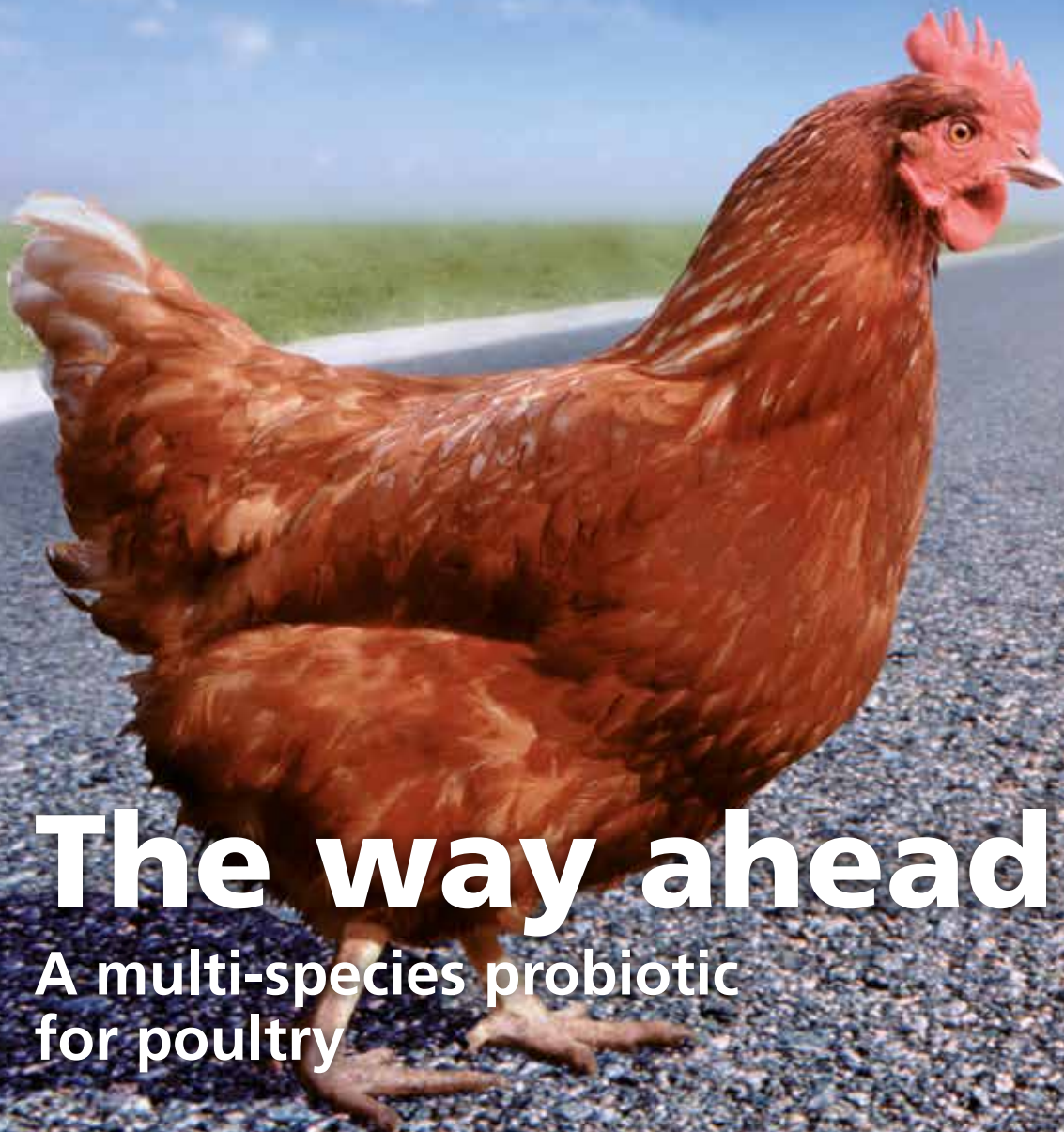


Science & Solutions



The way ahead

A multi-species probiotic
for poultry

Photo: Bryan Allen/COBBIS



Gut health for a brighter future

A balanced gut microflora protects poultry



Maximising poultry output

Feed additives for maximised poultry output

Editorial

Setting the trend and standard

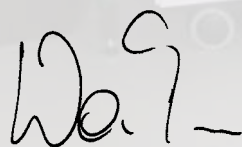
Food is something that is close to the hearts, and stomachs, of consumers all over the world. Today's consumers demand not only safe food products but also food that is produced in a transparent and natural way.

