

International Poultry Production

Volume 26 Number 6 (2018)

Practical information for progressive poultry professionals

EGG QUALITY

Important parameters to monitor and optimise quality

PERFORMANCE

Producing quality poultry with antibiotic-free programs

GUT HEALTH

The connection between the microbiota and the brain

TURKEYS

Understanding mycotoxins and their treatment

OILS & FLAVOURS

We look at options from around the world

WORMS

Infections: are they more important than ever before?





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¹ As shown in the study Ribbit M, Pritchard N, Le Gros FX, Goolbsy S Use of a vectored vaccine against infectious bursal disease of chickens in the face of high-titred maternally derived antibody. *Journal of Comparative Pathology*, 2007; 117: 81-84. ² As shown in the study Goolbsy S, Canal M, Jay JM, Ross C, Le Gros FX. Efficacy of a recombinant vaccine (VMTV7) against Gumboro disease in the presence of maternal antibodies. *British Poultry Science*, 2005; 44: 824-825. ³ As shown in the study Cruz G, J. Oliveira C, Pereira J, Ambrósio F, Gaudenzi A, Le Gros FX, Pritchard N. Efficacy of Turkey Herpesvirus (TVM) (MDV genotype 3) Infectious Bursal Disease (IBD) Vaccine, Live HVTVector, IBD VFC, Administered in ovo and to One Day Old SPF Chickens. *Poultry presentation, American Association of Avian Pathologists conference, Kansas, United States of America*, 2006. ⁴ As shown in the study Le Gros FX, Barreau A, Gaudenzi C, Pisoni R, Salsola M, Gaudenzi M, Pritchard N. Field efficacy trial of a novel IBD vector vaccine for 1-day-old broilers. *Vaccine*, 2009; 27: 3993-3996. ⁵ As shown in the study Masi P, Jost G, Fumagalli L. Experimental challenges that verify resistance against 8 infectious bursal disease virus (IBDV) in commercial flocks vaccinated with an IBD vectored vaccine or with three different modified live vaccines. *Zootecnica International*, November 2008; 50: 57. ⁶ As shown in the study Pritchard N, Le Gros FX, Davos N, Pizzoni L, Lamothiane C. Assessment of the immune response in broilers and pullets using two HVTs after in ovo or day-old vaccinations with a vectored HVT+IBD vaccine (VAXXITEK HVT+IBD). *Zootecnica International*, September 2008; 40: 50. ⁷ As shown in the study Lemiere S, Gauthier J-C, Kodjia A, Wint L, Uchechue A, Ponzoni F. Evaluation of the Protection against Infectious Bursal Disease (IBD) Challenge in progeny born to parents having received a vaccination program using a Herpesvirus of Turkey Infectious Bursal Disease (IBD) Vector Vaccine. *World Journal of Vaccines*, 2013, 1, 40-51.
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PUBLISHER & EDITOR
NIGEL HORROX
neh@positiveaction.co.uk

MARKETING TEAM
COLIN FOSTER
cf@positiveaction.co.uk
TIM BROWN
tb@positiveaction.co.uk
ALISON BURDASS
ab@positiveaction.co.uk
CLAIRE FUSSEY
claire@positiveaction.co.uk
STEPH WEIGHTMAN
steph@positiveaction.co.uk

PRODUCTION
SARAH DOVE
sarah@amneh.co.uk

DESIGN & DIGITAL
MATTHEW BAKER
bacca@amneh.co.uk

SUBSCRIPTIONS
SALLY WALKER
sw@positiveaction.co.uk

ACCOUNTS
ANNE SMITH
accounts@positiveaction.co.uk

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editor's perch

While sitting at my computer to write this editorial the following headlines flashed across the screen of my laptop: "Leicestershire Police issue warning over chickens trying to cross A1. Motorists urged to 'eggsercise' caution."

This was followed shortly after by: "Chickens currently gathered by the side of the road, 'plucking' up the courage to cross."

I checked my diary – yes it was 27th August and it was definitely not 1st April.

This humorous approach led me to thinking about ways in which we can compare man with chickens.

In Europe we often have a long hot summer and this has been particularly true this year with record temperatures. However, this is the first such summer in the UK when poultry suffering from heat stress and deaths has not hit the headlines.

Had this scenario occurred, the welfare lobbies would have made sure that everyone heard about it. This must mean we have a poultry population living in modern, well ventilated housing, whereas the human population is feeling

uncomfortable and complaining about the sweltering nights!

Go on the London Underground or the Bangkok Sky Train and you will see the most unusual human behaviour of cramming bodies into coaches. Have you ever thought what this equates to in kilograms of liveweight per m² of floor area?

Compare this to the limits set for poultry and you wonder what our legislators are actually doing.

Go into a modern poultry processing plant and compare it with many of the plants processing other foods for human consumption and you might wonder, bearing in mind the number of exposures that occur in the former, why our newspapers are not bulging at the seams with stories about other foodstuffs.

The answer probably lies in the fact that we do not have organisations like 'Cabbage Lib'!

You could argue that I have got caught up in what the British Press call the 'Silly Season', but perhaps there is something to be said for this approach and we should always try to look for the positive twist on a story rather than looking for the negative one! ■

Cover Picture:

Achieving the correct balance!
(Photo courtesy of Dupont)

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worldfocus

An executive summary of key international issues

Newcastle disease

Similar progression of outbreaks

Two outbreaks of Newcastle disease reported in California, USA and Belgium appear to be following similar paths. Both outbreaks were initially reported as involving two or three farms – in California these were all backyard flocks, in Belgium they involved a breeder in the backyard sector and a couple of small commercial flocks. By the 23rd July the Belgium situation involved 11 flocks and by mid-August exceeded 20 flocks. In California the latest figure is 117 cases, of which 84 are in San Bernardino County. The difference between the American and Belgium figures probably reflect the density of flocks on the ground as San Bernardino is near Los Angeles, where backyard or hobby farming of poultry is popular.

Food poisoning

It's not always the chicken!

In the USA, federal health officials recently reported an additional 123 cases of cyclospora infection in an outbreak linked to McDonald's salads that began in May. The number of laboratory confirmed illnesses from this outbreak is now 286. Symptoms, which can begin a week or more after consuming the parasite, include diarrhoea and frequent, sometimes explosive, bowel movements. The FDA is working with McDonald's to identify the common ingredients in the salads and to trace them back through the supply chain. McDonald's has removed its lettuce blend from approximately 3,000 locations in 15 states as a precaution and replaced it with lettuce from a different supplier.

Environment schemes

A double-edged sword?

Three farmland bird species have increased in number over a five-year period in response to an agri-environment scheme in the UK. Yellowhammers, house sparrows and tree sparrows rose in abundance in farms taking part in the project across east County Down in Northern Ireland. Yellowhammers, which had been in sharp decline, were up by an impressive 78% between 2006 and 2011. Yet their numbers continue to decline in the wider countryside where measures are not in place. While one has to applaud such schemes, what is their impact on the biosecurity of free range flocks? Perhaps minimal, but sparrows are not afraid to take a free meal or two and are not particular as to where they leave their droppings!

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Important parameters for managing good internal egg quality

Good internal egg quality can be defined by yolk colour, albumen quality, and vitelline membrane strength. Depending on where you are in the world, consumer preferences will differ on desired egg colour and egg size; however, good quality eggs should always be free from internal blemishes such as blood spots, pigment spots, and meat spots.

by **Paulien Rutten, Nutritionist,**
Hendrix Genetics Layers.
www.hendrix-genetics.com

Table egg quality is determined by genetics and management. Within Hendrix Genetics' breeding department, more than 50 traits are examined within their R&D facilities that are linked to egg quality. This large collection of data ensures that the best birds are selected for producing good quality eggs.

Genetics plays an important role in resulting egg quality, but management is another key factor.

Yolk colour and quality

Health and management are also important factors in achieving good internal egg quality. Egg yolk colour can be controlled using carotenoids, whether from synthetic or natural origin, to achieve the desired yolk colour. Carotenoids bring colour to the egg, and they also modulate the anti-oxidant potential of the eggs, which can affect embryo development as well as enhance the yolk's health benefits.

When looking at egg yolk composition, the feed composition will be a strong reflection of the end result. Egg yolk fatty acid profile is directly linked to the fatty acid profile of diets. Diets rich in omega 3 and omega 6 fatty acids will lead to egg yolk rich in a feed fatty acid profile.

The concentration of feed vitamins will also affect egg yolk vitamin composition. Within the egg yolk, mainly fat soluble vitamins are transferred, such as vitamin A, vitamin E and vitamin D.

Water soluble vitamins are also transferred to the egg yolk, such as riboflavin, folic acids, niacin, thiamine, pyridoxine, pantothenic acid, biotin and vitamin B12.

In addition to maintaining high internal egg quality, certain imperfections in the egg yolk should also be avoided. Blood spots found in the egg can have some nutritional links.

Blood spots are affected by mycotoxin contamination, such as ochratoxin, strong choline deficiency, vitamin A and vitamin K.

Egg white quality

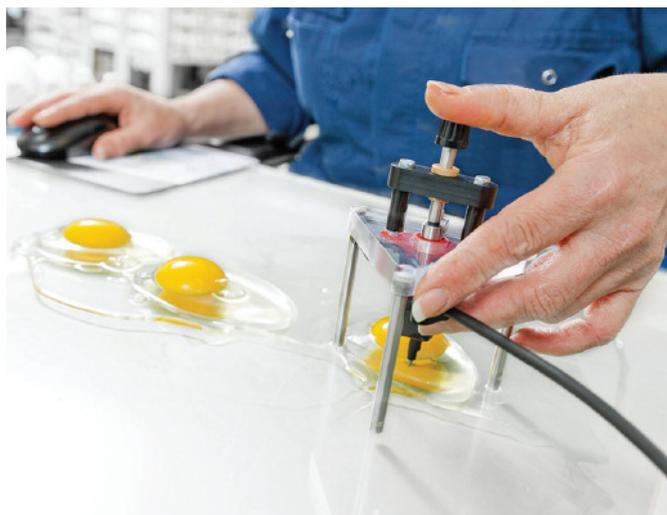
Egg white composition is also strongly linked to the bird's diet. Water soluble vitamins have been shown to affect egg white concentration, such as riboflavin, folic acids, niacin, thiamine, pyridoxine, pantothenic acid, biotin, and vitamin B12. These elements are transferred into the egg white and their concentration depends on feed concentration.

Albumen and vitelline membrane quality

The most common test for internal egg quality was invented by Raymond Haugh in 1937. After being weighed, an egg is broken onto a flat surface and a micrometer is used to determine the height of the thick albumen that surrounds the yolk. The height, correlated with the weight, determines the Haugh Unit, or HU rating. The higher the number, the better the internal quality of the egg. The albumen ratio is important to the food processing industry as standards demand a certain quantity of good solids (dry matter) in the eggs.

Another important parameter for egg quality is the vitelline membrane strength. A strong membrane is useful to keep the egg white and yolk separate.

A weak membrane can lead to important economic losses within an egg processing plant because once the membrane is broken, the egg yolk can pollute the egg white.



Measuring the Haugh Unit for internal egg quality.

There are a number of factors that may affect the Haugh Unit: egg storage time and temperature, hen age, nutrition, disease, supplements, exposure to ammonia, induced moult, and medication.

High vanadium levels in the feed are one potential cause of lower Haugh Units as vanadium can reduce the amount of crude ovomucin per millilitre of thick egg albumen.

Longer storage time, especially at higher temperatures, can reduce the albumen quality as the pH increases over time.

In addition, the quality of the vitelline membrane declines, making the yolk more breakable.

When identifying the cause of poor albumen quality, be sure to look at the risk of disease. Infectious bronchitis virus has been observed as a main contributor to reduced albumen quality.

Other potential disease factors are Newcastle disease, laryngotracheitis, or egg drop syndrome. Like the egg yolk, the vitelline membrane's fatty acid profile depends on the fatty acid profile of the feed.

Saturated fatty acids have been shown to increase vitelline membrane permeability.

Additionally, vitamin E can be used to increase vitelline membrane strength.

Egg composition and management interaction

All nutritional factors affecting egg composition, whether for internal or external egg quality, are linked to nutrient intake.

It is important to manage the birds' feed composition as well as feed distribution management. Laying hens have a strong preference for coarse feed particles.

Feed distribution management must introduce an empty feeder period in the middle of the day for 1.0 to 1.5 hours to secure fine particles consumption.

The goal is to secure an intake of small particles containing phosphate, vitamins, trace elements and pigments.

When birds are given the opportunity to sort feed particles, the eggs produced will be very variable in terms of their composition.

An empty feeder technique will promote uniform feed consumption for uniform egg quality.

Looking at each of these factors will enable egg producers to monitor and optimise egg quality. ■

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The withdrawal of antibiotics as performance enhancers and the rational use of the therapeutic form in animal production is a pressing issue all over the world, not only for consumers but also for the scientific community and international regulatory bodies.

by Liliana Longo Borges and Melina Bonato, R&D, ICC Brazil. www.iccbrazil.com

In January 2017 the United States banned the use of any antimicrobial substance of importance in human medicine and large companies in the fast food market adhered to antibiotic-free production, where antibiotics are no longer used even in the therapeutic form.

According to the WHO (2015), about 600 million, or nearly 1 in 10 people worldwide, become ill after consuming contaminated food. Of these, 420,000 people die, including 125,000 children under the age of five. Bacteria cause most cases of foodborne illnesses, and the most frequent serotypes are *Salmonella* spp, *Escherichia coli* and *Staphylococcus aureus*.

The impact of antibiotics on the gut microbiota has been more recently investigated and researchers have shown that, in addition to altering the composition of the microbiota, antibiotics can also affect the gene expression, protein

activity and the overall metabolism of the intestinal microbiota.

Microbial changes caused by antibiotics increase the immediate risk of infection and can also affect basic immunological homeostasis in the long-term.

With this new reality, it is imperative that the production chain adapts and applies a strict plan of management, health, and nutrition, since the transmission could be by the ration, environment or even vertical (from the breeder to the chicken/laying hen), so a proper management plan is essential in this control.

Alternative methods of control

There are several alternatives on the market to control pathogenic bacteria, such as live attenuated vaccines (which act on *Salmonella gallinarum*, *Salmonella typhimurium*, and *Salmonella enteritidis*); products that act on the feed as bactericidal antimicrobials, or products that act on the animal organism, such as probiotics, organic acids, plant extracts, prebiotics, etc.

Each product has a different mode of action, directly or indirectly modulating the microbiota and the response of the immune system.

