

International Poultry Production

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Practical information for progressive poultry professionals

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editor's perch

When we look around the international trade shows it is apparent that the large equipment manufacturers are becoming more selective about where they exhibit. One also sees far more stands offering solutions to problems rather than just their product range.

Is this a quiet way of telling us that our industry is going through a defining moment in its history?

Are we seeing the change from a cost of production in leading supply industry companies to one that is far more concerned about customer issues and safety and sees its future role as one of working with us to solve these problems, rather than inadvertently adding to them by focusing on price alone?

Interestingly, the success we have in producing poultry products is very much dependent on how we manage the four interfaces through which our poultry farms interact with the world. These interfaces are with the hatchery, the processing plant and the feed mill, with the fourth being the interface with diseases or biosecurity. All of these utilise major equipment such as incubators, processing equipment,

milling equipment and poultry houses. In all four we now find smaller companies emerging with new technologies that help that interface be more effective in terms of production, quality enhancement and improving product safety.

Some of these are acquired by the major players, such as sexing technology in hatcheries and in ovo vaccination for disease control. Others operate as successful independent companies.

At each of these interfaces the producers need to effectively communicate with their supply companies in a far more open way. This means that we need companies with workforces and management teams that are knowledgeable and capable of using this to improve productivity and profitability.

This will necessitate a greater interaction between suppliers and customers that will require a greater two way transparency. I remember being laughed at in the 1980s for suggesting that we needed to spray chicks in the hatchers with good bugs a day or two before pulling to maximise health status and live bird performance; and that air was a good antibiotic for turkeys! ■

Cover Picture:

Healthy beginnings!
(Photo courtesy of Kanter's Special Products BV)

Poultry weight systems

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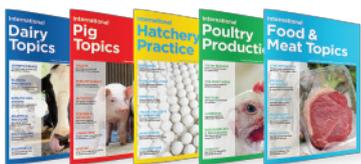
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worldfocus

An executive summary of key international issues

Newcastle

An early downside for refrigeration?

Historically, there was a challenge in providing fresh meat to the crews of ships. This was obviously a greater problem for ships moving in the Tropics because of the higher temperatures. The end result was that often meat had to be thrown overboard because it had decomposed and gone putrid. At the start of the last century this problem was solved with the advent of refrigeration. However, there was the inevitable downside. In 1927 surplus poultry meat was offloaded from a ship from Indonesia after docking in the UK. This went to a waste tip where it came into contact with local poultry and a disease outbreak occurred, similar to one seen the previous year in Java. That disease is now called Newcastle disease.

Gumboro

Two claims to fame?

In 1962 a new disease was seen in poultry in the Delmarva (Delaware, Maryland and Virginia) region of the USA. One of the first places where this new disease was seen was a small village in the south of Delaware called Gumboro. The disease had high morbidity and mortality. It also spread rapidly and within a couple of years was in all the major broiler and table egg producing areas of the USA. In 1976 the Gumboro disease virus was recognised as belonging to a new taxonomic group and its immunosuppressive property was confirmed. Probably Gumboro's only other claim to fame is its annual Gumboro Mud Bog, where people take four wheel drive trucks and SUVs into the mud.

Indonesia

Origin of the name, if not the breeds

A bantam is a small variety of domestic chicken that is a quarter to a third of the size of a standard bird and which lays similarly small eggs. The name derives from the city of Bantam in Java where European sailors bought the local small chickens for their shipboard supplies. True bantams have no large fowl counterpart. They are naturally occurring and include Nankin, Sebright and Rosecomb breeds. Miniature bantams are derived from a standard breed such as Rhode Island Red, Cochin or Orpington. Developed bantams are small breeds that have been further developed with some help and include Belgian, Pekin (Cochin) and Japanese breeds.

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Implementing effective health strategies in the poultry industry

One of the major limiting factors to successful performance in the poultry industry is the impact of disease on poultry production. Effective health strategies focus on the principle that prevention is better than cure.

by Dr Wiebke Oellrich,
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Animal owners have a responsibility to understand and meet the health and welfare needs of their animals. In the poultry sector the prevention of disease not only improves the welfare of the animals, but can also provide economic benefits.

Therefore, the industry must aim at improving the conditions surrounding the birds to prevent disease on a continuous basis. This can only be accomplished by a fully integrated approach, including investments and management improvements.

To achieve this, we advise a system based on several principal pillars. The most important factors contributing are biosecurity; flock health including sourcing of good quality birds, vaccination, gut health, water and feed quality; and the birds' environment including ventilation, temperature, and litter conditions.

Biosecurity

To safeguard the health of the birds by preventing the introduction and spread of infectious disease causing agents a strict biosecurity programme must be in place.

Biosecurity is the implementation of measures that reduce this risk and requires the adoption of a set of attitudes and behaviours by people to reduce risk in all activities related to poultry production.

An effective biosecurity programme requires the identification of the most likely sources of disease and the establishment of practices designed

to prevent the introduction and the spread of these pathogens into and between flocks. Using the Hazard Analysis and Critical Control Point (HACCP) principle is a helpful tool to identify potential hazards that could occur with regards to disease introduction and, following that, putting procedures in place to prevent these.

The successful implementation requires considerable technical input. Biosecurity consists of three major components: Isolation, traffic control and sanitation.

● Isolation

Production economics usually leads to larger sites and more densely populated poultry areas. These areas present the industry with challenges in preventing the introduction and persistence of disease.

Therefore, ever more emphasis needs to be put on the farm's infrastructure in high density poultry and/or livestock areas as it is more difficult to achieve isolation of a poultry farm. Isolation is not only important with regards to where the farm is based in the wider geographical area but within the farm itself. Whilst poultry units ideally should be built away from other poultry and livestock units to prevent air and vector borne transmission of disease causing agents onto the site, within the site each house should be seen as a unit in itself to allow the containment of any potential disease issues within a house.

Ideally no open water should be

in close proximity to the houses as this is likely to attract water fowl and increases the risk of the introduction of, for example, avian influenza virus. The same applies for major roads that handle high volumes of poultry business related vehicles, such as live haul lorries.

● Traffic control

The creation and maintenance of barriers will limit the potential opportunities for contaminated materials to enter an uninfected site. Practices include 'exclusion' of visitors, vehicles and equipment that visit other poultry or livestock farms, not sharing staff with other sites and 'containment' like isolating houses, controlling rodents and insects, and the entry of wild birds and other animals to the house. Showering-in and farm dedicated clothing should be standard on site. Site layout should enable feed to be blown into the bins from outside the perimeter fence, ensuring that feed lorries must not enter the biosecure area.

● Sanitation

Part of the programme is the correct use and application of cleansers, sanitisers and disinfectants for both ongoing or terminal cleaning and disinfection procedures. Using a suitable product in the correct way at the right concentration is paramount. Manufacturers are usually willing to advise how to achieve the desired outcome.

Site cleaning must remove all potential poultry and human

pathogens and minimise the number of residual bacteria, viruses, parasites, and insects between flocks. It is worth noting that the downtime between flocks is equally crucial to good performance. In this regard it is more important how many days the poultry house is rested under dry and clean conditions than how long the houses are empty. The time depends on the health challenges on the farm and the geographic location.

● Pest control

Rodents, wild birds, and insects can carry disease causing agents such as Salmonella enteritidis and typhimurium, avian influenza and Newcastle disease, or other viral diseases and campylobacter which can contaminate a poultry flock.

Preventing rodents and insects on a farm can be difficult due to plentiful food sources and nesting/ breeding sites.



Invest in a good bait box.

Their control requires an integrated pest management programme involving techniques such as rodent-proofing the farm area and houses; eliminating nesting sites and food sources; controlling/ eradicating existing populations, and preventing infestations. These control strategies must be carried out continuously to effectively control pests on the farm.

The best programmes for preventing or limiting pest populations on the farm utilise biological (elimination of food sources, debris and nesting sites), mechanical (traps, insect light traps) and chemical (rodent baiting,

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Factors to consider when preparing a biosecurity programme.



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Nature's Answer

Continued from page 7
 parasiticides and insecticides) controls (in accordance with local legislation). Farm building design should be such as to prevent access for rodents and wild birds.

Areas around poultry houses should be kept free from vegetation, debris and equipment, which can provide shelter for rodents. Feed and litter material need to be stored in an inaccessible area for all pests. Prevent nesting of wild birds by eliminating potential nesting sites.

Flock health

● Sourcing

Animal health planning and the promotion of best practices are part of effective health strategies. This starts with sourcing good quality day-old birds from healthy breeding stock and a well-managed hatchery.

As breeders can transfer vertically transmitted diseases such as mycoplasma, as well as beneficial intestinal microbes and immunity via maternal antibodies to their progeny, sourcing day-old birds from healthy breeder flocks which are fed a diet based on good nutrients and have an effective vaccination programme is vital for the adequate development of the embryo and birds in the first few days. Good hatchery management is equally important in producing good quality day-old birds.

● Vaccination

The use of a vaccination programme tailored for the location and situation of the flocks can help in the prevention of a range of viral and bacterial disease outbreaks. Where needed, the use of autogenous vaccines which are specifically designed for the individual operation, usually against bacterial infections, can be a good tool to minimise the impact of the pathogens specific to a farm.

● Water quality and hygiene

Water quality is often overlooked in poultry production systems. Water is a vital nutrient and can have a negative impact on the birds when it contains high bacterial loads. Whilst feed quality often gets a lot of attention, one needs to bear in mind that poultry will consume around twice as much water during their lifetime as feed.

Even if mains water of good quality is used, continuous water sanitation can be required in addition to water line cleaning between flocks. This is because bacteria, fungi or yeasts can quickly re-establish a biofilm in the water system.

A biofilm is an assemblage of microbial cells that is irreversibly



associated with a surface and enclosed in a matrix of primarily polysaccharide material which cannot be removed by rinsing alone. Some additive products like vitamins or vaccines provided via water can also create conditions favourable for the growth of biofilms.

Mortality is reduced and health greatly improved when this biofilm is removed. Knowledge of methods eliminating and controlling biofilms is essential for effective health strategies. Ideally the build-up of a biofilm is prevented right from the start after cleaning the water lines between flocks.

A daily water sanitation programme will therefore benefit the birds and the water system. Utilisation of disinfectants approved for use in the drinking water of food animals reduces the level of water-borne pathogens and helps to control biofilms. It needs to be kept in mind that poultry can be sensitive to taste and might reduce water intake as a result. During turn-around various sanitation methods are in use and a wider range of line cleaners and biocidal products can be used to treat the water distribution systems.

● Nutrition

Over the years the genetic capability of modern poultry breeds has significantly improved as part of a balanced breeding programme. Improved weight gain and efficiency of commercial crosses has resulted in increased growth potential with simultaneous improvement of health, welfare, robustness and sustainability.

These well performing birds

require nutrients suitable to their increased potential – therefore, while breeds develop, continuous (re)consideration of nutritional and feed management requirements is essential. Birds must be able to consume enough good quality feed providing all the necessary nutrients to achieve essential physiological organ development.

The cardiovascular, respiratory, digestive and immune system development is critical to enable the bird to adequately deal with any possible stressor and give it the best chance to stay healthy. The lack of essential and sufficient nutrients makes a flock more susceptible to disease causing agents.

● Gut health

Many factors influence gut health, and consequently performance and susceptibility to infection, in poultry. Good quality feedstuffs are essential for optimum digestibility. Anti-nutritional factors, including the physical form of the feed, impeded accessibility to feed due to high stocking density, nutrient content, and mycotoxins play a role in reducing gut health.

Production programmes need to place great emphasis on avoiding levels of mycotoxins that exceed recommended limits. Producers should be monitoring feed for mycotoxin contamination, and if necessary implement a mycotoxin management programme. Grain damage and conditions that could increase mould and insect spoilage should be minimised. Fats and oils with rancidity should be rejected.

Bacterial contamination of feed and/or water can damage the intestinal tract, leading to an

inflammatory response within the intestine that demands increased energy used along with a decreased transit time for the digesta in the intestine. Nutrient availability is then reduced.

The outcome of reduced gut health can be diarrhoea leading to wet litter, which in turn can lead to increased foot pad lesions in poultry. Diarrhoea can also lead to dirty eggs in laying flocks which may result in a greater number of eggs being rejected or becoming infected, potentially resulting in poor quality chicks.

● House environment

Good environmental conditions should be provided in the house for effective poultry production. Ventilation, temperature, litter management, and stocking density play a part in this.

Any bird not experiencing the right environmental conditions according to its age will be under stress. This can have a negative impact on its feed intake pattern which can affect intestinal motility, further impacting on gut health and disease resistance. During the brooding period it is important to allow the flock sufficient space.

This helps to avoid excessive competition for feed, drink and physical space and helps to give the birds a good start.

Maintaining precise temperature to avoid heat stress or chilling (prevent draughts) and providing the correct ventilation to extract harmful gases and humidity as well as providing oxygen helps to make the bird comfortable and eat properly.

Poultry spend their life in close contact with litter material. The aim is to establish good, dry but dust-free litter conditions to avoid problems like respiratory disease. High ammonia levels in the air lead to damage of the airway tissues and therefore increased susceptibility to infection.

Conclusion

Effective health strategies revolve around the principle that prevention is better than cure. Animal health planning and promotion of best practices, particularly with a focus on biosecurity, are at the heart of these strategies. The training of people working at the farm and hatchery is crucial.

Animals that are cared for appropriately and in accordance with acceptable welfare standards are more likely to be healthy, and less likely to contract or spread disease. In the poultry sector the prevention of disease not only improves the welfare of the birds, but can also provide economic benefits to the company. ■

The principles of a good biosecurity programme.



A close-up photograph of a person's hands holding a brown chicken. The person is wearing a grey button-down shirt and a red patterned scarf. The chicken has a prominent red comb and wattle. The background is a soft-focus green field.

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Feeding a broiler super prestarter boosts performance

Efficiency is the key to success in broiler production and the importance of a good start in life is discussed for all species. In the case of broilers, the first four days of a broiler's life represents around 10% of their whole life. What a chick eats during this time can directly impact its future performance.

by Daan van der Heijden,
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www.joosten.nl

Availability of the right nutrients immediately post-hatch is critical for growth and development of the internal organs. A rule of thumb says that every 10g more body weight at day seven results in 1.4% higher ADG and 1% lower FCR until final live weight (Fig. 1). To ensure good broiler chicken profitability, a perfect start is very important.

Early chick nutrition

Optimal development of the gastrointestinal tract (GIT) is essential in young birds for future growth and is related to immune function. The yolk, containing antibodies and good fatty acids, is the colostrum for the chick. In newly hatched chicks, the yolk

accounts for 16% of the body weight, which is absorbed during the first 2-3 days.

In commercial broiler operations it is not uncommon for newborn chicks to experience a delayed access to feed. With feed absence, the chick goes into survival mode and burns not only protein and fatty acids in the yolk, but also its own fat and muscle reserves from the organs, such as the liver and the heart.

The digestive system of the bird at hatch has limited ability to digest and absorb nutrients. It is therefore vital to provide a diet that contains highly digestible and available nutrients. The metabolisable energy and amino acid digestibility of grains are lower in young birds and indigestible nutrients can serve as substrate for undesirable gut micro-organisms.

The aim should be to kick start the digestive system of the young chick as soon as possible. Feed particle size and feed presentation will play a significant role in this.

Definition of a super prestarter

A special diet fed to broiler chicks for the first 3-5 days post-hatch is often referred to as a super prestarter (SPS). The primary aim of a SPS is to fulfill the specific nutritional needs of the young chick, supporting its transition from

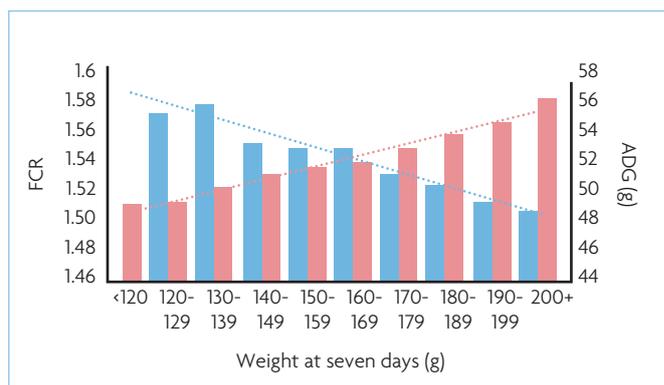


Fig. 1. Higher broiler weights at day seven results in better growth performance based on data of 102.3 million broilers.

eating the yolk sac to the first diet consumed. In a SPS, different high quality sources of protein, fats and carbohydrates are used and it has specific vitamin, mineral and amino acid specifications. It is important to provide the newborn chick with optimal nutrients in the right ratio and the right feed form. The ingredients should be highly palatable as well as easily digestible. SPS diets are often in the form of 2.0mm micro pellets or crumbs and should be highly palatable and dust free.

In order to achieve the best results, it is important to stimulate the chick's metabolism from the beginning and, as well as gut health, it is essential to focus on skeletal development.

Early feeding ingredients

Specialty ingredients often used in SPS formulas include animal plasma, wheat gluten, fish meal and highly digestible protein concentrates, all of which are highly digestible yet more expensive than conventional proteins.

Some of these ingredients provide significant side-effects beyond high digestibility. Such is the case for animal plasma that has an exceptionally high concentration of immunoglobulins and other bio-factors that enhance gut development.

Such specialty dual-action

ingredients should be evaluated based on their total contributions.

Based on this knowledge, Joosten – young animal nutrition provides two products specially designed for young animal (early) feeding, to boost gut health and performance: FMR Ω 3 and JPC 56.

Both products are ingredients of choice which perfectly match within the specific SPS diet and have an excellent protein digestibility of over 95%, a result based on the selection of ingredients and unique in-house processing technology.

The special products contain balanced levels of amino acids, including high levels of glutamine to support gut health development. With FMR Ω 3 the supply of essential omega 3 fatty acids (EPA/DHA) contributes to an increased anti-inflammatory capacity.

These premium products result in an improved gut integrity, a more efficient nutrient use and significant increased growth performance. Better performance and better gut health in the early feeding phase strongly contribute to a better profit for a lifetime.

Aims of a super prestarter

● **Boosting gut development**
During the first two weeks of life, the GIT grows four times faster than

Continued on page 13

Table 1. Trial results from feeding a super prestarter formula versus a conventional one for the first seven days post-hatch in a European commercial broiler integration.

| | Batch 1 | | Batch 2 | |
|-----------------------------|--------------|-------|--------------|-------|
| | Conventional | Super | Conventional | Super |
| Final weight day 35 (g) | 2,168 | 2,243 | 2,243 | 2,289 |
| FCR | 1.65 | 1.59 | 1.60 | 1.51 |
| Cost (€)/kg weight | 0.54 | 0.52 | 0.52 | 0.50 |
| Mortality (%) | 4.24 | 2.94 | 4.11 | 3.39 |
| Kg per m ² | 43.03 | 44.88 | 46.01 | 45.87 |
| Profit per chick placed (€) | 0.01 | 0.09 | 0.12 | 0.18 |

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| | Control (155g) | Super (155g) | Brooding supplement (5g) + Super (150g) | SEM |
|-----------------------|--------------------|--------------------|---|-------|
| Weight day 0 (g) | 48.7 | 48.7 | 50.2 ^s | 0.30 |
| Weight day 7 (g) | 180.8 ^a | 195.7 ^b | 191.5 ^b | 2.11 |
| Daily gain (g) | 18.9 | 21.0 | 20.2 | 0.28 |
| Daily feed intake (g) | 38.1 | 39.5 | 38.4 | 0.33 |
| FCR | 1.32 | 1.17 ^s | 1.23 | 0.018 |
| Mortality (%) | 13.2 ^s | 3.5 | 3.5 | 1.51 |
| Yolk weight day 4 (g) | 0.67 | 1.09 | 0.81 | 0.12 |

Table 2. Trial results day 0-7. ^{ab}significant differences (P<0.05); ^strend relative to control (P<0.10). In the first week the broilers became sick due to an E. coli infection; they were treated with antibiotics for three days.

Continued from page 11
the rest of the body. This growth is correlated with the feed intake. In avian species the formation of muscle fibre is completed at hatch and the skeletal muscle growth starts rapidly after hatch. Because of this high muscle growth, the demand for amino acids is high.

The highest priority in the first week is the development of the intestinal tract, because it is this package of organs that is driving body weight gain and, as such, requires up to 40% of the energy and protein that a young broiler consumes. High protein content is necessary in diets for young chicks for growth and also to help maintain body temperature.

Probiotics may be added to SPS diets in order to feed the gut with beneficial bacteria or protect it from pathogens.

● Supporting immunity

Mortality in broilers mainly occurs in the first week of life. At birth, chicks have no active immune system and after a couple of days the broiler runs out of maternal immunity and the development of their own immune system takes 7-10 days. This makes the broiler more sensitive to infections.

Development of the immune system starts in the embryo and

continues post-hatch. The bacterial flora strongly contributes to the modulation of the gut immune system.

In the first week of life, there is a rapid increase in the number of leucocytes, due to the growth of the lymphoid organs. These increases are important for acquired immunity development. The yolk sac is important because it transfers passive immunity in the form of immunoglobulins from the yolk and albumen to the newborn chick.

The synthesis of immune cells is a metabolically expensive process and is highly dependent on the presence of nucleotides. These protein building blocks can be found in certain concentrated protein products which should be used in SPS formulas.

Table 3. Trial results day 1-35. ^{ab}significant differences (P<0.05); ^strend relative to control (P<0.10).

| | Control | Super | Brooding supplement + Super | SEM |
|-----------------------|-------------------|--------------------|-----------------------------|-------|
| Weight day 35 (g) | 2,338 | 2,385 ^s | 2,355 | 13.8 |
| Daily gain (g) | 64.4 | 65.9 ^s | 65.4 | 0.44 |
| Daily feed intake (g) | 95.2 | 96.6 | 96.3 | 0.56 |
| FCR | 1.48 | 1.47 | 1.47 | 0.006 |
| Mortality (%) | 16.0 ^a | 7.6 ^b | 4.9 ^b | 1.86 |

● Improving uniformity

Uniformity is an important goal for commercial broiler producers. To achieve this, feed intake should be maximised at critical stages to support gastrointestinal development. Closing the growth gap will be most cost effective when the birds are still young chicks.

The development of the GIT and immune system is important in modern broiler production to support growth and performance.

Feeding a SPS diet that specifically meets the requirements of a chick in the first few days of life is the best way to ensure a good start. It is a significant investment with the aim of promoting efficiency throughout the broiler's life cycle.

Field trial results

Table 1 shows the results of feeding a SPS diet versus a conventional one for the first seven days post-hatch in a European commercial broiler integration. In this trial, a conventional and SPS diet were followed with typical starter and grower diets until slaughter. As can be seen, after two batches of broilers were tested, the conventional diet did a good job.

As expected, the SPS gave chicks an early advantage that lasted until market age (35 days). Broilers fed the SPS for the first seven days post-hatch were, on average, 60g heavier at market age, more

efficient in converting feed to meat by eight points, less costly to feed despite the extra cost of the SPS and more profitable by 7 euro cents per bird.

Another trial in broilers (Table 2), carried out in the Poultry Research Centre in Vliedden, The Netherlands, shows the results of feeding a typical starter diet (control) versus a SPS diet and a diet consisting of a brooding supplement in combination with a SPS, for the first seven days post-hatch followed by a normal feeding programme including haemoglobin powder. On day 35 the chicks that received the SPS diet were around 50g heavier compared to the control group (Table 3). This trial confirms again the advantages of feeding a SPS.

After establishing the need for a SPS, it is important to decide on the maximal length of its use to control the costs. In most cases, feeding a SPS is rarely practiced beyond the first week post-hatch. The higher the quality of the SPS, the shorter the duration of the feeding period required. In one controlled study, a SPS diet containing 2.5% animal plasma was offered for the first five days post-hatch.

The chick growth was enhanced by almost 35%. Broilers fed the SPS diet during the first five days were at market age (42 days) about 10% heavier than the ones that had been on a conventional starter diet.

These results show that the use of high-quality protein sources in SPS diets is a worthwhile investment. There is more on-going research trying to quantify the effects of SPS formulas, but it is worth the expense.