In the EU, the use of in-feed antibiotic growth promoters has been banned since 2006, partly due to the demand for natural processes. Regulations like these have put the pressure on the feed additives business not only in the EU but also all over the world. At BIOMIN, we believe that the way forward is in setting the standard proactively, rather than reacting to regulations.

Scientific research directs trends and standards and provides the solutions. Recently, BIOMIN received a positive opinion by the European Food Safety Authority (EFSA) on a novel feed additive product—a multi-strain, host-specific probiotic feed additive that is available in our PoultryStar® range. This product is the first of its kind to be authorised by the EU Commission, which is essentially a scientific approval that the product is safe for use in animals, humans and the environment with beneficial effects that have been proven in the target species. You can read more about the specific action of the unique EFSA-approved strains in our debut issue of **Science & Solutions** dedicated to poultry.

PoultryStar® was developed in an EU-supported research collaboration which began in 2003 between BIOMIN and industry partners from several universities and laboratories. Obtaining EU approval for our product signifies not only a prestigious development for BIOMIN and our research partners. It also confirms our strategic vision: That BIOMIN cares for health in animal nutrition. We believe that science is part of the solution and the key by which businesses can be proactive in the animal nutrition industry.

We hope that our colleagues in the poultry industry will enjoy this publication by BIOMIN and find **Science & Solutions** practical, informative and most of all, pleasurable to read.



Franz WAXENECKER

Director Development Department



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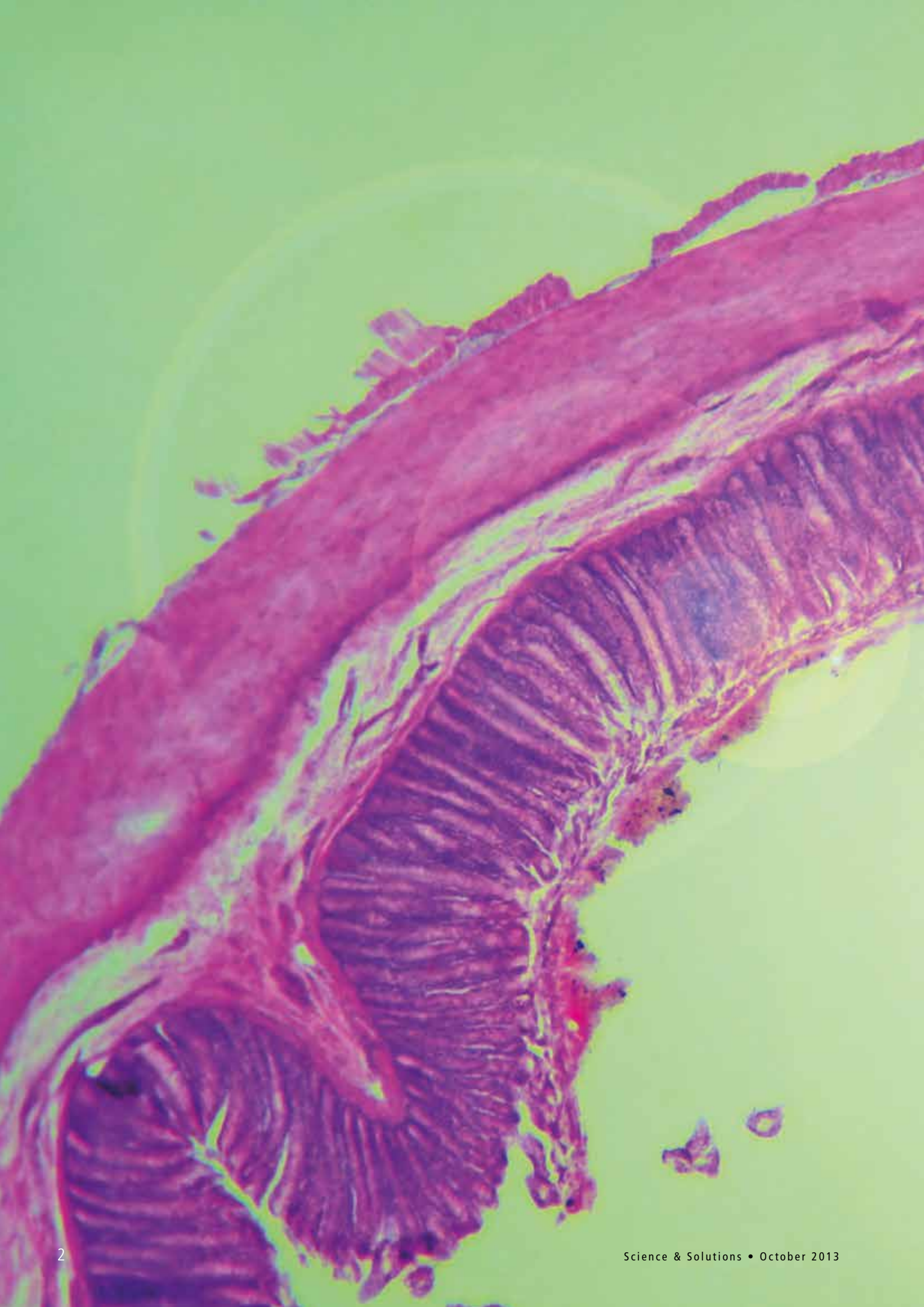
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Gut health for a **brighter** future