The yeast cell wall from *Saccharomyces cerevisiae* is one of the solutions that can help with a pathogen control program since it is a natural solution that helps to

reduce the contamination and prevent the problem. Based on this concept, ImmunoWall stands out from other products because it is composed of a dense yeast cell wall of *Saccharomyces cerevisiae* with high concentrations of β -glucans and mannan oligosaccharides (MOS), resulting in a feed additive with proven results and great cost/benefits.

MOS is known for its capacity to agglutinate pathogens. It will prevent pathogen colonisation in the gut as it offers a binding site to harmful bacteria that possess type 1 fimbriae present in the intestinal tract.

Because the β -glucans are indigestible, the 'trapped' bacteria will be excreted together with the faecal material.

It is important to highlight that to reach its full functionality, the yeast cell walls must have a low digestibility in the intestine.

β -glucans are the indigestible portion of the yeast cell wall, thus, the higher the β -glucan concentration, the lower the digestibility of a yeast cell wall. The β -glucans present will also modulate the immune response of the animals as they are natural stimulants of the innate immune system. When phagocytic cells are in contact with β -glucans, these cells are stimulated, and cytokines are produced.

The production of cytokines will trigger a 'chain reaction', inducing a higher immune status in animals, making them able to resist opportunistic infections better.

Thus, supplementation with ImmunoWall ensures that birds maintain the balance of the intestinal microbiota and improve their immune system responses, resulting in decreased contamination and transmission of pathogenic bacteria to other organs of the body.

Study of performance

A study (unpublished data) was conducted with the aim of understanding the performance responses of the animals supplemented with different levels of ImmunoWall compared to an antimicrobial growth promoter (AGP).

No statistical difference was found between the studied doses of the yeast cell wall and the positive control (AGP) related to body weight gain. The feed conversion was similar to AGP when the level of 0.5kg/MT was supplemented (see Table 1).

The results showed that the substitution of AGP with a natural product does not impact on animal performance since the expected benefits on intestinal health also reflect zootechnical indexes.

Security begins on the farm

A link between quality, nutritional value, and food safety is a task that has required a lot of research by the industries to ensure public health.

While intensive poultry production is a challenging environment, food security begins on the farm, where it is possible to control pathogens without the use of antibiotics as growth promoters.

However, it is of the utmost importance that producers, who are the first link in the chain of production, commit themselves fully. This is because it is proven that the reduction of pathogens in the field contributes significantly to reducing the risk of foodborne diseases due to bacterial contamination.

Table 1. Performance of broilers at 42 days of age supplemented with AGP or different levels of ImmunoWall (Dr Michael D. Simms, Virginia Diversified Research Corp., Harrisonburg, USA, 2012. Unpublished data).

Treatments	FI (kg)	BWG (kg) ²	FC (kg/kg) ³	Mortality (%)	PF ⁴
Negative control	4.320	2.242 ^b	1.927 ^c	1.7	267
AGP (BMD) ¹	4.273	2.395 ^a	1.784 ^a	2.3	307
IMW 0.25kg/MT	4.437	2.360 ^{ab}	1.880 ^c	0.0	294
IMW 0.50kg/MT	4.256	2.359 ^{ab}	1.804 ^{ab}	1.0	303
IMW 1.00kg/MT	4.347	2.399 ^a	1.812 ^b	1.0	307

¹AGP - Bacitracin Methylene Disalicylate. ²Means followed by different letters in the same column, differ by Tukey test at 5% significance. ⁴PF: production factor = [(BWG (kg) x viability (%)) / (FC x age)] x 100.

References are available from the author on request



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The microbiota-brain connection: the key to enhanced performance

Numerous publications show the various impacts that the microbiota has on the whole living being. When this flora is unbalanced, it leads to abdominal pain, psychological stress and therefore an alteration of the quality of life. As a consequence, top-performing animals do not reach their potential.

by Jean-François Gabarrou,
Poultry Market Manager,
Phodé, France.
www.phode.com

Antibiotics as growth promoters were used to reduce opportunist microflora activity, but this also reduced microbiota diversity and interesting microflora activity.

By adopting a holistic approach to the animal, Phodé offer sensory solutions with original modes of action and proven efficacy.

Microbiota-brain connection

Gut health is essential for animal production. Bacteria present in the gut are closely linked to other systems, such as the immune system and the brain. The microbiota-gut-brain axis (Fig. 1) is a bidirectional homeostatic axis. It is now recognised that a dysfunction of this axis can lead to pathogenesis.

This symbiotic relation between host and bacteria is at the origin of an overall balance. When this balance is not optimal, modulation

of the stress response, behaviour and immunity can be altered.

Alteration of immunity is likely to lead to sickness (lower innate and adaptive immune response, and an increase in pro-inflammatory cytokines in plasma). The microflora also impacts the brain by controlling the concentration of various neurotransmitters, affecting behaviour.

In modern farming, dysbiosis (unbalanced microbiota) may occur at different stages of production. It can be caused by farm management, feed transitions, psychological or physical stress, sickness or antibiotics, etc.

When an animal faces dysbiosis, it is possible to restore the optimal gut health status within three weeks. During this time, the economic loss will not be recovered. Obviously, the use of preventive methods to maintain digestive tract homeostasis is a key driver for performance.

Phodé's concept

Phodé considers 'Better-Being' in animal farming as the cornerstone for reaching optimum performance. The microbiota-gut-brain axis is a unique system called the 'cerebral ecosystem'.

Based on this original approach, Phodé offers specific and innovative solutions adapted to modern farming expectations.

Oleobiotec is an exclusive blend of essential oils and spice extracts designed to optimise transmission of the 'Better-Being' message through the microbiota-brain connection.

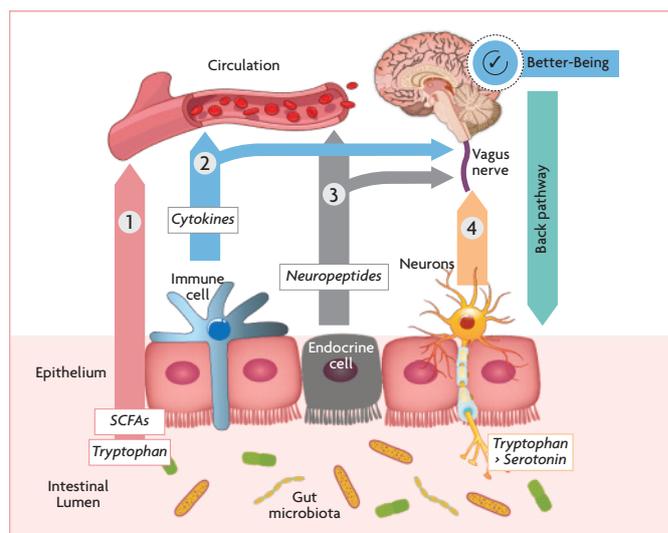


Fig. 1. The microbiota-brain connection.

A naturally inspired solution

Essential oils and spices are widely known in human medicine and are also used in animal medicine. They regulate microflora and stimulate the secretion of enzymes, gastric juices and motility of the gut.

Firstly, the action of an essential oil depends on its chemotype defined by nature: the plant, the area where it was grown, the season and other factors.

Phodé draws on 20 years of expertise to carefully select active ingredients and create unique solutions.

The company guarantees consistent and effective solutions,

thanks to a sourcing commitment and strict quality standards.

Secondly, Phodé's expertise and know-how foster enhanced efficacy, combining natural active compounds in order to benefit from their synergistic effects.

Each species has its own gut microbiota. Specific products were thus created to offer solutions for poultry, swine and ruminants. For the last 10 years, over 30 trials have been conducted with scientific partners, commercial partners and customers around the world.

Laying performance and egg shell quality

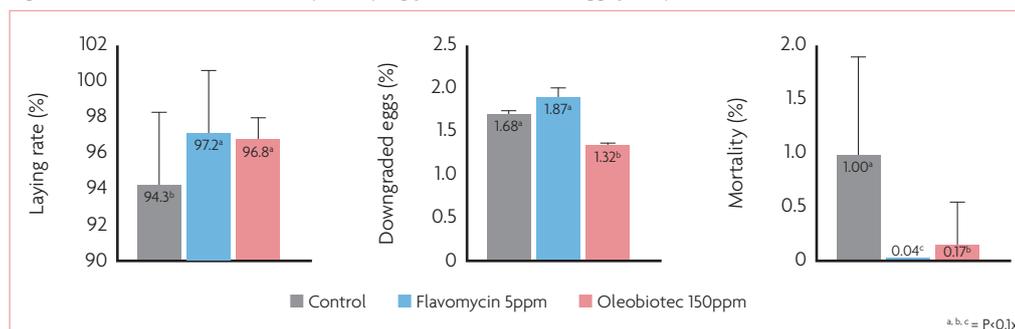
Oleobiotec Poultry has been successfully used with a view to replace growth promoters in laying production.

For example, in an experimental station in Mexico, three groups of 216 Bovans White hens were distributed into 12 cages each (n=12) at 16 weeks of age for 12 weeks (first period of laying). Climate was very unstable from 15-34°C with a high RH of 82%.

The first group was a negative control, the second a positive control with 5ppm of flavomycin on

Continued on page 13

Fig. 2. Effect of Oleobiotec Poultry on laying performance and egg quality.

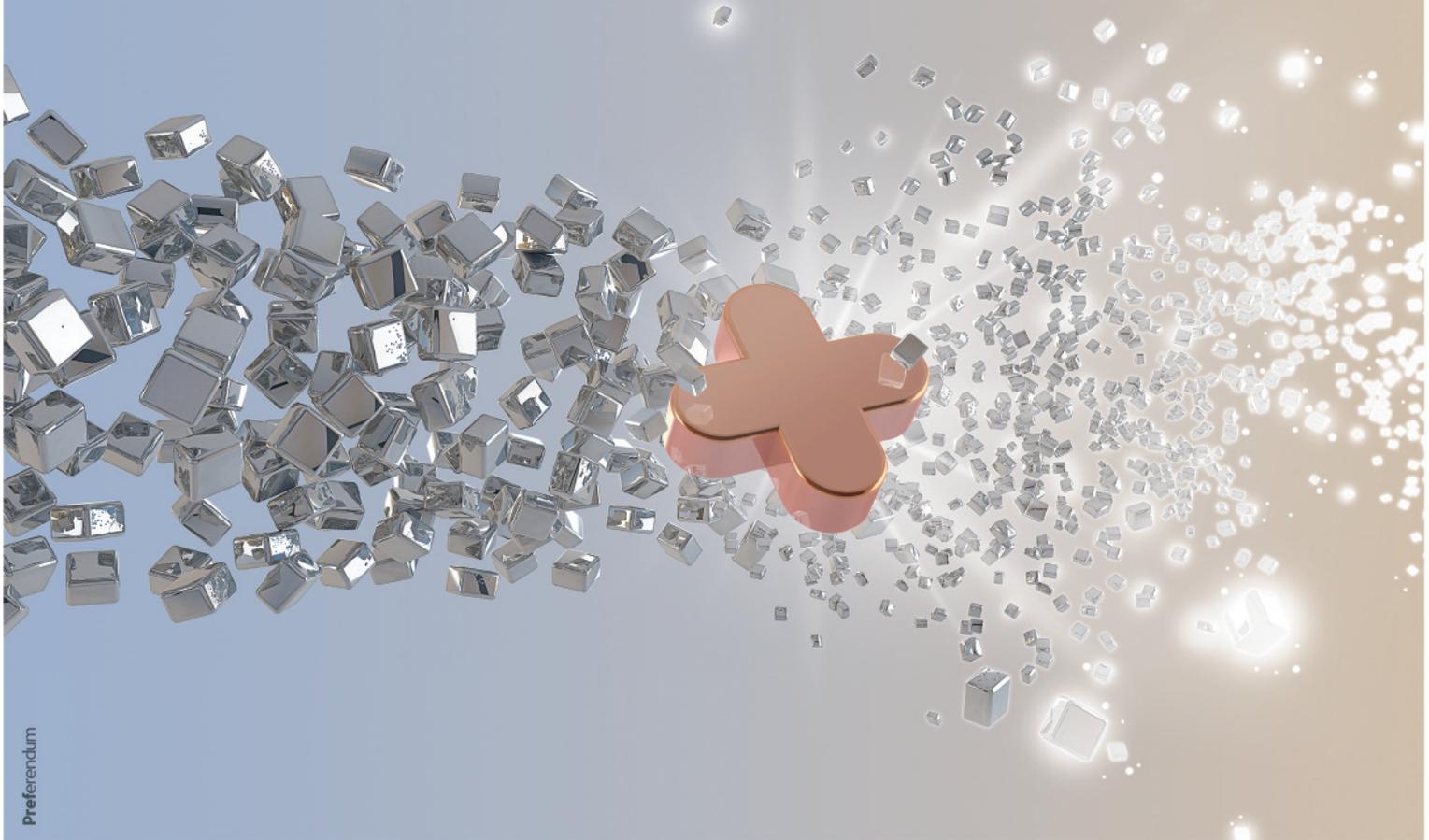




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Type of treatment n = 6 x 24	Feed intake	Live weight	FCR
Standard specifications + BMD 55ppm	4447 ± 29	2568 ± 22 ^a	1.740 ± 0.062
Low specifications (-2.5%) + BMD 55ppm	4417 ± 25	2484 ± 23 ^b	1.774 ± 0.076
Low specifications (-2.5%) + Oleobiotec 100ppm	4398 ± 23	2553 ± 21 ^a	1.718 ± 0.052
P	0.231	<0.001	0.146

Table 1. Comparison of different diets with Oleobiotec Poultry and bacitracin methylene disalicylate (BMD) to balance a poor quality feed.

Continued from page 11
top of the feed, and the third group was the treatment group with Oleobiotec Poultry also on top of the feed (100ppm).

In these conditions, the laying rate was significantly increased compared to the negative control exhibiting no significant differences between flavomycin and Oleobiotec (Fig. 2). The feed conversion ratio was improved only by Oleobiotec. Mortality was also very low thanks to Oleobiotec compared to the control.

Better nutrient efficiency

Oleobiotec Poultry is also used to replace growth promoters in broiler

production. In an experimental farm in Canada, 432 one day old Ross 308 were placed into 6 pens x 3 treatments (18 pens x 24 birds). The positive control (T1) was formulated to conform to Ross specifications with 55ppm of bacitracin methylene disalicylate (BMD).

Treatments 2 (T2) and 3 (T3) were fed a low nutrient diet, where metabolisable energy, crude protein and amino acids were reduced by 2.5%. T2 diet included BMD (55ppm), and T3 included OLEO (100ppm).