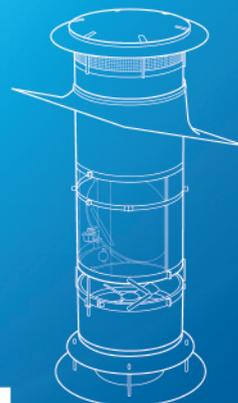
It looks surprising that such small changes in feed formulation for just a small period of time have a big impact throughout the commercial life of a broiler. An investment in early nutrition pays good dividends at the end. ■

References are available from the author on request

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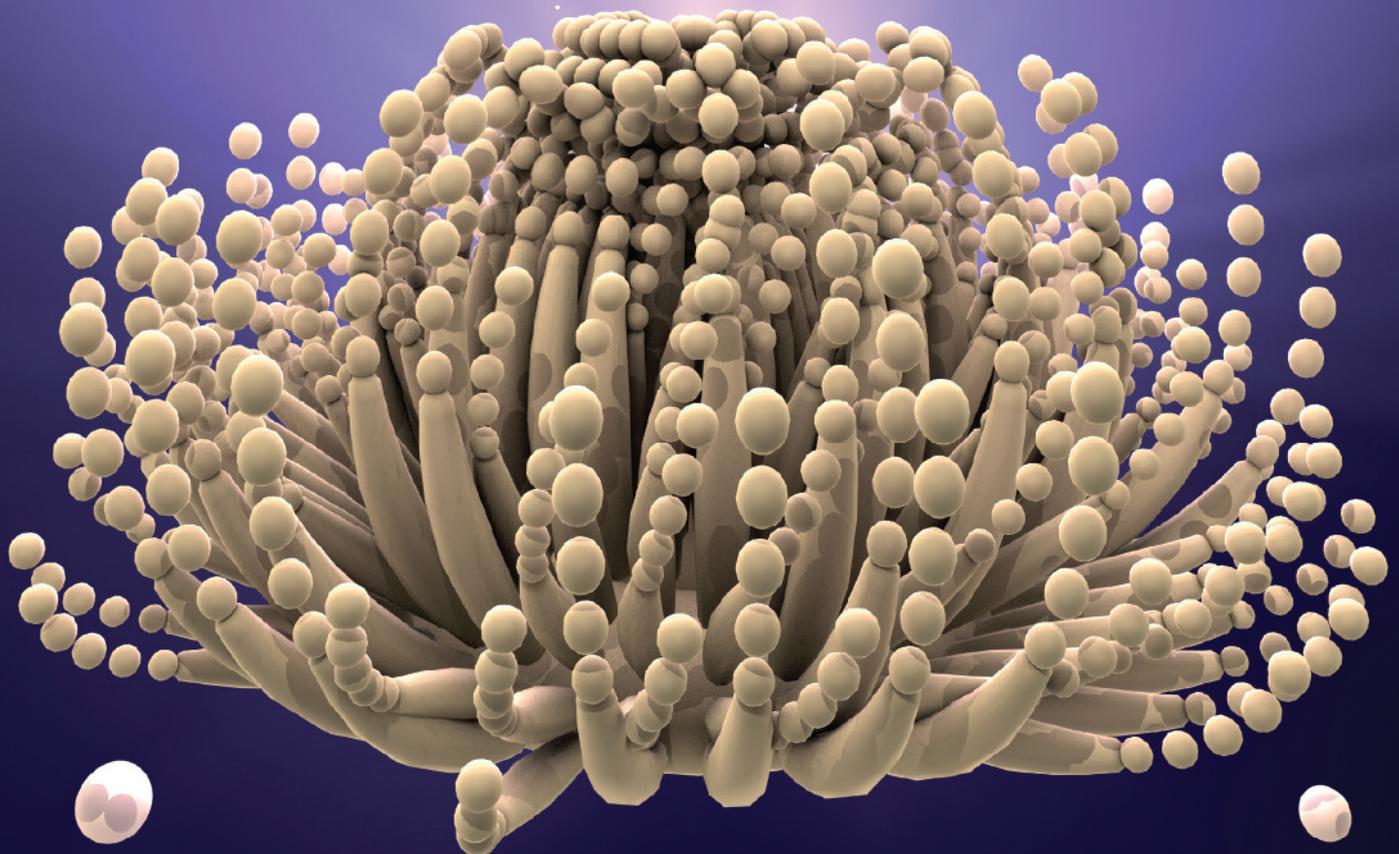
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The effect of zinc on the intestinal health of poultry

Zinc requirement of poultry is defined according to specific criteria, related to growth, bone composition, or immune function and could vary according to the criteria considered.

Supplementation with inorganic salts or the chelated form aims to satisfy the animal's need on top of the zinc contained in feedstuffs.

by David Mathé,
Animine.
www.animine.eu

While little is to be expected in animal health from the usual sources of zinc added on top of requirement, the use of potentiated zinc oxide has shown positive effects on gut microbes and intestinal health parameters. Data obtained in necrotic enteritis (NE) challenge conditions with a potentiated zinc oxide have demonstrated a source-related effect on growth, mortality and intestinal lesion score.

These results support the use of this novel zinc oxide form to improve intestinal health and to manage NE in poultry.

Zinc requirements of poultry

Zinc (Zn) is an essential nutrient in poultry for gene expression, cellular replication, stabilisation of proteins,

and hormone structures. It is also crucial for bone growth through alkaline phosphatase and collagenase.

It plays a major role in the body as a constituent or a cofactor of 300 enzymes involved in the synthesis or degradations of lipids, proteins and nucleic acids. Zn is also essential for immune function.

Zn naturally occurs in plants used in poultry nutrition, but its concentration is very variable, even within the same species. The amount of zinc in raw materials is often too low to satisfy the animal's requirements and some anti-nutritional factors like phytate can decrease its bioavailability. Therefore, Zn is usually supplemented in the premix to reach total dietary levels of between 60-150ppm.

As requirements from different institutes vary from 40 to 80ppm Zn added on top of plant-born Zn (evaluated between 20 to 40ppm Zn), feed levels often exceed the animal's needs and avoid zinc deficiency.

Zinc levels and sources for optimal body function

Despite adequate levels being fed to poultry, some publications and practices are reporting benefits to skin (skin lesions or dermatitis) and carcase quality when using non-commodity zinc sources at slaughter. Considering the usual zinc

| | RBV Zn (% bone) | RBV Zn (% plasma) |
|--------------------------------------|-------------------|-------------------|
| ZnSO ₄ , H ₂ O | 100 ^b | 100 ^a |
| Potentiated ZnO (HiZox) | 105 ^a | 126 ^a |
| ZnO 1 | 66.1 ^c | 84.1 ^b |
| ZnO 2 | 92.0 ^b | 83.5 ^b |

Table 1. Relative Biological Value (RBV) of four zinc sources (Narcy et al.)

levels in feeds, these effects can be explained by a low bioavailability of native zinc and/or added zinc.

It is also hypothesised that the animal requirement can be increased in case of environmental challenge as heat stress or disease challenge. We might then expect that zinc sources with high bioavailability would better serve the animal demand in such cases.

The development of a new potentiated zinc oxide (HiZox) resulted in a product with superior physico-chemical properties. When compared with other zinc oxide sources and zinc sulphate, this new form of zinc showed significant higher Relative Biological Values (RBV) in a state-of-the-art experiment conducted at INRA.

This experiment highlighted the huge variation on RBV values of zinc oxide, ranging from 66% for the lowest and 105% for HiZox on tibia Zn concentration (Table 1).

Feeding animals such a source of highly bioavailable zinc would result in higher Zn supply to the animal

and optimise body function related to zinc status.

Source-specific effect of zinc on intestinal health

The antibacterial effect of the pharmacological dosage of zinc oxide is well known by pig nutritionists but not by poultry nutritionists, because of the toxicity it will induce to avian species at levels above 500-1000ppm in the feed.

The concept of potentiated zinc oxide, with an increased surface area, has proven to be more anti-bacterial than regular zinc oxide products. Its superior effectiveness has been demonstrated on Escherichia coli, Salmonella enteritidis and typhimurium and Clostridium perfringens species in in vitro experiments.

Considering the effect of potentiated zinc oxide on Clostridium perfringens, the effect

Continued on page 17

Fig. 1. Necrotic enteritis lesion score of challenged broilers

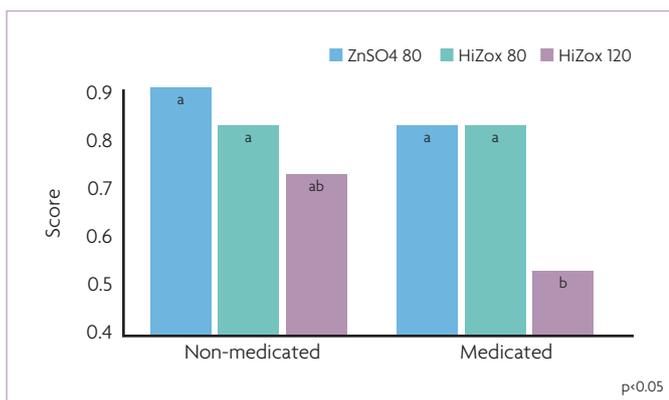
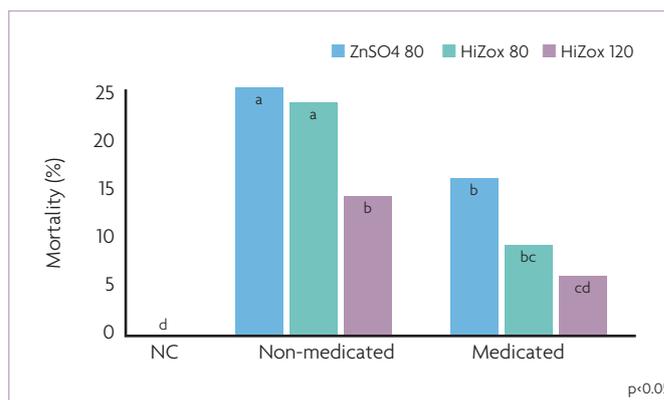


Fig. 2. Mortality of necrotic enteritis challenged broilers.



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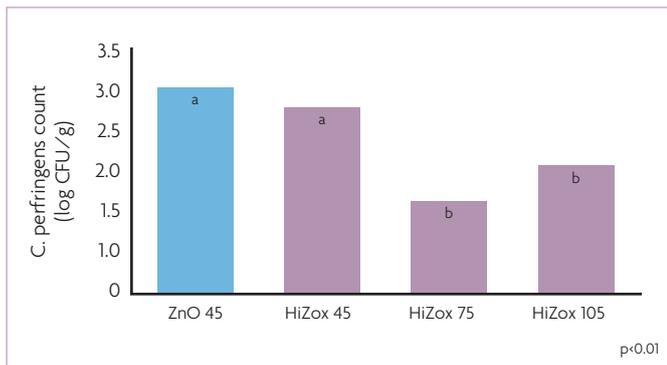


Fig. 3. C. perfringens intestinal count of challenged broilers.

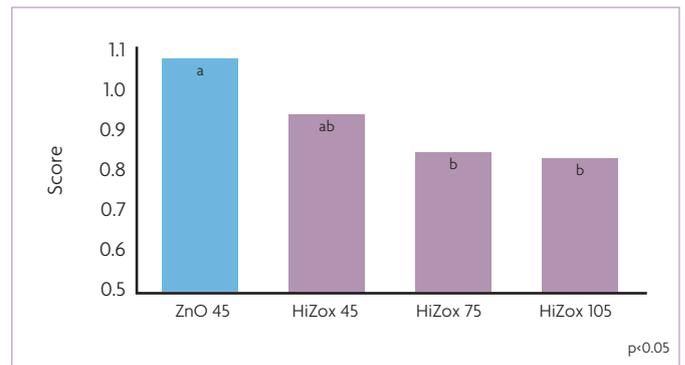


Fig. 4. Necrotic enteritis lesion score of challenged broilers.

Continued from page 15
 on NE was investigated in a broiler challenge experiment at Southern Poultry Research in the USA.

The trial consisted of 72 cages starting with eight chicks each. They were divided into three groups of 24 cages: one group fed with 80ppm of Zn from zinc sulphate (ZnSO₄) and the others with Zn from potentiated zinc oxide (ZnO) source (HiZox), at 80ppm or at 120ppm.

Each group was then subdivided into three groups of eight cages: non-challenged birds, challenged birds with non-medicated feed and challenged birds with virginiamycin at 20ppm.

On day of trial (DOT) 14, all the broilers were orally inoculated with ~5,000 oocysts of *E. maxima*.

On DOTs 19, 20 and 21, animals of challenged groups were given a broth culture of *C. perfringens* ~10⁸cfu/mL. Growth performance per cage was recorded on DOT 0, 14, 21 and 28.

On DOT 21, three birds from each cage were sacrificed and examined for the degree of presence of necrotic enteritis lesions, from zero (normal) to three (sloughed and blood small intestine mucosa).

Concerning the growth performance, the differences were essentially related to challenge and to medicated feed: on DOT 28, non-challenged birds and challenged birds fed virginiamycin had the

highest bodyweight and the lowest feed conversion ratio, compared to challenged birds with non-medicated feed.

For the necrotic enteritis intestinal scoring, challenged broilers fed 120ppm of Zn from HiZox was numerically (non-medicated feed, 0.7 vs 0.8-0.9) or significantly (medicated feed, 0.5 vs 0.8) lower.

Mortality decreased in groups fed HiZox, numerically (80ppm of Zn) or significantly (120ppm of Zn), compared to groups fed ZnSO₄ (see Figs. 1 and 2).

In another experiment in Thailand, using coccidial and *C. perfringens* challenge as well, potentiated zinc oxide was compared with standard zinc oxide in broilers.

Some 45ppm added Zn from standard ZnO was compared to the same Zn level added or 75 and 105ppm from potentiated zinc oxide (HiZox).

The use of HiZox improved numerically (at same dose) or significantly (at higher dose) the lesion score. The bacterial count was significantly lower with 75ppm and 105ppm of HiZox compared to the other treatments (see Figs. 3 and 4).

These two experiments tended to indicate a zinc source and a zinc level effect on the severity of NE lesions as well as on the NE consequences on broiler performances.

Recent field investigations on an *E. coli* outbreak in laying hens showing a reduction in bird mortality, confirms the potential of such a novel zinc source to attenuate bacterial challenges in poultry.

Another experiment conducted in Iran at Tehran University looked at the effect of this innovative zinc oxide source in heat stressed broilers. Basal corn-soybean meal diets were formulated and supplemented with 100ppm of zinc from standard ZnO or with a potentiated ZnO source (HiZox), at 75ppm, 100 or 125ppm.

The potentiated ZnO tended to reduce the number of dead birds (2.5% to 3% depending on treatment) in comparison with the standard ZnO. The skin resistance was also improved in groups fed the potentiated ZnO, as shown in Fig. 5.

The effect of the potentiated zinc oxide has also been investigated in a high density challenge at the University of Putra Malaysia. In this study, experimental diets were supplemented with 60ppm of zinc from ZnSO₄ and three doses of zinc from the potentiated zinc source (HiZox: 60, 90 and 120ppm).

The potentiated ZnO at 60ppm significantly improved feed conversion ratios and weight gains of broilers raised in high density during the starter period (day 1-21), compared to ZnSO₄ at the same dosage (Fig. 6).

In addition, increasing the supplementation level of the potentiated ZnO numerically increased growth performance.

Conclusion

Despite some discrepancies in zinc poultry requirements throughout reference publications, the practical levels used by the industry seem to be well over animal needs, thus avoiding deficiencies. The quality of the zinc sources used might be questioned as it is well established now that all sources do not have the same bioavailability.

The arrival on the market of an innovative potentiated zinc oxide, HiZox, is a way to secure zinc supply in poultry. For the first time in the feed industry, the zinc oxide source in HiZox has shown unique anti-bacterial properties.

Studies in poultry revealed an interesting potential to alleviate the consequences of necrotic enteritis as well as management and environmental challenges, like heat stress or high stocking density.

The use of this new zinc source will advantageously replace any zinc source in the feed, while also improving animal conditions under challenge. ■

References are available from the author on request

Fig. 5. Skin resistance of broilers under heat stress.

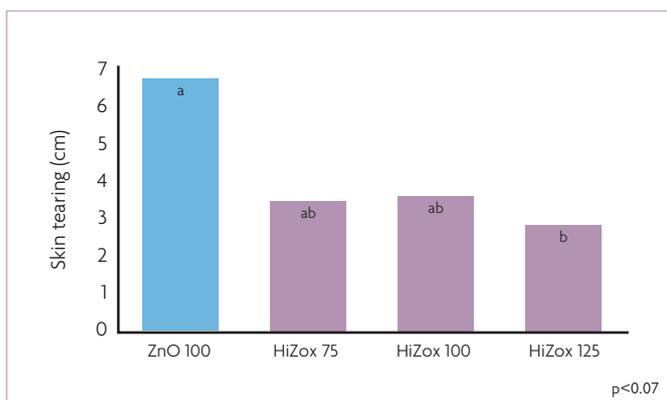
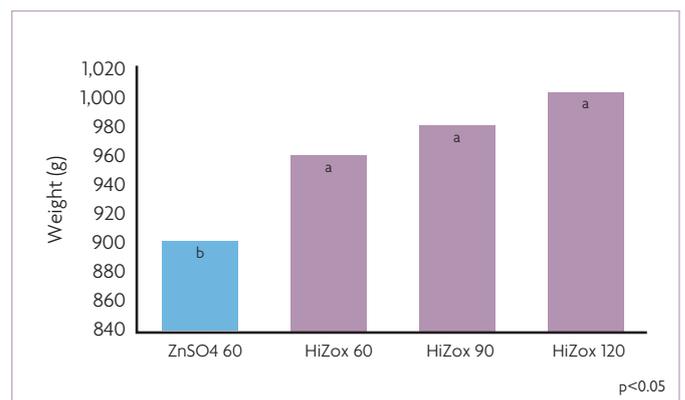


Fig. 6. Weight gain of broilers raised in high density (1-21 days).

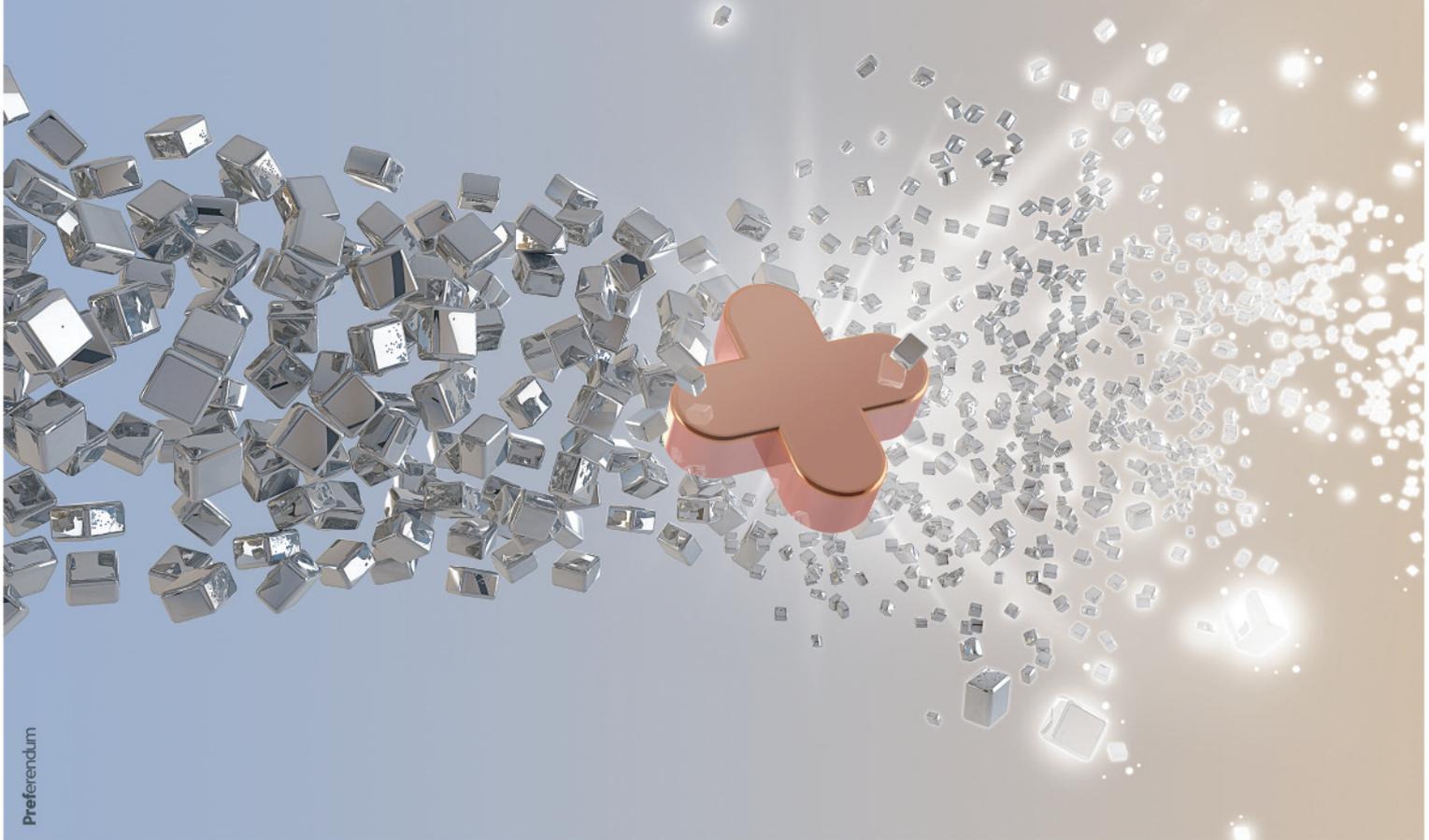




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Reaping the benefits in sub-Saharan Africa with new livestock initiative

In a hotel in Kampala, Uganda, a group of poultry farmers, producers and veterinarians are gathered to hear about ways to control and identify coccidiosis safely through feed. The seminar they are attending is being run by animal health company Zoetis, and they are listening to Dieter Vancraeynest, Senior Director of Commercial Development and Lifecycle Management, Poultry at Zoetis.

Meanwhile in Ibadan, Nigeria, smallholder farmers and the veterinary community are looking forward to the opening of a new diagnostics centre, which should ensure correct diagnosis and treatment of poultry and, as a result, reduce the mortality rate of their birds.

ALPHA initiative

These activities – aimed at improving poultry health, increasing production and boosting the incomes of smallholder farmers – are a result of the role being played by the African Livestock Productivity and Health Advancement (ALPHA) initiative.

Launched last year, ALPHA brings together veterinarians, poultry industry representatives, producers, suppliers and farmers, with the aim of establishing sustainable veterinary diagnostic networks and animal health infrastructures in Uganda, Nigeria and Ethiopia.

Funded by a \$14.4 million grant from the

Kasujja Abdu, Ugandan poultry farmer.



Bill & Melinda Gates Foundation. ALPHA is a three-year initiative that sees Zoetis providing and coordinating on the ground support and expertise in each country.

Positive impact

One year into the project, the company has facilitated the establishment of the main hubs and basic framework required to ultimately improve poultry health and positively impact on the livelihoods of farmers in sub-Saharan Africa.

To do this, Zoetis has built a team to address regulatory and technical issues, increase the supply and reliability of quality veterinary medicines, diagnostics and services, and engage with local farmers, veterinarians and government stakeholders to understand local needs and develop sustainable solutions.

“We have made good progress and have been applying our learnings to achieve pioneering results in our first project year,” Dr Gabriel Varga, Regional Director Africa for Zoetis, and the leader of the project, told International Poultry Production.

For poultry farmer Kasujja Abdu, who attended the seminar in Kampala, the ALPHA initiative means being able to access good quality veterinary medicines and services, as well as practical training.

“ALPHA has helped farmers get more knowledge about how we keep our poultry



Dr Godwin Abonyi, Nigerian Veterinary Medicine Association.

and how to prevent infections on our farms,” he says.

Dr Atedu Pius, Zoetis Field Veterinarian for ALPHA, says the challenges facing poultry veterinarians in Uganda are primarily the lack of diagnostic tools, which leaves most veterinarians with the options of basic guess work, assumptions and post-mortem reports to reach a diagnosis.

“We also lack the appropriate medication for all the disease conditions in Uganda,” he says. Similar issues are being faced in Nigeria, where Dr Godwin Abonyi, President of the Nigerian Veterinary Medicine Association says veterinarians and farmers alike are trying to ensure production in disease-free environments.

Dr Abonyi says the importance of ALPHA

Continued on page 20

Continued from page 19

cannot be over-emphasised, as it offers experience based on better developed veterinary practices, superior technological information and diagnostics as well as husbandry practices.

“We are in the tropics, where there are a lot of disease-causing agents so accurate diagnosis of disease is key,” he says. He adds however that “even with the right medications we often have the challenge of having the right drugs at the right time.”

As a result, Zoetis has been working to increase the reliable supply of quality veterinarian medicines by submitting registrations in Uganda for poultry and livestock vaccines and has applied for product registrations in Ethiopia and Nigeria.



New diagnostic centre

Based on discussions and support from ALPHA, the Nigerian government will open a brand new diagnostic centre in Ibadan, the country's main poultry production area in June, while ALPHA will provide technical expertise as well as materials and equipment for education and training.

Martin Middernacht, CEO of Lagos-based poultry supplier Chi Farms, has been working closely with Zoetis to develop a network of diagnostic centres around Nigeria, and says

ALPHA will have a big impact on its own operations as well as the industry when the new diagnostic facilities open.

“The new laboratories will help our clients and general farms in Nigeria through the correct diagnosing of the health status of birds so that the correct medication and vaccinations can be given,” he says.