A balanced gut microflora protects poultry of all ages from colonisation by pathogenic bacteria. With the phasing out of antibiotic growth promoters, the synergistic action of probiotics and prebiotics in a multi-species, host-specific feed additive has proven to be efficacious in improving poultry health and performance, and increasing producer profits.

“The product development process started with the isolation of intestinal of several healthy chickens. To obtain the

For decades, antibiotic growth promoters (AGPs) have been used in livestock production to prevent poultry diseases and improve production performance in many parts of the world. Nevertheless, the use of antibiotics in sub-therapeutic or therapeutic doses, arguably, has led to an increase in antimicrobial resistance in birds. In addition, AGPs disturb the microflora balance within the birds' gastrointestinal tract (GIT) and as a result, performance may not match producer expectations. Moreover, public health concerns and demands for drug residue-free products have led to a complete ban on AGPs in the European Union since 2006. The demand for alternative feed ingredients, especially in the EU, has increased.

Probiotics that protect

One of these alternatives is the use of probiotics, which can be defined as a live microbial feed supplement that beneficially affects the host animal by improving its microbial intestinal balance. The efficacy of probiotics in stabilising the GIT microflora and increasing broiler growth performance has been well documented. Probiotics could exert this beneficial action by competitively excluding pathogens, enhancing feed intake and digestion, producing antimicrobial substances and reducing the GIT pH, in addition to having immune modulating and anti-inflammatory effects.

The protective ability of probiotic bacteria, commonly known as competitive exclusion (CE), was first described by Nurmi and Rantala who demonstrated that introducing mixed bacterial preparations from the caecal contents of healthy adult chickens can protect young birds from *Salmonella* infection. Some probiotic species such as *Lactobacilli*, *Bifidobacterium* and *Enterococcus* are found to increase the jejunal villi height-crypt depth ratio. This increases the absorption surface of the intestinal tract and subsequently improves feed efficiency and growth performance.

The effect of probiotics in growth promotion can also be explained by their ability to reduce the challenge posed by pathogenic bacteria and their toxins within the birds' GIT. Consequently, energy is preserved as immune cells are not mobilised to fight pathogens and fewer resources are needed to repair damaged tissue.

There are many ways to further improve the efficacy of probiotics. These include the selection of several efficient strains that work synergistically together and the inclusion of prebiotics. Prebiotics are defined as non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth or activity, or both, of one or several beneficial bacteria in the GIT.

Suitable strains for PoultryStar®

The product development process started with the isolation of intestinal bacteria taken from the gut of several healthy chickens. This provides a rationale for their safe use as a feed additive for poultry. To obtain the most efficient strains, different strains were selected from different parts of the GIT from chickens of different ages and genotypes.

A pool of diverse aerobic, facultative anaerobic and obligate anaerobic gut bacteria was isolated out of four main intestinal compartments—the crop, jejunum, ileum and the cecum—using a wide variety of conventional microbiological cultivation techniques. Pure cultures of isolates were stored for further investigations and thoroughly characterised with regard to their metabo-



Newly hatched broiler chicks, under current modern poultry husbandry, do not come into contact with mother hens. This lack of contact is believed to delay the development of the intestinal microflora. As a result, chicks are particularly susceptible to pathogen colonisation.