There was no significant effect of treatment on FI (Table 1). Live BW was significantly lower (P<0.001) for T2 than T1 and T3. There was no significant effect on FCR, maybe due to the low number of replicates (n=6) for this indicator. The N and P

conversion ratios were significantly reduced (p<0.05) in T3 compared to T1 and T2 (Fig. 3). In both cases the increment of feed cost compared to growth promoter was widely balanced by the best performances due to Oleobiotec Poultry.

Conclusion

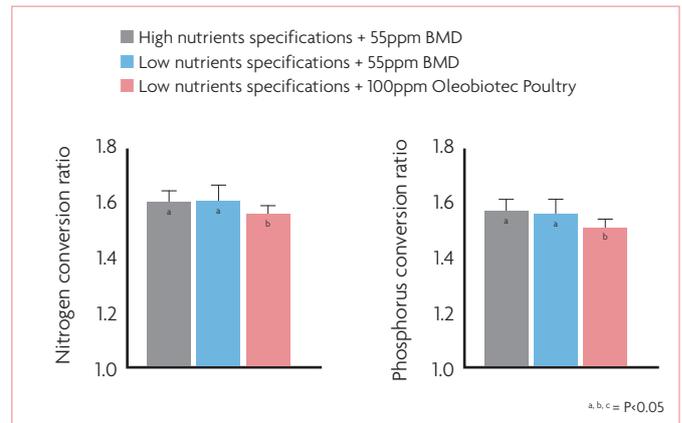
Phodé's product is a unique solution, proven effective in promoting the balance and diversity of the gut microbiota for 'Better-Being'.

Acting on the whole cerebral ecosystem is the key to help animals reach their full potential.

Ongoing research on plant extracts promise novel solutions in the future to combine animal performance and sustainability. Its original mode of action of balancing the microbiota will have a positive effect on the whole cerebral ecosystem, allowing animals to reach their potential through 'Better-Being'.

References are available from the author on request

Fig. 3. Nitrogen and phosphorous efficacy are improved with Oleobiotec Poultry.



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Nutritional solutions enhance bird health in an antibiotic-free era

Worldwide population growth, rising incomes and urbanisation are triggering an explosion in demand for high quality animal protein. By 2030, the World Health Organisation (WHO) projects annual meat production to reach 376 million tons globally – up from 218 million tons in 1997-1999.

by Dr Dan Karunakaran,
Technical Services Manager,
Poultry, ARM & HAMMER, USA.
www.ahanimalnutrition.com

This trend is great news for the livestock industry, but it also comes with challenges. Surging demand requires producers to achieve highly efficient growth and optimal animal health.

Among other management challenges, they must control a myriad of diseases, including those caused by bacterial infections.

One estimate notes that 80 types of bacteria pose serious threats to the poultry industry. *Escherichia coli*, *salmonella* and *clostridium* are among the leading pathogens causing disease in poultry, as well as in swine, dairy and beef production.

Meanwhile, changing consumer preferences and new government regulations often require adjustments in antibiotic protocols to control these pathogens.

Researchers worldwide are seeking non-antibiotic solutions that overcome disease while still enhancing performance.

Understanding clostridia

The first step in finding non-antibiotic solutions to animal health threats is to understand common disease-causing pathogens.

For example, clostridia live in the soil and in poultry facilities throughout the world and are part of the normal digestive tract bacterial community for animal species everywhere, including your birds. As such, clostridia continually make their way into facilities, feedstuffs and poultry flocks,

causing various challenges to bird health and efficiency – including severe mortality – when conditions get out of balance.

Necrotic enteritis is caused by *Clostridium perfringens*, which typically occurs in broiler chickens but has also been diagnosed in various avian species. Several predisposing factors for necrotic enteritis have been identified, including dietary factors, immune status, stress, intestinal physiology and pathology and coccidiosis.

During gut integrity compromising events (such as with coccidiosis) they can proliferate to cause necrotic enteritis.

A comprehensive sampling program on US poultry farms offers insight into microbial communities in specific environments – including the presence and prevalence of clostridia and other bacterial species. The information also helps provide a snapshot of bird health on tested facilities. For instance, in addition to clinical signs of necrotic enteritis from individual bird samples, this information also shows levels of subclinical challenges that cut into profits even though you may not see clinical disease symptoms – losses due to poor weight gain and greater variation in performance.

In the case of subclinical enteritis, chronic intestinal mucosal damage leads to production losses due to poor digestion and absorption, reduced weight gain and increased feed-conversion ratio. Generally, no overt clinical signs are present and usually there is no elevated mortality.

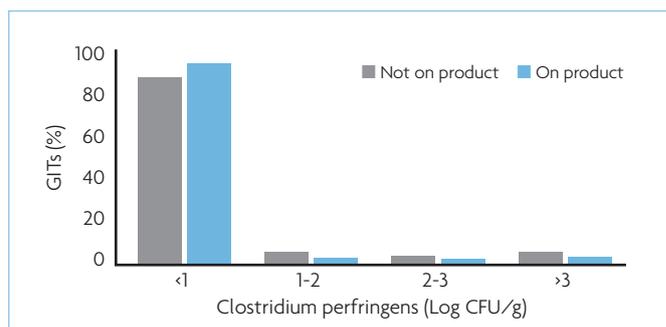


Fig. 2. The effect of targeted microbial solutions on *C. perfringens*.

ARM & HAMMER laboratory results show a significant portion of the samples from seemingly healthy birds show pathogen levels that may lead to subclinical disease challenges (Figs. 1 and 2).

By collecting samples from across the United States and organising them into regions defined by geography and prevailing farm management styles, researchers created a clear picture of clostridial populations in specific regions.

Microbial differences

Test results indicate that both the species of clostridium and the level of diversity differ across regions. Regional differences may be due to varying litter types, environments, feedstuffs, animals and management styles. Taken together, these elements form the Microbial Terroir – or microbial makeup – of a region or individual farm. Differences in

Microbial Terroir help explain why certain challenges plague some areas more than others.

This same principle applies to all environments and animal species. Collection and testing programs for swine and cattle show similar results in bacterial diversity by farm and region.

Microbial solutions

The robust sampling and analysis program has led to a solution for combating pathogens like clostridia and *E. coli* on a regional and individual basis. The solution harnesses *Bacillus* bacteria, which coexist with clostridia in the soil and are natural enemies of bacteria.

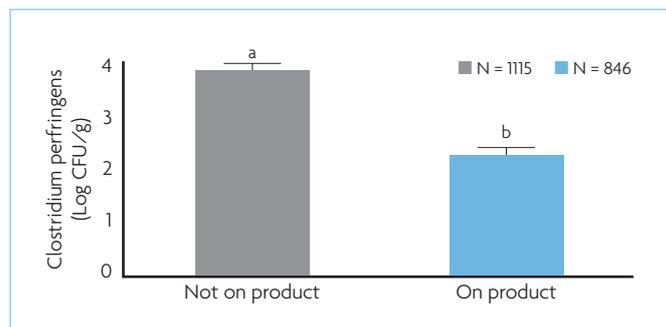
Utilising specific bacterial strain profiles, researchers identified several specific combinations of proprietary strains of *Bacillus* bacteria that inhibit toxigenic and non-toxic clostridium and avian pathogenic *E. coli*, known as targeted microbial solutions.

Feeding these proprietary bacillus strains helps lower harmful bacteria loads in gastrointestinal tracts and enhances overall animal health, production and efficiency. With long-term use, feeding bacillus changes the pathogen profile of a farm. The data shows the positive effects targeted microbial solutions have on *Clostridium perfringens*, reducing total counts and shifting towards lower levels in the GIT.

The important lessons are:
 ● Bacterial populations and

Continued on page 16

Fig. 1. The effect of targeted microbial solutions on *C. perfringens*.



Continued from page 15
 diversity vary across the country and across the globe. Different combinations of Bacillus are necessary to address these challenges specific to each region.

- Feeding bacillus over the long term changes the Microbial Terroir of a farm, including changes in clostridial populations and species diversity.

Positively affect gut health

Gut health is another pathway to finding non-antibiotic production solutions. As Australian researchers note: "The nutritional and health status of poultry are interlinked with gut health, which includes immune

system, gut microbial balance and macro and micro-structural integrity of the gut. The health of the gastrointestinal tract affects digestion, absorption and metabolism of nutrients, disease resistance and immune response." Swine, dairy and beef researchers share similar sentiments.

In the quest for non-antibiotic solutions to help enhance animal health and productivity, producers are increasingly turning to Refined Functional Carbohydrates (RFCs). RFCs have been shown to offer many benefits that may be associated with gut health and immune response.

RFCs are the components harvested from yeast cell walls (*S. cerevisiae*) using specific enzymes during a proprietary manufacturing

process. This enzymatic hydrolysis yields MOS (mannan oligosaccharides), Beta 1.3-1.6 glucans and D-Mannose – all of which are readily bioavailable in Celmanax due to this proprietary process.

Research shows that each RFC has a specific mode of action and outcome when fed to livestock. Across numerous studies RFCs improved feed conversion ratio (FCR) by five points in broilers (Fig. 3).

Overcoming challenges

Additional trials explored how RFCs helped broilers improve performance in the face of health and environmental challenges.

In this study, researchers examined

the effects of clean water, mycotoxins and coccidia, as well as RFCs (50g/MT), on broilers. The basal diet contained on average 50ppb aflatoxin, 0.4ppm deoxynivalenol (DON) and 2.7ppm fumonisin.

Treatments included new or used litter, clean or unchanged water and diets that did or did not include a coccidiostat.

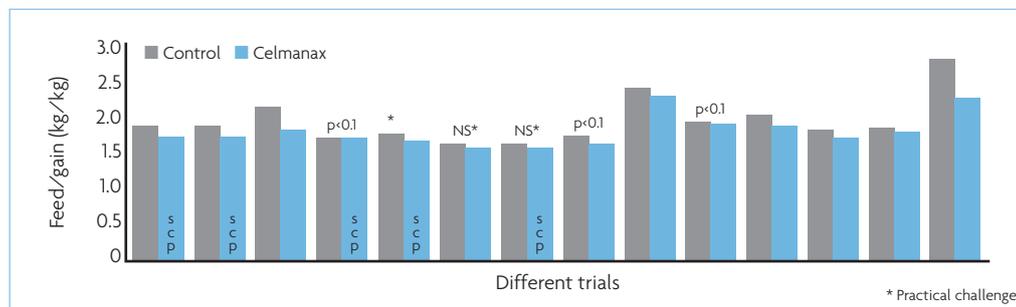
Researchers found:

- The study demonstrated the capacity of RFCs to maintain feed efficiencies in the absence of a coccidiostat in the grower and finisher phase.
- In the presence of water, litter, mycotoxin and coccidia challenges, RFCs improved the feed conversion ratio at 35 and 49 days of age.
- Under these challenge conditions, the addition of RFCs to diets in all three broiler growth phases was found to support optimal performance.

Therefore, including RFCs in an animal's diet throughout its life cycle can help improve immune function by providing a defence mechanism against pathogenic bacteria. As a result, RFCs can help maintain gut health and overall animal health, boosting the immune response. ■

References are available from the author on request

Fig. 3. Effect of Celmanax on feed conversion ratios in broilers.



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Understanding mycotoxins in turkeys: Part 2

A rigorous testing schedule should be put in place to continuously assess the mycotoxin threat to the feed stuff and also assist in identifying contaminated lots.

by Marcus Kenny, Company Nutritionist, Aviagen Turkeys. www.aviagenturkeys.com

There is significant variability in the process of testing for mycotoxins brought about by the variability in sampling, sample preparation and analytical variation. Table 1 shows the variability associated in measuring aflatoxin in a lot of contaminated corn. Variation through sampling contributes to over 75% of the overall error of testing.

Sampling error is large because of the extreme distribution among contaminated particles within a lot.

It is estimated that only six kernels in 10,000 are contaminated in a lot containing a concentration of 20ppb aflatoxin.

A single spot sample or probing point is satisfactory if the contaminated particles are evenly distributed through the lot, however mycotoxins generally occur in isolated pockets through the lot. Increasing the number of samples taken from a lot can increase the chances of identifying contaminated lots. Procedures used to take a

Fig. 1. An example of a 5 and 8-probe sampling pattern (adapted from Whitaker et al., 2005), X = 5 Probe Patterns; X+O = 8 Probe Patterns.

Front		
X	O	
		X
	X	O
O		X
X		
Rear		

sample from a bulk lot are extremely important; every individual item in the lot should have an equal chance of being chosen.

The sample should be an accumulation of many small portions taken from many different locations throughout the lot. When drawing a sample from a bulk container a probing pattern should be developed so that product can be collected from different locations in the lot. An example of a probing pattern used by the USDA is shown in Fig. 1.

The sampling probe should be long enough to reach the bottom of the container when possible. When sampling from a moving stream, for example a moving belt, small increments should be taken along the entire length of the moving stream.

Composite all the increments to obtain a bulk sample. If the bulk sample is larger than required then blend and subdivide the bulk sample to obtain the desired size test sample.

Analyses

Rapid strip tests:

Analyses of feedstuffs for presence of mycotoxins can be conducted efficiently through the use of enzyme linked immunosorbent assays (ELISAs) testing kits and have become a standard tool for rapid monitoring of mycotoxins. This method is satisfactory in order to establish if a specific feedstuff is either under or over a legal compliance level.

HPLC and GC-MS analyses provides more accurate determination of the level and type of mycotoxins present in the feedstuff.

Table 1. The variability measured by the variance associated with a 0.91kg sample, 50g subsample, measuring aflatoxin in 1 aliquot by immunoassay in a lot of shelled corn at 20ppb aflatoxin¹.

	Variance	Ratio (%)
Sample = 0.91kg	268	75.5
Subsample ² , 50g	56	15.9
Immunoassay, 1 aliquot	30	8.6
Total	355	100

¹Sampling, sample preparation, and analyses errors account for about 75.5, 15.89 and 8.6% of the total errors, respectively. ²Romer Mill used to grind.



Fig 2. Artemia salina.

Some toxins can escape detection as they may be masked by glycosides or proteins which are attached to the toxin giving a false negative result, more refined analyses methods are required to measure such toxins.

Bio-assays are used to establish the presence of specific mycotoxins. An example is using crustacea, such as Artemia salina (see Fig. 2), and assessing survival rate from a sample of material

Preventative approaches

Assessing the mould levels of grain can indicate the likelihood of mycotoxins occurring.

Testing the material for the level and type of mould can sometimes indicate what the likelihood of mycotoxin contamination may be. However it is possible that moulds may no longer be present in the material but the mycotoxins are; the

best practice is to analyse for both moulds and mycotoxins.

Damage or stress to the plant by diseases, insect or bird damage, weeds, frost or drought permits easy entrance of moulds and fungi, and promotes rapid development of moulds.