For Dr Gabriel Varga of Zoetis, seeing first-hand the dire animal health situation in sub-Saharan Africa has meant working on all possible fronts to quickly establish the framework for success of the ALPHA initiative.

“Key to our approach is the ownership we can create with veterinarians, authorities, distributors and farmers, which starts with awareness, education and training.

“Looking ahead we will continue to build the infrastructure needed to improve animal health and productivity across the sub-Saharan region.”

The first anniversary of the ALPHA initiative was marked with the production of a short video which can be viewed at: <https://vimeo.com/ketchumstudios/reviww/264652850/72f80384fa>



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Biosecurity as an aid to reducing the use of antibiotics

Antimicrobial resistance (AMR) is a well-known worldwide problem, both in human and veterinary medicine. It is the ability of bacteria to withstand an antibiotic treatment. AMR might occur in nature, however it is strongly selected for by using antibiotics. As a result, classical therapies are becoming lesser effective and infectious diseases can persist.

by **Bo Vanbeselaere and Jeroen Dewulf**, Ghent University, Faculty of Veterinary Medicine, Department of Obstetrics, Reproduction and Herd Health, Veterinary Epidemiology Unit and CID Lines NV, Ieper, Belgium. www.cidlines.com

On the other hand, our world population is growing very fast and the livestock industry has made huge changes all over the world. The animal husbandry has expanded in a very professional way to meet all our demands.

Unfortunately, alongside this evolution the use of antibiotics has also substantially increased to prevent animals from diseases and to cure them if needed. Next to that, in a number of countries, antibiotics are still applied for growth promotion.

Global health threat

As antimicrobial resistance has become a global health threat, it is important to reduce the antibiotic usage in order to avoid further selection and spread of this resistance. Moreover, as we all live together very closely, we have to focus on all aspects of our society (one health: people – animal – environment).

It has been shown repeatedly that using less antibiotics results in less resistance selection. Therefore, in every sector, we have to find a way to deal with this demand for using less antibiotics and in the end, for our livestock industry, we have to look for effective and feasible solutions at farm level to replace these antibiotics.

One of the most promising ways to do so in animal husbandry is by limiting the need for antibiotics through disease prevention,

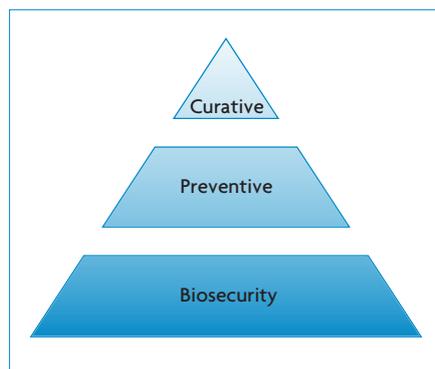


Fig. 1. Disease management in our livestock industry: biosecurity as a strong basis for every disease prevention and control programme.

especially with biosecurity. Disease prevention includes two major entities: biosecurity and preventive management (the use of vaccines, feed additives, acidification of the drinking water etc).

Biosecurity can be defined as the combination of all measures taken to reduce the risk of introduction and spread of infectious diseases at farm level, throughout the region, country or even worldwide. It is (should be) the basics of every disease prevention and control programme.

By having an effective biosecurity programme, all the other preventive measures, such as vaccines or drinking water treatment, will definitely give better results

on disease prevention within our farms and in the end the need for curative treatments (treatments to cure a disease) will decrease substantially (see Fig. 1).

Biosecurity can be divided into external biosecurity and internal biosecurity. External biosecurity consist of all procedures designed to protect the farm against infectious diseases from outside the flock and it also prohibits the spread of diseases to other farms.

All measures, which are taken to prevent the spread of any disease within the farm, are part of the internal biosecurity.

General principles

All biosecurity measures are based on some general principles.

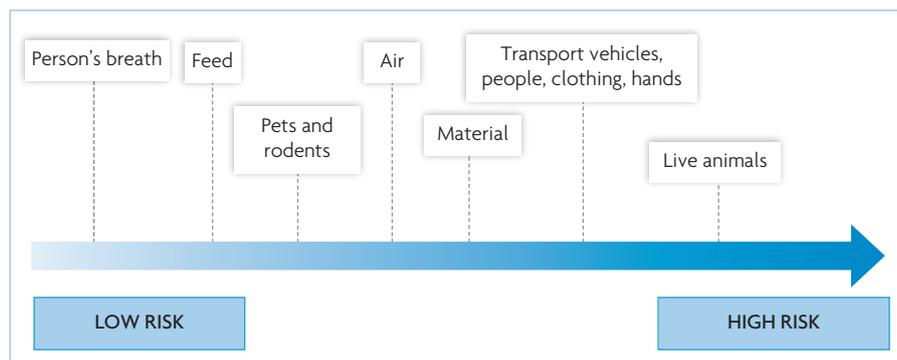
First of all, it is important to have a good separation between high and low risk animals or areas on the farm. When you want to avoid the spread of infectious diseases, you must ensure that possible sources of infection (for example wild birds) cannot reach the sensitive population.

At the same time, it is recommended to have a clear separation between the clean (internal movements at the farm) and dirty (all inbound and outbound traffic) sections or areas at the farm to limit any contamination.

Second, it is essential to lower the general infection pressure at the farm to the level that the immune system of the animals can

Continued on page 23

Fig. 2. Ranking of the different transmission routes of infectious diseases (adapted from Boklund, 2008).



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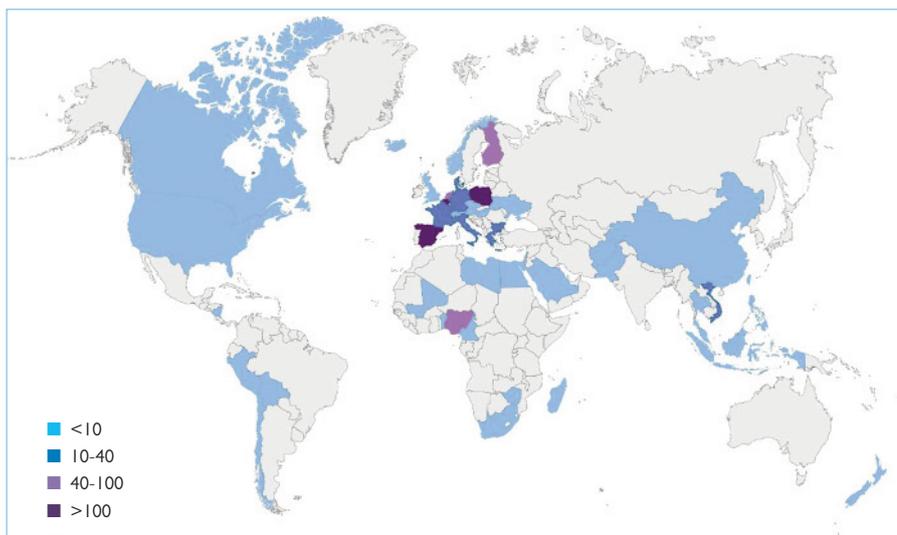


Fig. 3. Worldwide use of the Biocheck.UGent for broiler farms (last updated December 2017).

Continued from page 21

handle the infectious diseases without difficulty.

It is also important to consider the different transmission routes of the relevant diseases as not all transmission routes are equally important. Airborne transmission for example, is considered less risky than the purchase of living animals at the farm. Therefore, more measures are to be taken to control and reduce risk linked to the latter (see Fig. 2).

Finally, a good biosecurity programme needs to be adapted to the specific circumstances. Larger farms for instance need more biosecurity measures as they have higher risks of becoming infected.

This can be explained by the fact that larger farms have more external contacts and also often have multiple age groups present on the farm.

New tool developed

Having defined that there is a need for biosecurity as a strong basis to decrease the on-farm antibiotic usage, in 2012, the Biocheck.UGent for broiler farms was developed at the faculty of Veterinary Medicine, Ghent University.

The Biocheck.UGent is a freely available risk based scoring tool to measure and quantify the biosecurity at broiler farms (also existing for pig farms) and it can be used by any farmer, veterinarian or herd advisor.

This scoring tool is based on years of scientific research and field studies by many poultry experts from all over the world.

It is an online questionnaire which consists of 79 questions, mostly composed of multiple choice questions, subdivided into external (with eight subcategories: purchase of one day old chicks, exports of live animals, feed and water supply, removal of manure and dead animals, entrance of

visitors and personnel, supply of materials, infrastructure and biological vectors and location of the farm) and internal biosecurity (with three subcategories: disease management, cleaning and disinfection and materials and measures between compartments).

Every question has a score between zero (biosecurity measure is not applied at the farm) and 100 (biosecurity measure is fully applied at the farm). The final score for both external and internal biosecurity ranges from zero (indicating a total absence of the described biosecurity measures) to 100 (indicating the full application of the described biosecurity measures).

The Biocheck.UGent scoring tool is different from other biosecurity questionnaires as it takes into account the relative importance of the different transmission routes and puts all of this into a risk-based scoring system: depending on

Table 1. Results of the study on 13 broiler farms in Belgium: first audit to evaluate the current biosecurity status (before) – second audit after giving custom made advice on biosecurity (after).

| | Before | After | Change |
|------------------------|--------|-------|--------|
| External biosecurity | 64 | 69 | +5 |
| Internal biosecurity | 73 | 77 | +4 |
| Mortality first week | 1.08 | 1.27 | +0.19% |
| Total mortality | 3.54 | 3.05 | -0.49% |
| Av. daily weight gain | 57 | 57 | 0 |
| Feed conversion | 1.8 | 1.7 | -0.1 |
| Performance index | 318 | 332 | +14 |
| Antimicrobial use (TI) | 192 | 136 | -29% |

the importance of the biosecurity measure (according to the risk of the associated transmission route) the score per question is multiplied by a weight factor.

In addition, every subcategory gets a certain value and weight factor.

Objective report

After filling in the questionnaire, a report is created, which provides an objective and structural overview of the on-farm biosecurity. In this way, all critical points of the on-farm biosecurity are being detected and a perfect overview of the possible biosecurity improvements at the specific flock becomes available.

In this way, the Biocheck.UGent report allows producers to avoid generic advice and give specific counselling.

The report also provides the opportunity to compare the biosecurity level in time (evolution of the farm) and to compare the different biosecurity levels between farms (the report includes both a country average and a worldwide average score).

Since the launch of the Biocheck.UGent, the questionnaire has already been filled out more than 1,000 times for broiler farms (over 4,000 times for pig farms) in more than 40 countries all over the world (see Fig. 3).

The Biocheck.UGent tool was used in a study on 13 broiler farms in Belgium, where the on-farm biosecurity level was evaluated together with the relationship to the antibiotic use and the production results. There were two farm visits/audits for each broiler farm.

During the first audit, the biosecurity level was checked by using the Biocheck.UGent questionnaire.

Depending on the farm specific results, the researcher gave custom-made advice to improve the biosecurity level at the farm. During the second audit, the biosecurity level was checked again with the aid of the Biocheck.UGent scoring tool.

Results

The results of the study showed a wide variation in biosecurity levels on those broiler farms, which gave the opportunity for further enhancement of their biosecurity levels according to the priorities.

In addition, the study demonstrated that, by improving the biosecurity at the farms, it is possible to have a reduction in the on-farm antibiotic usage.

It was also clear that this reduction was feasible without negative effects on the technical performances of these broiler farms (see Table 1). ■

References are available from the authors on request



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Clean drinking water essential for poultry health



Clean drinking water is essential for poultry health and plays a key role in poultry performance. Water is the nutrient of highest importance, making contaminated water a serious threat to animals and profits.

by **Lotte Schakel & Erica Bongers,**
Kanters Special Products BV,
The Netherlands.
www.kanters.nl

While poultry producers are critical about the quality of the feed, the quality of drinking water often does not receive the attention it deserves. Frequent cleaning and monitoring of the drinking system is necessary to maintain good quality drinking water. When products like antibiotics, vitamins, and acids are added to the drinking water this becomes even more important.

Water quality

Water quality can be distinguished in two categories, namely microbial and chemical water quality. Those two characteristics are however inextricably connected to each other. Microbial quality of water is determined by living organisms.

Although tap water contains a low number of bacteria, the microbial pressure at the drinking nipple can be enormously high through a contaminated conduit system. Through the drinking water system, pathogenic organisms are excellent in transporting animal-to-animal infection.

The scope of microbial quality in drinking water goes beyond water alone, it is very important that the piping system is also clean.

Chemical quality includes molecules such as iron, manganese, calcium and magnesium, whereof the last two largely determine the hardness of the water. Too much minerals cause precipitation in the pipes that can cause leakages. Precipitation is also an ideal soil for micro-organisms that form biofilm.

Two minerals that deserve extra attention are iron and manganese.

Iron by itself, in normal concentrations, is not harmful for chickens to consume via drinking water. It can, however, deposit on the inside of water lines by the presence of oxygen, in which soluble iron converts into insoluble iron. The colour of water is mainly caused by the presence of iron.

Manganese is also not harmful to the chicken in concentrations in which it is normally present in the water. It can cause black sediment in the water lines, especially when the water flow is low. Elevated levels of iron and manganese can cause differences in the taste of water and can cause gastrointestinal tract disorders. It will deposit on the inside wall of water lines, clog up nipple-type drinkers or cause them to leak.

A suitable environment is also created for the attachment of microbes and subsequently formation of biofilm, i.e. a structured community of micro-organisms enclosed in a self-produced polymer matrix that is attached to a surface.

Drinker lines in poultry houses are vulnerable to the formation of biofilms, particularly in the first weeks after hatch because of low water flow and increased

temperatures suitable for the growth of microbes. Biofilm can harm water equipment, give an odour and unpleasant taste to the water and can spread disease through the flock.

Biofilm as a hiding place

The biofilm serves as a breeding ground for micro-organisms as it contains sugars, proteins, iron, and manganese. As such, it is a serious issue on the poultry farm. Forming a biofilm is considered to be a protective mode that allows micro-organisms to survive in a hostile environment.

The biofilm protects micro-organisms against pH stress, UV radiation, chemical exposure, phagocytosis and dehydration. Besides the protective effect of a slimy matrix, biofilm has an important role in the spread of antimicrobial resistance by hiding bacteria which are carrying genes coded for antibiotic resistance.

Biofilm in drinker lines and contaminated water reduces the effectiveness of antibiotic treatments and feed supplements. In fact, infections associated with biofilms are, in public health, proven to be 10 to 1000 times more resistant to the effects of

antimicrobial agents. The biofilm formation can be distinguished in five phases.

During the first phase, planktonic bacteria attach to the substrate surface. This is a process which is reversible, as some bacteria attach to the surface and detach from it in a short period of time.

In the second phase, bacteria adhere to the substrate surface and attach to other bacterial cells and lose their mobility. In the next two phases, the bacteria start to communicate to each other by quorum sensing, and a matrix of extracellular polysaccharide substances (EPS) is produced.

Subsequently, the bacterial colonies start to grow to their maximum size and thickness, the bacterial cells still have no mobility. The biofilm becomes adopted with the external conditions by manipulation of its structure, physiology and metabolism.

In the last phase the bacterial cells inside the biofilm regain their mobility and different enzymes break the biofilm to release bacterial cells, so they can disperse to colonise at new surfaces.

Remove the biofilm

To remove a biofilm, a product is needed which can disorganise the slimy extracellular matrix. At the same time it needs to be safe for the animals to drink.

Efficacy, toxicity and corrosiveness are important characteristics to take into account.

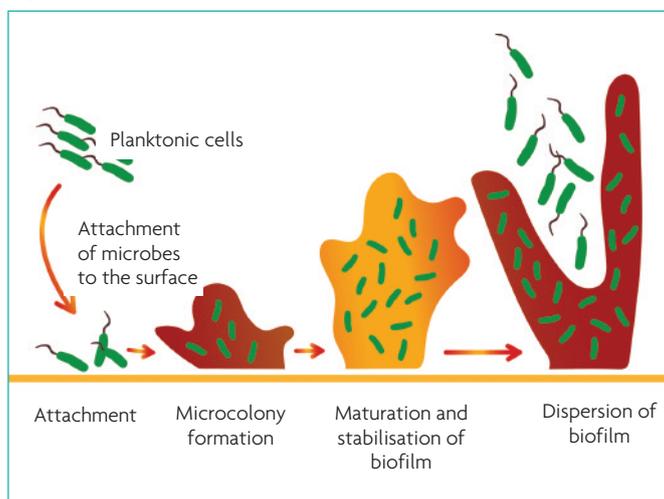
To find a good product, producers need to be careful because what seems to be a good product solving one part of the problem may cause other problems.

For example, some acidic sanitisers will kill most of the bacteria in the drinker lines but will also corrode and subsequently damage the lines.

Different products have different modes of action, for example chlorine will kill bacteria and micro-organisms that live in the water, but this product will not affect the biofilm in the drinker lines.

Continued on page 26

Fig. 1. Biofilm formation.



Continued from page 25

Other than that, it will also affect the taste of the water and therefore the animals could drink less.

Taking this into account, a producer needs a product that kills the pathogens and microbes that exist in the water, removes the biofilm by oxidising and will not damage the drinker lines or the supply lines.

One of the most, if not the most effective chemical for biofilm control, is hydrogen peroxide in combination with silver.

Already in 1934 Haber and Weis described the reaction of hydrogen peroxide when exposed to oxygen. The reaction of hydrogen peroxide is $2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$.

The products of this reaction are highly reactive free oxygen radicals which give a highly reactive reaction. Free oxygen radicals will degrade pollution by their oxidative and disinfectant effect. When using hydrogen peroxide in the drinker lines of the farm a sassing sound can be heard.

This is the oxygen that escapes from this reaction. Hydrogen peroxide is also very strong on the deactivation of lipids, proteins and nucleic acids. In a large number of scientific papers we can find the effect of this oxidising reaction. One of the catalysts of this

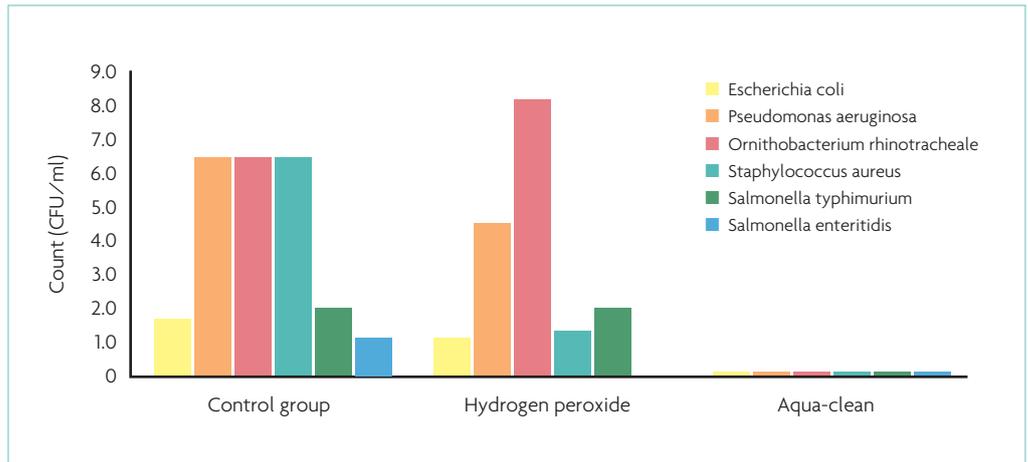


Fig. 2. Growth of pathogens in drinking water when using Aqua-clean, hydrogen peroxide or no product (Animal health services, Department of Bacteriology, Deventer, The Netherlands).

reaction can be iron or manganese. This will lead to a very strong, quick reaction also known as the Fenton reaction.

We can find iron or manganese in the biofilm of every drinker line and therefore the oxidising effect of hydrogen peroxide is combined with iron and manganese for a very effective cleaning reaction.

When combining hydrogen peroxide with silver, this exhibited a synergistic action on the viability of, for instance, E. coli.

In some instances, the combined bactericidal effects were 1000-fold higher than the sum of the separate ones.

Fig. 2 shows the results of a trial that compared using no sanitiser (control) with using only hydrogen peroxide and using hydrogen peroxide with silver.

As shown, the product Aqua-clean has the best results. Aqua-clean is a product from Kanter's Special Products that consists of hydrogen peroxide and silver.

At a commonly recommended dosage for water treatment, it eliminates biofilm and it does not lead to toxicity or corrosion problems.

By being 100% biodegradable, Aqua-clean is considerably more environmentally compatible compared to many other disinfectants used so far.

References are available from the author on request

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International Poultry Production • Volume 26 Number 4

For efficiency and health - think medium chain fatty acids (MCFAs)

There are big differences between different acids and in this article we would like to explain the different mode of action of different acids and some trial results with medium chain fatty acids (MCFAs).

by **Manu De Laet**,
Product Manager Poultry,
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Organic carboxylic acids can be divided into several subgroups according to their molecular structure (Fig. 1).

Depending on its effect, they can be divided into three groups.

1. Acids that are included as regulators of feed hygiene, that limit the growth of fungi, yeasts or enterococci and that limit losses of associated nutrients. Examples of acids in this group are propionic and sorbic acid.
2. Acids that cause a decrease in pH in the stomach and improve the digestibility. This effect is of less importance in poultry, since birds are able to maintain a pH in the stomach which is low enough to ensure the protein digestion. Reducing the pH of the stomach will cause a bacteriostatic effect. Fumaric acid, formic acid and lactic are used in this regard.
3. Acids with a direct antibacterial effect. The reduction of pathogenic bacteria in the stomach will lead to a reduction in the incidence of diarrhoea and an effect stimulating health in general. This group is particularly important for the reduction of antibiotics. An example of acids which are antibacterial are the MCFAs.

Bactericidal effect

To eliminate pathogens in the stomach and to reduce infection pressure, there are very important properties of acids such as the following:

- pKa value: determines the ability of an acid to approach the bacteria.

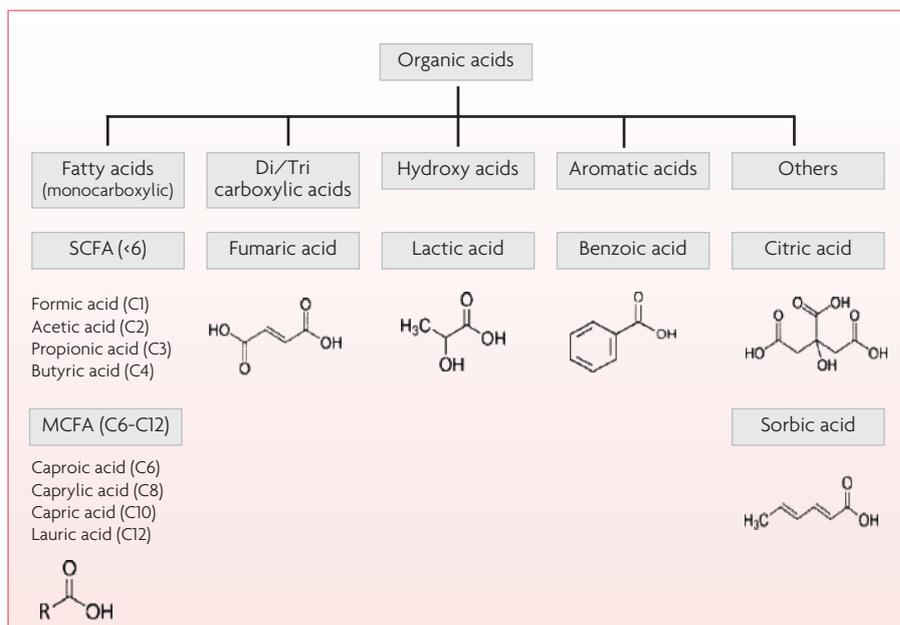


Fig. 1. Commercially used organic acids.

- HLB: determines the ability to destabilise the cell membrane of the bacteria.

The conditions of an efficient bactericide are a high pKa and an optimal HLB balance.

pKa value

The pKa value of an acid (Table 1) determines whether it is pH reducing or antibacterial. Each acid has a unique pKa value, which is the pH at which 50% of the acid appears in its undissociated (RCOOH) form and 50% in its dissociated form ($H^+ + RCOO^-$). So the molecules change depending on the pH of the medium.

Since the membrane of bacteria has a negative charge (due to the P which gives a negative charge in the phospholipid bilayer), we always need the undissociated form (RCOOH) of an acid before we can see an antibacterial effect.

This form is neutrally charged, and can be attracted by the cell membrane of bacteria. The dissociated form (RCOO⁻) is negative, and so they can not approach the bacteria (negative and negative will never attract each other). If an acid has a pKa value of less than the environmental pH, the equilibrium

moves to the dissociated form. Dissociation releases H^+ ions, resulting in acidification.

