

# Objective: Growth Promotion

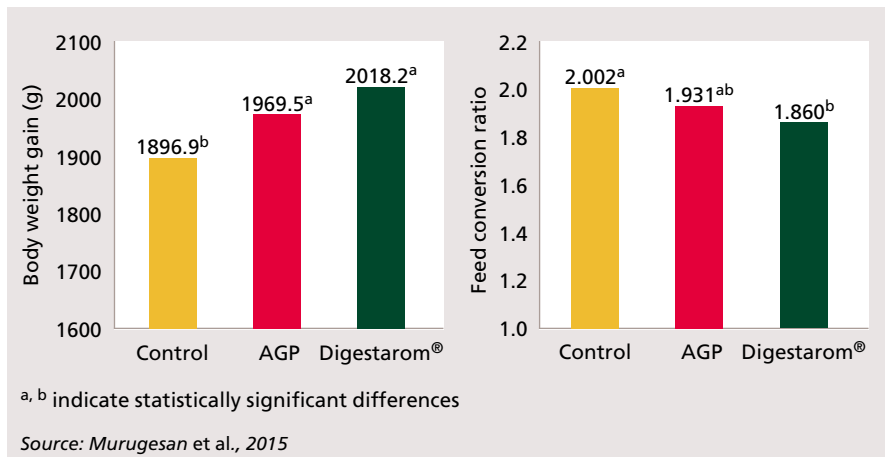
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The trend towards the reduction or elimination of antibiotic growth promoters (AGPs) in poultry production continues, though at different speeds, across the globe. The search is on for the next generation of growth promoters that deliver consistent production improvements. Finding the right solution means revising management practices and tailoring objectives for feed additive application.

**A**ntibiotics are one of the crucial medical discoveries of the 20th century and still have significance for treating humans and animals in the 21st century. Risks of antibiotic resistance and antibiotic residues in products of animal origin and in the environment have raised health concerns among the public and scientific community about the risk

of so-called 'superbugs'. The banning of AGPs has had a negative impact on animal performance in some countries. The next generation of growth promoters includes novel, natural strategies tailored to mimic growth promotional effects of AGPs and even have additional benefits, such as the promotion of beneficial gut bacteria, meat and egg quality improvement or reduced environmental emissions.

**Figure 1.** Phytogetic feed additive delivers best broiler performance in trial up to 39 days of age.



### Aiming for performance

Plant-derived substances have been used for centuries for the purposes of flavoring as well for their beneficial effect on the organism (biological effect). Digestarom®, a selected and standardized blend of herbs, spices, essential oils and extracts, has shown to be able to achieve comparable results in animal production as with applying selected AGPs.

Scientific findings demonstrate that a phytogetic feed additive (PFA) such as Digestarom® can improve broiler performance, delivering similar or better results compared to AGPs. In one study, broilers receiving a Digestarom® supplemented diet recorded higher body weight gain and improved feed conversion compared to both the control and AGP groups (Figure 1).

### Three keys to growth promotion

The formulation of Digestarom®, a phytogetic feed additive, contains three major modules that target: (1) appetizing and digestive secretion enhancement, (2) gut microbiota modulation and (3) gut protection. For the first module, digestive secretion enhancing effects support nitrogen retention and improved digestibility that contribute to better feed efficiency. The second module shifts the intestinal microbiota balance towards more favorable bacteria. The third module decreases the inflammatory response in animals, preserving that otherwise spent energy

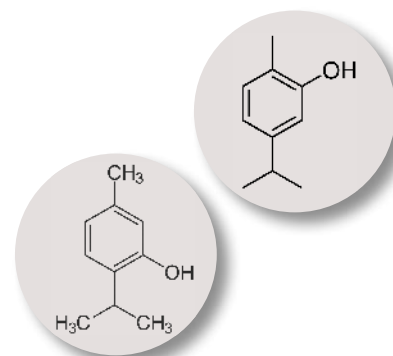
for growth, and increases the anti-oxidant status of gastrointestinal cells. Combined, these modules deliver not just performance enhancement, but also additional benefits, such as the promotion of beneficial gut bacteria, meat and egg quality improvement or reduced environmental emissions.

The mode of action of AGPs has been discussed considerably in literature. Aside from the antimicrobial effect, several hypotheses were proposed to explain the resulting growth enhancement. Explanations included an interference with the microbial toxin production or increased nutrient absorption due to changes in the intestine. Studies have also shown that some but not all AGPs are involved in the inhibition of the inflammatory response.

Given that feed additives and antibiotic growth promoters only partly rely upon identical modes of action, it comes as no surprise that their effects can also vary. Selecting the appropriate management goal tailored to specific farm conditions can help to achieve the desired outcome. Farm management plays a crucial role in the achievement of positive results.