Insect damaged grain is more vulnerable to mould growth so reducing insect infestations is critical in preventing mould growth in grains. Some toxins such as aflatoxins tend to occur in broken and damaged kernels and in foreign material.

Avoid harvesting grain at an excessively high moisture content and keep in a holding bin using forced air to keep cool, store the grain in weatherproof, well ventilated facilities and monitor the temperature of stored grain.

Drying the grain slowly and at low temperatures for long periods promotes aflatoxin development.

All handling equipment and storage facilities must be kept well ventilated and clean and dry prior to and during use.

Storage facilities must be free of moisture leaks and all residue removed to reduce contamination.

Applying liquid or dry mould inhibitors, use of organic acids such as propionic acid and ammonium isobutyrate will prevent mould growth if correctly applied as it is augured into the silo.

However, organic acids will not destroy toxins already present in the grain.

Continued on page 19

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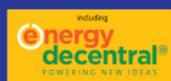


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Continued from page 17

Visual assessment of the lot

Look out for visual clues of contaminants. Grains can show signs of mould growth (see Fig. 3) and/or insect damage and presence of 'fines' which are associated with mould growth.

Cleaning

During the cleaning process of contaminated grain, dust, husks, hair and shallow particles are blown away by aspiration or scouring. Grain cleaners have been shown to reduce the level of aflatoxin in maize grain by as much as 50%.

Mechanical sorting and separation

In this process the clean product is separated from mycotoxin-contaminated grains. High feed losses are possible due to incomplete and uncertain separation. Therefore mechanical sorting and separation is not always considered cost-efficient. 'Blending down' material which has been analysed higher than maximum permitted levels of toxins is not permitted in some regions.

Washing

Washing procedures using water or sodium carbonate solution result in some reduction of mycotoxins in grains.

Treatment:

Nutritional approaches

● Increased levels of antioxidants, methionine, selenium and vitamins in affected feeds have been shown to counteract the effects of mycotoxins as well as addition of chlorophyll, algal derivatives and aspartamine.

Chemical detoxification

● Detoxification with ammonia or ammonia related compounds is considered to be one of the most practical means of decontamination of aflatoxin in agricultural commodities. Dietary aflatoxin inactivation by ammonisation for layer breeders had no detrimental effect on the immunological response elicited by Newcastle disease vaccination as measured by haemagglutination-inhibition titers. Hydrogen peroxide is an oxidising agent acceptable in foods and the potential to destroy up to 97% of aflatoxins. Similar effects have been found with treatment by organic acids and surfactants.

Mycotoxin sequestering agents

Supplementation with non-nutritive mycotoxin-sequestering agents is by far the most practical and most widely studied method for reducing the effects of mycotoxin exposure.

● Activated charcoal is an amorphous form of carbon heated in the absence of air and then treated with oxygen to increase porosity. There is some data to suggest activated charcoal is effective in absorbing some aflatoxins but not toxins derived from other species. Activated



Fig. 3. Maize grains contaminated with mould.

charcoal can also result in absorption of micronutrients in the feed.

● Silicate minerals (clays) include bentonite, zeolite and hydrated sodium calcium aluminosilicate. The absorption technique uses compounds that form a complex with the toxin preventing absorption of the aflatoxin across the intestinal epithelium reducing the amount of toxin absorbed into the blood stream. High levels of inclusion could provide excessive sequestration capacity that may decrease the bioavailability of important micronutrients.

● Yeast cell wall-based adsorbents, principally modified glucomannan, are able to adsorb higher levels of several mycotoxins at lower inclusion rates than inorganic binders. The specific mode of action of some yeast cell wall components suggests that their activity would not affect the availability of micro-nutrients. Modified glucomannan has been shown to bind fusarium derived toxin.

Biotransformation

Biological detoxification by enzymes and/or micro-organisms degrades mycotoxins within the gastrointestinal tract, before resorption into the animal occurs. There are now enzyme and micro-organism based products effective in transforming specific toxins such as fumonisins and trichothecenes into non-toxic metabolites.

Summary

- Prevent fungal growth on crops in the field, at harvest, during storage of feedstuffs and processing of feed.
- Implement mechanical means of removing contaminated material from the feedstuff and consider addition of mould inhibitors/killers.
- Implement a mycotoxin testing schedule. This is important for the risk assessment to livestock and also from a regulatory and human health point of view.
- Apply a robust sampling plan. Increasing the number and size of samples taken from a lot can increase the effectiveness of testing and the chances of identifying contamination.
- Detect and quantify the mould and mycotoxin concentration in the feedstuff remembering many mycotoxins co-contaminate materials. Detection of one toxin may indicate presence of another more toxic mycotoxin.
- When the feedstuff is contaminated take action before the birds consume the feed, not after the birds are affected by the toxin.
- Remove and replace the feed or apply an appropriate mycotoxin binder or bio-transforming agent specific to the type of toxin recovered in the feed.
- Monitor the flock for any performance or clinical related signs of mycotoxicosis.
- Implement an ongoing mycotoxin surveillance program.

References are available from the author on request

Table 5. The effect of T-2 toxin on laying hen performance.

T-2 toxin (ppm)	Egg production (%)	Egg weight (g)	Body weight (g)
0.0	96.29	52.45	1,332
0.5	93.81	51.77	1,313
1.0	91.75	51.35	1,286
2.0	86.65	51.33	1,285

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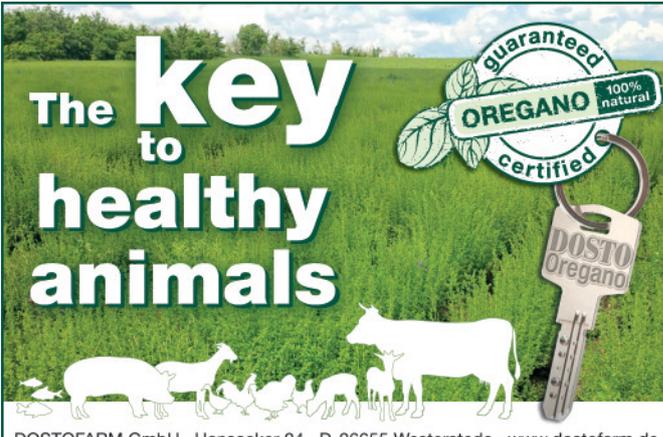
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Phytobiotics in multiple challenged environments

The complexity of animal welfare in the broiler industry highlights several factors that have a serious impact on productivity, among which, the role of pathogens is very crucial.

drbata.com

Depending on the farm specific hygiene program, handling or water supply, broilers face multiple challenges and this can result in reduced production parameters.

Phytobiotics are materials of plant origin that help in limiting selectively the growth of different pathogenic micro-organisms due to their antibacterial, antifungal or antiprotozoal effect.

In a recent in vivo trial the preventive potential of Herbanoplex CP – a hop-based phytobiotic-prebiotic feed additive – was examined.

As a challenge model litter filtrate was used through drinking water on day 4, 7 and 14.

Altogether four groups were established:

- A positive control group receiving the litter filtrate.
- A negative group without being challenged.
- A trial group receiving Herbanoplex CP in 1kg/t concentration and the multiple challenge via litter filtrate.
- A heat treated positive control group receiving litter filtrate with inactivated pathogens but

containing the potential microbial toxins found in commercial litter.

Litter was obtained from a commercial farm with low hygienic standards with serious E. coli related problems. It contained high numbers of E. coli, C. perfringens and Eimeria oocysts. Altogether, 200 birds were involved in the trial, which took place in two houses with two replicates per pen and lasted for 42 days.

Birds were weighed individually. The results of the 14 day and 42 day old bodyweight measurements are detailed in Fig. 1. Statistical analysis was performed using Anova analysis.

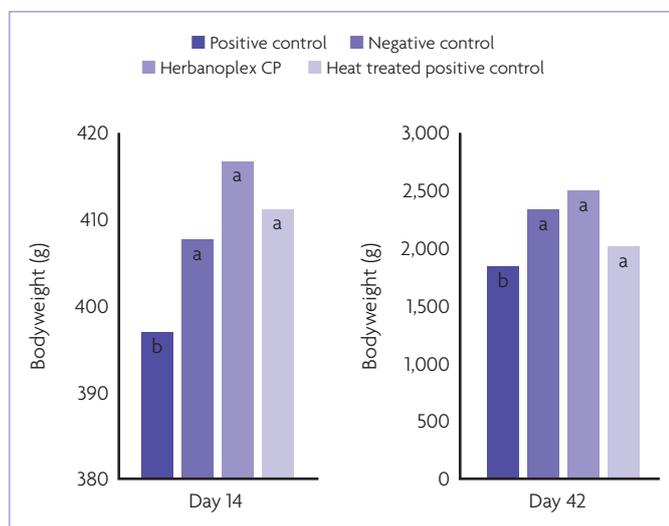
Results indicated that the tested phytobiotic-prebiotic compound can successfully be applied for the prevention of multiple diseases, even when farm conditions are mimicked and complex challenge is present.

While the obtained body weights in the negative control and heat treated positive control group were very similar, the trial group receiving Herbanoplex CP performed slightly better, both in day 14 and day 42 body weight measurements.

The body weight of the positive control group was significantly lower compared to the other groups.

The continuous implementation of phytobiotic-prebiotic compounds, such as Herbanoplex CP, can prevent the reduction in production parameters during multiple challenges.

Fig. 1. Average body weights at day 14 and day 42.



Natural solutions with a wide range of benefits

The Innovad Aflorin range of natural solutions consists of different essential oils, extracts and natural chemicals with a wide range of benefits.

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Aflorin PL offers the ultimate aid for respiratory stress. This composition of menthol, eucalyptus and saponins offers the following benefits:

- Improves respiration and air passage.
- Reduces mucus accumulation and discharge out of respiratory cavities.
- Reduces the negative effects of disease as well as aiding quick recovery.
- Reduces stress and loss of valuable feed intake.
- Improves resistance to all respiratory infections.
- Reduces the negative effect and stress due to live vaccination.
- Improves survivability and reduces mortality.

Aflorin Liva L combines various plant extracts and liver protective compounds selected to maintain,

support and to restore organ function in case of high metabolism. It supports the animal during:

- Mycotoxin contamination.
- Rancid fat in the diet.
- Fast growth and high metabolic demand.
- Mobilisation of fat in the liver.
- Heat stress.
- Fatty liver.

Aflorin BF L is a natural concept to combat oxidative stress. It is a unique formulation of water soluble source of polyphenols and powerful chelators, representing an efficient source of antioxidants, reinforcing the natural antioxidant defence system and offering a good tool to improve the aspect of meat quality.



Phytogetic adaptation formula for gut agility in laying hens

Competitive egg production requires egg farmers to be highly responsive to quickly changing market needs and at the same time to continuously increase efficiency.

anco.net

In this fast-moving business environment, operational agility becomes key to profitability and success. This also increases the requirement for robustness and the ability to adapt to nutritional and environmental challenges in birds for reliable performance. Important for profitability is how animals react to

these stressors. The phytogetic adaptation formula in ANCO FIT Poultry boosts gut agility and empowers birds to adapt to nutritional stressors including mycotoxins more efficiently.

The improved ability of hens to cope with nutritional stressors leads to a more efficient and agile operation, which can adapt to nutritional challenges in a natural and profitable way.

Stress reactions such as oxidative stress, reduced gut integrity and inflammation are reduced in favour of saving metabolic energy and maintaining a healthy liver for egg production. The resulting support for increased laying persistency can enable longer laying cycles for further economic efficiency and sustainability. Trials have shown that Anco FIT Poultry improves the antioxidative capacity in birds and improves laying persistency in the late laying period under commercial conditions.



Protection for the upper respiratory tract

Mintamix is a well proven synergistic liquid preparation that contains peppermint oil, eucalyptus oil, and vitamin A. All these ingredients can significantly reduce losses in farm conditions that cause inflammation of the upper and lower respiratory tract.

ovet.com.pl

They are especially useful at the time of high temperatures, poor environmental conditions, such as high concentration of ammonia and excessive dust.

The most important ingredient is menthol contained in the mint oil. Its action brings relief in inflammatory airways because it affects cold receptors causing a feeling of coldness. It also has a topical anaesthetic effect, which facilitates breathing, dilates blood vessels, acts as a relaxant and displays a strong antiseptic action. Substances contained in eucalyptus

oil act as a bronchial relaxant, analgesic, and offer strong antibacterial as well as antiviral properties. Vitamin A has a supportive and protective effect on epithelia, including the airway epithelium and mucous membranes, as it accelerates the regeneration and reduces drying.

The product is used as a spray or as a drinking water supplement with great results in a growing number of countries globally.



High production performance despite heat stress

ProtectOx DW is a liquid mixture of organic acids with a strong antibacterial effect, mixed with selected plant extracts with a high content of polyphenols, with a known antioxidant effect in the animal's body.

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● Five times as potent:
The active polyphenols in ProtectOx DW is more than five times as potent as antioxidants as pure ascorbic acid, which is often used against heat stress in broilers.



● Prevents heat stress:
Heat stress in production animals is a challenge, especially in parts of the world where high temperatures and a high relative humidity are present. During heat stress loss of appetite often occurs, and therefore the water system is a great way to provide the animals with sufficient antioxidants, ensuring balance between antioxidants and the free radicals in the animal body.

● Remarkable effect on feed intake and weight gain:
In a university trial ProtectOx DW showed a great effect in broilers from day 1-35, especially when the broilers were exposed to heat stress from day 23-35.



Upgraded performances with upgraded MCG oil

Excellent growth, low conversion rate and diminished mortality – in short, optimal cost-efficiency – is the intent of all farm managers. This is a challenging goal, especially when feeding antibiotic-free feeds.

avevebiochem.com

To help birds achieve optimal performances, AVEVE Biochem upgraded well selected medium chain glycerides (MCGs) with standardised aromatic compounds and developed an in-feed concept called AveMix Plus.

Validation of AveMix Plus on a Belgian farm reports 3.5% extra growth, 2% lower FCR and 15% less mortality.

Literature and trials have reported the effect of medium-chain products and phytochemicals on both

the animal itself as well as on the microbiota present in the gut.

Along with their direct antibacterial effect on pathogens (especially on G-bacteria), medium-chain fatty acids have proven to down-regulate bacterial virulence genes and thus invasion in epithelial cells in broilers. The effect on the intestinal tract of the animal has been documented as well: increased V/C ratio, which favours digestibility and absorptive capacity.

Amongst other effects, carvacrol and thymol are reported to improve intestinal integrity and modulate the immune response in Clostridium perfringens challenged broiler chicks. Their destructive effect on chicken Eimeria oocysts is published.

