group, as shown in Figure 5.

Overall, Digestarom® DC supplementation resulted in a 2.83% increase in feed intake, a 4.96% increase in weight gain and a 1.75% decrease in FCR. The efficiency gains translate into direct economic benefits producers. 

LOG SYNTHESIS POTENTIAL CHEMISTRY PRODUCTION MOLECULAR
E CHEMISTRY SIDE
E DE ONARY TIONS
RUG US E TIONS
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DISCOVERY



Antibiotics Reduction in Modern Broilers

A 360-degree approach is the way forward in using antibiotics responsibly and maintaining high performing flocks. Highlights from the first ABF Days at BIOMIN world headquarters, where experts shared their views with delegates from 23 countries.

There's growing demand for antibiotic reduction on the market," observed Luca Vandi, Technical and Regional Marketing Officer EMEA at BIOMIN. "It stems from a combination bottom-up pressure coming from consumers and top-down influence of laws and legislation."

Resistance matters

Antibiotic reduction is not about antibiotic residues potentially finding their way into meat, milk and eggs: withdrawal periods and monitoring ensure that antibiotics do not enter the food supply. Rather, it relates to growing concerns around bacteria that are resistant to one or more drugs (single or multi-resistant), along with the potential impacts on human and animal health.

The phenomenon is not new. "Antimicrobial resistance (AMR) is an issue that was recognized in the 1950s," stated Ellen van Eerden, researcher at Schothorst Feed Research. The existence of antimicrobial resistant bacteria stretches back much further. "Resistance is as old as bacteria

themselves," noted Nataliya Roth, scientist at BIOMIN. Gut bacteria found within 1000-year-old mummies from the Inca Empire have been shown to be resistant to antibiotics. While a certain level of resistance is innate, or natural, application of antibiotics puts selective pressure on resistance genes in bacterial populations. It is the latter that deserves attention in the field.

"Even if the transmission of antibiotic-resistant genes from animal production to humans remains controversial, it's a reality that in animal production, more and more multi-drug-resistant (MDR) pathogens can be found in the field," observed Mr Vandi. Consequently, resistance is a key driver in the push to reduce antibiotic in livestock.

Preserving medicinal value

An important element of the discussion about antibiotic reduction involves setting realistic expectations and properly framing the role of antibiotics in the industry.

"At BIOMIN, we believe in the prudent use of antibiotics, which means preserving the medicinal value of antimicrobials



Luca Vandi



Ellen van Eerden

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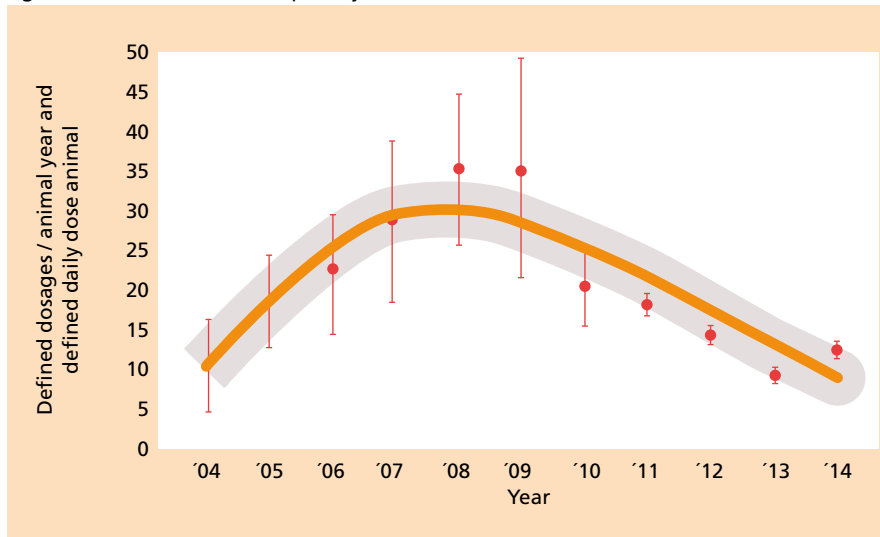


Nataliya Roth



Franz Waxenecker

Figure 1. Use of antibiotics in poultry in the Netherlands.



Source: Maran, 2015

for treatment of disease,” stated Franz Waxenecker, Development Director at BIOMIN.

Responsible or prudent use does not mean the complete elimination of antimicrobials in all circumstances, but rather their application in situations deemed relevant and necessary. “There will never be zero antibiotics,” commented Mr Waxenecker.