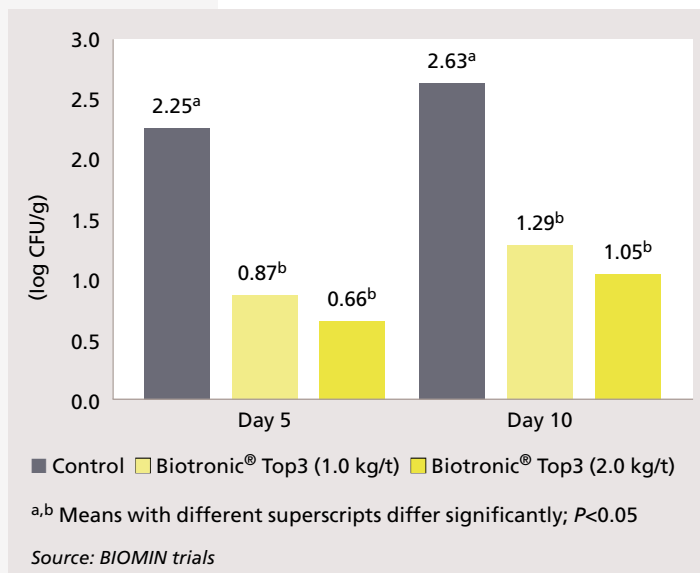
### Phytogenics counteract gram-positive bacteria

Phenolic compounds (a group which includes e.g. thymol and carvacrol; major active compound in thyme and oregano) within essential oils and other essential oil

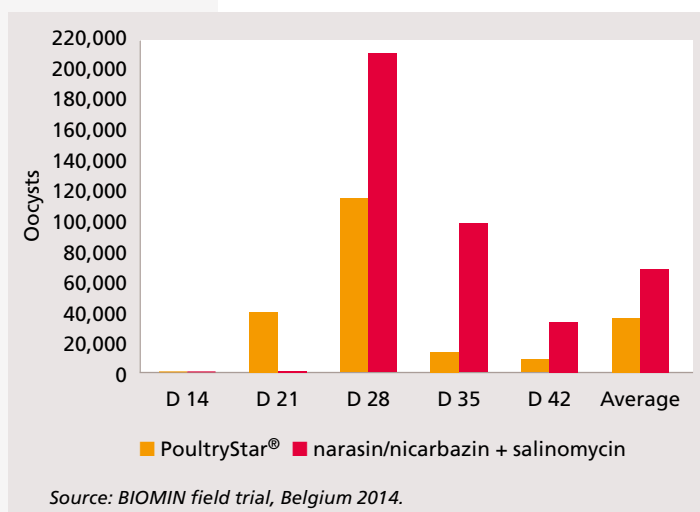


Phenolic compounds including thymol and carvacrol, major active compound in thyme and oregano, have been shown to have antimicrobial properties, mainly against gram-positive bacteria.

**Figure 2.** *S. enteritidis* counts in the cecal content of broilers on day 5 and day 10 post infection.



**Figure 3.** Weekly oocysts shedding per gram of dropping in Ross 308 broilers. On day 2 all birds received an artificial coccidiosis infection.




derivatives have all been shown to have antimicrobial properties, though these tend to target gram-positive bacteria. Gram-negative bacteria, however, possess an outer cell membrane that limit the antimicrobial effect of phytochemical constituents. A permeabilizing substance that weakens this outer membrane can allow antimicrobial agents, including phytochemical and a blend of organic acids, to act effectively to reduce the Gram-negative bacterial load.

Figure 2 illustrates the effectiveness of the Biotronic® Top product line, which combines selected organic acids and their salts with a phytochemical and the unique Biomin® Permeabilizing Complex, in combatting gram-negative bacteria such as *Salmonella enteritidis* in broilers. (See also “Is Zero Salmonella Possible?” in **Science & Solutions Issue 4**). Besides the reduction of the pathogenic bacteria, Biotronic® products are also known to increase the number of beneficial bacteria in the intestinal tract of poultry. Overall, a healthy digestive tract will lead to a better performance of the animals.

### Coccidiosis challenge

Probiotics and phytochemical feed additives, with or without the use of coccidiostats or vaccines, can help alleviate the negative effects of coccidia infection. Both, but particularly probiotics, have shown to be a novel strategy to manage coccidiosis in poultry. The host-specific multispecies synbiotic, PoultryStar®, reduces intestinal lesions, oocyst count in dropping and mortality which are positively reflected on performance (Figure 3). Hence it is able to alleviate the impact of internal parasite infection on chickens by improving gut integrity, reducing sporozoite invasion into the intestinal epithelium and modulating the bird’s immune response.