Photo: jsandovej/stockphoto

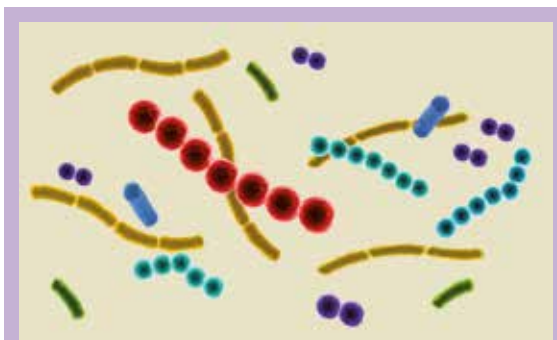
bacteria taken from the gut most efficient strains, different strains were selected from different parts of the GIT from chickens of different ages and genotypes. ”

lic properties, growth and fermentation performance, adaptability to industrial processes, stability in the end product and inhibitory activities.

Evaluating suitable strains for PoultryStar®

The most promising strains were evaluated for important probiotic criteria such as adhesion to intestinal cell walls, inhibition of pathogens, range of metabolic end-products, fermentation performance, stability against acids and bile salts, storage stability and safety status.

In order to investigate the adhesion ability of various isolates to intestinal cells, a tissue culture test system was used. The results clearly showed the ability of several isolates to attach to intestinal cells *in vitro*. A co-cultivation agar plate assay was used to test the



What makes a feed additive safe and effective?

The isolation, characterisation, and risk assessment of intestinal strains are essential for the development of a safe probiotic feed additive. The selection of probiotic strains for use in feed additives requires critical evaluation, especially in the light of region-specific requirements. For instance in the EU, the European Food Safety Authority (EFSA) gave the green light for the registration of a novel product in the EU in August 2013. This is the first poultry-specific, multi-species synbiotic product to be approved in the EU market (PoultryStar®, BIOMIN GmbH, Austria).

One of the PoultryStar® isolates with the ability to inhibit *Salmonella in vitro*.



isolates for their ability to inhibit the growth of pathogens like *Salmonella Enteritidis*, *Salmonella Typhimurium*, *Salmonella choleraesuis*, *Campylobacter jejuni*, *E. coli* and *Clostridium perfringens*.

Several isolates had the ability to inhibit pathogenic strains and the results showed that the inhibition potential of single strains against the pathogens was quite different. Based on these results, it was decided to combine a number of very promising chicken strains from different parts of the birds' GIT to design a multi-species product. Besides the probiotic strains, PoultryStar® contains the prebiotic inulin which selectively stimulates the growth of beneficial strains.

Critical appraisal

Safety assessments were an essential phase in the development of the probiotic feed additive for BIOMIN. Each single strain of the final product was carefully evaluated for safety. Furthermore, an economic fermentation process with the highest quality standards for the production of the selected product strains was developed.

The efficacy of PoultryStar® in preventing a wide range of pathogenic conditions such as coccidiosis, necrotic enteritis, bacterial lameness, salmonellosis, in addition to improving performance parameters, have already been confirmed in several feeding trials worldwide. ☺

Maximising poultry output

Especially in difficult times

Cutting back on feed costs alone are not enough to increase profitability in this tough economic climate with an uptrend in raw materials prices. Instead, the focus should be on reducing per unit feed costs and on monitoring and improving production efficiencies.

The years 2012/13 have been difficult for poultry producers around the world for many reasons—the economic downturn subduing overall growth in the industry, increasing feed raw material prices due to adverse weather conditions which have also resulted in greater-than-average variations in quality, and the age-old problem of feed prices rising faster than returns to the producer. Droughts in North and South America and southern Europe and early droughts followed by a cold wet harvest in northern Europe in 2012 have severely limited the quantity of high quality grains and further exacerbated the pressure on feed raw material prices.

Throughout the world, the traditional and most common response in difficult times is to try to reduce feed costs as much as possible as this represents between 60% and 70% of the total cost of production. This is based on the idea that by reducing input costs, you can improve profitability. But is this the best course of action to sustain a struggling business, even if it helps with the cash flow? A more progressive response would be to look at ways to maximise output by reducing individual unit costs of production.

The first to go

One of the first casualties at such times are feed additives. Even though they represent only a very small percentage, often less than 1% of the total cost of the feed, feed additives are reduced or removed. But as feed additives were included in the diet for the benefits they bring, why remove them at this time?