AveMix Plus is a broad concept for which upgraded performances in AGP-free feed is recorded.

Effective natural enhancer brings health and nutritional benefits

The Bioflavex range is an effective natural enhancer for adding to feeds for all species, bringing health and nutritional benefits to the animal organism. Bioflavex is a rich Citrus flavonoid complex made from bitter orange (Citrus Aurantium) and grapefruit (Citrus paradisi).

bioflavex.com

Flavonoids are powerful phenolic compounds and their intake has demonstrated improvements in efficiency and performance and reduced mortality in animals.

In the case of monogastric species, such as swine and poultry, research has proven that gut health is directly related to animal well being. Due to its flavonoids composition, Bioflavex displays important functions in the large intestine, such as

antioxidant, anti-inflammatory, modulator of microbiota populations and immunomodulator.

Flavonoids present a low bioavailability after ingestion due to their structure of glycoside, acting directly in the large intestine where they are metabolised by the colonic bacteria forms.

Ferrer HealthTech provides effective solutions for animal health and nutrition. The company has been a pioneer in the field of citrus-derived additives for animal feed since 1978.

Currently, Ferrer HealthTech is a leader in the research development and manufacture of APIs, flavours and excipients from citrus fruits to be used in the feed market.



Promoting gut health through all the critical stages of growth

Orego-Stim is a natural product which contains oregano essential oil and is available as a powder or liquid for inclusion in feed or water.

anpario.com

It uses proprietary extraction techniques and rigorous quality standards to ensure a high quality and consistent product.

Orego-Stim promotes gut health throughout all the critical stages of growth, maintaining a healthy appetite and supporting the animal through periods of stress.

Maintaining good gut health helps the animal to achieve its genetic potential, which in turn maximises profitability.

Orego-Stim is a key tool in the management of intestinal health.

Thymol and carvacrol are strong

antioxidants, combating free radicals that can damage cells and helping prevent the process of peroxidation that can damage vitamins.

Increasing antioxidant status can, for example, improve meat quality, lower cellular stress and support gut integrity.

Combine these benefits with the strong immune-regulatory properties of oregano, such as lowering markers of inflammation, and Orego-Stim is an effective tool to support the animal in response to intestinal stress.



Essential oils as non-antibiotic growth promoters

Eco-friendly non-antibiotic growth promoters (NAGPs) were developed due to the increased threat of antimicrobial resistance. The replacement of antibiotic growth promoters with other safe and natural alternatives is an important goal in the poultry industry worldwide.

lessantibiotics.com
xvetgermany.com

Essential oils (EOs) are fragrant and volatile compounds of plants, extracted by different methods giving different beneficial activities depending on the origin of the plant.

EOs consist of two classes of compounds, terpenes and phenylpropenes. Phenolic compound contents of essential oils, for example carvacrol and thymol have beneficial activity on poultry performance.

Generally, EOs have antimicrobial, antioxidant and antifungal activities as well as increasing appetite and enzyme secretion. The antimicrobial

activity of EOs is a cumulative effect on many different targets in bacteria cell known to be marginally more effective on Gram-positive bacteria. EOs have been used in poultry feed extensively to increase growth, feed efficacy, egg production and improve general health.

XVET has a vast experience with NAGPs for poultry industry with products like Aromax and OregoPlus which are concentrated combinations of high quality plant extracts. Their effectiveness is a result of the synergistic effect of different essential oils.



Palatability solutions to stimulate feed intake

With over 50 years of expertise Nutriad offers a broad portfolio of innovative products designed to ensure palatability, acceptance and intake in poultry feed applications.

nutriad.com

From stimulating feed intake at critical periods to masking or accentuating the taste and aroma of diet ingredients, Nutriad has a solution.

Their Delistart and Optisweet product families provide specific taste cues to stimulate intake of starter feeds and are the only products to contain Talin the natural flavour modifier, which is unique to Nutriad.

Nutriadi palatability solutions comply with current feed additive regulations and no additional labelling requirements are necessary when using at recommended inclusion rates.

Investing in innovation and research for species-specific products

Today's agricultural industry is experiencing a transformation and Jefe is strongly committed to meeting the current and future needs of livestock producers. Producers in turn will need to comply with stricter regulations and respond to the demands of more informed consumers.

jefe.com

For this reason, Jefe invests in innovation and research to provide reliable, cost-effective species-specific products such as Gallinat +; a selected blend of essential oils and organic acids designed and developed exclusively for poultry feed.

Within the company's Jefe Care and Jefe Peak programs, Gallinat + is currently available in 53 countries and presents numerous advantages. These include: effective at low inclusion rate, mixes easily and homogeneously, can be used with

various formulations, has no harmful effects on feed or nutrients, safe to handle for employees, not corrosive to equipment, and many others.

Available in 25kg bags, Gallinat + can be stored for 18 months in its original packaging, in a cool and dry environment.

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Retailing & digital marketing in the poultry business will welcome Mr. John Kirkpatrick, Agricultural Manager, Tesco Plc. (UK), who will explain The Challenge of Rural Entrepreneurship - Working with farmers and agribusiness to deliver for consumers.

Mitigating risk of emerging diseases by scientific input will conclude the day, presented by WVPA India Branch and Dr Sujit Menon- Managing Director, Petersime.

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The brain-microbiota connection: the key to enhanced performance

Phodé considers 'Better-Being' in animal farming as the cornerstone for reaching optimum performance. The microbiota-gut-brain axis is a unique system called the 'cerebral ecosystem'.

phode.com

Based on this original approach, Phodé offers specific and innovative solutions adapted to modern farming expectations.

Oleobiotec is an exclusive blend of essential oils and spice extracts designed to optimise transmission of the 'Better-Being' message through the microbiota-brain connection. Essential oils and spices are widely known in human medicine and are also used in animal medicine. They regulate microflora and stimulate



the secretion of enzymes, gastric juices and motility of the gut. Phodé draws on 20 years of expertise to carefully select active ingredients and create unique solutions. It guarantees consistent and effective solutions, thanks to a sourcing commitment and strict quality standards. Phodé's expertise and

know-how foster enhanced efficacy, combining natural active compounds in order to benefit from their synergistic effects. This expert use of synergies resulted in the Oleobiotec range.

Oleobiotec for Poultry is a unique solution, proven effective in promoting the balance and diversity of gut microbiota for 'Better-Being'. Acting on the whole cerebral ecosystem is the key to helping birds reach their full potential.



Better balance of the gut microbiota with phytochemicals

Phytochemicals are aromatic molecules that have been extracted from specific plants or plant parts and provide well-known benefits to animal production that include improving feed intake, priming digestion, and helping to better balance the gut microbiota.

dupont.com

This allows more nutrients to be absorbed, which then directs more of the animal's energy towards growth and health, a phenomenon commonly described as dynamic energy budget (DEB). Enviva EO, a phytochemical blend, demonstrates increased animal productivity, an improved microbiome as well as protection of feed from pests. Additionally, Enviva EO has shown

positive mechanistic effects on the immune system, which has a direct link to the animal's dynamic energy budget, creating a surplus of energy for growth. This phytochemical blend boosts the activity of defence immune cells, while also improving regulation of the immune signalling system.

The improved regulation allows the bird to better manage a robust immune response against challenges, while also reducing the potential for a prolonged inflammatory response, which diverts needed energy away from growth.

Altogether, Enviva EO can play a significant role in a gut health strategy and should be examined for use among enzymes to further enhance the animal's energy and growth.

Vectorised essential oils and organic acids to optimise performance

Digestive stress is among the most encountered challenges in poultry farming.

mixscience.eu

This is often related to an unbalanced gut microbiota. Lumigard is a range of vectorised products designed to promote the balance of the gut microbiota and thus support the zootechnical

performance of poultry, in different contexts of sanitary pressure.

Vectorising is a process of carefully choosing the best ingredients – taking into account the possible synergies between them – and associating them with carriers and possibly an encapsulation agent. The aim is to ensure optimal efficiency of the selected ingredients, by using them at the right place, at the right time.



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Worm infections: more important than ever before

Even in well managed poultry farms, worm infections still contribute worldwide to significant production losses. Recent changes in European regulations for the housing of laying hens and consumer demands for better animal welfare have led to the switch from traditional cages to inside floor husbandry like aviary systems and barn egg production sites. Sometimes, chickens are also reared free range (outside).

by Lieven Claerhout,
Product Manager,
Veterinary Products,
Huvepharma, Belgium.
www.huvepharma.com

Unfortunately, these housing systems benefit the spread of parasitic infections with their typical faecal-oral infection route and hereby increase the prevalence of worm infections enormously. The subsequent losses constitute mainly impaired technical performances due to damage to the intestinal mucosa and competition for feed ingredients.

As a result, worm infections have a negative effect on egg production, hatchability, feed conversion rate and average daily weight gain. In some cases, poor general condition and diarrhoea is observed. Finally, a lower immune response after bacterial and viral infections or vaccination leads to animals that are more susceptible to infections. In poultry, nematodes



A. galli adult worms.



H. gallinarum adult worms.

are the most important group of worms and include *Ascaridia galli*, *Heterakis gallinarum* and *Capillaria* spp.

Nematodes have a direct life cycle without an obligatory intermediate host. The worm eggs are rapidly and massively spread in the surroundings and can survive for many years. Shed eggs first need to embryonate in the litter or soil to become infectious. Earthworms may serve as paratenic hosts for worm eggs without further development of the infectious larvae.

Prevalence

A. galli and *H. gallinarum* have by far the highest prevalence rates in all housing systems. Infections with *A. galli* worms (large roundworm: 50-116mm) in the small intestines are associated with higher feed conversion rates and a decrease in

body weight gain and egg production. Severe infections may also result in an increased mortality rate and occasionally in the migration of the parasite into the eggs of laying hens. Birds infected with *H. gallinarum* (small roundworm: 7-15mm) show inflammation and thickening of the caecal wall.

The main economic importance of *H. gallinarum* in the caeca is linked to its role as a potential carrier of *Histomonas meleagridis*, a protozoan parasite which induces blackhead disease. Furthermore, *Salmonella* spp and viruses can also be transmitted via worm infections.

The prevalence of worm infections was examined in 48 Belgian farms in which laying hens were housed cage free (aviary systems, barns or free range). Of the 284 faecal samples that were analysed, 56% were infected with worms and 81.3% of the screened farms were found positive.

A. galli and *H. gallinarum* represented in total 75.2%

(respectively 41.9 and 33.3%) of all worm species found. *Capillaria* (caecal worm or hairworm) was much less present and only found in free range sites. Tapeworms, also called cestodes, like *Raillietina* are mainly encountered in poultry from free range or backyard flocks because their presence is closely related to the presence of obligatory intermediate hosts, such as flies, ants, beetles, earthworms or slugs. These cestodes are more present in tropical countries, where poultry is mostly reared outside.

Deworming strategy

Worms have an enormous impact on productivity. However, the prevalence and economic impact is frequently underestimated as most infections are subclinical and the current diagnostic tools have many restrictions (Table 1).

Consequently, poultry are often
Continued on page 28

Table 1. Restrictions of diagnostic tools.

Necropsy
Sufficient number of chickens needed
Recently euthanised chickens
Coprological examination for the typical egg forms and egg counting per gram of faeces (EPG)
Proper faecal sampling (type of faeces, time of sampling & analysis, quantity)
Proper temperature control of the faecal samples sent to the laboratory
Variable shedding
Immature stadia do not excrete eggs yet

Visual difference between Gallifen nanosuspension (left) and another benzimidazole suspension (right).





Fig. 1. Efficacy of a treatment with Gallifen 200mg/ml oral suspension against natural co-infections of A. galli (left) and H. gallinarum (right) in layer chickens. Gallifen was administered at 1mg fenbendazole/kg body-weight/day for five consecutive days. Five days after treatment, the total number of adult worms in treated layers were compared to an untreated control group (both groups: n=30).

Continued from page 27
not treated correctly and, in turn, this results in a higher and more dramatic infection pressure.

Management measures, such as good sanitation, all in-all out, cleaning and disinfection and reducing contact with wild birds may help to reduce the infection pressure but are certainly not sufficient for complete and successful worm control.

Worm infections can only be monitored by a simultaneous implementation of management practices and a well-considered deworming strategy. In the case of a high infection pressure, a single

random treatment will never be sufficient for adequate control.

A deworming strategy should be based upon the prepatent period (the interval between the uptake of infectious eggs and re-excretion of new eggs) and therefore consecutive treatments every six weeks are advised. This strategy prevents the development of a persistently high infection pressure in the surroundings and ensures optimal animal welfare and performance.

Benzimidazoles are still the most efficacious and safe anthelmintic molecules and can be administered in feed as well as via the drinking water.

In general, benzimidazoles show a low solubility profile. To overcome this, Huvepharma recently launched Gallifen 200mg fenbendazole/ml oral nanosuspension for use in drinking water.

The unique milling technology reduces the fenbendazole crystals to the nanometer level.

Together with the applied excipients, the very small particle size contributes to a superb homogeneity in stock solutions and bulk tanks. Compared to other benzimidazole based anthelmintics for use in drinking water, this liquid formulation offers optimal ease of use, efficacy and safety.

- **Ease of use:** Time consuming pre-dilution steps and additional stirring is no longer needed. Easy application of a liquid formulation without any loss of product in the packaging.
- **Efficacy:** Homogeneity results in the correct dosing in each individual chicken.
- **Safety:** Sedimentation and obstruction of the filter on the tubes of the proportioners, pipelines or nipples is no longer observed. Maximal safety is ensured for breeders as well as for layers with a zero day withdrawal time for eggs. Gallifen Oral suspension is licensed for the treatment of the most prevalent nematodes A. galli and H. gallinarum. The administration of a total dose of 5mg fenbendazole/kg bodyweight, divided over five consecutive days (1mg/kg body-weight/day), demonstrates a 100% and 99.4% reduction of adult worm counts for A. galli and H. gallinarum respectively (Fig. 1). This corresponds to 5ml/ 1000kg bodyweight/day for five days (25ml in total). A deworming strategy with this innovative formulation can improve the health status of chickens significantly. ■

References are available from the author on request

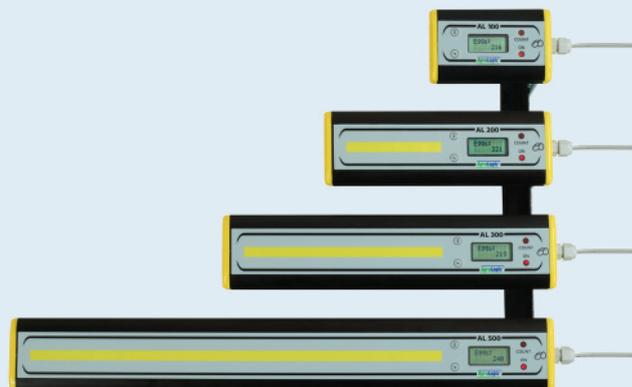


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The four pillars for optimising egg size in commercial layers

Each commercial variety has a genetically determined range of egg size and, within this range, environment plays an important role in the expression of egg size.

by The Technical Team,
Hy-Line International.
www.hyline.com

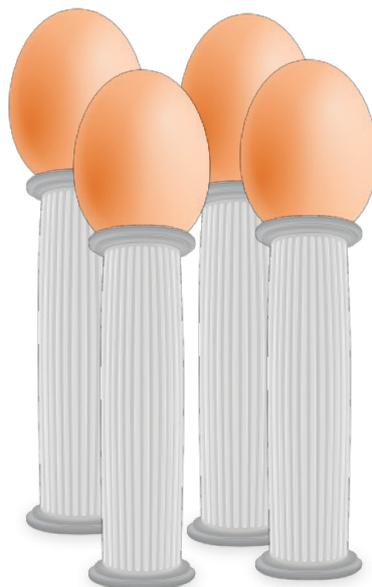
Genetics, body weight management, nutrition, and lighting programs are the four pillars of egg size and are useful tools for the egg producer to change egg weight profiles to best supply the optimum egg size to a market.