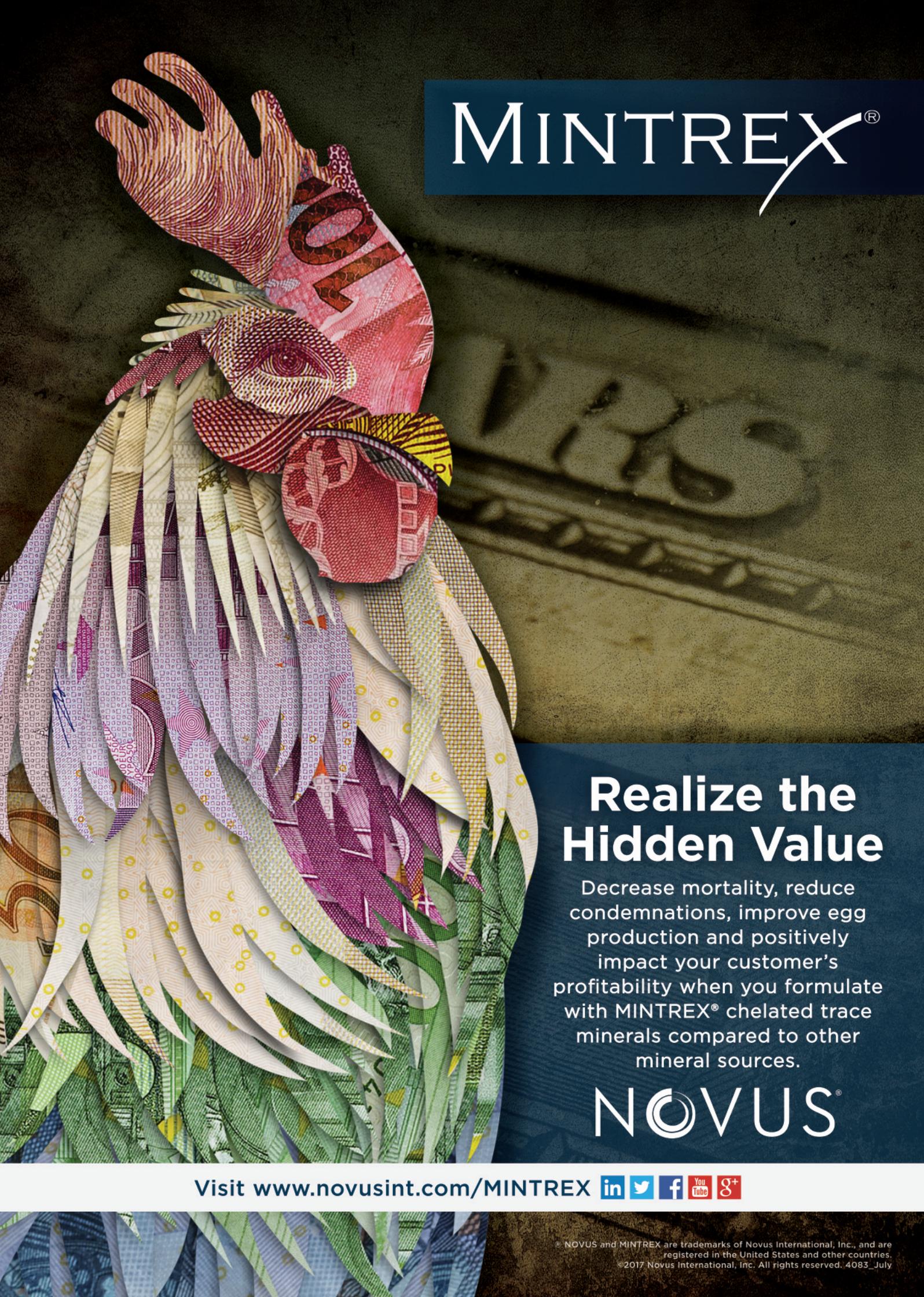
If the pKa value is bigger than the environmental pH, it will move the equilibrium to the undissociated form. An acid in the undissociated form is able to address the bacteria. This is the case with MCFAs.

The greater the difference between the pKa and the pH in the stomach, the more the equilibrium shifts towards the undissociated form and the greater the antibacterial effect. The MCFAs have the highest pKa value, so they will have a better antibacterial effect. In this sense, it is

Continued on page 29

Table 1. pKa values of different acids.

| Acid | pKa value | Acid | pKa value |
|---------|-----------|-----------|-----------|
| Fumaric | 3.02 | MCFAs | 4.90 |
| Citric | 3.13 | Propionic | 4.88 |
| Formic | 3.75 | Butyric | 4.82 |
| Lactic | 3.83 | Acetic | 4.76 |
| Sorbic | 4.76 | Benzoic | 4.20 |



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sometimes effective to use pH reducing and antibacterial acids together.

The reduction of pH will ensure a better action of the antibacterial acids by increasing the difference between pH and pKa. But in birds, the pH is already low enough, and pH reducing acids are often used for feed and water hygiene, but less as antibacterial action in the birds. For the antibacterial action, MCFAs are much more effective.

HLB value

Approaching bacteria is the first condition for being antibacterial. The second condition is an optimal HLB value.

- The membrane of the bacterial cell consists of phospholipids, which contain a hydrophilic head and a lipophilic tail.
- An organic acid also has a hydrophilic group carboxyl (COOH) and a hydrophobic tail (R).
- The amphiphilic character can be expressed in a value of HLB (hydrophilic – lipophilic balance).

To destabilise the bacterial cell membrane, the HLB value of acids should be similar to that of the bacterial cell membrane. The medium chain fatty acids have this optimal HLB and that is why they will destabilise the bacterial cell membrane in the most efficient way.

- Gram negative bacteria are more susceptible to caproic acid (C6) and caprylic acid (C8).
- Gram positive bacteria are more susceptible to capric acid (C10) and lauric acid (C12).

It is known that the combination of the four MCFAs work synergistically and broad spectrum as antibacterial acids. Acetic acid, butyric and propionic do not have this optimal HLB balance (they are too hydrophilic), and that is why they will be less bactericidal as MCFAs.

Mechanism of different forms of MCFAs

The MCFAs show lower minimum inhibitory concentrations compared to other acids, and provide an initial barrier against pathogens, directly in the stomach where the pH is low. Compared with medium chain triglycerides (MCT), which only release free MCFAs in the intestinal tract after the action of lipases, the action of free added MCFAs is much faster.

In addition, the MCFAs that are liberated from MCT will be less efficient since they are released in an environment where the pH is higher than 5.

That means that the MCFAs will switch to the dissociated form and will not be attracted by the bacterial cell membrane. That is why adding free MCFAs to the feed will be much more effective to have a direct

| | Negative control | Positive control (AGP programme) | MCFAs |
|-----------------------------------|--------------------|----------------------------------|--------------------|
| Lesion score (day 21) | 2.00 ^a | 1.23 ^b | 1.27 ^b |
| Body weight (g/bird) (day 42) | 1962 ^b | 2128 ^a | 2109 ^a |
| FCR (mortality adjusted) (day 42) | 2.07a | 1.97 ^b | 1.98 ^b |
| Mortality (%) (day 42) | 9.01 ^a | 3.79 ^b | 2.62 ^b |
| EPEF (day 42) | 197.9 ^b | 245.7 ^a | 245.6 ^a |

Table 2. Challenge trial against Clostridium perfringens.

action in the stomach. In addition, MCFAs have a powerful effect on persistence of pathogens at the intestinal level.

By reducing virulence of pathogenic bacteria such as salmonella or clostridium, its intestinal and systemic colonisation is reduced.

The MCFAs can also prolong the life of neutrophils, so they act much faster and stronger against pathogens that enter through other pathways, such as the lungs.

Trial results

In a recent trial, MCFAs were shown to be the perfect alternative to AGPs. In a Clostridium perfringens challenge trial, 900 Cobb 500 birds (10 repetitions over three treatments, 30 birds per cage) were challenged with Clostridium perfringens.

The European production efficiency factor (EPEF: the number that concludes every important performance parameter) of the birds who received MCFAs was exactly the same as the EPEF of the birds who received the AGP programme.

Both groups performed significantly better than the negative control group. Also the lesion scores at day 21 were significantly better for the group which received MCFAs compared to the negative control group (Table 2).

It is clear that the trial model was successful: the performance of the birds is low and the mortality of the negative control group is around 9%.

That means there was a clear induction of the clostridium in the birds. From this trial, we can conclude that MCFAs are a good alternative to AGPs currently used in the market.

Conclusion

It is clear that the broad spectrum activity and the mode of action of MCFAs make them an ideal solution for reducing the use of antibiotics. ■

More information about the trial is available from the author on request

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Are you ready for AGP-free poultry production?

Soon after the therapeutic use of antibiotics was introduced, the growth-promoting effect of these products in chickens was discovered. Several antibiotics have been in use as growth promoters of farm animals ever since.

by Rolando A. Valientes,
DSM Nutritional Products
Philippines, Inc.
www.dsm.com

The introduction of these agents coincided with intensive animal rearing. These products improved feed conversion and animal growth and reduced morbidity and mortality due to clinical and subclinical diseases. The average growth improvement was estimated to be between 4 and 8%, and feed utilisation was improved by 2-5%.

The level of performance improvement depends on management and housing conditions. As sanitation improves on the farm, there are smaller increases in performance response.

While in the past, farmers relied heavily on antibiotic growth promotants (AGPs) in modulating the intestinal ecosystem, the banning of AGPs in Europe has intensified the search for alternatives to antibiotics. The key issue which precipitated the ban was the growing problem of antimicrobial resistance in human medicine.

While it is generally accepted that the greater majority of the resistance originates from medical use to treat human disease, concerns were expressed that the use of antimicrobials in animals may be a contributory factor to human resistance. In 2008, reports indicated that Korea's Ministry for Food, Agriculture, Forestry, and Fisheries was tightening restrictions on the use of antibiotics in animal feed. USDA reported that Korea would phase down the number of allowable drugs over the period of 2008-2011 as a way to reduce their overall use in compound feed that are premixed during production.

Eventually in July 2011, South

Korea followed the lead of the EU in banning the use of AGPs. As consumer pressure on food safety mounts and the threat of antibiotic resistance grows, it is just a matter of time before other countries in Asia will legislate against AGP use.

Antimicrobial resistance

The widespread use of antimicrobials in food animal production has been linked to the development of antimicrobial resistance (AMR) in bacterial populations; AMR has emerged as a global health crisis.

When antimicrobials are administered to food animals for disease prevention or growth promotion, they are commonly administered at lower doses and for longer durations than when these drugs are used for disease treatment and control; administration of low doses for extended periods can increase selective pressure for AMR.

In these cases, antimicrobials are usually administered via medicated feed or drinking water on a herd- or flock-wide basis, leading to imprecise dosing when animals can choose what quantity of feed or water to consume and potentially enhancing selection for AMR.

Additionally, although veterinary oversight of antimicrobial use has been associated with reduced selection for AMR, veterinary involvement in the use of antimicrobials by the US food animal industry is often limited.

Consumer pressure

Since 2015, NRDC and their allies – Friends of the Earth, Consumers Union, Food Animal Concerns Trust, and Center for Food Safety – together representing millions of consumers, have reviewed and rated the top 25 fast-food and casual restaurant chains in the United States on their antibiotics use policies and practices. They also looked at overall transparency in their meat and poultry supply chains. The results are published annually in a report called Chain



Fig. 1. Scorecard on antibiotics policies and practices (National Resources Defense Council, 2016).

Reaction. The 2016 results are shown in Fig. 1.

For the affluent consumers in the West, particularly in Europe, animal welfare, quality, safety and sustainability are important considerations. Retailers on the other hand are keeping close tabs on these developments and for them traceability and certifications are a must to stay in business.

Voluntary commitments from top restaurant chains to shift away from the routine use of antibiotics in their large meat and poultry supply chains are an important lever in changing how these drugs are used in the meat industry. Consumers are voicing their concerns about the public health threat of antibiotic resistance in greater and greater numbers.

Over the past few years, the largest chicken producers and some of the restaurant chains they supply have become leaders in curbing routine antibiotics use. We hope that others follow suit.

In the USA, the evolution is less marked than in Europe although organic production is increasing as consumers in large US cities are demanding more natural products. The high-profile food scandals and diseases have driven the public to look for safety which they trust the FDA/USDA to ensure.

Recently, the US FDA announced that it will take concrete action on the threat of antimicrobial resistance and has outlined a proposal that would help reduce the use of some antibiotics in animal production to counter

bacterial resistance to those drugs when they are prescribed for humans.

This is expected to have a ripple effect on other countries in the Asia Pacific region which usually adopt the policies of the US.

In March 2015, McDonald's announced that it would begin using chickens that are not raised with antibiotics used to treat humans, a move likely to put pressure on competitors of the fast-food chain, which now sells more chicken than beef. The decision by McDonald's, which is also one of the largest buyers of chicken in the United States, is likely to have a major impact on how poultry is raised and on the kinds of chicken restaurants serve.

In the Asia Pacific region, some key players have started marketing antibiotic-free chicken. For instance in the Philippines, Bounty-Agro ventures, Inc is differentiating their brand of rotisserie chicken 'Chooks-to-Go' as no-antibiotics-ever (NAE). Kee Song in Malaysia for a number of years has been producing antibiotic-free chicken.

Holistic approach to AGP-free poultry production

Raising chickens in an AGP-free production system is very challenging. Especially, since antibiotics have been used to cover for lapses in management. Moving to AGP-free poultry farming is not simply replacing the antibiotic

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 growth promotant with a non-antibiotic alternative. There is no silver bullet. We need a holistic approach and focus on three key areas, namely: management, nutrition and health.

Proper husbandry is a paramount consideration when shifting to AGP-free farming. Stocking density, feeding management, ventilation (temperature and humidity) must be optimised to deliver the genetic potential of the bird. In other words, the flocks must be provided with a comfortable environment so that they express their full genetic potential.

In the aspect of nutrition, the following should be handled adequately. For instance, stringent quality control of raw materials (quality and safety) must be observed. The level of trypsin inhibitor activity must be carefully monitored. In a study conducted by Palliyeguru et al (2011), they increased the level of non-toasted soybean to spike the trypsin inhibitor activity.

They demonstrated that by doing so this resulted in a marked reduction in protein digestibility, weight gain and feed conversion efficiency. There was also a linear increase in sub-clinical NE lesions in the duodenum, jejunum and ileum, and the caecal clostridium perfringens counts.

Mycotoxin control is of critical importance. Common mycotoxins found in the feed have to be addressed. Mycotoxins can affect the animals either individually or additively in the presence of more than one mycotoxin, and may affect various organs such as the gastrointestinal tract, liver, and immune system, essentially resulting in reduced productivity of the birds and mortality in extreme cases.

Aflatoxin, aside from being hepatotoxic, is immunosuppressive rendering the birds more susceptible to infections and can result in a poor response to vaccination.

Optimum vitamin nutrition is also essential. Vitamins have a small inclusion ratio in the diet but they have essential impact on growth, feed efficiency and reproduction.

Some of them can even have an effect on carcass quality. However, genetic improvements constantly change the game.

Due to the constant genetic change in broilers, DSM estimates that there is probably a 1% increase every year in overall vitamin requirements. Another consequence is that feed intake tends to be reduced over time as the feed conversion ratio improves.

Maximising the digestibility of feed ingredients with enzymes helps in reducing the population of pathogenic bacteria. Presence of high levels of NSP in cereals like wheat, rye and barley can increase viscosity of digesta and decrease digesta passage rate; increased digesta retention time facilitates bacterial colonisation and activity in the small intestine.

Poultry production has become more challenging over the years. Intensive production systems have put a lot of pressure on the birds especially with high stocking density. An additional challenge is that because of the increasing development of antimicrobial resistance in veterinary and human medicine, this prevention should not be achieved through an increased prophylactic use of antibiotics.

As a result, biosecurity, defined as all measures taken to prevent both the introduction and the spread of infectious agents on the farm, is of key importance in the concept of animal disease prevention.

Despite the recognised importance of biosecurity, it is known from practice and research that there are still serious shortcomings in the application of preventive measures on poultry farms. Moreover, biosecurity at the farm level provides the foundation for biosecurity of the entire production chain. While most producers desire to improve biosecurity, this is difficult to do especially when there is hardly a way to measure it in the farms, hatcheries, and processing plants. As the saying goes, 'You cannot improve what you do not measure'.

The University of Ghent, developed Biocheck, a biosecurity scoring system and investigated the possible relationship between

biosecurity, technical performances, and antimicrobial use. There was an improvement in production results and reduction of antimicrobial use after biosecurity at the broiler farms was optimised.

However, this does not mean that statistically significant relationships were found between biosecurity, health, and production characteristics. Apart from implementing good biosecurity, maintaining the health of the flock entails a vaccination programme covering the major poultry diseases prevalent in the area of operation. Remember that antibiotics cannot kill viruses, hence, vaccination against the important viral infections is essential to achieving satisfactory flock health.

Responsible and judicious use of antibiotics still has a place in the poultry industry in the AGP-free context. Even in Europe and in South Korea, administration of antibiotics to treat diseases, under veterinary supervision, is allowed.

The advent of natural alternatives to antibacterials

Legislation and the increasing consumer pressure to stop routine use of antibiotic growth promotants have been the main drivers in the advent of eubiotics in the poultry industry.

Eubiotics contribute to health and performance of animals by ensuring optimum gastrointestinal functionality. Eubiotics are classified into four categories namely: direct-acting gut flora modulators (e.g. organic acids and essential oil compounds), probiotics, prebiotics and immune modulators.

Optimum gastrointestinal functionality is defined as a steady state where the microbiome and the intestinal tract (host) exist in symbiotic equilibrium and where the welfare and performance of the animal is not constrained by intestinal dysfunction.

Several eubiotics have been introduced in the market with differing modes of action yet having the same goal: achieving the desired ratio between the good bacteria and pathogens. Probiotics are micro-organisms that have a positive effect on the host by improving the balance of pathogenic to beneficial bacteria in the gut. Although, their use has grown over the years, there is still a lot to be learned about the gut microbiota and how their growth and multiplication can be modulated to positively influence the microbial balance.

Prebiotics are non-digestible oligosaccharides serving as substrate for probiotics and/or competing with pathogens regulating gut cell

adhesion. Direct acting gut flora modulators are defined as compounds directly modulating the microbiota via growth inhibition. Examples of these are essential oil compounds and organic acids. Dietary supplementation of organic acid increases the bodyweight and improves feed conversion ratio of broilers and reduces colonisation of pathogens on the intestinal wall thus preventing damage to the intestinal wall.

Antibacterial effects of benzoic acid

Dissociation of benzoic acid is strongly pH dependent and in its undissociated form it exhibits various antibacterial and antifungal activities. Rahn and Conn (1944) reported that the antimicrobial effect of benzoic acid was nearly 100 times as efficient in strongly acid solutions as in neutral ones.

Its spectrum of activity includes mainly enterobacteria, Bacillus spp. and micrococci, as well as various fungi and yeasts. Its inhibitory action on yeasts and fungi is the background for a long-term use of benzoic acid as the food preservative. Knarreborg et al. (2002) compared the antimicrobial effects of six different organic acids (formic, propionic, butyric, lactic, benzoic and fumaric acid) in swine stomach content (pH 4.5) and in small intestinal content (pH 5.5), using a specially developed in vitro methodology. The results of this experiment showed that benzoic acid demonstrated the strongest antibacterial property.

The results of a study in broilers (Table 1) showed antibacterial properties of the benzoic acid in the broiler chicken GIT. The best performance results were noted only in early stages of growth reflecting in better feed conversion as well as bodyweight gain after its supplementation.

In the main absorption site in chickens, which is the ileum, a strong reduction in potentially pathogenic coliforms was recorded.

Selected properties and effects of essential oils

The other group of eubiotics which has been extensively evaluated is essential oils. An essential oil is a mixture of fragrant, volatile compounds, named after the aromatic characteristics of plant materials from which they can be isolated. The term 'essential' was adapted from the theory of 'quinta essentia' proposed by Paracelsus who believed that this quintessence was the effective element in a medical preparation. Because the

Continued on page 35

Table 1. Effect of benzoic acid on broiler performance and coliform counts in the digesta (Josefiak, et. al, 2008).

| Parameters | Control | Benzoic acid (0.1%) |
|---|-------------------|---------------------|
| Bodyweight gain (g) | 2257 | 2318 |
| Feed conversion | 1.80 | 1.73 |
| Coliforms (log cfu per 1g digesta) | | |
| Crop | 4.88 | 3.36 |
| Ileum | 6.60 ^a | 4.45 ^b |
| Caecum | 6.76 | 6.98 |



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 term, 'essential oil' is a poorly defined concept from medieval pharmacy, the term 'volatile oil' has been proposed.

Whereas a mixture of essential oils may vary in the active ingredients due to the natural variation in the plants from which they were derived, a mixture of essential oil compounds will be consistent, reproducible and measurable.

Stimulation of digestive enzymes

The mechanism of hot spices activating sensory nerve fibres is through an ion channel.

Platel and Srinivasan (2000) reported that the dietary consumption of the active principle of certain spices like capsaicin, piperin and curcumin, stimulated pancreatic enzyme production in rats without affecting feed intake.

The stimulation, by hot spices, of endogenous enzymes is a well-known effect with the basic mechanisms recently elucidated.

Antimicrobial effect of essential oils

The antimicrobial properties of essential oils are well known and a huge amount of literature is available and the basic mechanisms for some of them were reported.

Simms et al. (2003) as well as Kamel and McKay (2003) reported that two different commercial blends of essential oils and essential oil compounds could alleviate the growth depression induced by a challenge with *Clostridium perfringens* in broiler chickens.

The exact antimicrobial mechanism of essential oils is poorly understood. However, it has been suggested that their lipophilic property and chemical structure could play a role.

Helander et al. (1998) investigated how two isomeric phenols,

carvacrol and thymol, and the phenylpropanoid, cinnamaldehyde, exert their antibacterial effects on *Escherichia coli* O157 and *Salmonella typhimurium*.

Both carvacrol and thymol, in a similar fashion, disintegrated the membrane of bacteria, leading to the release of membrane-associated material from the cells to the external medium. On the other hand, cinnamaldehyde failed to affect the membrane, indicating that two molecules have different mechanisms underlying antibacterial activity.

It was thus suggested that terpenoids and phenylpropanoids can penetrate the membrane of the bacteria and reach the inner part of the cell because of their lipophilicity, but it has also been proposed that structural properties, such as the presence of the functional groups, and aromaticity are responsible for the antibacterial activity. It is thought that membrane perforation or binding is the principle mode of action, leading to an increase of permeability and leakage of vital intracellular constituents, resulting in impairment of bacterial enzyme systems.

Effect of essential oil compounds in chickens

The results obtained from several studies with chickens are either significant or non-significant. A beneficial effect of EO-mediated improvement in animal production was associated with increases in antimicrobial and digestive activities.

A series of trials were undertaken to investigate the effect of a specific blend of essential oil compounds on the intestinal colonisation of *Clostridium perfringens*. Two groups of around 30,000 birds on a diet based on wheat and soya and peas were compared. A control group received 20ppm of zinc bacitracin as a growth promoter.

Fig. 2. Prevention of colonisation of *Clostridium perfringens* on broiler intestines by a blend of essential oil compounds.

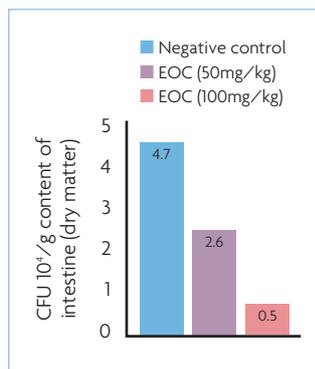
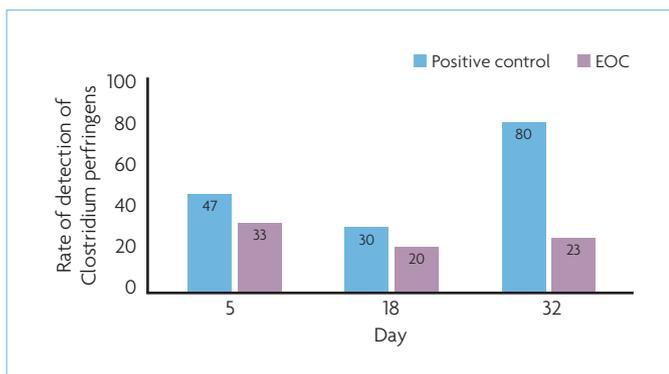


Fig. 3. Dose response effect of essential oil compound blend on *Clostridium perfringens* level.

For the treatment group, the zinc bacitracin was replaced by 50ppm of the blend of essential oil compounds (EOC).

As shown in Fig. 2, supplementation of the EOC blend reduced the concentration of *Clostridium perfringens* in the ileum, caecum and colon. By day 32, the number of birds infected with *Clostridium perfringens* was 70% lower on the EOC group.

Effects of essential oil compounds are dose-dependent. This has been shown in trials where the effects of zero, 50ppm and 100ppm essential oil compounds blend were compared with their effects on the levels of *Clostridium perfringens* (Fig. 3). At the higher dose of EOC blend 100ppm, the concentration of *Clostridium perfringens* was 20% that of the lower dose (50ppm) and only 10% of the levels found in the control birds.