Today, veterinary costs are seen as

necessary for the well being of the health of the stock and are often accounted for separately from feed costs. On the other hand, feed costs are often seen as negotiable and when feed prices rise, steps are taken to reduce overall feed costs even if the net effect can be detrimental to the company. In reality, both feed and veterinary costs should be combined rather than kept separate, to better establish the true costs of production.

Unit costs of production can be affected in many ways—through decreases in mortality, increases in growth rates or egg production and feed efficiency along with enhanced intestinal function. Improving immunity or reducing pathogen challenges consequently require much less veterinary intervention. The net result of all or some of these is a reduction in the unit cost of production.

There are also many fixed costs such as heating, labour and depreciation. If productivity increases through the use of additives, this reduces the overall cost of production per unit of fixed costs.

Feed additives—not for nothing

The main aim of probiotics is to rapidly develop a healthy intestinal microbial balance. This will reduce the risks of pathogen through competitive exclusion for attachment sites on the intestinal lining and/or the production of organic acids and bactericines. It also lowers the overall number of pathogens in the intestine, thereby reducing disease challenges. One of the main benefits is a reduction in dysbiosis or bacterial imbalance in the gut. Reduced dysbiosis is usually accompanied by increases in liveability, growth rate and

Unit costs of production refer to the cost of producing each unit of poultry product, such as an egg or a kilogram weight gain. Higher total costs may be offset by more eggs produced or higher live weight, which translate to lower per unit costs and more profit for the producer. ↙



Table 1. Economic effect of removing additives from the diet. These cost calculations were carried out at different times with different feed prices and returns per kilogramme live weight.

Product type	Product	No. birds	Cost saving	Zootechnical performance			Lost Income
				Liveability	Live weight	FCR	
Probiotic /Prebiotic	PoultryStar®	20,000	252.00	+0.30	-160g	+0.10	2,797.33
Organic acids	Biotronic® Top3	41,200	461.13	-0.46	-50g	+0.07	2,240.77
Organic acids	Biotronic® SE forte (L)	10,000	137.81	+1.93	-130g	+0.12	1,477.84
Phytogenic	Digestarom® P.E.P. Poultry	46,600	421.04	-0.40	-10g	+0.07	3,066.44
Phytogenic	Digestarom® Poultry	588,616	6,986.28	+0.07	-171g	+0.04	43,398.90

Source of data: BIOMIN field trials

feed efficiency as birds benefit from improved digestibility.

It has been suggested that in Europe, about 30% of all culling in processing plants can be attributed to lameness and/or bacterial chondronecrosis and osteomyelitis (femoral head necrosis).

Recent trials carried out at the University of Arkansas using a lameness model have shown significant reductions in induced lameness when a multi-species, multi-strain probiotic (PoultryStar®) was included in the diet. Ongoing field trials are attempting to quantify the benefits of lameness reduction under standard commercial conditions.

Proven results

Phytogenics tend to be included in poultry feed to enhance digestibility and modulate the intestinal microbiota, thereby improving the health of the animal and reducing pathogen challenges. These, in turn, result in improved performance particularly in feed efficiency, growth rates and liveability. Many trials with Digestarom® P.E.P. and Digestarom® Poultry have shown consistent benefits in feed efficiency along with improvements in daily weight gain. When these gains are accompanied by an improvement in economic benefits, where is the sense in removing them from the diet?

In a major field trial with more than one million broilers in the Netherlands with Digestarom® Poultry, the average body weight of the broilers increased by approximately 170g against the standard control group with a saving of 4 points in FCR. This resulted in the production

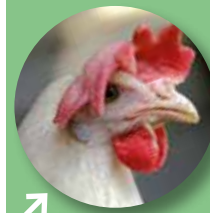
of 50.26 tonnes more live weight and an increased income of €49,256 at €0.98/kg live weight sold. Flock health was also improved as seen by a halving in veterinary treatment costs. This demonstrates the need to combine both feed and veterinary costs in order to determine the true benefit of any additives used.

Organic acids, be they straight acids, protected acids or acids on slow release carriers are designed to have an antimicrobial effect in the feed, the intestine or both, and have been used for many years to control *Salmonella spp.* They also help buffer the feed, thereby enabling improved protein digestion. The net outcomes are improved health and better zootechnical results. If organic acids were added for these reasons, taking them out when feed prices rise will affect overall performance negatively.