### Conclusion

The reduction of sub therapeutic antibiotic use is set to continue. Numerous trials and studies indicate the effectiveness of Digestaron® in promoting growth and feed efficiency. In the case of a Gram-negative bacteria challenge and growth promoting effect, Biotronic® has demonstrated effectiveness in both scientific and field trials. PoultryStar® has demonstrated high efficacy in the competitive exclusion of pathogenic bacteria. A more granular framework that allows for the distinction between health and production efficiency — two closely related objectives — can help to guide the application of feed additives that deliver the greatest benefit to birds and producers. 

# What's wrong with my birds?

## Part 4: Impaired feathering/feather loss

In poultry, feathers serve important roles in terms of protection and insulation of the body. While moulting, or renovation of older feathers by new ones, is a natural process occurring in mature layers upon completion of a laying cycle (which itself can be influenced by many factors), feather loss or impaired feathering may be indicative of other problems in the farm.

Feather-related problems in poultry can be roughly divided into two groups, either:

- They are not properly developed (linked to feather formation) which is often related to nutrition or the presence of mycotoxins.
- They are pulled off by birds (feather pecking), which is a management-related issue.

In each case it is critical to understand the foundation of the problem so that it can be properly solved (see table right).

Stressful conditions in the barn, especially during brooding, such as heat, cold and existence of air currents, amongst others, can result in feather loss and poor feather quality in the birds. In this case, it is crucial that the behavior and interaction of animals is observed. Often, feather pecking and pulling can also be triggered by inadequate intake of nutrients. Due to the high protein content in feathers, higher protein levels in feed may encourage faster feather development and shedding.

Imbalance of amino acids in the feed, particularly sulphur amino acids cysteine and methionine, may cause feather abnormalities and/or rough feather appearance.

The dermatotoxic effect of trichothecene mycotoxins, such as T-2 toxin and others, may also contribute to low feather quality along with other negative effects, such as oral lesions and decreased performance.

Overall, excessive feather loss or impaired feathering adversely affects feed conversion as birds have to allocate extra energy from the diet to compensate for heat loss.

As such, management, housing and nutrition should be optimized to reduce this occurrence. In terms of mycotoxins, prevention can be undertaken through the use of a proper mycotoxin risk management tool which adsorbs and/or biotransforms mycotoxins, thus eliminating their toxic effects for the animals, while guaranteeing liver and immune protection.

Check list	Corrective action
<b>Potential cause: MANAGEMENT: Temperature of barn</b>	
<ul style="list-style-type: none"> <li>• Temperature of barn</li> <li>• Humidity of barn</li> <li>• Ventilation system</li> </ul>	<ul style="list-style-type: none"> <li>• Improve management of barn</li> <li>• Correct temperature, ventilation rate and humidity according to management manuals</li> </ul>
<b>Potential cause: MYCOTOXINS: T-2 toxin (T-2)/Deoxynivalenol (DON)/ Other trichothecenes</b>	
<ul style="list-style-type: none"> <li>• Positive for trichothecenes in raw materials (ELISA) or feed (HPLC)</li> <li>• Raw materials originating from supplier/ region with a history of trichothecenes contamination</li> <li>• Histopathology: Check other target organs for trichothecenes (ex. liver, for hepatic vacuolisation)</li> <li>• Decline in overall flock performance</li> </ul>	<ul style="list-style-type: none"> <li>• Check the average contamination levels</li> <li>• Use Mycofix® at the correct dosage level</li> <li>• Avoid contamination of feed bins or feed/water lines by stale, wet or mouldy feed</li> </ul>
<b>Potential cause: NUTRITION: Amino acid (AA) deficiency/unbalance</b>	
<ul style="list-style-type: none"> <li>• Level of Total Sulphur Amino Acids (TSAA) in diet</li> <li>• Ratio TSAA/Lys/Arg/Thr</li> <li>• AA scale at feed mill</li> </ul>	<ul style="list-style-type: none"> <li>• Increase level of synthetic Amino Acids (AA) in low digestible diets (high levels of by-products)</li> </ul>
<b>Potential cause: MANAGEMENT: Red mites</b>	
<ul style="list-style-type: none"> <li>• Presence of red mites in the barn during the night.</li> </ul>	<ul style="list-style-type: none"> <li>• Flame cages during withdrawal period</li> <li>• Clean egg belts during withdrawal period.</li> <li>• Increase biosecurity level</li> <li>• Use plastic egg belts whenever possible</li> </ul>
<p>Note: Pathogens were excluded from the table due to space constraints but may be important to consider.</p>	

References are available on request

For more information, visit [www.mycotoxins.info](http://www.mycotoxins.info)

DISCLAIMER: This table contains general advice on poultry-related matters which most commonly affect poultry and may be related to the presence of mycotoxins in feed. Poultry diseases and problems include, but are not confined to the ones present in the table. BIOMIN accepts no responsibility or liability whatsoever arising from or in any way connected with the use of this table or its content. Before acting on the basis of the contents of this table, advice should be obtained directly from your veterinarian.