A new eubiotic concept

A novel concept recently introduced to the market is the combination of a blend of essential oil compounds and benzoic acid (CRINA POULTRY PLUS). These components have complementary mode of action, effectively moderating the proliferation of pathogenic bacteria in the bird's gut.

This potent combination has a two-pronged approach in modulating the intestinal ecosystem. First, essential oils like piperine (pepper extract) stimulate digestive enzyme secretion to enhance digestion. The compounds of essential oils interact with receptors on the cell walls in the pancreas, increasing the secretion of the major digestive enzymes, including lipase, amylase and trypsin.

Second, some compounds of essential oils like thymol attack the cell wall of bacteria, making it more permeable to benzoic acid, facilitating its entry into the cell, altering their physiology by

reducing pH inside the bacteria, causing metabolic disorders that prevent their proliferation or cause their death.

By combining essential oil compounds with organic acids, a reduction of the number of certain intestinal bacteria can be achieved, greatly reducing the growth of certain Gram-positive bacteria as *Clostridium perfringens*, as well as Gram-negative bacteria, such as *E. coli*, *Salmonella* and *Campylobacter*, without affecting the growth of beneficial bacteria such as *Lactobacillus*.

Essential oil compounds and benzoic acid in broilers

The combination in the appropriate proportions of a specific blend of essential oil compounds (Crina) with benzoic acid, allows a more effective synergy between these compounds.

Benzoic acid is a natural organic acid that is found naturally in certain berries (blueberries). This acid is used as a food preservative, mainly for its antibacterial properties against bacteria such as *E. coli* and *salmonella*, fungi and yeast. It provides a preservative effect in the feed.

The combination of essential oil compounds like thymol, eugenol and piperine stimulates the production and the secretion of digestive enzymes and inhibits the proliferation of *Cl. perfringens*, and thus improves zootechnical performance.

Six experimental trials carried out in different institutes in Europe and the USA, using this type of combination, showed positive results on the production performance in chicken with an increase of 44g in the final average weight of chickens and an improvement of the feed conversion rate of 0.9% in the supplemented birds from the first day of life until slaughter in comparison to the control.

A meta-analysis with all the data from the 300mg/kg eubiotic feed additive (EFA) supplemented treatments in comparison with the non-supplemented controls revealed that the eubiotic product significantly improved bodyweight on day 21 (+2%; P=0.0021) and on day 42 (+1.4%; P=0.0151).

Furthermore, the birds on the EFA 300mg/kg treatment expressed a higher average daily gain in the starter phase (day 1-21; +2.1%; P=0.0023) and over the entire experimental period (day 1-42; +1.5%; P=0.0154). Feed conversion rate was more favourable with the dietary EFA supplementation (-0.6%; P=0.0414), when compared with the control birds.

Continued on page 37

Broiler Health 2018

a one day technical conference

The programme



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lunch and refreshments

| | |
|-------|---|
| 8:50 | Welcome and introduction |
| 9:15 | Contribution of genetics <i>Magnus Swalander, Aviagen, Scotland</i> |
| 9:45 | Getting the best possible start <i>Mark Foote, Cobb-Europe, UK</i> |
| 10:15 | Break |
| 10:45 | IB - Current situation and challenges <i>Kostas Koutoulis, Ceva, France</i> |
| 11:15 | AI - current status and future prospects <i>Timm Harder, Friedrich-Loeffler-Institut, Germany</i> |
| 11:45 | Respiratory diseases <i>Alan Pearson, Consultant, UK</i> |
| 12:15 | Lunch |
| 13:15 | The role and management of the gut microbiome in health management <i>Daniel Petri, Biomim, Austria</i> |
| 13:45 | Campylobacter <i>Phil Hammond, Crowshall Veterinary Services, UK</i> |
| 14:15 | Coccidiosis - latest thinking on control strategies <i>Monita Vereecken, Huvepharma, Belgium</i> |
| 14:45 | Break |
| 15:15 | Poultry Red Mite: New, breakthrough treatment resulting in improved bird welfare and performance <i>Rik Koopman, MSD, Netherlands</i> |
| 15:45 | Good immunity - The cornerstone to healthy broilers <i>Stephane Lemiere, Boehringer Ingelheim, France</i> |
| 16:15 | Turning big data into smart data for broilers <i>Maarten de Gussem, Vetworks, Belgium</i> |
| 16:45 | DISCUSSION AND CLOSE |

Continued from page 35

This combination of essential oil compounds with organic acids, with its right proportions and the right doses, also has important effects on the sanitary status and the productivity of laying birds.

Reviewing the mode of action of these compounds we can use their effects to improve the digestibility in adult birds, which will result in better health, increased production and improved egg quality.

The antimicrobial effect will allow reduction of the level and the growth of Clostridium and most importantly of Enterobacteriaceae, mainly E. coli and other enterobacteria.

E. coli is usually a normal saprophytic bacteria, but sometimes it becomes pathogenic, mainly in high producing birds in stress situations and in birds suffering immune depression and especially in layers close to their production peak. The use of these products in a preventive way improves the birds' health and productive status, as observed in different production lots in field conditions.

These layers have been fed with the right combination of essential oil compounds and organic acid since they arrived in the laying farm until the peak production.

Thus, in hens the addition of a

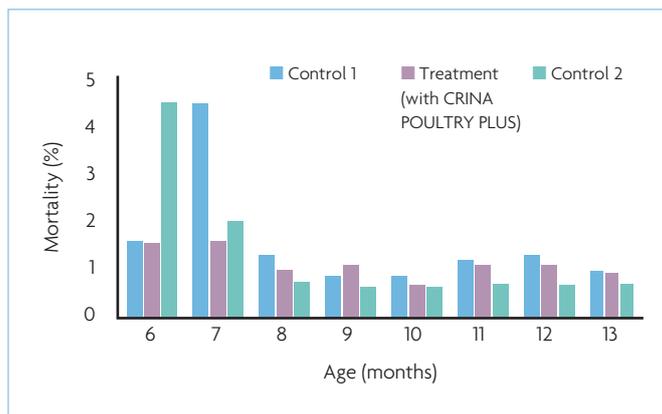


Fig. 4. Percentage of monthly mortality in three lots of layers reared in the same conditions.

combination of benzoic acid and a blend of essential oil compounds can significantly reduce mortality in the initial stage of implementation. These results can be seen from field study data shown in Fig. 4.

Replacement layers raised under the same conditions were separated in three different production halls (on the same farm) at the start of their productive lives.

The birds of Group 2, which consumed the combination of benzoic acid and a blend of essential oil compounds had no high mortality nor problems of

colibacillosis during the initial phase of implementation, so no antibiotic medications had to be applied, contrary to what happened in Groups 1 and 3, which were not supplemented with the eubiotic combination.

Conclusion

While antibiotics are still being freely used in most countries in Asia, the pressure to reduce the use of AGPs has been mounting, hence there is a trend towards the use of

more eubiotics in poultry production. The key drivers of such pressure are changing consumer preference and legislation.

To adequately prepare the poultry producer in the event that AGPs are banned, like in South Korea and Indonesia, it has to be emphasised that it takes more than using a non-AGP alternative to shift to an AGP-free poultry production system.

Reducing reliance on antibiotics through a holistic approach is a must and this includes a focus on three key areas namely: management, nutrition and health.

A high level of biosecurity has to be in place and digestibility of feed raw materials has to be optimised with the use of exogenous feed enzymes. Achieving good overall health of flocks requires a high level of biosecurity, responsible use of antibiotics and a good vaccination programme to prevent viral infections.

Eubiotics like organic acids, essential oil compounds + benzoic acid and probiotics can be used as tools to replace antibiotics and enable poultry farmers to profitably produce chicken meat and eggs. ■

References are available from the author on request

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The challenges of working with highly aggressive chemicals

The overuse of antibiotics and the resulting increase in antimicrobial resistance on farms has become one of the biggest threats to human health. Over the last few years, consumers have begun to push back on meat and dairy products that are treated with antibiotics.

by **Scott Campbell**,
Global Product Manager,
Hydro Systems.
www.hydrosystemsco.com

Additionally, the US Food and Drug Administration (FDA) recently introduced a new regulation that requires a prescription from a veterinary feed directive (VFD) to administer antibiotics in feed and water. To ensure their livestock remains healthy, farmers have begun replacing antibiotics for growth purposes with highly aggressive chemicals (HACs), such as organic acids.

As different chemicals are introduced to the farm, new threats arise. Farming equipment that previously dispensed and diluted medications and vaccinations may not be designed to handle new chemistries, leading to malfunctions and biofilm build-up which could spread diseases on the farm. To phase out antibiotic use and begin using HACs safely, farmers should understand the benefits and challenges of working with new chemicals.

The benefits of HACs

HACs, specifically organic acids, deliver efficacy and safety, address specific feeding requirements and can even protect against reactivated salmonella.

In fact, a recently published study found that organic acid treatments for drinking water significantly reduced salmonella contamination in chickens.

Organic acids and HACs are not new to farms. They have been used in poultry diets for decades, eliciting a positive response in

growth performance, while decreasing pathogenic bacteria. Adding organic acids to drinking water reduces the level of pathogens in water, regulates gut microflora and increases digestion of feed to improve growth performance.

Unlike antibiotics, organic acids do not contribute to antimicrobial resistance. While there is no perfect 'one chemical fits all' for farms and farming applications, there are several different types, such as lactic, formic, citric and fatty acids, that can be used to keep animals healthy, enhance growth and ultimately benefit both the farm's success and the health of consumers.

The challenges of HACs

In order for HACs and other chemicals to be as effective as antibiotics and kill dangerous micro-organisms, they need to be potent. However, the more powerful and effective these chemicals are at destroying micro-organisms, the more of a threat they pose to equipment that has been used on farms for decades.

Much of the equipment used to dispense and dilute chemicals on farms was originally designed to handle specific medications and vaccinations, but not necessarily equipped to adapt to harsh chemistries like organic acids.

As equipment is repurposed and relied upon to handle different chemicals, compatibility becomes an issue.

Older equipment may not have undergone laboratory testing with diluted and concentrated chemicals, from soaking seals, plastics, metals and more.

Without proper testing, there is no way for farmers to know if a new chemistry will work with current equipment. If the equipment is not compatible, the use of HACs could cause issues, such as biofilm build-up in water lines, attracting diseases like E. coli and bordetella.

Whether farming equipment is being used to create cleaning sprays or foams, sanitise water lines or

distribute chemicals to improve gut health, there is a wide range of chemicals for each application. And if equipment can not handle multiple chemicals, the profitability of the farm may be in danger.

Finding the right fit

Selecting the right equipment is key to productivity and profitability on the farm.

It is essential to utilise equipment that has been tested and approved to work with a wide range of chemicals. Farming equipment that is in use but has not undergone laboratory testing should be replaced.

The right equipment should be:

- **Compatible:** Your dispensers and water-driven pumps (WDPs) should be compatible with different types and combinations of HACs. Most farms do not use just one type of chemical to keep animals healthy, so it is essential to find equipment that has been tested with multiple HACs and can be used with any additional chemicals needed. Steer clear of equipment that is not compatible with HACs, or can not handle chemical adjustments as livestock grows.

- **Reliable:** Although new chemicals and regulations are introduced regularly, dispensing and sanitising equipment should be ready for any challenge. Seek out dispensers and WDPs that do not just work for you now, but will work with you for years to come by adapting to future needs.

- **Precise:** Sanitising and de-scaling water lines is crucial to keeping dangerous bacteria from infecting animals. Similarly, administering the right amount of medication or vaccination is essential to animal growth and profitability. Look for equipment that regulates water pressure to control and eliminate dilution variance, as well as adjusts ratios for organic acids, vitamins, medications and probiotics.

- **Advanced:** Look for equipment that features advancements to enhance the overall safety and productivity of the farm. For example, today's WDPs can feature enhanced modulatory and a large injection range, ideal for farms that use multiple chemicals on a daily basis. Additionally, dispensers often include water pressure regulation technology, eliminating dilution variance so there is no wasted chemical or danger to animals.

- **Easy to install and maintain:** Finding equipment that is easy to install and maintain saves you time and reduces costs. To keep equipment working best, make sure to routinely check for and address any issues.

Healthy farming with HACs

As farming evolves, technology must as well. To protect the health of animals, and the consumers who eat animal products, farms must take biosecurity measures to limit disease and ensure all equipment is compatible with HACs. With the proper dispensing, spraying and injecting equipment, farms can improve their productivity and the bottom line, and reap the benefits of HACs for years to come. ■



Hydro Systems' AquaBlend Xtreme is a water-driven pump compatible with highly aggressive chemicals used to treat or medicate water lines.

Programme: Day 1

| | | |
|---|--|--|
| 7.45 | Registration and coffee | |
| 8.35 | Opening ceremony | |
| 8.45 | NDV – Revisiting an old disease with new diagnostic approaches | <i>Bart van Leerdam, BioChek NV, The Netherlands</i> |
| 9.25 | Be prepared for the return of an old adversary | <i>Phang Yuen Fun, Boehringer Ingelheim, Malaysia</i> |
| 9.45 | Comprehensive approach to diagnose and control Malaysian variant infectious bronchitis virus | <i>Lee Jin-ee, Ceva, Malaysia</i> |
| 10.05 | Coffee break | |
| 10.30 | Detection and management of mycotoxins | <i>Tan Seong Lim, Biomin, Singapore</i> |
| 11.10 | aMPV – Control of respiratory and reproductive problems | <i>Jorge Villa, Hipra, Spain</i> |
| 11.30 | Oxidative stress: The polyphenolic counteraction | <i>Gil de Clercq, Impextraco, Belgium</i> |
| 11.50 | Antibiotic reduction and removal in commercial poultry production | <i>Derek Detzer, Jefe, Canada</i> |
| 12.10 | Lunch | |
| 1.00 | Disrupting bacterial quorum sensing as an emerging alternative to antibiotics: Human and animal applications | <i>Maximillian Sim Kwang Hui, Amlan, USA</i> |
| 1.40 | The Poultry Health Tracking System (HTS) as a predictive tool for flock productivity and efficiency | <i>Aurelio Tayao, Elanco, The Philippines</i> |
| 2.00 | Broad protection induced by associating 1/96 (793B-type) and Massachusetts IB vaccine strains against different infectious bronchitis variants in Asia | <i>Marcelo Paniago, Ceva, Malaysia</i> |
| 2.20 | Optimising livestock production through water disinfection | <i>Rik Daneels, Aquaecologic/Zamira, Belgium/Singapore</i> |
| 2.40 | Mycoplasma detection and control in commercial layers | <i>Kahled Hussein, ECO Animal Health Ltd, UK</i> |
| 3.00 | Tools and sampling strategies for detection of aMPV infection | <i>Javier Scorella, Hipra, Spain</i> |
| 3.20 | Break | |
| 3.40 | Vertically transmitted viral diseases | <i>Rafael Monleon, MSD Animal Health, Malaysia</i> |
| 4.00 | Mitigating disease susceptibility in laying hens through dietary immunomodulation by supplemental folic acid | <i>Glenmer Tactacan, Jefe, Canada</i> |
| 4.20 | Broadening protection against infectious bronchitis infections | <i>Aris Malo, Boehringer Ingelheim, Germany</i> |
| 4.40 | Antibiotic problems in Asia – Diminishing control of avian mycoplasma | <i>Chris Morrow, Bioproperties, Australia</i> |
| 5.00 | Mycoplasma synoviae – New qPCR tools and DIVA strategies | <i>Marina Gaimard, Id-Vet, France</i> |
| 5.20 | Short break | |
| The 4th Asian Avian Pathology Lecture Introduced by Professor Richard Jones, Chairman of the Houghton Trust 5.45 Translation sojourn from mind to market – The case for new generation vaccines Presented by Professor G. Dhinakar Raj, Projector Director of The Translational Research Platform for Veterinary Biologicals, Tamil Nadu Veterinary and Animal Sciences University, Chennai, India | | |
| 6.45 | Retire for drinks, reminiscing with old friends and making new ones | |

4th WVPA Meeting

Detection and Control of Infectious Bronchitis in Poultry

October 1 - 2nd, 2018

Kuala Lumpur, Malaysia
www.wvpaasia2018.com

On the first two days of October this year, the Malaysian Branch of the WVPA will host the 4th WVPA Asia Meeting in Kuala Lumpur. This is a meeting that has quickly become a 'must attend' event for anyone involved in poultry health, whether they are researchers, academics, poultry company veterinarians, private practitioners, government veterinarians or those who work in companies who are suppliers to the industry.

As well as two days of excellent technical presentations, this meeting is a networking opportunity for Asian poultry veterinarians and anyone else involved in all aspects of poultry health.

The meeting has excellent support from commercial companies in the pharmaceutical, nutrition and diagnostic fields. They also actively participate in the meeting by providing technical speakers from their global poultry technical field teams and research divisions for the first day of the programme.

The second day's papers are sourced from the WVPA's membership and the region's academic and research institutes and universities. WVPA Asia has used this programme format for the previous three editions of this event and have found that the two days complement each other extremely well.

Previous meetings have been held in Bangkok in 2012 and 2014 and in Manila in 2016. The WVPA Asia meeting take place in the year between the organisation's global congress.

Incidentally, the next global congress (WVPAC2019) will be hosted by the Thai branch and held in Bangkok.

During the Asia Meeting, WVPA takes the opportunity to present its two annual awards.

The first of these is the WVPA-Zoetis Young Poultry Veterinarian of the Year Award, which is for a young poultry

WVPA Asia Meeting 2018:

and Control of Diseases

veterinarian (less than 35 years old) who does something that differentiates them from their peers.

They might be a poultry lecturer who does more than just gives lectures, but spends time with the students and inspires and motivates them, or they could be a field veterinarian who always has time to explain what they are doing and the reasons why.

Previous winners have included two academics, a poultry company veterinarian, a practitioner and a veterinarian from a pharmaceutical company.

The second award is the WVPA-Boehringer Ingelheim Innovation in Vaccination Award.

This can involve primary and secondary research and vaccine production and application, or it could be for teaching or training people about vaccines and their use in the field.

Now is the time for nominations. To find out more about these two awards and to source your nomination form, please go to the awards section on www.wvpa.net.

Previous winners of the WVPA-Zoetis Young Poultry Veterinarian Award.

| Year | Name | Country |
|------|---------------------------|--------------|
| 2017 | Gowthaman Vasudevan | India |
| 2016 | Dennis Umali | Philippines |
| 2015 | Maximillian Sim Kwang Hui | Malaysia |
| 2014 | Adrian Knoetze | South Africa |
| 2013 | Philip Hammond | UK |
| 2012 | Kelli Holloway Jones | USA |

Previous winners of the WVPA-Boehringer Ingelheim Innovation in Vaccination Award.

| Year | Name | Country |
|------|----------------------|----------|
| 2017 | Nikolaus Osterrieder | Germany |
| 2016 | Mohd Hair Bejo | Malaysia |
| 2015 | Siba K. Samal | USA |

Programme: Day 2

| | | |
|-------|---|--|
| 9:00 | Optimising gut health without antibiotics | <i>Gil de Clercq, Impextraco, Belgium</i> |
| 9:20 | Value of E. coli vaccination in modern poultry farming practice | <i>Gary Low Chen Peng, Zoetis, Malaysia</i> |
| 9:40 | Genotypic classification of infectious bursal disease virus and detection of segment reassortant viruses in Bangladesh | <i>Mohammad Rafiqul Islam, BAU, Bangladesh</i> |
| 9:55 | Effect of betaine supplementation on performance, immune response for better disease protection and gut health in heat stressed broilers | <i>JJ Rokade, ICAR-CARI, India</i> |
| 10:10 | Coffee break | |
| 10:40 | Presentation of the 7th WVPA-Zoetis Young Veterinarian Award & 4th WVPA-Boehringer Ingelheim Innovation in Vaccination Award | |
| 10:55 | Molecular characterisation of Newcastle disease viruses isolated during outbreaks in vaccinated flocks reveal circulation of novel subgenotypes within genotype XIII | <i>V. Gowthaman, Tamil Nadu Veterinary and Animal Sciences University, India</i> |
| 11:10 | West Africa could become a hot spot for emergence of avian influenza viruses after recent introduction of H9N2 | <i>Mohammed El Houadfi, Agronomy and Vet Inst, Morocco</i> |
| 11:25 | Aflatoxicosis in broilers and its control by supplementation of distillery sludge: immunological perspective | <i>Aisha Khatoon, UAF, Pakistan</i> |
| 11:40 | Growing incidence of fowl adenovirus-associated disease in poultry and its control strategies | <i>Teguh Y Prajitno, Japfa Comfeed, Indonesia</i> |
| 11:55 | Efficacy and economic impact of different anticoccidial programs on broiler productivity and gut health | <i>Mah Choew Kong, Zoetis, China</i> |
| 12:10 | Dissecting respiratory integrity and co-infections in poultry using RPN-PCR (Respiratory Panel Nanofluidic real-time PCR): field investigations in Asian countries | <i>Alexis Kiers, Elanco, Thailand</i> |
| 12:25 | Circulation of a new genotype of highly pathogenic avian influenza H5N1 virus of clade 2.3.2.1a in ducks, chickens and turkeys in Bangladesh | <i>Emdadul Haque Chowdhury, BAU, Bangladesh</i> |
| 12:40 | A review study on management practices to control infectious laryngotracheitis virus | <i>Hammad Ur Rehman, UVAS, Pakistan</i> |
| 12:55 | Lunch | |
| 1:55 | WVPA Business Meeting A few words from the WVPA President, Nigel Horrox The Asia Meeting of WVPA (WVPAAM2020) – Selection of hosting branch and venue city WVPAC2019 (Bangkok) – A brief insight into what to expect next year in Thailand | |
| 2:15 | In vivo efficacy of activated charcoal on ochratoxin-A induced toxicopathological and serum biochemical alterations in broiler chicks | <i>Sheraz Ahmed Bhatti, BZU, Pakistan</i> |
| 2:30 | Characterisation of QX-like and variant IBV strains in Malaysia based on partial genomic sequences and comparative pathogenicity study of both viruses in SPF chickens of different ages | <i>Nguyen Phuc Khanh, Can Tho University, Vietnam</i> |
| 2:45 | Immunopathological effects of avian adenovirus infection in broilers fed with aflatoxin B1 contaminated feed | <i>M. Kashif Saleemi, UAF, Pakistan</i> |
| 3:00 | Antibiotic use as a growth promotant in poultry: the dilemma | <i>Latiffah Hassan, FPV-UPM, Malaysia</i> |
| 3:15 | Break | |
| 3:30 | Disease dynamics of reticuloendotheliosis virus in commercial broiler breeders | <i>Khalid Naeem, AveyRose Lab, Pakistan</i> |
| 3:45 | Polyphenols improve heat stress induced immune suppression in broilers | <i>M Gopi, ICAR-CARI, India</i> |
| 4:00 | The pathology of fowl paratyphoid and molecular characterisation of its pathogen | <i>Md Golam Haider, BSMRAU, Bangladesh</i> |
| 4:15 | Destructive innate immune response in chickens following infection with genotype VII Newcastle disease virus | <i>Dilan A. Satharasinghe, University of Peradeniya, Sri Lanka</i> |
| 4:30 | Nanoparticles as feed additives for improving the immunity of chickens | <i>Asawaree Hable, Maharashtra Institute of Pharmacy, India</i> |
| 4:45 | Isolation and characterisation of Avibacterium paragallinarum from layer and broiler chickens in Bangladesh | <i>Md Ariful Islam BAU, Bangladesh</i> |
| 5:00 | Close | |



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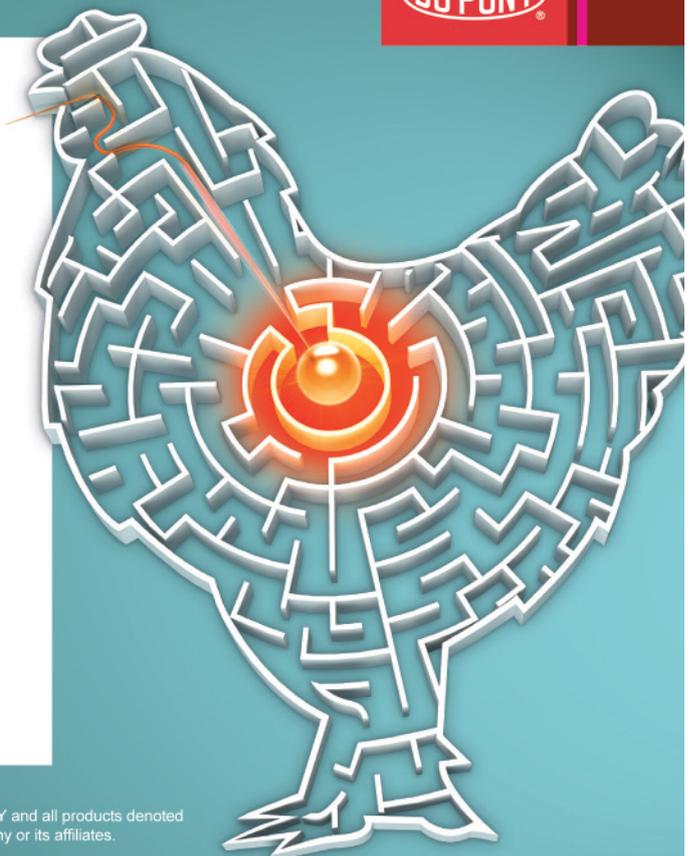
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Successfully managing poultry health in an alternative system

The health management of your flock in an alternative system involves choosing the right breed, feeding programme, and system design. After that, it is up to you to plan, observe and adjust.

by **Bart Stokvis, Veterinarian, Hendrix Genetics Layers.**
www.hendrixgenetics.com

In the past, managing health in a cage system layer house involved few steps. As many experienced egg producers know, a conventional cage system means small group sizes, climate controlled houses, lower dust concentration, easy access to feed and water, and a lower risk of disease. Manure can be easily separated and removed from the birds, and the eggs are delivered and collected in a clean and easy to manage system. However, from a welfare perspective, the alternative systems allow the birds to express natural behaviours such as perching, scratching, and wing flapping.