Penny wise, pound foolish

As Table 1 demonstrates, removing feed additives from the diet results in feed cost savings. But the flipside of this is a drop in the performance of the birds and the profitability of the enterprise. The figures are produced from a range of field trials carried out in broilers with BIOMIN products.

The outlook in regard to feed prices is likely to remain high with an increasing world population competing for basic dietary staples, although there may be short periods when prices ease, provided climatic conditions permit universally good harvests. Just cutting feed costs alone will not be enough for companies to survive in this tough economic climate. Efficiencies have to be monitored and improved with a focus on reducing per unit costs of production. ☺



➤ Besides an increase in both growth and feed efficiency, feed additives may also reduce the need for medical interventions. As such, savings in medication costs should also be taken into account. Above all, the appropriate use of feed additives increases poultry revenues for the producer.

News & Events

Mild relief for US soybean and corn output

The EU gives the green light for a multi-species, host-specific poultry probiotic **more on page 2-6**

The BIOMIN **American Nutrition Forum** San Antonio, 4-6 Nov 2013

Did you know...

“that DON targets the brain of animals directly, causing vomiting or anorexia?”

Discover this mycotoxin Hot Topic in the BIOMIN Mycotoxin Info Blog!



In the Americas **Brazil's** Ag Minister pushes for more poultry exports; lower feed prices bode well for **US** broiler & egg

BIOMIN news

BIOMIN completes its second facility in Vietnam with a grand opening on 2 Oct 2013. The 4.7 ha **pre-mix facility in Binh Duong** boasts a micro dosing system, state-of-the-art laboratory and technologies complete with “green” features in line with the company’s Nutri-Economics® concept.



The **American Nutrition Forum**, sponsored by BIOMIN, brings two full conference days packed with programs that focus on “Reshaping the Future of Animal Production”. The program also includes

three breakout sessions for poultry, swine and ruminant. Speakers include a range of industry leaders in the field of animal nutrition. www.americannutritionforum.info



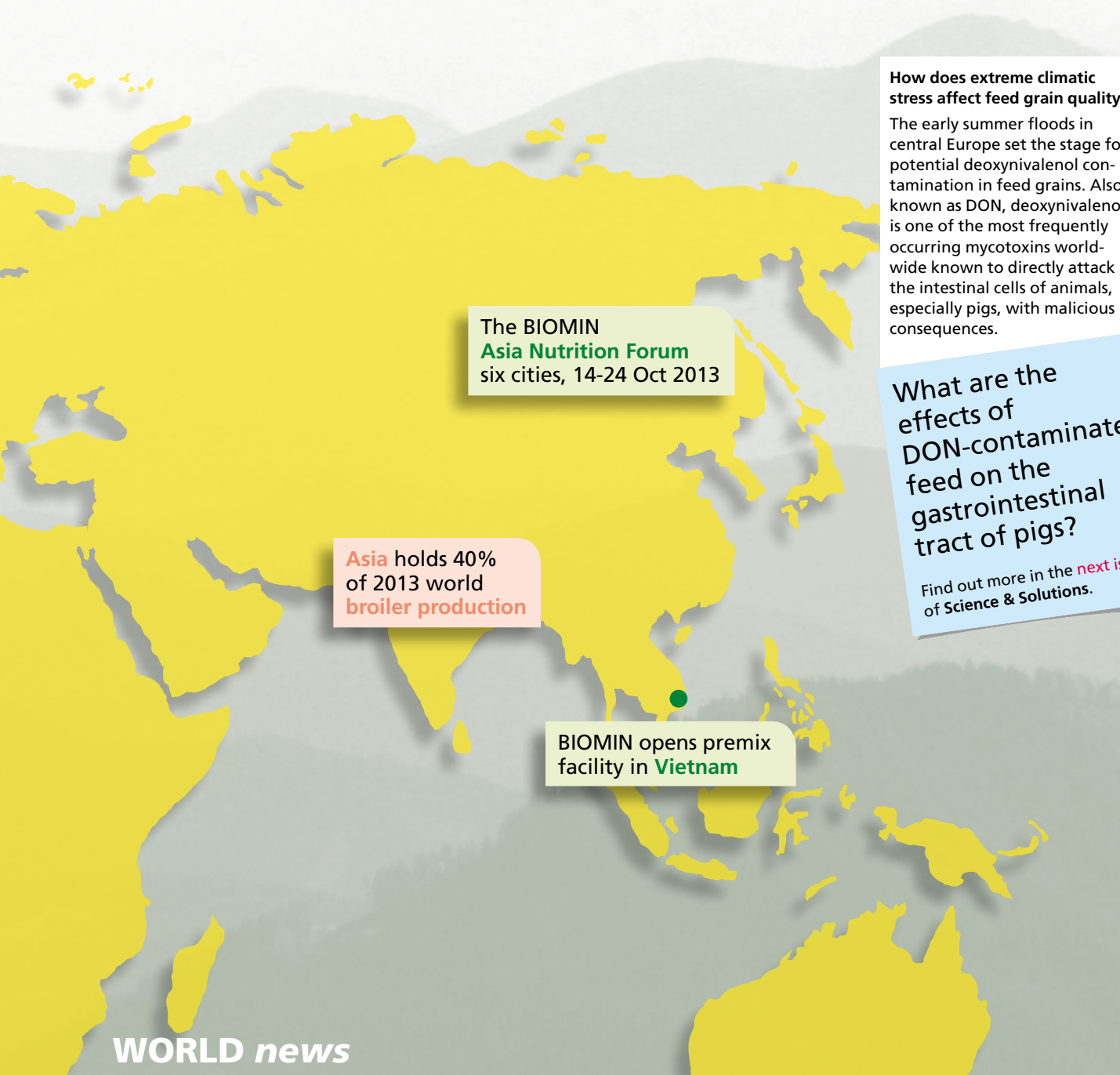
October. Under the theme “Nutri-Economics®—Balancing Global Nutrition & Productivity”, the