Genetics

Hy-Line is working at the genetic level to create commercial lines that have different egg size ranges. Egg weight is a heritable trait (~40%) that responds well to genetic selection. About 60% of egg size variation, however, is due to non-genetic factors (nutrition, management, etc). These non-genetic factors can be manipulated by egg producers to achieve the desired egg size profile.

Hy-Line has been collecting egg weight data and selecting on egg weights for decades. Historically, egg weights have been collected periodically throughout a hen's lifetime.

Currently, Hy-Line weighs the first three



The four pillars of egg size: genetics, bodyweight management, nutrition and lighting programs.

eggs a hen lays, eggs laid mid cycle, and eggs laid late in the cycle. The Hy-Line Research department uses these egg weights to select for a more desirable shape to the egg weight curve. Specifically, they select to increase early egg weights, hold mid-cycle egg weights constant, and decrease late egg weights (Fig. 1).

Egg numbers and breaking strength have a negative correlation with late egg weight. As Hy-Line varieties continue to improve late

persistence and shell strength, the egg sizes at later ages will come down. To help adapt to this selection pressure, Hy-Line is relaxing the selection pressure to reduce late egg weight to ensure that sufficient egg size and egg mass is available in the genetic potential of the birds.

Body weight management

An important factor in egg weight is the pullet's body weight at maturity. Heavier hens tend to lay more eggs throughout the production period and will have greater flexibility in adapting different egg size profiles.

Body weight is affected by many factors, including beak trimming, vaccination program, transfer, disease challenges, pullet lighting program, space allotment, and nutrition.

Due to the direct affect of body weight on egg weight, the achievement of flock target body weight with good flock uniformity is important for egg size management.

Nutrition

Nutrition during the rearing and laying period has a critically important role in egg weight. Proper rearing nutrition allows the hen to achieve or exceed the standard body weights.

Changing the rearing diets based on attaining body weight standards (and not bird age) will best match the diet to the actual nutritional needs of the pullet. During the laying period, the specification of diets can be used to manage egg size.

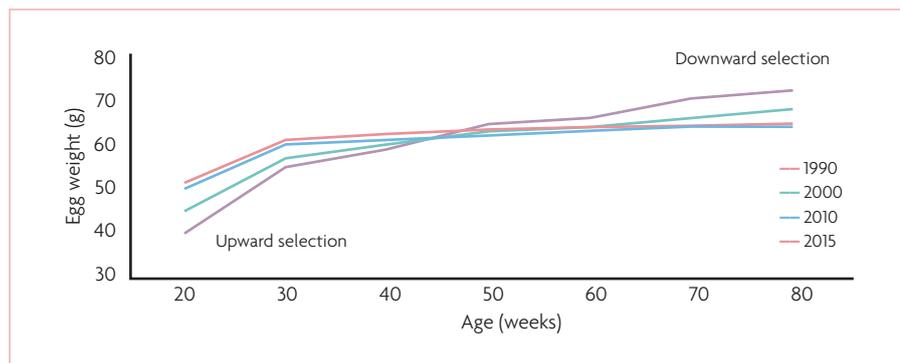
Energy, methionine/cystine, other digestible amino acids, linoleic acid, and total fat can directly affect the egg size. These components can be specified in layer diets to influence egg size downwards or upwards.

The protein content of the diet should be balanced to ensure the amino acids are utilised efficiently by the bird. Unbalanced protein can result in poor utilisation of amino acids and suboptimal egg size.

Breghendahl (2008) estimated the 'ideal amino acid profile' and determined that the

Continued on page 31

Fig. 1. Egg weight changes for Hy-Line Brown, 1990-2015.



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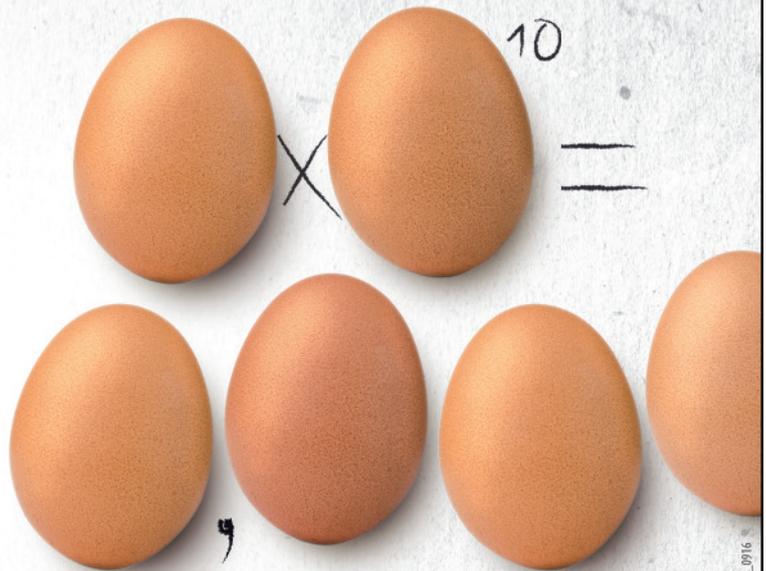
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Continued from page 29

ratio of methionine to lysine should be a minimum of 47:100 to support maximum egg mass.

All other amino acids should be balanced relative to lysine to ensure egg size is optimised as efficiently as possible.

To avoid excessively large egg size and weak egg shells later in the laying period, these nutrients are gradually reduced after peak egg production (30 weeks of age).

Pushing nutritionally for greater egg size could result in thinner shells and more cracked eggs if mineral requirements of the bird are not adequately provided for.

Management for larger egg size should include nutritional considerations in rear for subsequent shell quality and bone strength (i.e. pre-lay diet).

Egg weight can be regulated through the use of a phase feeding regime. Optimal egg weight will be easier to achieve when formulating feed according to egg weight or egg mass and constantly updating the formulas according to these parameters. This tool can be very helpful either to increase egg weight on earlier production, or to control egg weight on late production.

Be aware that not only nutritional levels, but all aspects of nutrition management can

Management tips for smaller egg size

- Select a variety that has a regular egg weight profile.
- Use a faster step-down lighting program in rear (seven weeks).
- Light stimulation at a lighter pullet weight.
- Make larger gradual reductions in energy, methionine/cystine, and total digestible amino acids during the phase feeding program.
- Nutritional management for controlling egg size is more complex and generates slower results than managing for increased egg weight.
- Reduce methionine + cystine to lysine ratio (<84%). This reduction should be done gradually to avoid reduction of egg production as well.
- Control total digestible amino acid intake. Studies have shown that a reduction of intake of all amino acids can be more effective in controlling egg weight than reducing only methionine and methionine + cystine.
- Limit linoleic acid intake to 0.9g/day per bird. Change to an oil source with lower linoleic acid content, such as palm oil.
- Start to control egg weight with phase feeding at least 2-3g before the desired egg weight. Provide clear objectives of the amount of cumulative amino acid intake per egg weight phase you desire.

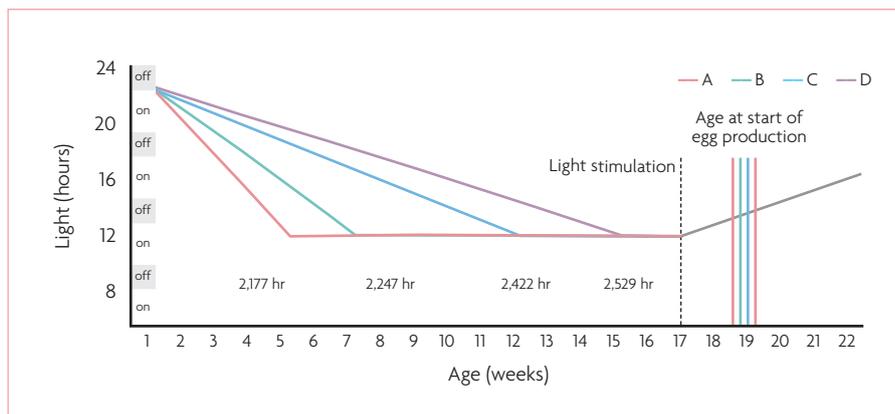


Fig. 2. Effect of different lighting programs on total hours of light, age of sexual maturity, and egg weight. A: Early maturity, smaller egg size. B: Normal maturity and egg weight. C: Slight delay in maturity and increase in egg weight, promotes pullet growth. D: Delayed maturity, heavier egg weight, promotes pullet growth.

affect egg size. Feed particle size, water intake, water temperature, and feeding schedule can affect daily feed intake and nutrient intake as a consequence.

Heat stress can depress egg weight. High environmental temperature above the thermoneutral zone (>33°C) has a depressing effect on the bird's feed intake. The result can be a shortfall in nutrients like protein (amino acids) and energy, which will decrease egg weight. It is common to see decreased egg size as a consequence of heat stress.

Appropriate adjustments in feed formulation to match the actual bird feed intake and mitigation of heat stress conditions can minimise this depression of egg size. In environmentally controlled houses, lowering the environmental temperature will increase feed intake and support egg weight.

Lighting programs

Chickens are responsive to changes in day length, and this has a significant effect on egg production and egg size (Fig. 2).

Slow step-down lighting programs (C and D) during the rearing period provide the pullet with more light hours to eat and grow. At the same time, these slow step-down lighting programs can also delay maturity and increase egg size.

Faster step-down lighting programs (A and B) provide fewer light hours and slower growth but earlier sexual maturity with smaller egg size.

Age of light stimulation and body weight are interacting factors that help determine the onset of egg production, as well as egg size.

Light stimulation should be done based on the flock's body weight and uniformity. Generally, early light stimulation at lighter body weights will accelerate maturity and decrease egg size; while later light stimulation at heavier body weights will delay maturity and increase egg size. Generally, the hen has the ability to produce

a certain egg mass. As egg weight is changed, the egg number tends to change inversely to keep the egg mass constant. ■

Management tips for larger egg size

- Select a commercial variety with a heavier egg weight profile. The Hy-Line Brown can be customised to influence the egg weight profile.
- Use a slower step-down lighting program in rear (12 weeks).
- Light stimulation at a heavier pullet body weights.
- Make smaller gradual reductions in energy and methionine/cystine during the phase feeding program.
- Use feed formulation that provides 10-15% higher digestible amino acid intake (mg of digestible amino acid per bird per day) than recommended in the Hy-Line guide. Increase the ratio of methionine + cystine to lysine to be >90%.
- Linoleic acid has a positive impact on egg size. For increased egg size, use 1.5g linoleic acid per bird per day. Use sources of supplemental oil which are higher in linoleic acid, like soybean oil or flaxseed.
- Increase total and supplementary fat content in the diets. Studies have shown that at the same linoleic acid levels, birds consuming a higher amount of total fat will produce larger eggs.
- Keep an optimal energy intake. In situations of deficient energy intake, laying hens will utilise protein and amino acids as an energy source, resulting in less amino acids available for optimal egg size. Many situations of low egg weight are due to low energy intake. Overfeeding energy above recommended amounts tends to depress egg weights, as a consequence of lower feed intake.

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Introduction

There are few areas of the world that have not been affected by Newcastle disease and the disease occurs quite frequently in Africa, Asia and the Middle East. Recently, cases have been seen in western Europe. The Newcastle disease virus is capable of infecting many bird species – not just poultry.

Transmission, vectors and spread

Newcastle disease virus leaves infected birds via their oropharyngeal secretions and faeces. These can become contaminated dust or the former can leave the bird as an aerosol. The main route of infection is via the ingestion of contaminated materials. Spread by man is mediated by the transportation of contaminated fomites, such as boots, clothes (overalls) and equipment. Other fomites include feed, water, poultry products, birds (wild and poultry) and insects. Control is centred around strict quarantine procedures and vaccination.

Clinical signs

Mortality can be as high as 100% in susceptible chickens infected by virulent viscerotropic strains of the Newcastle disease virus. With oculonasal infections, conjunctivitis and some facial swelling may be seen. The faeces of infected birds can be green and watery and the comb becomes blue as the bird becomes cyanotic. If the viral strain involved is neurotropic, nervous sign such as tremors, torticollis and paralysis of a wing or a leg may be seen. In well vaccinated layers the only clinical sign may be an egg drop, followed by misshapen and/or white eggs.

Pathology

Lesions are often absent in vaccinated birds. Necrotic and haemorrhagic lesions are seen in areas with lymphoid tissues (lower eyelids, caecal tonsils and Peyer's patches). An enlarged spleen and haemorrhagic thymus and proventriculus are also often commonly seen. Egg yolk peritonitis and atrophied ovarian follicles are often seen in birds in lay.

Diagnosis

Diagnosis is made on the basis of clinical and post mortem findings, coupled with virus isolation and serology. Newcastle disease is a notifiable disease that is reportable to the OIE.

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focus on research

Supplementation with vitamin D

This Brazilian trial (*Energ. na Agric.* 32 364-371) was undertaken to assess the productivity and bone quality of broilers supplemented with vitamin D (25-OHD₃). Some 2,400 Ross and Cobb broilers were used and they were distributed in a randomised block design with a 2 x 2 x 2 factorial arrangement based on gender, breed and whether or not treated. The trial consisted of eight treatments and six repetitions.

There was an interaction between gender and strain for feed intake and weight gain – FCR was better for males. There was an interaction between strain and supplementation for viability and there were differences in gait score for gender and strain. Male femurs had a higher Seedor index, bone resistance and lower ash level with the Ross strain having the higher Seedor index.