When making the switch to an alternative system, how can one maintain good health within the flock? The good news is that once you have spent some time observing the birds in the system and then making the necessary adjustments, it is possible to achieve the same technical results as in previous cage systems. Time is the biggest investment.

Breed

The first factor when choosing what breed to use in your operations is whether you are serving a white or brown egg market.

After determining which colour breed is needed, it is important to use a breed that is docile and robust when using an alternative system.

Within a cage free system, the birds are able to move freely and express natural behaviours, so they use significantly more energy in their daily activity. For this reason it is important to start out with very robust birds that continue to produce a high number of eggs,



An example of an alternative system.

maintain good health and are able to resist disease.

Additionally, the birds must be able to seek out their feed and eat well, especially during the rearing process. Starting with a breed that has the drive to eat and will explore the system in order to find food and water will go a long way in maintaining good health.

During the rearing process, the goals are to achieve low mortality and make sure pullets are strong with high uniformity; pullets should be trained in moving around the system, keep a high feed intake, and maintain clean and undamaged feathering. This is all possible by starting with the right genetic solution. In addition, make sure that the system used for rearing is the same as what is used during production. Training is important so the birds can learn where to nest, eat, and keep busy.

Using the right breed will also affect how you lay out the house so that the birds are able to access food, water, and nests. For example, white birds are more mobile and are able to navigate the different levels

of an aviary system without posts for support, whereas brown birds need more support such as ladders between levels. Keeping your birds' behaviour in mind when choosing a house layout will help prevent injuries when navigating the system.

Feed

The feeding technique used when managing hens is a key factor in achieving the best possible shell quality and nutrition levels. The empty feeder technique is helpful for this goal. To encourage natural feeding behaviour, especially in an alternative system, it is advised to provide at least 60% of the daily feed in the afternoon and before this period starts, the feeders should be emptied in the middle of the day for at least one hour to a maximum of 1.5 hours.

Applying the empty feeder technique controls body weight, flock uniformity and egg shell quality because the total diet is consumed daily, including the fine

particles containing important vitamins, minerals and amino acids.

Design of the house

Choosing the right aviary system as well as the right lighting is extremely important in an alternative system. It allows you to manage behaviour and guide the birds to be able to eat and nest properly. First, be sure to light where the birds can access food and water as well as the litter areas to prevent floor eggs.

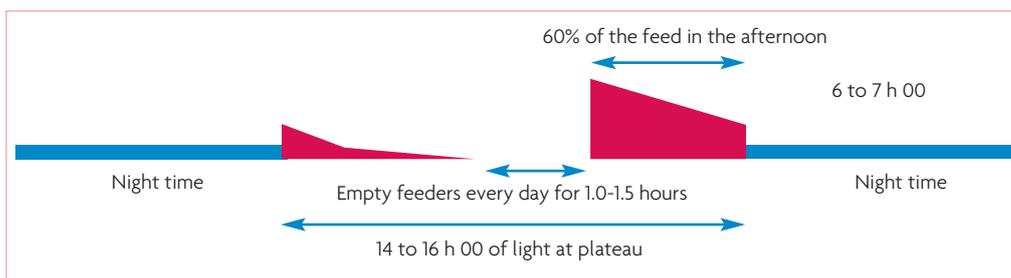
Additionally, the colour of the light used matters in maintaining docile behaviour. It has been found that warm spectrum lighting can calm the birds, whereas brighter, blue-tinged lighting can increase aggression.

Ventilation is another important factor. In an alternative system, fine dust is increased and can cause health issues. Using the right method of ventilation to reduce the dust and circulate air will improve efficiency and health. The air must flow so it is distributed evenly.

This will keep ammonia levels low, litter dry, and the birds comfortable and productive.

For an alternative layer house to be successful, the design of the system, breed selection, and nutritional profile need to work together. When you have each piece in place, be sure to observe and adjust as needed. Once you have committed the extra time to learning the system, it is possible to keep the birds healthy and producing at their full potential. ■

Fig. 1. The empty feeder technique.





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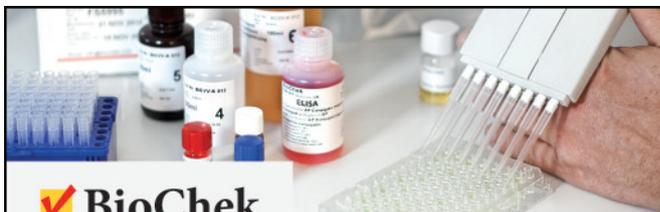
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- **Digital Haugh Tester.** This is extremely precise and friendly to use in order to assist you with the correct process of reading the albumen height.
- **Egg OR Candler:** This is a portable LED battery/mains operated egg candling lamp for both white and brown eggs in any environment.
- **Wireless Egg Node.** This provides a real-time measure of shock, vibration, rotation, tilting and temperature to which eggs are subjected, helping to monitor egg conveying, grading and packing installations and transportation extending from laying location to point of sale.

The ORKA range of instruments is used extensively in QC laboratories operated by egg producers, packers, universities, regulatory authorities, and primary breeders.



The new elevator for reliable egg transport

The newly developed EggSmart elevator from Big Dutchman provides everything that is needed for the safe transportation of eggs from up to four tiers.

From the longitudinal belt the eggs are conveyed onto a short rod conveyor, from where they are then transferred onto the elevator's conveyor chain.

bigdutchman.de

This process does not require any additional dosing units: a deflector helps to distribute the eggs over the entire width of the elevator chain.

- Advantages include:
- Large collection capacity: one elevator can collect up to 9,000 eggs per hour.

- No dosing units required, therefore there are minimum maintenance requirements.
- A short rod conveyor between the longitudinal belt and the elevator chain ensures that eggs without shells and dirty eggs do not reach the elevator chain.
- The special, patent-pending elevator chain ensures gentle transportation of the eggs to the transfer unit of the cross belt.
- Less space is required in the end set area.
- Easy access to all cage rows. There is no obstruction because of the cross collection.
- The system is simple to assemble and adjust.
- Can be used for cage systems and with all types of laying nests.





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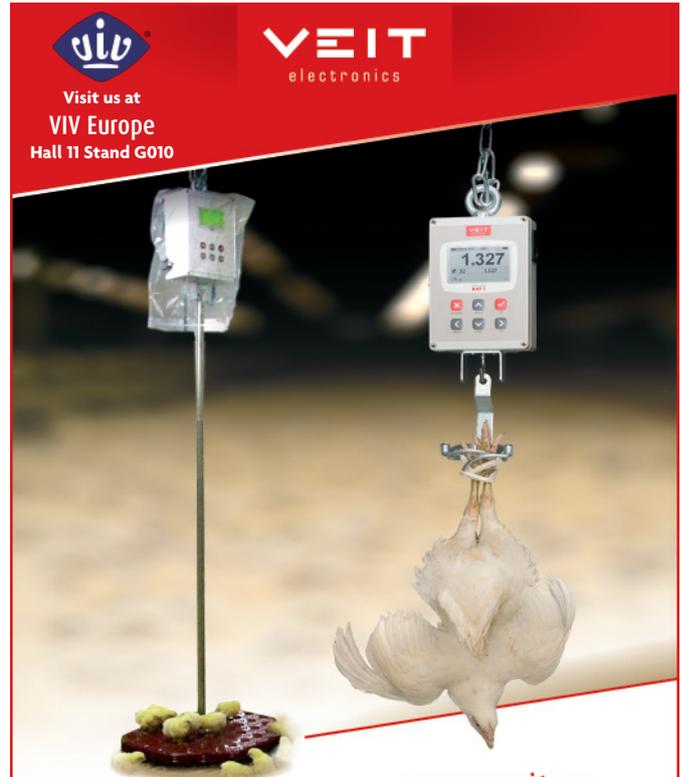
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farmtec.com

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The egg collecting systems meet the various requirements of poultry farmers and local conditions. With the expanded drive unit product range; consisting of a front drive,

intermediate drive and an end drive, systems of any length can be designed without additional transfers offering smooth transport of the hatching eggs.

Depending on the total length of the conveyor system the front drive will be the main drive and can be supported by an end drive or one or more intermediate drive units.

The different drive units can be combined with all Farmtec conveyor types/widths, curves, inclines and lifts. Also available are egg lift systems, egg elevators, automatic oil dispensers, curves/S-curves, top covers, inclines/declines, junction conveyor, and a dirt collection belt under the system.

Offering maximum protection to eggs during transportation

Transportation of eggs from farms to the grading, processing and hatchery facilities is a very important part of the supply chain and cracks need to be reduced to a minimum.

eggscargosystem.com

For this reason, 20 years ago Giordano Poultry Plast, in close collaboration with Twinpack Special Products, invented the EggsCargo-System. The EggsCargoSystem offers maximum protection to eggs while they are transported. The system contains a plastic pallet, a special divider to separate the stacks and a variety of trays, suitable for all sizes.

All items belonging to the system are made of the very best plastic raw materials available. The EggsCargoSystem can be loaded and unloaded by special robots, improving productivity and cutting labour costs. The pallets are provided with an internal RFID

microchip, making tracking and tracing more easy and reliable.

For customer identification, the system can be supplied in almost all RAL colours combined with customer inscriptions.

Currently, over 170 million trays, in combination with pallets and dividers, have been sold to over 1,000 customers worldwide.



Continuous developments to optimise egg transport

Lubing has been developing and manufacturing egg conveying systems since 1976. Their 42 years of experience and the solid building method make Lubing conveyor systems the most reliable solution worldwide.

lubing.com

In addition to continuous further improvements, Lubing are constantly developing new units to optimise egg transport.

These new units are developed to ensure safe and clean egg handling at your farm. Various solutions for different situations can be provided by their loader conveyors for egg transport from the laying area to the central conveyor. Their accumulator

tables are used before egg processing at packing or grading machines or to join the eggs from different conveyors on site.

The cleaning units can be used for the complete and secure cleaning of Lubing conveyor chains. In order to reduce dirt under the conveyor line, their dirt removal belt can also be installed.

With a redesign of their lift system they have updated the efficient and cost effective system to the latest technology.

Their EMEC egg counter, which can be placed on top of the conveyor, counts the eggs during transportation.

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Bird health starts with a healthy gut: effective management programme

The success of poultry production relies heavily on animal health, gut health, in particular, because the gut plays a critical role in ensuring efficient growth and animal welfare.

by Jules Taylor-Pickard,
Alltech.
www.alltech.com

Numerous performance indicators are influenced by gut health, including obvious parameters such as feed efficiency, growth and mortality, reducing pathogen load in bedding and housing, improving immunity responses and maintaining gut epithelial integrity during processing, and other benefits.

The premise for establishing correct gut microflora and health through the Alltech Gut Health Management programme for poultry is based on 'seed, weed and feed' principles; in other words, 'seed' with the correct bacteria and gut conditions to begin with, 'weed' out the pathogens and prevent their colonisation, and 'feed' beneficial bacteria, as well as making more energy and nutrients available to the host bird.

A balanced approach

The gastrointestinal tract of chickens requires a balance of water, bacteria and pH for correct function. The best approach to support this is by promoting good bacteria, building natural defences from hatch (such as immunity) and maintaining them throughout the animal's life.

The importance of early gut development does not always receive the focus it deserves, even though it is directly related to digestion and absorption efficiency throughout the bird's life. Access to feed immediately after hatching, as well as supplying specialist technical ingredients such as prebiotics and acidifiers to promote correct microfloral balance, is key to developing the villi surface area and integrity of the epithelial lining

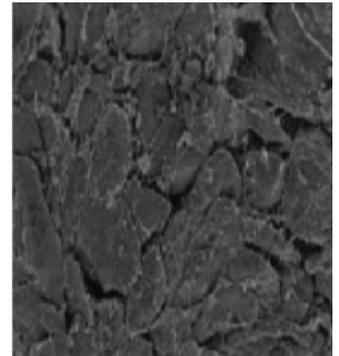
of the intestine. The villi that line the epithelial surface increase surface area by approximately 600 times during development.

The gut wall regulates water and nutrient absorption continuously and acts as a physical barrier to prevent microbes and their toxic metabolites from entering the bloodstream, and hence into tissues and organs. The gut lumen contains micro-organisms that are beneficial in terms of assisting nutrient digestion and absorption, regulating pH and providing essential, energy-rich volatile fatty acids from fibre breakdown. It also contains pathogens that can cause disease through toxin production, which also leads to damage and erosion of the villi and gut wall, and poor water absorption, manifested as diarrhoea.

Vital relationship

The relationship between the gut microbiota and host is vital to normal gut function and any disruption in this relationship leads to a series of events ending with inflammation and gastrointestinal disease in the birds, thereby reducing animal welfare, health, performance and, ultimately, profitability.

Pathogen exposure in poultry can be from water, feed or the housing environment. Water quality is often overlooked in poultry production, despite chickens consuming two times more water than feed per day,



Left, dense villi, with Alltech Gut Health Management. Right, sparse villi, without (Dr Steve Collett, University of Georgia).

on average. Water is a common vector for disease transmission, especially for *Campylobacter* spp., which poses a major risk to chickens and human consumers of resultant meat.

Acidifiers can be added to drinking water to lower the pH level and keep the intestinal pH at an optimum range, promoting healthy microflora and helping to maintain digestive enzyme activity, which is particularly sensitive to pH. Acid-Pak 4-Way is such an acidifier and, when added to drinking water, is readily consumed by poultry.

The supplementation of enzymes and electrolytes is also useful in maintaining gut and therefore animal health. Electrolytes assist by replacing daily salt losses, maintaining a proper range of sodium and potassium and balancing nutrient absorption.

Various in-feed strategies are available to ensure the best start possible for poultry, which are detailed and utilised in the Alltech Gut Health Management programme, including the use of a number of specific gut active products such as the prebiotic Actigen and Natustat.

Actigen contains high levels of mannan-oligosaccharides. This latter activity allows the immune system to develop appropriate responses to harmful bacteria within the environment, feed and water that they are exposed to, without launching an energy-expensive, full-scale immune response.

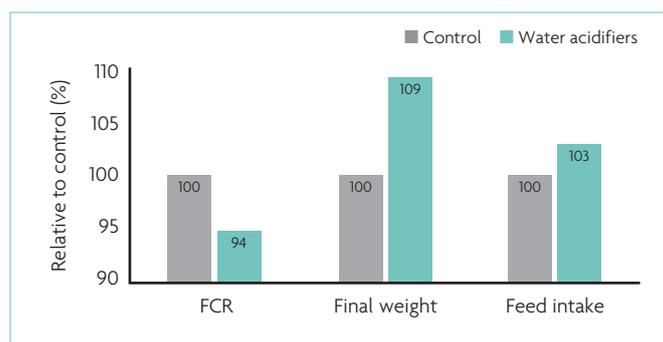
Extensive research

Extensive research into the activity and effectiveness of Actigen has been conducted in the last 20 years, with meta-analyses showing consistent benefits in poultry performance, typically resulting in 129g more body weight, a 5-point improvement (0.05) in FCR and 0.8% more survivability at slaughter.

Natustat is a blend of plant extracts*, essential oils*, yeast and organic minerals used in the Alltech Gut Health Management programme. This product enhances the repair of lesions in the epithelial tissue of the gut. Immunoglobulins are generated by the immune system in the bird to fight disease;

Continued on page 51

Fig. 1. Effects of water acidifiers on broiler performance.



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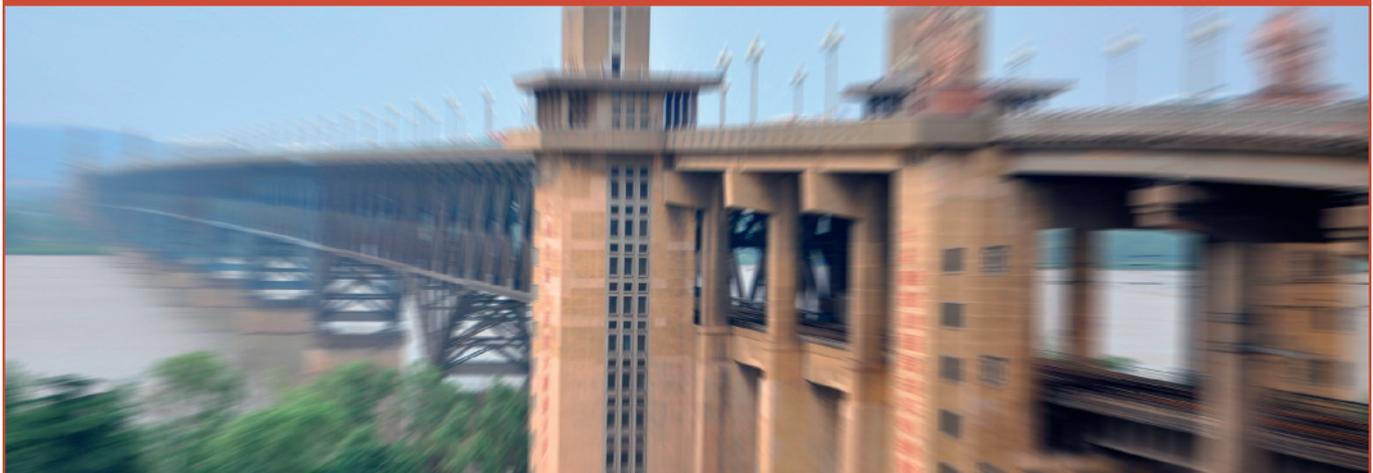
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Continued from page 49

however, natural immunoglobulin production can be inhibited, reducing its efficacy when exposed to disease conditions.

Therefore, Natustat helps to strengthen the bird's natural defences, optimise gut integrity and overall animal performance. Eimeria colonisation has been shown to work in collaboration with the pathogenic bacteria Clostridium perfringens to cause necrotic enteritis, leading to major gut wall lesions and damage, poor nutrient absorption, reduced growth performance and higher mortality.

Damage to the gut walls makes them fragile and prone to tearing during processing, increasing the number of downgraded carcasses in the slaughter plant.

Study in turkeys

A study on the effect of the yeast and organic mineral blender on histaminases (blackhead) has been conducted in turkeys, where birds were split into four diet treatment groups: non-challenged and non-supplemented (CON), challenged and non-supplemented, challenged and supplemented with the anticoccidial drug Nitarsone at 0.1875kg per tonne of feed and challenged and supplemented with the yeast and organic mineral blender at 1.925kg per tonne of feed.

The challenged birds were challenged with Histomonas meleagridis-infected litter at day seven of age. Body weight, FCR, mortality, caecal lesions and liver lesions were measured in the birds.

The results showed that the drug Nitarsone significantly improved FCR and reduced caecal lesions; however, the blender performed better by increasing bodyweight at day 42, decreasing FCR at day 28 and day 42, and decreasing caecal and liver lesion scores. Hence, the data showed that Natustat can replace Nitarsone successfully for the control of histaminases.

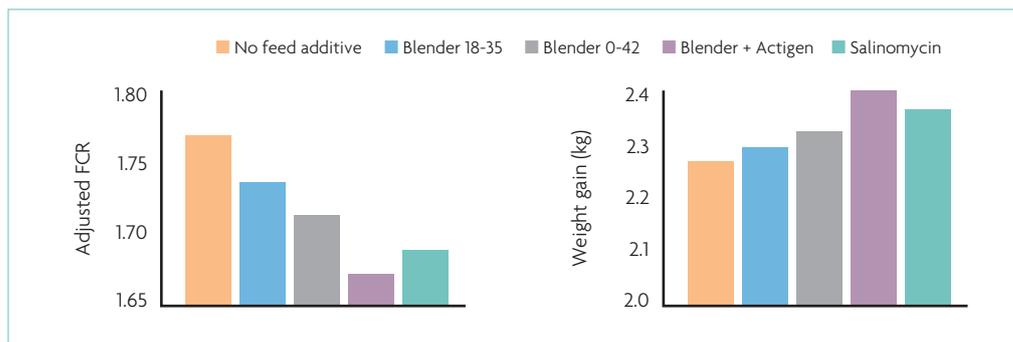


Fig. 2. Day 42: Performance.

Research using turkeys challenged with cochlosoma was conducted where the birds were divided into five dietary treatment groups:

- Non-challenged and non-supplemented.
- Challenged and fed no supplement.
- Challenged and supplemented with the coccidiostat drug Monensin at 0.0794kg per tonne.
- Challenged and supplemented with the coccidiostat drug Nitarsone at 0.1875kg per tonne.
- Challenged and supplemented with the yeast and organic minerals blender at 1.925kg per tonne.

Birds were challenged using infected litter from an Eimeria-positive farm from one day old and specifically infected with 2×10^6 Cochlosoma anatis organisms via oral gavage at day 14. The results showed that the challenged birds had increased intestinal lesions and poorer performance compared to unchallenged turkeys.

The yeast and organic minerals blender, Monensin- and Nitarsone-supplemented, diets were statistically equal in improving the bodyweight of the challenged birds.

The results showed that dietary supplementation with these products in challenged birds' diets reduced the severity of intestinal lesion scores compared to the unsupplemented, challenged birds.

Research investigating coccidiosis and performance using combined

product supplementation or the anticoccidial drug Salinomycin was conducted using coccidian-vaccinated broiler chickens.

The birds were split into five groups:

- No feed additive.
- The yeast and organic minerals blender supplemented at 908g per tonne from days 18-35.
- The blender supplemented at 908g per tonne at days 0-42.
- Actigen-supplemented at 400g per tonne from days 0-18 then the blender at 908g per tonne from days 18-35 and Actigen again at 200g per tonne from days 35-42.
- Salinomycin-supplemented at 40g per tonne from days 18-35.

The supplemented feeds all improved bird performance in the presence of a coccidia vaccination programme. However, feeding diets containing the yeast and organic minerals blender either throughout the growing period or during peak coccidia challenge significantly improved performance, and Salinomycin only during peak challenge significantly improved performance.

Results

The results effectively demonstrated that the combination of the blender and Actigen supplementation performed the best. The aim of Alltech's Gut Health Management

programme is to nurture beneficial micro-organisms within the intestinal lumen by creating an ideal environment and minimising colonisation opportunities for pathogens. The combined benefits from the different modes of action – acidified environment, maximising and protecting villi and epithelial structures and promoting immune responses – all contribute to the welfare and performance of the animal.

As pathogens compete with the bird for nutrients and reduce absorptive capacity of the villi, negating their presence allows extra productive performance, as well as limiting potential disease development.

Using these technical ingredients in feed and water systems from the first day assists in early gut development, the establishment and maintenance of a correct gut environment and bird immunity, ultimately leading to better animal health and productive performance.

Using tools such as Alltech's Gut Health Management programme will help producers select and implement the best water and feed supplements to maintain health status on-farm. Bird health starts with a healthy gut.

References are available from the author on request

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Why should I be feeding distillers grains to poultry?

Dried distillers grains with solubles (DDGS) represents a nutritious ingredient which nutritionists can use in feed formulations for all types of poultry. Furthermore, the ample supply of DDGS makes the product available to poultry producers at a very competitive cost compared with other ingredients typically used in poultry feed formulations.

by Dr Kevin Herrick,
 Technical Services Director,
 POET Nutrition, USA.
www.dakotagold.com

These reasons alone should motivate producers and nutritionists to include DDGS as part of their feeding programme.

However, partly because of incorrect perceptions and partly because of early experiences with poor quality DDGS, many producers do not use DDGS or include DDGS in the diet at less than optimal concentrations. This represents a missed opportunity for the poultry industry.

Economics

Part of any decision about feeding management needs to include an economic evaluation. The poultry industry recognises DDGS as an affordable ingredient.

However, how much could producers save on feed costs when

using DDGS? Conditions vary from producer to producer so answering this question proves difficult.

Producers may have different ingredients available or nutritionists may have different formulation strategies. Furthermore, ingredient prices vary between regions. All these factors can change the relative value of DDGS.