BIOMIN brings the biennial **Asia Nutrition Forum** this year to six cities in the region in the month of

Forum discusses issues with a focus on people, performance, profit and planet. <http://anf.biomin.net>



BIOMIN obtained the EU authorisation for its innovative multi-species, host-specific probiotic as a feed additive for fattening chickens. Marketed in the EU under the umbrella of the globally successful **PoultryStar®** brand, the probiotic feed additive is the first and only feed additive of its kind to achieve a positive scientific opinion. *Source: BIOMIN*



The BIOMIN
Asia Nutrition Forum
 six cities, 14-24 Oct 2013

Asia holds 40%
 of 2013 world
broiler production

BIOMIN opens premix
 facility in **Vietnam**

How does extreme climatic stress affect feed grain quality?
 The early summer floods in central Europe set the stage for potential deoxynivalenol contamination in feed grains. Also known as DON, deoxynivalenol is one of the most frequently occurring mycotoxins world-wide known to directly attack the intestinal cells of animals, especially pigs, with malicious consequences.

What are the effects of DON-contaminated feed on the gastrointestinal tract of pigs?
 Find out more in the **next issue** of **Science & Solutions**.

WORLD news



Photo: unpict - Fotolia.com

Chicken consumption is expected to overtake pork as the world's most popular meat by 2020, at 128m tonnes a year. For 2013, poultry meat consumption is forecast to exceed 105m tonnes, with 40% of demand from Asia.

Sources: Rabobank, The Economist

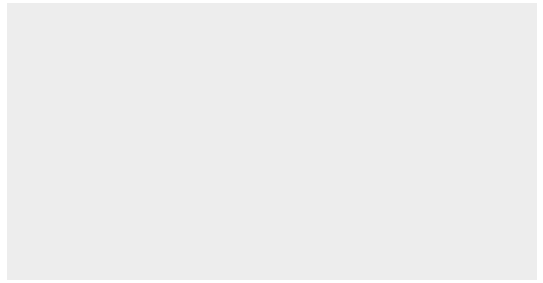
Despite its lead in poultry, **Brazil** fears a **loss in global market share** and billions of dollars in poultry exports owing to tough competition. Revenues from poultry exports, however, increased in the first eight months of 2013 compared to 2012. In the **US**, lower-than-expected feed prices are seen to boost poultry production in 2013 and into 2014.

Sources: Globalmeatnews, Brazilian Poultry Union (UBABEF), USDA



US soybean and corn gain moderate momentum this autumn thanks to favourable weather in the east. Production and yield forecasts for both crops are up from last year. Persistent droughts in the Midwest regions, however, place increasing stress during the filling stages of both corn and soybean crop development.

Source: USDA



PoultryStar[®]

Healthy gut – strong chick!

Host-specific, well-defined, multi-species probiotics combined with prebiotics promote a beneficial gut microflora.



For the
profitability of
your chicks!



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