Solving the puzzle

“Reducing antibiotics requires a 360-degree strategy that involves many different and closely connected aspects of broiler production, including genetics, nutrition, biosecurity and management,” noted Mr Vandi. As the role of antibiotics is restricted to disease prevention, these aspects fill the role of disease prevention and growth promotion.

“In modern production, we need growth promoters in feed,” remarked Mr Waxenecker. “The challenge in antibiotic exit programs is to reduce antibiotics while keeping performance high,” he added. The successful implementation antibiotic-free (ABF) feeding programs has been documented in many cases, and could be instructive to those looking to make the shift.

“The ABF puzzle can be solved,” said Ms van Eerden, citing the example of The Netherlands, where antibiotics use in broilers fell considerably (Figure 1), while performance parameters continued to improve. The feed conversion ratio (FCR) fell from 1.75 in 2010 to 1.61 in 2015, while average daily gain (ADG) rose.

One delegate pointed out that although antibiotic reduction involves multiple moving parts, management

“Reducing antibiotics requires a 360-degree strategy that involves many different and closely connected aspects of broiler production, including genetics, nutrition, biosecurity and management.”

Figure 2. Optimum condition of the air inside a poultry house.

Oxygen	>19.6%
Carbon dioxide	<0.3% (<3000 ppm)
Carbon monoxide	<10 ppm
Ammonia	<10 ppm
Relative humidity (%RH)	45-65%
Dust	<3.4 mg/m ³

Source: BIOMIN

practice remains crucial, stating ‘if you don’t have good management practices to start, the rest is almost a waste of time.’

Management

In most modern broiler operations, the genetics are largely the same—regardless of country—and birds have similar growth potentials. Management practices and environmental factors can make the difference. Epigenetics, the study of how internal and external environments change the expression of genes, may explain variation among birds with the same genetics. These differences can influence birds’ health and performance—and consequently a producer’s economic result.

“Environmental factors in your poultry houses—e.g. temperature, ventilation, light, etc.—are not free. They cost you money. But they will cost you more money if they are not looked after properly,” cautioned Mark Karimi, Technical Sales Manager at BIOMIN.

He offered a number of tips regarding poultry house temperature:

- Temperature tables are mere guidelines. Make sure you understand the environmental conditions before using them.
- Chicks exposed to low temperatures have a quite different behavior pattern compared to those at normal temperature.
- Chicks’ gastrointestinal tracts develop best when their internal temperature reaches 42°C.
- Elevated brooding temperature may improve birds’ welfare without affecting final body weight or uniformity.

Regarding ventilation, the optimal condition of indoor air for a poultry are well documented and can be found in numerous textbooks (*Figure 2*). “If you want the best health and performance from your birds, you have to get to these numbers,” stated Mr Karimi, adding “There is no compromise. It costs you money...and it’s not easy. It takes time and practice to master.”

Birds are highly sensitive to changes to air quality parameters, and because the negative effects of dust, ammonia and CO₂ in early stages have repercussions later on, these factors are best addressed early in the production cycle.

Nutrition

Nutrition typically accounts for 60-70% of broiler production costs, and can affect birds’ gut performance. Ellen van Eerden, researcher at Schothorst Feed Research, offered a number of nutrition tips. First, use sufficiently coarse particles. Second, reduce viscosity of the diet. “Viscosity is a risk factor for intestinal health,” according to Ms van Eerden.

Third, use a balanced amino acid concept, and use highly digestible protein. “Protein quality becomes more important when antibiotics are removed,” stated Ms van Eerden. Fourth, reduce protein as substrate for fermentation. “5-phase feeding reduces, but does not remove, excess protein from the diet,” she added.

Biosecurity

“Biosecurity is often overlooked as an area for investment,” observed Zeno Bernardi of Unitec. “Yet, biosecurity and animal welfare are a major requirement for end consumers—and therefore important to retailers and supermarket chains. It’s an opportunity to add value to the company.”

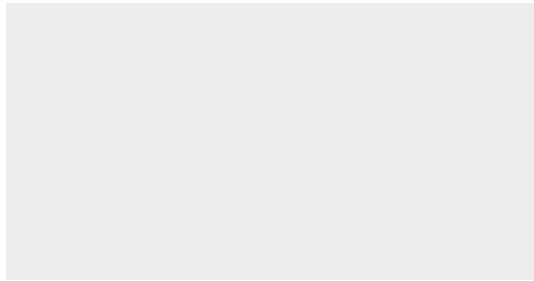
He emphasized practical biosecurity and hygiene measures, including a 7-step empty house protocol, the greater importance of flow rate over water pressure of washers/sprayers, and highlighted the care and attention that are required for best results. “Details matter,” he said. “Be thorough.”



Mark Karimi



Zeno Bernardi



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