However, previous publications provide a thumb-rule that 100 pounds of DDGS will replace between 50-60 pounds of corn and 40-50 pounds of soybean meal. If we use these general substitution guidelines and current commodity prices, we see that replacing corn and soybean meal in poultry diets could result in feed cost savings of almost 50-52%.

DDGS history and background

As previously mentioned, some individuals have incorrect perceptions about DDGS value. A brief look at the history of the DDGS industry provides an opportunity to challenge these perceptions.

Although ethanol production has existed for several decades, the real growth only occurred during the past 15-20 years. Political influence and global strategies encouraged ethanol production and as a result, ethanol producers took advantage by rapidly constructing biorefineries to meet the growing ethanol demand.

Fig. 1. DDGS fat content vs. gross energy.

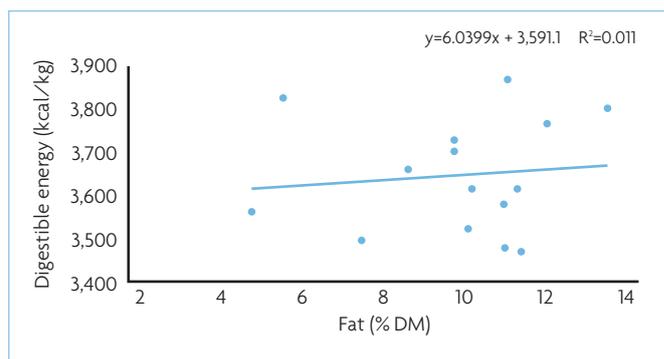
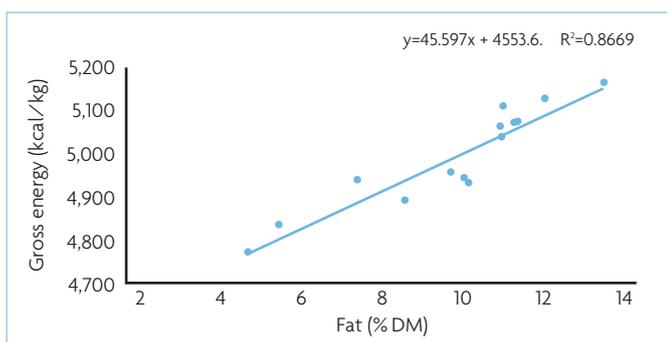


Fig. 2. DDGS fat content vs. digestible energy.

Unfortunately, some ethanol producers focused only on ethanol production and largely ignored DDGS quality during this early growth. As a result, a portion of the DDGS used by the industry probably had heat damage or reduced availability of nutrients. This resulted in poor experiences for some nutritionists and farmers who used this early product.

As the ethanol industry matured, ethanol producers developed new equipment and started to better understand the ethanol process. This evolution improved ethanol efficiency, but it also resulted in a greater emphasis on DDGS quality because ethanol producers quickly recognised DDGS as a potentially valuable co-product.

Improvements in nutrient testing, drying equipment, and a focus on reducing variability helped to create a product which livestock producers could successfully include in their feed formulations.

This focus on DDGS quality continues today as several ethanol producers currently conduct research or support university research to better understand DDGS nutritional value.

DDGS and fat content

One of the most significant advancements in DDGS nutrition relates to increased oil removal. Distillers corn oil prices encouraged ethanol producers to implement technologies which allowed for

greater oil recovery during the ethanol process.

At first, this practice would seem to suggest that current DDGS contain less energy compared with full-fat DDGS and, as a result, less value to the livestock producer. However, research demonstrates that other factors besides fat contribute to the DDGS energy value for the animal.

In order to better understand this relationship, we need to first highlight the differences between gross and digestible energy as it relates to animal nutrition. Gross energy represents the total energy in any ingredient, while digestible energy accounts for energetic losses by the animal through the digestion process. Thus, digestible energy represents a more accurate and true energy value to the animal compared with gross energy.

We can look at data from previous research to see how this discussion on gross and digestible energy relates to DDGS.

Kerr et al. (2013) evaluated multiple sources of DDGS for gross and digestible energy in swine. Although this example highlights swine research, the same relationship exists in poultry.

Furthermore, similar types of relationships exists between different measures of energy (metabolisable or net energy). When we plot the fat content of each DDGS against gross energy, we see a very strong linear relationship (Fig. 1). We expect this type of

Continued on page 55

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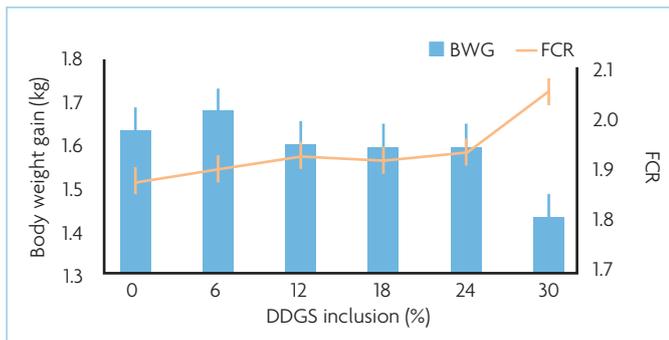


Fig. 3. DDGS inclusion during finisher I phase.

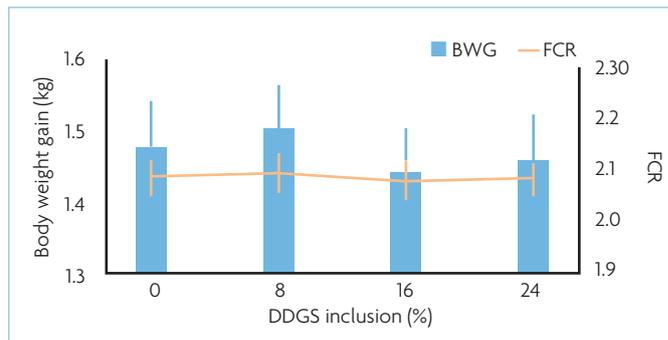


Fig. 4. DDGS inclusion during finisher II phase.

Continued from page 53 relationship since fat contains more energy than carbohydrates.

However, when we plot the fat of these same DDGS samples against digestible energy (Fig. 2), we see very little relationship. This clearly demonstrates a poor relationship between fat content of DDGS and energy available to the animal.

Inclusion in poultry diets

As previously discussed, including DDGS in poultry diets can reduce feed costs. In order to capitalise on these feed cost savings, a significant amount of research has focused on identifying the maximum inclusion

of DDGS in poultry diets without affecting production.

Researchers from the ARS-USDA Poultry Research Unit at Mississippi State recently published results from a study investigating the inclusion of a reduced-fat DDGS on broiler diets.

Experimental diets for the finisher I phase (day 28-42) included 0, 8, 16, 18, 24, or 30% of a reduced-fat DDGS, while diets for the finisher II phase (day 43-56) included 0, 8, 16, and 24% of the same reduced-fat DDGS. All diets contained similar energy and met or exceeded all other minimum nutrient requirements.

Body weight gain during the finisher I phase did not vary ($P>0.05$)

between the 0, 6, 12, 18, and 24% DDGS treatments (Fig. 3). Body weight gain only decreased when researchers added 30% DDGS to the diet. Researchers observed a similar relationship with feed conversion rate. Bird performance (body weight gain and feed conversion rate) did not differ ($P>0.05$) during the finisher II phase (Fig. 4).

Researchers concluded that including a reduced-fat DDGS at 24% of the diet supported bird performance similar to a diet containing no DDGS. Based on previous research, they also suggested that including a reduced-fat DDGS supported similar animal performance to diets formulated with a higher-fat DDGS.

Conclusion

Replacing other more expensive feed ingredients with DDGS can reduce feed costs and improve profit margins for poultry producers.

However, in order to achieve success with this strategy, nutritionists and producers need to recognise recent advancements in DDGS nutrition.

Furthermore, having a precise nutrient characterisation of DDGS will allow for accurate formulation and optimal bird performance. ■

References are available from the author on request

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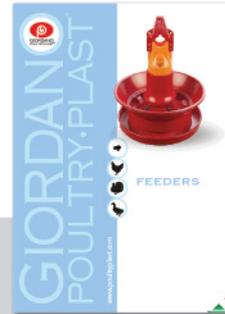
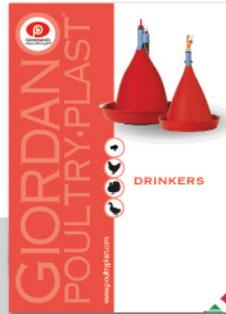
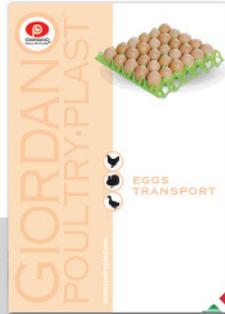
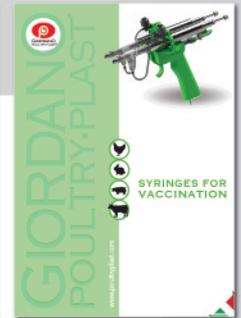
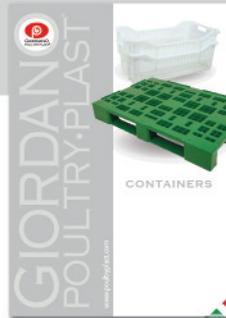
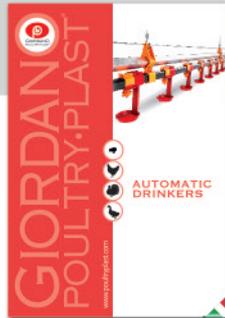
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How to compare different phytases for use in poultry feed

Exogenous phytase is added to poultry feed to liberate phosphorous (P), bound as phytate in raw materials, with the aim of lowering feed costs by reducing the amount of inorganic P added to the diet and having a degradation of phytic acid, known as an anti-nutritional factor in feed. Both actions lead to an improved poultry performance.

by Lode Nollet, Msc, PhD,
Global Product Manager Enzymes,
Huvepharma.
www.huvepharma.com

Comparing phytases: bone ash and digestibility studies

In order to compare different phytases on their potential to release P from phytate, trials are often conducted by adding the phytase at different inclusion levels to a P deficient diet. Technical performance is measured alongside parameters related to P digestion by the animal. This can either be the measurement of bone ash or by calculating a P digestibility value.

In the bone ash method, a feed deficient in P is fed to the animal. This leads to poor bone formation, substantiated by a low bone ash content. Adding inorganic P to the feed (MCP or DCP) leads to a reduction of the P deficiency, resulting in a better bone

formation and higher bone ash in the bird (Fig. 1).

This way, a 'calibration curve' between P added to the feed and bone ash is produced. Adding a phytase at a certain level to the P deficient feed will also reduce its P deficiency due to the liberation of P from phytate, leading to a higher bone ash content. With the latter value, and using the calibration line, the equivalent P (from MCP or DCP) value can be estimated for this phytase (see arrows in Fig. 1).

Alternatively, P values of a phytase can be estimated from digestibility studies, similar to trials conducted for protein digestibility. In brief, P intake in the bird is measured, while P excretion (in manure) or P levels in the end part of the intestine are also determined. Based on these values, and using an indigestible marker in feed, the amount of P retained or digested by the animal can be calculated.

Adding a phytase to this feed will reduce the P level at the intestinal level and in faeces, which allows the calculation of a digestible P value for the phytase.

Biased comparisons based on equal FTU per kg of feed inclusion

The way to determine the levels of different phytases to be included in the feed in order to compare them can already skew the outcome of the trial.

In comparative trials, it is often seen that

the activity of the different phytases is 'quantified' using the official method (ISO 30024:2009) expressed in FTU per gram pure phytase product.

Based on this analytical result, the different phytases are then dosed to reach a certain inclusion level, for example, 500, 1000 or 1500 FTU per kg of feed. However, this is not the correct way, as explained below, as every phytase has its own pH profile.

The ISO method is measuring the activity of the phytase at pH 5.5, while it is common knowledge that phytases need to work at levels between pH 2 and pH 4 (Fig. 2). The phytase indicated in blue in Fig. 2 has a pH optimum at 5.5, while the phytase indicated in green has pH optimum around 3.5, meaning that the latter will perform better in the animal.

When the activity of both phytases is determined by the ISO method (at pH 5.5) it can be seen that the blue phytase will have a higher activity (for instance 10,000 FTU/g), while the green phytase has a lower activity at this pH (for instance 5,000 FTU/g).

According to this trial protocol, one should then add 50g of the blue phytase, but 100g of the green phytase per kg of feed in order to reach 500 FTU/kg feed inclusion level.

This means that this type of trial protocol will favour the phytase which has the better pH profile for activity in the animal

Continued on page 58

Fig. 1. Correlation between phosphorous in feed and bone ash, and estimation of P equivalency for a phytase based on bone ash (arrows).

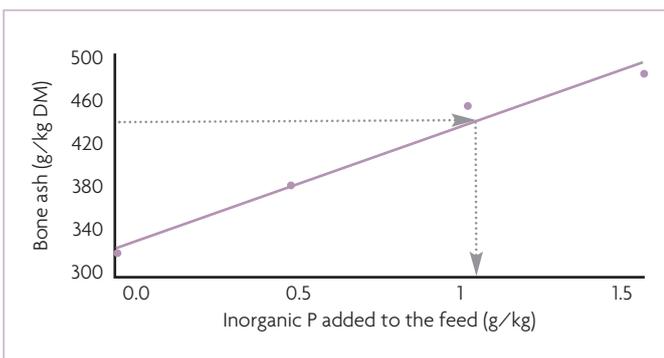
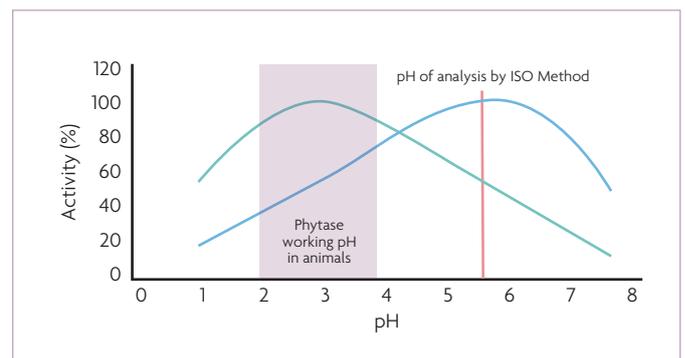


Fig. 2. pH profile of two phytases – pH area at which phytase needs to work in the animal, vs pH at which phytase activity is measured using the ISO method.



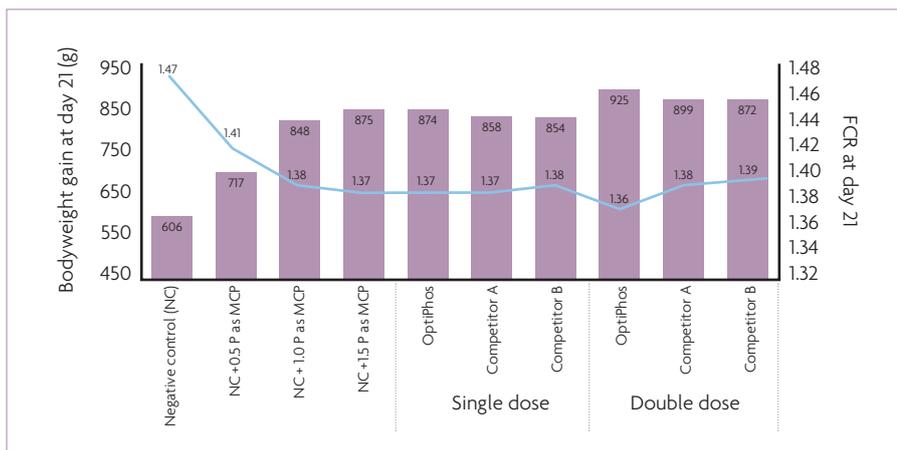


Fig. 3. How to set up a phytase trial with the appropriate inorganic controls and different phytases at inclusion levels proposed by the supplier.

Continued from page 57
(pH 2 to 4; this is the green phytase) and a lower activity measured at pH 5.5.

How to do it better

From a commercial point of view, the main question for the feed industry is: how many grams of a commercial phytase product, with a certain declared activity, with a certain claim for P and with a certain price, are comparable?

Indeed, every phytase has its own phytase unit based on its own analytical method, and this phytase unit corresponds to a certain P or dig. P value declared by the supplier. For instance, a trial could be set up in which a feed, not deficient in P (= positive control) is reduced in P by 0.5, 1.0 and 1.5g/kg (negative controls).

To these feeds, each of the phytases is included at the supplier recommended inclusion levels to compensate for the 0.5, 1.0 and 1.5g reduction.

By doing so, it can be validated, based on

technical performance, bone ash analysis and/or P digestibility, if the matrix value for P proposed by each phytase supplier is correct. At the same time, all phytases can be compared on technical performance, including economic performance, as these are the drivers for the correct choice of a phytase.

It should, of course, also be clear that when comparing phytases, the same form (liquid, granular or coated) should be used. It is well known that coatings might hinder the release of a phytase, which can impact its P release from phytate. As phytate degradation needs to take place in the first part of the intestine (gizzard), a reduced release of phytase might impact its effect.

Conclusion

It is quite clear that the set-up of trials to compare different phytases needs to be done properly in order to provide practical answers to the nutritionist.

This means comparing different phytases at their recommended inclusion levels, taking into account their proposed matrix values for phosphorous and their price, and not based on their FTU activity measured at pH 5.5. In this way, an easier and more correct comparison can be made based on the technical and economic performance obtained. ■

Watering Wisdom 8

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DRY FLOORS PROMOTE BIRD WELFARE AND REDUCE RELIANCE ON ANTIBIOTICS



Enhancing bird welfare and eliminating non-therapeutic use of antibiotics is a world-wide trend and poultry producers are discovering that one of the most effective ways to achieve this goal is by maintaining dry litter conditions. Central to this goal is effectively managing nipple type watering systems in a manner that discharges sufficient water to stimulate bird growth, but not over-supply water which creates wet litter. Wet litter can become a breeding ground for disease and ammonia release resulting in pododermatitis and a host of other bird welfare and health issues.

Understanding enclosed watering system concepts and applying them when managing watering systems is essential for maintaining drier litter conditions year round.

Best practices and guidelines available for enclosed watering systems are available through poultrywatering.com, a reference and resource site for all things related to poultry watering.

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A new bioeconomical approach to supporting poultry health

Fulvic acids are a water-soluble compound of humic substances. They form during the biodegradation of plant material, also known as humification. That is why fulvic acids are present in almost any soil.

by **Daniel Molnar**,
Product manager,
Humintech GmbH, Germany.
www.humintech.com

They function as natural complexing agents, enhance the availability of minerals and inhibit the growth of harmful germs.

Peat soils are especially rich in fulvic acids and are thus used as soil conditioners, plant fortifiers and as a fodder additive.



Leading Dutch water supplier Vitens NV and German biotech company Humintech GmbH have realised the first goals of their exclusive partnership.

As part of their Zero Liquid Discharge principle, Vitens is



supplying Humintech with food-grade quality fulvic acids extracted from drinking water, while Humintech turns these fulvic acids into high quality products for livestock breeding, agriculture and horticulture.

Fulvic acids in animal nutrition

Fulvic acids fulfill a similar function inside the digestive tract of animals as they do in soils: they improve feed conversion and help to reduce diseases of the gastrointestinal tract by inhibiting bacteria, viruses and other pathogens and prevent their take-up inside the digestive system. The germs bind to the fulvic acids and are excreted with them.

While free range animals take up fulvic acids and other humic substances from the soil, they are utterly missing in the feed recipes for modern factory farming – despite the fact that they have

always been a natural component of daily fodder. There is a reason they go unheeded by most: to produce pure fulvic acids has yet been very arduous and expensive.

That has now changed. Vitens NV has succeeded in extracting ultrapure fulvic acids out of Frisian peatland groundwater rich in fulvic acids in a patented process that makes it possible for the first time to extract the fulvic acids in an eco-friendly way, using no chemical additives to ensure a food-grade commodity.

What can we expect in practice?

Intensive farming is pushing the physiological boundaries of our livestock. Farmers must focus on the prevention of stress situations including illnesses and must optimise feed utilisation.

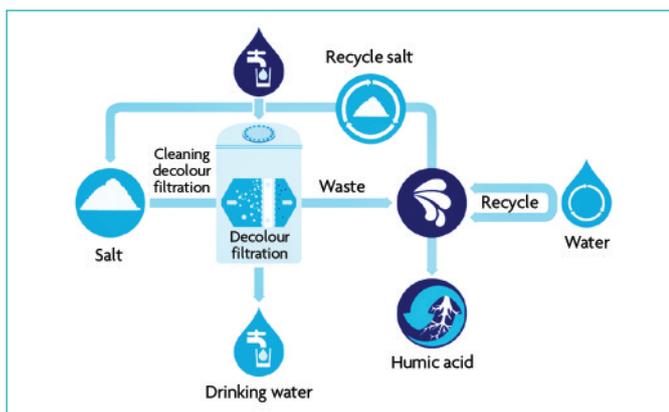
Any change in conditions can cause a drop in productivity, and

the regeneration demands nutritional requirements beyond the conventional feed rate. This can lead to deficiency symptoms like feather pecking and cannibalism.

Our practical and scientific experience shows that incorporating water derived natural fulvic acids into the diet or drinking water of animals helps to prevent and ease cannibalism as well as intestinal irregularities and contributes to the general well-being of animals.

This improved health status can lead to a productivity increase of up to 5%.

Given that it is a new product, we need further research to understand its effects in detail. But we already know that the capabilities of aquatic fulvic acid make it exceptional in developing liquid and powdered immune enhancers, intestinal health promoters and stress management products, as well as for direct application in animal breeding. ■



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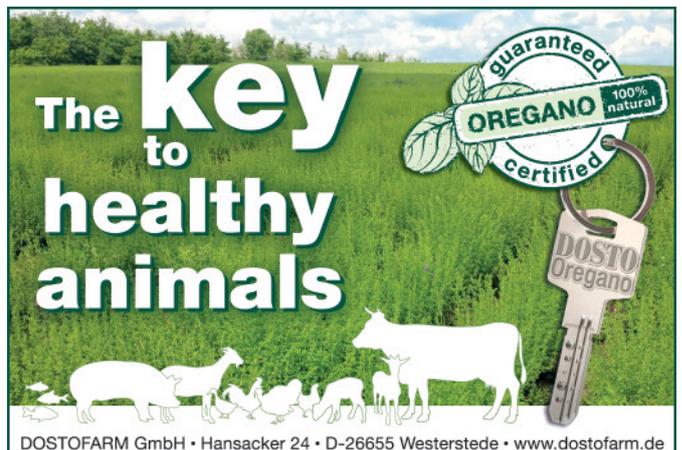


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Helping birds to handle stress with a sensory solution

Modern poultry farming systems are managed with a high level of precision. From nutrition to the livestock building through to health, each production parameter is precisely defined to correspond to animals' needs and to help reach their optimal performance potential.

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

In such cutting-edge breeding systems, any single risk factor can cause an imbalance and lead to serious, negative, physiological or behavioural consequences.

Furthermore, production standardisation creates a homogeneous environment which limits animals' stimulation. Thus, being used to uniformity, birds are particularly likely to suffer when faced with any single environmental variation, which is then deemed as a stressor. All these parameters lead to an increase in the animal's perception of stress.

Metabolic cost of stress

Due to cortisol levels being too high for too long, stress leads to a reduced feed intake compared to what is normally expected and sometimes leads to reduced

immunity. The large number of consequences on performance which are induced by stress means that it causes collateral damage to high-performance production systems.

Thus, breeders work on a wide range of production parameters to get as close as possible to reaching an animal's genetic potential.

Management of an animal's perception of stress is an essential factor in reaching this goal of multichannel return on investment.

This article presents the relevant results obtained under VeO treatment, first with broilers and then laying hens. Most of these trials include a period of high temperature which is a typical source of stress in poultry production.

Results observed with VeO and broilers

● Feeding behaviour modulation

In a hot climate, broilers naturally reduce their feed intake, especially under hot afternoon conditions in order to reduce thermogenesis.

As diet-induced thermogenesis occurs four hours after feed intake, some farmers stop feeding birds in the morning to avoid late afternoon thermogenesis.

In such feeding patterns, birds are expected to balance out this lack of consumption early the next morning. However, it is often found

Fig. 1. Daily feeding pattern of broilers from 30-35 days of age (%).