With regards to tibial ash levels and femoral magnesium levels there was a strain and supplementation interaction. Black bone syndrome was not influenced by the variables used in this study.

Some of the assessed characteristics had positive responses, while others responded to the treatments.

Natural antioxidants from citrus waste

In these Pakistani studies (*Sarhad J. of Agric.* 33 371-376) citrus waste was mixed with broiler feed replacing maize at levels of 0, 2.5, 5.0, 7.5 and 10.0%.

It was demonstrated that as the percentage of citrus waste increased, feed intake and body weight decreased but there was no significant effect on FCR. However, the citrus waste did have a positive impact in that the levels of superoxide dismutase, catalase and glutathione peroxidase increased as the content of citrus waste rose in the feed being given to the broilers.

Although the citrus waste had no effect on broiler performance it did have positive effects on the antioxidant enzyme profile.

Digestible phosphorus for broilers

This Czech work (*Brit. Poult. Sci.* 58 712-717) was undertaken to determine the coefficients of pre-caecal digestion of phosphorus in maize (3.90g per kg of total phosphorus, 0.83g per kg of phytate, 138 phytase units per kg feed) and wheat (3.17g per kg of total phosphorus, 1.94g per kg of phytate, 666 phytase units per kg feed).

Two sets of diets containing three different levels of maize or wheat were used. For both wheat and maize pre-caecal digestible phosphorus rose linearly with the inclusion level of the cereal. The coefficients of digestion of pre-caecal phosphorus were estimated to be 0.18 for wheat and 0.33 for maize.

Glucose transporter and mucin producer genes

This Iranian research (*Braz. J. of Poult. Sci.* 19 629-638) found that the expression level of glucose transporter gene (SGLT1) and mucin producer gene (MUC2) in the jejunum was significantly affected by the inclusion of wheat or barley to a corn-soy based diet with or without exo-enzymes.

It was concluded that the inclusion of wheat or barley to corn-soy based diets without enzyme supplementation has an adverse effect on growth, ileal microflora, villi morphology, digesta viscosity, pancreatic enzyme activity and gene expression levels of nutrient transporters. However, enzyme supplementation of the wheat and barley diets

significantly improved these traits restoring many of them back to normal.

Glycine in crude protein reduced broiler nutrition

This German review (*Lohmann Info.* 51 2) looks at the possibilities for reducing the crude protein content of broiler feeds. If one considers the concentrations of all essential amino acids there is the possibility to reduce the crude protein in broiler feeds in the first three weeks to about 19% without impairing growth.

The non-essential amino acids glycine and serine are growth limiting in feed for broilers containing 19% crude protein. They are best assessed together as glycine equivalents (Glyequi) due to the equal effects of these amino acids on growth. Adequate concentrations of Glyequi will allow the crude protein concentration in the feed for the first three weeks to be reduced to 16% with no adverse effects on growth. The requirement for Glyequi depends on the concentration of other nutrients in the feed, such as threonine, choline and cysteine.

A reduction in crude protein below 16% is expected to be possible in the future by optimising Glyequi concentration in the feed and the factors influencing the response to it.

Post-hatch sugar cane yeast

This Brazilian study (*Revist. Brasil. de Zootec.* 46 924-928) evaluated the effect of sugar cane yeast (0, 12.5, 25.0, 37.5 and 50.0g per kg feed) on the performance of day old broilers in terms of body composition and development of the intestinal mucosa.

The increasing feed levels of yeast resulted in a linear increase in feed intake and FCR.

Villus height and crypt depth in the jejunum had maximum values of sugar cane yeast of 20.9 and 20.6g per kg of feed respectively. In the ileum a crypt depth reduction at an in feed yeast level of 25.6g per kg of feed resulted in an increased villus: crypt ratio.

It was concluded that yeast inclusion increases feed intake and conversion, improves body mineral absorption and increases villus height in the jejunum.

Yeast for improved bird welfare

The objective of this Turkish study (*Archv. An. Breed.* 60 439-446) was to assess the effects of feeding different levels of the yeast *Saccharomyces cerevisiae* on broiler tibiotarsus and whether it reduced leg problems.

Ross 308 broilers were used and they received 0, 0.1, 0.2 or 0.4% *S. cerevisiae*.

It was seen that the use of *S. cerevisiae* led to an improvement in bone traits.

Optimum bone mineral content, biomechanical traits and strength were obtained by the addition of 0.2% *S. cerevisiae* to the broiler feed.

The authors considered the use of a feed supplement as an economic and convenient way of improving bird welfare and preventing commercial losses due to leg problems.

Factors affecting broiler chicken meat

This Brazilian research (*Poult. Sci.* 96 4270-4279) was undertaken to assess commercial loads of broiler chickens at different distances in summer (rainy) and winter (dry) seasons and their effects on meat quality.

Longer distances influenced meat quality in the rainy season. These longer distances had the highest enthalpy comfort indices, which suggests a tendency towards dark, firm and dry meat with lower cooking losses. The lowest enthalpy comfort indices were recorded in the dry season.

Broiler chickens transported and slaughtered in the winter months presented normal meat pH and L* (lightness) but with higher cooking losses. Seasons and distances had no significant effects on tenderness.

No effects were seen on meat quality with respect to crate positioning in the lorry. These results suggest that season and distance have more influence on broiler meat quality than the position of the crate on the lorry.

Marginal wheat based diets

This Australian work (*J. of Appl. An. Nut.* 5 e12) concluded that multi-carbohydrase could overcome the negative effects in broiler performance brought about by nutrient reduction. However, there was an indication that nutrient density affected bird response to supplementation with multi-carbohydrase.

Bovine colostrum in broiler diets

This Indian trial (*Ind. J. of Poult. Sci.* 52 157-160) was undertaken to assess the effects of including 2% bovine colostrum as a feed additive in broiler diets.

The inclusion of 2% bovine colostrum improved both the body weight and feed conversion ratio but was found to have no effect on feed consumption.

Clostridium butyricum

This Chinese study (*Euro. Poult. Sci.* 81 187) looked at the effects of *Clostridium butyricum* on growth rate, lipid metabolism and caecal microecological environment of broilers.

The broilers were fed a maize-soybean meal that was supplemented with 0 or 5×10^8 cfu of *Clostridium butyricum* per kg of diet for 42 days. The *Clostridium butyricum* supplemented birds had higher ADG and lower FCR throughout the whole study. In addition, the supplemented birds also had more intramuscular fat and increased lipase activity in the breast muscle.

The butyric acid content in the caecal contents

at 42 days enhanced the relative abundance of lactobacilli in caecal contents at 21 and 42 days, but the activity of hormone sensitive lipase in breast muscle at 42 days was reduced.

These results indicate that dietary supplementation with *Clostridium butyricum* can improve growth performance, lipid metabolism and the caecal microecological environment of broilers

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Individually weigh broilers

Birds should be weighed at least weekly from 21 days of age. Routine accurate estimates of average body weight are essential in planning the appropriate ages for processing and for determining the coefficient of variation (CV%) to ensure that the maximum number of birds fall into the desired weight bands at depletion.

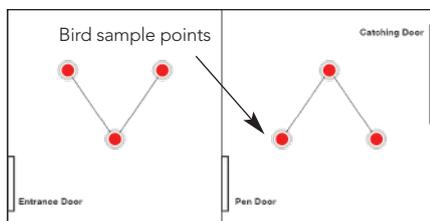
Birds must be handled in a calm and correct way by people who have been appropriately trained. Bird welfare must be a priority at all times.

Procedure:

Birds should be weighed on the same day each week.

Step 1: Suspend/situate scales in a secure, easily accessible place in the house or pen (if growing sexed broilers). Set scales to zero and have a secure shackle to hold birds in place before weighing begins.

Step 2: Catch and pen up a minimum of 100 birds or 1% of the population whichever is larger. If birds are sexed then a minimum of 100 birds or 1% of each sex should be weighed. Birds should be sampled from at least three points within each house (or sexed pen if growing sexes separately), away from doors and walls.



Step 3: Collecting one bird at a time, place its legs into the shackles, wait until the bird is calm and read the weight from the scale (to the nearest 20g for mechanical scales).

Step 4: Record the weight obtained and gently release the weighed bird back into the main pen population. Mechanical dial scales require manual data records to be kept and data calculations to be made for:

- Total number of birds weighed.
- Average weight per bird (total weight of all birds divided by number of birds weighed).
- Weight range.
- Coefficient of Variation (CV%).

Step 5: Repeat the weighing process until ALL birds in the catching pen have been weighed and the weights recorded. This will eliminate selective bias.

Step 6: Calculate average weight and the Coefficient of Variation (CV%). CV% is usually calculated automatically when using digital scales. If manual scales are used, it will be necessary to calculate the standard deviation using either a scientific calculator or a computer spreadsheet.

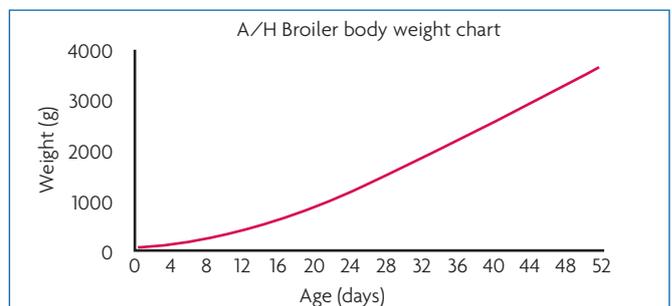
Example for calculation of CV%

$$CV\% = \frac{\text{Standard Deviation}}{\text{Average body weight}} \times 100$$

Where standard deviation = 0.248kg
and average weight = 2.471kg

$$CV\% = \frac{0.248\text{kg} \times 100}{2.471\text{kg}} = 10.2$$

Step 7: Average body weight and CV% should be plotted on a body weight for age chart and compared to target. Variation from performance targets will help determine any management inputs needed and future processing requirements.



Interpreting results

A deviation from expected body weight may be due to an inaccurate weighing. If an inconsistent body weight is recorded, check that the scales are working correctly and then weigh a second sample of birds immediately as a check before making any changes to the birds' environment.

1. Live weight lower than target:
 - Check environmental conditions to ensure ventilation and house temperatures are being achieved.
 - Check lighting program is implemented correctly and light intensity is not too low.
 - Check feeder and drinker heights are correct for bird age and size.
 - Check birds per feeder and drinker are sufficient for stocking density.
 - Check feed and water intakes are as expected for flock age.
2. Live weight higher than target:
 - This may affect processing yield needs and anticipated targets. Flock depletion times may need to be altered to account for this.

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Algae: a source of biological treasures

Macroalgae, or seaweeds, are eukaryotic and pluricellular organisms, divided into three different groups: green, red and brown. Detailed screening of macroalgae functions revealed new ranges of biological activities including anticoagulant, antiviral and antibacterial, anti-tumoral, anti-proliferative and immunomodulatory activities. All of them could be of relevance in nutraceutical functional food. Indeed, green, brown and red macroalgae cell walls contain large amounts of sulphated polysaccharides, named respectively ulvans, fucoidans and carrageenans, ranging from 4 up to 76% of seaweed dry weight. The high content of these sulphated polysaccharides, their unusual structure, and their biological properties shed a new light on these compounds as promising natural products for medicinal and dietary applications. The specificity of marine sulphated polysaccharides is in the complexity of their structure. Indeed, they are mainly branched polysaccharides, in contrast with linear polysaccharides like cellulose which contain only one type of linkage between sugars. Also, they are composed of various and some rare sugar units (xylose, rhamnose), unlike homopolysaccharides, such as starch, which are exclusively composed of glucose units. Finally, these sugars can be sulphated, conferring them a special reactivity. All of these parameters show a phylogenetic similarity with polysaccharides from the animal kingdom (GAGs – glucosaminoglycans) such as heparin, known for its numerous biological properties, thus explaining their unique activities. Sulphated polysaccharides reactivity, hence their biological properties, varies a lot according to the type of sugars and linkage they contain, their level of sulphation and also their molecular weight. Therefore, several macroalgal sulphated polysaccharides with distinct biological activities can be found in macroalgae. It is important to note that sulphated polysaccharides are specific macroalgae (they are not found in terrestrial plants, microalgae or yeast cells walls) as the marine environment is the only one where sulphur in a proper chemical form is abundant enough to be integrated in the structure of organisms. Then, the key is to be able to selectively extract them to ensure a targeted effect on animals.

ALGIMUN: unique technology and formulation

Olmix has been studying marine biotechnologies for more than 20 years and has focused in the past 10 years on the extraction and use of specific sulphated polysaccharides (Olmix MSP®) extracted from macroalgae to meet the challenges faced by animal production. This has led to the development of an in-feed product, ALGIMUN®, which is based on the combination of two biologically active macroalgal extracts: MSP®IMMUNITY which constitutes an innovative modulating agent that reinforces innate and adaptive immune responses and MSP®BARRIER which enhances the barrier function of the intestinal mucosa. Improving intestinal health and immunity is paramount to ensure that animals are efficient in the use of feed. Providing animals with good intestinal integrity will have a positive impact on

the immune status and overall technical performance. ALGIMUN's potential and reliability has been thoroughly tested in research stations and in the field. It can be used during the whole cycle. To make the most of ALGIMUN's benefits, it has to be used in starter and grower phases or during high production or stress phases.



internationalnews



Aviagen and Bounty Fresh Foods Inc recently hosted an educational seminar series for Bounty Fresh's Indian River customers in the Philippines. The seminars were designed to help customers succeed by sharing advice and expertise for getting the most from Indian River broilers and breeders. Bounty Fresh is a long-time customer of Aviagen's Indian River brand of broiler breeding stock, which is growing in popularity in the Philippines due to its high meat yield, feed efficiency and environmental tolerance.

aviagen.com

Coventry Chemicals' sweeping rebrand



Coventry Chemicals, part of the Coventry Group of companies, have announced a complete change of name and new visual identity for its 55 year old business.

They will now be called: Mirius – Global Hygiene Solutions.

As a leader in the manufacture and supply of cleaning liquids, powders and tablets to suit all professional, retail and international cleaning and hygiene requirements, the change of name better reflects the company's global commitment and its expertise in driving innovation within the cleaning and hygiene industry. The business has created individual brand identities for each of its divisions.

mirius.com

has in the further development of livestock farming in Serbia and the greater Balkan region. This follows an extensive investment programme for the factory in Sabac, which focused on modernising the production process and expanding production capacity by 50%.

The new plant will be entirely renovated to meet De Heus' high quality standards. For this purpose the production line will be renewed and equipped with the most advanced production techniques.

These adjustments are expected to be completed by the end of 2018.

deheus.com

Cobb's new Saudi Arabia Distributor



Al-Watania Poultry Company, one of the leading poultry producers in the Middle East, recently signed a distributor agreement with Cobb Europe for the territories of Saudi Arabia and a number of surrounding Gulf Cooperation Council (GCC) member countries.

Al-Watania Poultry has worked closely with Cobb Europe for more than two decades in Saudi Arabia.

Currently the company processes more than 860,000 broilers/day. New state-of-the-art automated hatcheries, feed mills, and processing lines have started operation. Further expansion will take the daily production to one-million broilers by 2020.

cobb-vantress.com

De Heus acquires Serbian feed plant



Royal De Heus have signed an agreement for the acquisition of the Serbian compound feed plant Komponenta. With this new plant in Cuprija, De Heus now has two production locations in Serbia, thus strengthening its leading position.

The demand for high quality poultry, pig and cattle feeds is rapidly increasing in Serbia. The purchase of this plant will enable De Heus to amply meet this rapid growth in the near future.

The acquisition of Komponenta confirms the confidence De Heus

next level in freezing

Butyrate research results

Nutriad's multi-year research project on the use of butyrate as a feed additive has now been concluded with the completion of Pierre Moquet's PhD thesis which studied the effects of butyrate in broiler diets.

Dr Moquet started his PhD research in the Wageningen Animal Nutrition Group to investigate an important conundrum related to the use of butyrate as an additive in animal feed: on one hand, this molecule has received considerable attention for its potential to improve intestinal health and animal performance, while on the other hand, the mechanisms underlying these effects have been described as very diverse and seemingly less consistent.

Together with a fellow PhD student at Ghent University, Dr Moquet set out to explore this topic in the framework of a research project that was co-financed by feed additive producer Nutriad and VLAIO, the Flanders Innovation & Entrepreneurship agency.

Dr Tim Goossens, Business Development Manager Digestive Performance at Nutriad, coordinated support for the project.

"Dr Moquet found evidence supporting his hypothesis that at least part of this variation can be attributed to the fact that different products deliver butyrate in distinct

parts of the gastrointestinal tract (GIT)," Dr Goossens told International Poultry Production.

"These different release profiles result in specific digestive, microbial and immunological responses."

For example, when butyrate levels were increased solely in the proximal part of the GIT, or specifically in the small intestine, expression of host defence peptides was modulated and the levels of certain antibodies in the blood was increased.

However, these treatments also triggered caecal microbial dysbiosis and inflammatory responses.

On the contrary, when additives were used to increase butyrate not only in the proximal GIT, but also the hindgut, no signs of gut inflammation were observed, while the apparent digestibility of methionine was improved, as well as the feed conversion ratio.

"All in all, the data suggest that butyrate indeed has the potential to elicit important gut health stimulating mechanisms", Dr Goossens added "but it is not an 'always beneficial, everywhere' product.

"Instead, the importance of precision delivery of this molecule is highlighted once more. This is especially important for butyrate producers if they are to provide practical and smart solutions to animal producers."

nutriad.com

Cheaper IB vaccines?

A research team at The Pirbright Institute, UK, has genetically modified an infectious bronchitis virus (IBV) vaccine strain so that it can be grown in cell cultures in the laboratory rather than in hen eggs, which could make vaccine production more efficient and reduce costs.

Infectious bronchitis remains a major problem in the global poultry industry despite the existence of many different vaccines.

Most IBV strains do not grow in cell cultures so IBV vaccines are currently produced in hen's eggs, which is a cumbersome and expensive process.

The team has now identified the exact genetic code which enables a

non-virulent laboratory strain of IBV to grow in cell cultures rather than eggs.

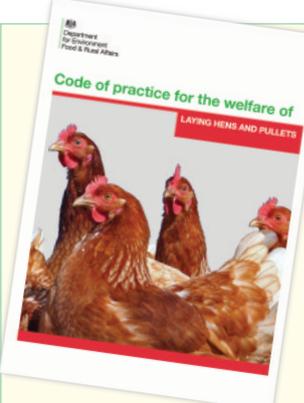
They then transferred this code into a vaccine strain, which allowed it to also be grown in cells.

The most interesting part of the study was discovering that the sequence which allows laboratory growth of IBV strains results in the change of only three amino acids in the spike protein.

This modification can now be applied to other IBV vaccine strains, which will help improve the speed and efficiency of IBV studies and can eventually be applied to vaccine production.

It has been estimated that every 10% reduction in IBV incidence would be worth around £654 million to the global poultry industry.

pirbright.ac.uk



Animal welfare has been enhanced by a new code for laying hens and pullets. It reflects the very latest advice from vets and animal husbandry developments, as part of a programme of reforms to safeguard and enhance animal welfare. The full code is available to read online. gov.uk/government/publications/poultry-on-farm-welfare



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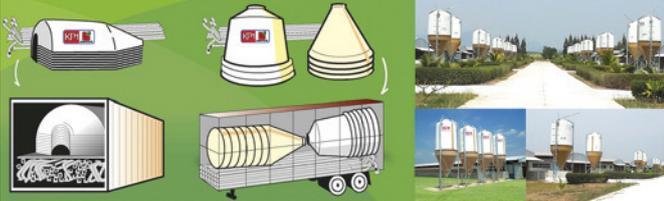
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Poultry housing in Ukraine



VetEffect recently conducted research into how Ukrainian producers can increase exports of eggs to Europe through adopting more animal friendly housing systems. As such, they were invited to make a field visit to two layer farms in Ukraine.

Here they made a cost-benefit analysis of the animal welfare situation with a focus on poultry houses, equipment and management, and on the costs of improving the facilities to comply with EU poultry welfare standards. Economics and costs of egg production were calculated for the

present situation, and when poultry houses would be modernised. In addition they collected data on market prices of eggs for this company and in Ukraine.

The farm has a capacity of 400,000 rearing birds and 1,200,000 laying birds and following the completion of the planned renovation works, these figures are expected to rise by 30%.

VetEffect's mission was to collect the data required for a study to assess whether bird friendly housing systems in Ukraine are technically and economically feasible. Based on this information the perspective to change to alternative housing systems was assessed, such as enriched cages or the barn system.

An investment plan and feasibility study was included, as well as staff training, because changing to more animal friendly housing has consequences for daily operations.

veteffect.eu

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'Training' the microbiome



Renewed interest in the fibre-degrading enzyme (NSPase)

mode of action is behind new research suggesting changes in the animal gut microbiome to more efficiently degrade fibre.

The production of oligosaccharides by NSPases and subsequent fermentation of these by the gut microbiota to generate a 'prebiotic' effect, is regarded as one of the mechanisms for NSPase activity.

Now new research from AB Vista and Alimetrix explores how NSPase mode of action is due to more than improved fibre digestibility and fermentation of the oligosaccharides generated. An in vitro study looking at the fermentative capacity of caecal contents of birds at 35 days, showed significant differences in ability to ferment xylan added exogenously. Caecal contents of xylanase-fed birds showed significant enrichment of bacterial species capable of fermenting NSP, which in turn produced greater quantities of volatile fatty acids

abvista.com

(VFAs), including butyrate, a valuable energy source for enterocytes and supporting gut function.

Dietary xylanase was shown to effectively increase the capacity of the caecal contents to digest insoluble xylan in addition to soluble xylo-oligosaccharides. This highlighted a possible 'training' effect on the caecal microbiome, resulting in adaptive changes towards a greater capacity to degrade xylan.

Dr Mike Bedford, AB Vista Research Director, who presented the findings at the recent 2018 Poultry Science Association Annual Meeting, held in San Antonio, Texas, said: "We need to think of NSPases as tools to accelerate the ability of the bird to digest fibre. Rather than quantitatively degrading plant cell wall fibre, the enzyme is in effect increasing the intrinsic fibre-digesting capacity of the bird. This has significant implications with regard to selection of NSPase enzyme classes and dose rate."

EU approval for feed additive preparation



The European Commission has published the official regulation approving Avimatrix feed additive preparation as a zootechnical feed additive in the European Union.

Avimatrix, from Novus International Inc, is an eubiotic solution containing benzoic acid, calcium formate and fumaric acid, embedded in a lipid matrix (Novus Premium Blend Technology). The additive has been thoroughly evaluated by EU authorities, leading to this breakthrough approval (2018/982).

This registration follows positive opinions from the European Food Safety Authority in 2015 and 2017, where the authority ultimately concluded that the inclusion of Avimatrix feed additive preparation at a minimum dose of 500mg/kg complete feed has the potential to improve the performance of chickens for fattening and chickens reared for laying.

In reaching its conclusion, the EFSA took into consideration the significant improvement in feed conversion ratio seen in chickens fed

Avimatrix. Under the proposed conditions of use, this feed additive preparation was also confirmed to be safe for the target species, the consumer, the user and the environment.

novusint.com

Innov'SPACE innovation award



Lallemand Animal Nutrition's probiotic yeast Levucell SB (*Saccharomyces cerevisiae* boulardii CNCM I-1079), recently authorised in the EU as a zootechnical additive for fattening, has received an innovation award from the organisers of French leading livestock exhibition SPACE.

This is the first time that a feed additive is authorised in the EU with a specific food safety function. This means the authorities have acknowledged the benefits of a probiotic feed additive beyond zootechnical performance, on end-product quality, a benefit for the whole food chain up to the consumer.

lallemand.com



Aviagen recently held the first-ever Nutrition School for customers throughout Europe, Middle East and Africa (EMEA) in Bangkok, Thailand. Led by top specialists from Aviagen and the wider poultry industry, the Nutrition School offered a fully packed program focused on achieving the highest level of quality, balanced nutrient intake and biosecurity of breeder and broiler diets. Visits to the Bangkok Agricultural Research Center (BARC) feed mill, laboratory and farm facilities were among the highlights of the week, enabling students to hand produce their own diets, feed them to day-old chicks and analyse gut health in a practical workshop.

aviagen.com

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APPOINTMENTS

DENIS KAN

Jamesway Incubator Company
President
www.jamesway.com

PAULO RAFFI

Diamond V
Poultry Technical Specialist
www.diamondv.com

DAVID KELLY

Diamond V
Poultry Marketing Manager
www.diamondv.com

DR ALESSANDRA MONTEIRO

Animine
R&D Team
www.animine.eu

DR JINXIAO ZHANG

Animine
Technical Lead Support
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Trouw Nutrition are to launch a new and innovative precision-feeding tool: the NutriOpt On-site Adviser. This will help close the gap between theory and practice by delivering all NutriOpt's nutritional expertise directly to the farm through the use of a handheld scanner and smartphone.

"Using today's digital technology, we can now support farmers in running their business more efficiently and give them better control of their resources. I look forward to working with the NutriOpt On-Site Adviser users to understand how we can continue to develop this innovative tool," André Brand, Marketing Director NutriOpt, Trouw Nutrition, told International Poultry Production.

"Within our NutriOpt precision nutrition programme, we want to enable everyone to perform real-time, on-the-spot NIR analysis."

The NutriOpt On-site Adviser combines a handheld NIR scanner

with an easy-to-use mobile application, linking the on-site scanning process of feed samples directly to practical advice based on the NutriOpt Nutritional Database.

Supported by four worldwide research centres, their global laboratories, and an extensive network of research facilities and experts, this database provides the basis for reports that are sent directly to the user.

These reports include analytical results for poultry and show whether the tested samples meet the optimal quality standards and advice, or whether an adaptation of the diet/load list is required.

This enables any NutriOpt On-site Adviser user to make informed decisions in managing their feed (all common raw materials and silages) and feeding programmes.

The result is increased feed efficiency or reduced feed costs by making optimal use of the nutritional variation in raw materials and silages.

trouwnutrition.com

Training of first Saudi Arabian students



A graduation ceremony at Al Bukayriyah, Al Qassim marked the achievements of the first Saudi Arabian students to complete their training at Al Watania Poultry Institute of Technology (WIT) in a joint program with Cobb-Vantress.

WIT is a charity set up to train the country's nationals to world-class standards in poultry production with a plan to extend this opportunity to students across the GCC's member states.

The training covers all aspects of poultry production as well as the English language and basic science. In 2016 Cobb joined hands with WIT to provide practical training at its European and US production facilities.

The first group of more than 50 students has completed their training at the institute, which is equipped with state-of-the-art laboratories and hatcheries and farms where they received hands-on training.

Cobb, among others, including the University of Arkansas, is a sponsor of the project.

cobb-vantress.com

Positive impact on poultry production



Early investment in the growth cycle is essential to enable birds to reach their full genetic potential.

Supplementing their diet with nucleotides is vital for several metabolic processes and tissues at certain stages of growth. Hilyses, an ICC Brazil product, is a source of free nucleotides that is rapidly absorbed, helping to strengthen the immune system for efficient growth.

A recent experiment on how low dosages of Hilyses affect the performance of broiler chickens up to 42 days of age, was conducted by Dr Melina Bonato, ICC Brazil's R&D Coordinator. An improvement in birds' feed conversion ranging from 28 and 42 days of age was seen when compared to the negative control; in addition, it was numerically superior to the other treatments.

The results indicate the benefits of Hilyses as a source of nucleotides in pre-initial and initial diets. Also, the results reinforce the nucleotide's importance in the period of quick growth and animal development. The benefits are reflected in weight gain and feed conversion.

iccbrasil.com

VIV China

17-19th September
Nanjing, China
www.vivchina.nl

European Poultry Conference

17-21st September
Dubrovnik, Croatia
www.epc2018.com

Bangla Livestock

20-22nd September
Dhaka, Bangladesh
www.banglalivestock.com

WVPA Asia Meeting

1-2nd October
Kuala Lumpur, Malaysia
www.wvpaasia2018.com

Vietstock

17-19th October
Ho Chi Minh City, Vietnam
www.vietstock.org

Agrena

25-27th October
Cairo, Egypt
www.agrena.net

Eurotier

13-16th November
Hannover, Germany
www.eurotier.com

Poultry India

28-30th November
Hyderabad, India
www.poultryindia.co.in

2019

IPPE

12-14th Feb
Atlanta, GA, USA
www.ippexpo.com

VIV Asia

13-15th March
Bangkok, Thailand
www.vivasia.nl



Check all vitamin levels in poultry feed. Always.

Irreplaceable and essential, vitamins are key nutrients to optimize poultry health and performance.

We therefore encourage you to feed animals high-quality vitamins in the amounts and ratios appropriate to their life stage and growing conditions.

The DSM vitamin supplementation guidelines are the industry's key reference tool for cost-effective optimization of your vitamin nutrition strategy.

Download the DSM vitamin supplementation guidelines at www.dsm.com/ovnguidelines or on the OVN® app!



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