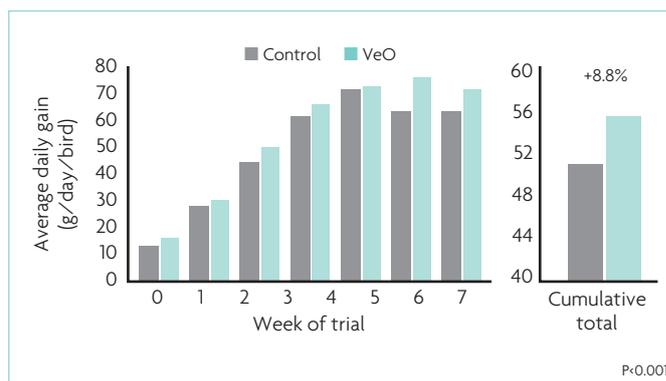
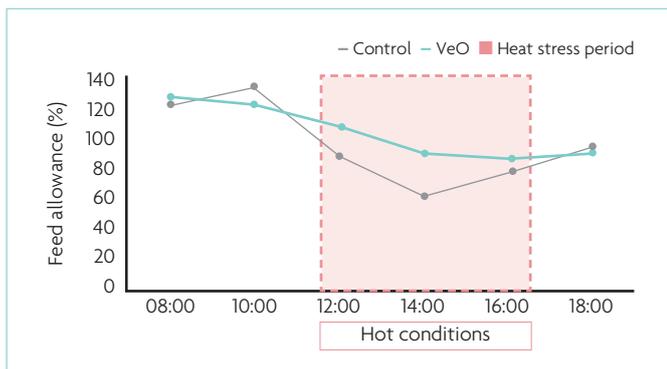


Fig. 2. Average daily weight gain (g/day/bird).

that total feed consumption decreases, as well as growth rate.

In an experimental farm in the Philippines (Trial A: 34-36°C, RH >80%), 20,000 laying hens were divided into two groups (five replicate groups of 2,000 broilers), under hot conditions that were particularly intense between 12.00 and 16.00 hours (Fig. 1).

VeO broilers exhibited a higher feed intake in this heat-stress situation. VeO reduced the feed conversion ratio under these hot conditions (-4%).

This could be explained by a higher water intake during the hot period.

● Growth rate

As time is money, chickens with a fast growth rate are a key

economical factor for broiler production.

● In four commercial farms in Mexico (Trial B, animals from the VeO group exhibited a higher daily weight gain from week one to week seven of the trials (Fig. 2).

● VeO broilers had a significantly ($p < 0.001$) higher (+8.8%) cumulated daily weight gain than the control group (55.4g/day/bird vs. 50.9g/day/bird).

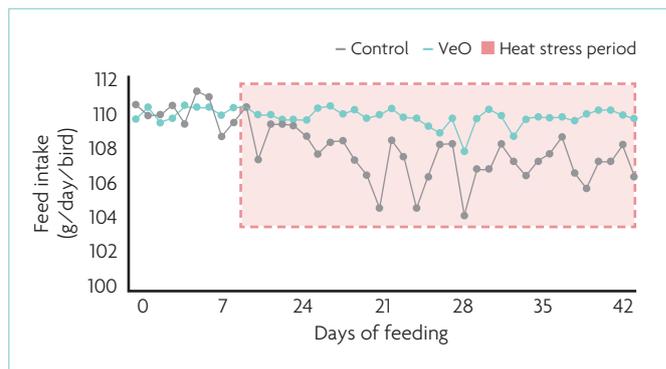
Results observed with VeO and layers

● Feeding behaviour modulation

Under heat stress, birds try to reduce thermogenesis by reducing their feed intake (as feed digestion

Continued on page 63

Fig. 3. Feed intake of laying hens from 30-35 weeks of age (g/bird/day).



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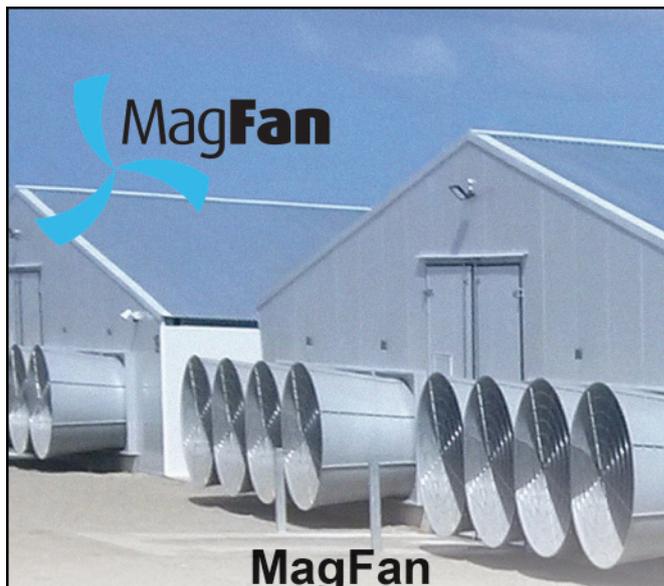
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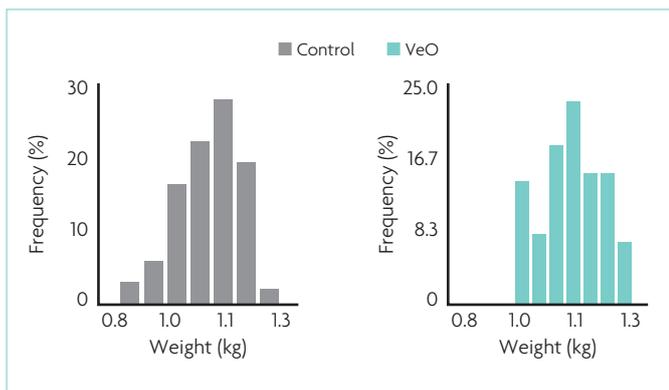


Fig. 4. Live weight at week 15.

Continued from page 61 induces body thermogenesis) in order to adapt to high temperatures. In doing so, they also reduce production performances.

In an experimental farm in the Philippines (Trial C: 33-35°C, RH >80%), 20,000 laying hens were divided into two groups (four replicate groups of 2,500 laying hens).

- In the control group, heat stress reduced feed intake (110g/birds./day to less than 105g/bird/day) based on peak temperatures (Fig. 3).
- VeO regulated feed intake, mitigating both variations and decreases in consumption. Birds adapted to the high temperature more easily, without a decrease in feed intake and production.

● Homogeneity

Animals react to their environment in various ways depending on their genetic make-up and their perception of environmental parameters.

This leads to differences in maturity between birds that can have an effect on economic performance.

For example, all pullets are usually fed based on the most immature pullet's nutritional needs, which leads to a higher feed investment than the real feed requirements of

the group. This explains why the homogeneity parameter is economically as important as average performance.

In a Mexican experimental farm (Trial D), 1,080 pullets were grown for up to 17 weeks.

They were all fed with the same diet except for the VeO supplemented group (250g on top/TM).

- At the end of the growth period (Fig. 4), both groups of pullets had the same average live weight. However, the VeO group produced larger pullets compared to the control group.

Heterogeneity was significantly reduced ($p < 0.02$).

- This resulted in a quicker and higher laying rate in the VeO group because the pullets were more mature and homogenous.
- The feed conversion ratio was also significantly ($p < 0.005$) lower in the VeO group (-7.9%) compared to the control group (4.27 v.s. 4.6 respectively).

Conclusion

VeO is a stress neuro-modulation solution.

- VeO counteracts the negative effects of stress. It aims to increase the animal's level of awareness, improving its flexibility when facing

environmental challenges and thus allowing it to adapt behaviour for better performance.

- Due to its mode of action (Fig. 5) which induces various biological chain reactions, VeO can have positive results on one or several parameters, depending on the challenges involved and the breeding conditions.

- Phodé does not consider an animal as an association of systems or physiological units but rather as a unique entity integrated in its environment, forming a totally balanced system.

The Phodé solution changes an animal's environmental perception through sensory stimulation.

The animal's level of awareness increases, its perception of stressors is mitigated and its efforts to adapt to variations decrease. ■

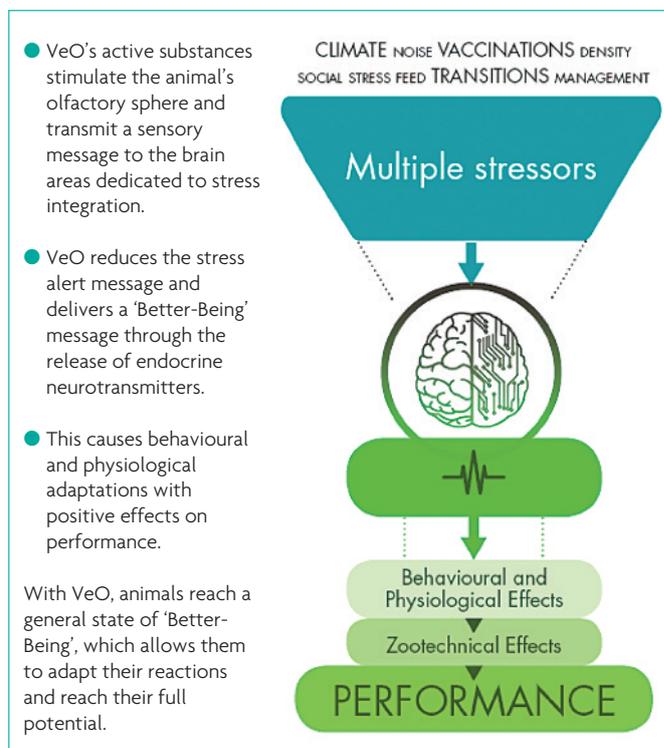
Take home message:

VeO modulates stress perception, thus increasing broilers' awareness of their environment, enabling them to better adapt to variations in production conditions

- **Broilers:** VeO modulates feed and water intake, improves heat tolerance and productivity parameters.

- **Laying hens:** VeO regulates layers' feed consumption, which improves group homogeneity leading to an earlier peak in egg production. This earlier peak of laying rate improves the feed conversion ratio.

Fig. 5. VeO mode of action.



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Assess crop fill

Assessment of crop fill at key times after placement is a useful means of determining appetite development and checking that all chicks have found feed and water.

If adequate crop fill is not achieved, appetite development will be depressed, early growth rate will be compromised, feed conversion ratio (FCR), average daily gain and skeletal development will be below the desired levels and flock uniformity and processing performance will be affected.

It is also useful for monitoring of brooding procedures.

Procedure

Crop fill should be monitored during the first 48 hours, but the first 24 hours are the most critical. An initial check two hours after placement will indicate if chicks have found feed and water. Subsequent checks at 8, 12, 24, and 48 hours after arrival on farm are required to assess appetite development.

Step 1: Using the catching frame, collect 30-40 chicks in total; approximately 10 chicks at a time from 3-4 different places in the house (or surround where spot brooding is used).

Step 2: Handling each chick with care, gently feel the crop of each chick in the pen using your thumb and forefinger (see photograph top right).

Step 3: Record the content of the crop of each chick using the following categories:

- Full, soft, and rounded – chicks have found feed and water.
- Full but hard with original feed texture felt – chicks have feed but little/no water.
- Crop empty – chicks have not found feed or water.

Step 4: Calculate the percentage (%) of chicks in each category by dividing the number of chicks recorded in each category by the total number of chicks assessed and multiplying by 100.

Step 5: Compare your results with the target crop fill assessment guidelines.

Example of crop fill recording sheet:

| Hours after placement | 8 |
|--|------------------|
| Category | Number of chicks |
| Full, soft and rounded | 30 |
| Full but hard with original feed texture | 3 |
| Empty | 2 |
| Total recorded | 35 |



Example calculation:

$$\text{Chicks in category 1} = 30 \text{ divided by } 35 \times 100 = 86\% \text{ measured at eight hours after placement.}$$

Target crop fill assessment guidelines.

| Time of crop fill check after placement | Target crop fill (% of chicks with full crops) |
|---|--|
| 2 hours | 75 |
| 8 hours | >80 |
| 12 hours | >85 |
| 24 hours | >95 |
| 48 hours | 100 |

Interpreting results:

Crop fill on or above target guidelines

No action required

Crop fill 5% below target guidelines (75% or lower at eight hours after placement)

Action required:
Further investigation of brooding practices required

Areas to consider:

Environment

- Ensure that houses are pre-heated prior to chick arrival.
- Ensure chick comfort is optimum by monitoring and adjusting if needed:
 - Air temperature at chick height
 - Litter temperature
 - Relative humidity
- Ensure light intensity is at the optimum level in the brooding area.
- Ensure ventilation rates are correct for young chicks.

Feed and water

- Ensure chicks have unrestricted access to feed and water.
- Ensure that at least 80% of the floor area is covered in paper with feed on.
- Replenish feed on paper in small amounts given frequently.
- Ensure supplementary (mini) drinkers are used.

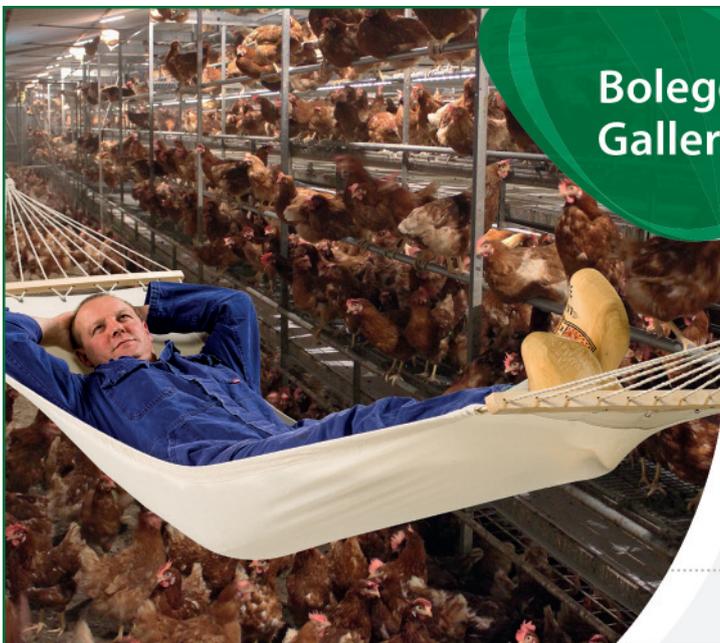
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Vaccination – management and environmental conditions

The protection produced by a vaccine under laboratory conditions in SPF chickens controls all the variables and gives the best immune response. In the field, vaccinal response will be suboptimal unless all the variables that have an impact on immunity production are managed and effectively removed.

Management of environmental variables must address the following:

- Failure to vaccinate sufficient number of birds to achieve flock immunity
- Administering less than the recommended dose to the birds
- Use of low cost, poor quality vaccines, for example with inadequate antigen content
- Incorrect storage and transportation of vaccine
- Immunosuppression, whether from concurrent diseases, such as Gumboro disease or chicken anaemia, or from specific substances, such as aflatoxins

Thus, good biosecurity, education, diagnostics, surveillance and elimination of infected poultry are essential.

Remember, vaccines are not perfect and they are only one part of an effective avian influenza control programme.

| | | |
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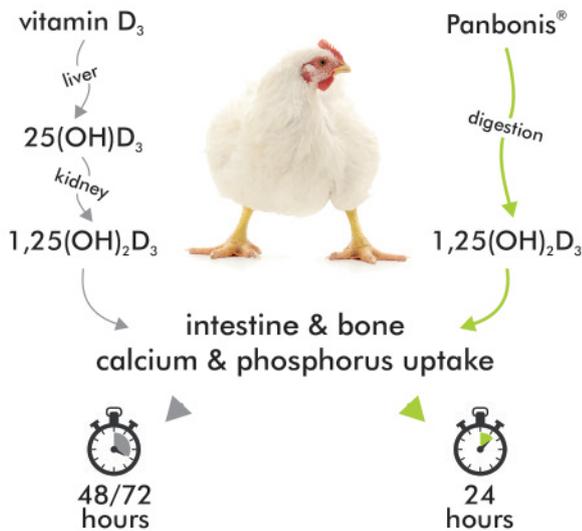


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In ovo feeding of broiler chicks

This Chinese study (*Liv. Sci.* 206 59-64) investigated the effects of in ovo feeding of creatine pyruvate on growth performance, muscle growth and meat quality in broilers.

Some 960 hatching eggs were placed into one of three groups – non-injected control, 0.6ml sterile saline and 0.6ml sterile saline + creatine pyruvate – and the eggs were treated on day 17.5 of incubation.

No differences were seen in hatchability between the three groups but the hatching weight, body weight gain and feed intake were greater in the creatine group.

On the farm, the creatine treated broilers had greater total and relative weights, myofibre diameters and cross sectional area of pectoral muscle on days 21 and 42. However, differences were seen in creatine and phosphocreatine levels of pectoral muscles at days 21 and 42 as well as in meat quality between the groups. In conclusion, it was found that in ovo feeding with creatine pyruvate improved hatching weight, growth performance and pectoral muscle (breast meat) weight of broilers but it did not affect breast meat quality.

Influence of dietary citrus peel oils

This Turkish study (*Atatürk. Üniv. Vet. Bilimleri Dergisi* 12 157-166) was undertaken to assess the effect of different levels of citrus peel oils (orange, lemon and bergamot) on meat fatty acid composition and shelf-life in broilers.

It was found that 2ml per kg of lemon peel oil and 3mg per kg of orange peel oil added to the feed significantly increased eicosapentaenoic acid and docosahexaenoic acid levels in leg and breast meat respectively. It was concluded that orange peel oil at the 3ml level influenced fatty acid composition and TBARS of the meat.

Substituting maize with date waste

In Algeria date waste accounts for about 25% (200,000 tonnes) of date palm production so its use in animal feed is worthy of consideration.

In this Algerian study (*Liv. Res. for Rural Devel.* 29 article 196) the effect of maize substitution (0, 10, 20, 30 and 40%) with date waste was

evaluated. The results showed significant reductions in final live weight, mean daily gain and feed intake at the 30 and 40% levels and the consumption index significantly increased.

Meat yield was not affected, whereas body fat increased with substitution rate. Finally, it was shown that 10 or 20% substitution did not adversely affect growth performance, as was the case with 30% or more substitution.

Effect of dietary β -mannanase in old layers in hot conditions

This Korean study (*Asian-Aust. J. of An. Scis.* 30 145-1455) investigated the effect of dietary β -mannanase on productive performance, egg quality and utilisation of dietary energy and other nutrients in aged layers (84 week old Hy-Line Brown) raised under hot climatic conditions (29.2°C). Two diets were designed with high energy (2,800 kcal per kg) and low energy (2,700 kcal per kg). Two additional diets were

formulated containing 0.04 and 0.08% β -mannanase to the low energy diets. It was found that the addition of β -mannanase to the low energy diets increased the energy values for diets fed to aged hens. However, this increase had little positive impact on laying performance and egg quality. These results indicated that β -mannanase does not mitigate heat stress of laying hens raised under hot climatic conditions.

Benefit of *Syzygium cumini* leaves

This Brazilian work (*Anais da Acad. Brasil. Cienc.* 89 2479-2484) showed that the inclusion of *Syzygium cumini* (Java plum) leaves in the diet of laying hens improves the pigmentation and lipid stability of yolk.

Dietary zinc for broilers

This Jordanian study (*Braz. J. of Poultr. Sci.* 19 519-526) used 400 as-hatched commercial Ross 308 chicks to evaluate the effects of two dietary levels of zinc sources on the performance, carcass traits and blood parameters of the birds.

The two treatments were 80mg per kg inorganic zinc (ZnO) or 80mg ZnO + 42mg of an organic Zn-amino acid complex making 122mg of combined inorganic and organic zinc.

The results did not find any significant effect of either of the evaluated zinc sources on broiler performance. Mortality was significantly less in the birds receiving the higher level of zinc.

Carcass yields were not affected, but breast meat quality was juicier as was demonstrated by a higher shear force. Higher concentrations of zinc, phosphorus and total protein were seen in the birds receiving the higher level of zinc. Birds fed the higher level of zinc as a mix of inorganic and organic zinc produced overall better results.



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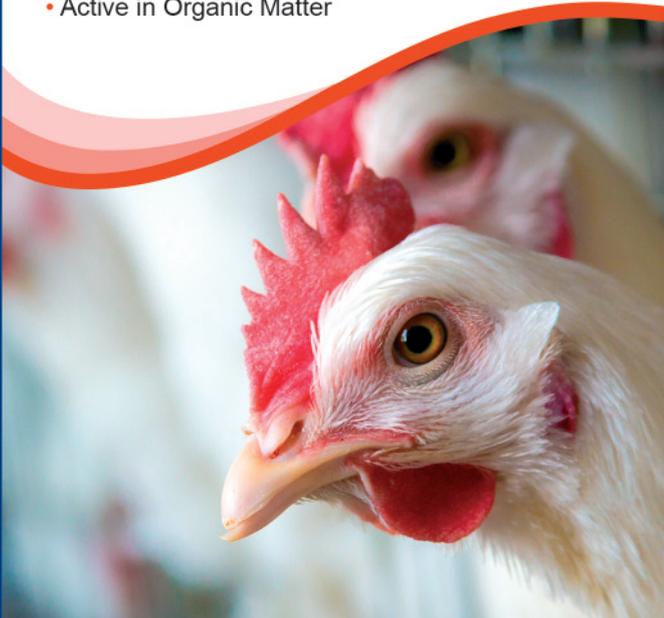


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Swedish egg production

This paper (Svensk Vet. 69 11-18) focuses on egg production in Sweden following the change to alternative housing with special reference to biosecurity and control programmes. The health and welfare status of Swedish laying hens are perceived favourably internationally and, despite high stocking densities in non-caged flocks (7-9 hens per m²), increasing flock size, longer production periods and limited vaccine use, the number of disease outbreaks are relatively few. This is the result of extensive preventive work, including on farm biosecurity routines and control programmes coordinated by government or industry. The Swedish Egg Association Animal Welfare Programme was developed to monitor flock health and welfare in the transition period between systems and it later became a requirement for those producers wanting to stock at nine birds per m² in aviary systems.

The control programme's check list includes 25 control points that cover farm design and condition, biosecurity, house environment and bird condition. In 2017, 94% of commercial layers and 80% of pullets were in the programme. In addition to mandatory salmonella testing, a voluntary salmonella control programme was started in 1995. It focuses on on-farm biosecurity and the prevention of salmonella spread between houses and farms. There is an annual veterinary inspection. By early 2017 96% of all pullets and 94% of all laying hen were in this programme.

Since 2009, there has also been a voluntary salmonella control programme for laying hens with access to the outdoors. There is a helminth control programme to limit the spread of worms, especially *Ascaridia galli* between houses and farms. This programme also has a faecal sampling of pullets prior to transfer to the laying farm and at 35-40 weeks of age. By March 2017, 83% of both pullets and layers were affiliated to the helminth programme.

Eggshell characteristics

This Czech study (Czech J. of An. Sci. 63 11-16) was undertaken to compare the eggshell characteristics and cuticle deposition of three breeds (45-56 week old Lohmann Brown, Hy-Line Silver Brown and ISA Brown layers) kept in two different housing systems with enriched cages (100 hens, 750cm² per hen and 10 hens per cage) and littered pens (100 hens, 9 hens per m² and 10 hens per pen).

No significant breed or housing interactions for eggshell quality parameters and cuticle deposition were found, although genotype had a significant effect on eggshell thickness, with ISA Browns having the thickest eggshell. Eggshell percentage was significantly affected by housing type and breed. Breed also had a significant effect on cuticle deposition which was significantly higher in Lohmann Brown eggs.

Although breed had a significant effect on eggshell quality and cuticle deposition the same could not be said for housing effect, which was significantly less important.

Garlic and immunity

This Ethiopian work (Biotech. in An. Husb. 33 333-348) showed that mixing layer diets with 1-3% garlic powder could be used to improve some blood and immunoglobulin levels, which consequently might improve blood circulation and immunity.

Study of aggressive behaviour in chickens

At present little is known about the underlying genetics of aggressive behaviour in chickens. In this work (Sci. Repts. 6 30981) Chinese scientists studied the genetic mechanism associated with aggressive behaviour.

The results showed that 33 SNPs were associated with aggressive behaviour traits. In particular, rs312463697 on chromosome 4 was

significantly associated with aggression. Sortilin related VPS10 domain containing receptor 2 (SORCS2) gene also plays an important role.

American statistics

This life cycle assessment looked at the driving force(s) behind the changes in environmental performance of poultry meat production so that an effective sustainability strategy can be implemented (Agric. Syst. 157 107-117).

The life cycle assessment involved material and energy flows associated with crop production and live poultry operations, commencing with day olds at grandparent level and ending with live market weight broilers.

The results indicated that improvement in background systems and bird performance were the primary drivers behind a reduction in environmental impacts and reduced resources requirement when 2010 was compared to 1965.

Climate change, acidification and eutrophication associated with poultry production decreased by 32, 29 and 25% per 1,000kg poultry meat respectively over the 45 years.

Furthermore, resource related impacts for fossil fuels, water depletion and agricultural land occupation decreased by 39, 58 and 72% per 1,000kg poultry meat produced.

DDGS for broilers

The objective of this Brazilian study (Rev. Ciênc. Agron. 48 548-557) was to evaluate the effect of distiller's dried grains with solubles (DDGS) on the performance and carcass yield when fed to broilers from 22 to 42 days of age.

It was found that adding DDGS to broiler feed at 5-20% resulted in a reduction in performance and carcass yield in male and female broilers as well as increasing the deposition of abdominal fat in the females.



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Influence of additional probiotics

The digestive tract's highly complex microbiota generally consists of beneficial bacteria and, on occasions, pathogenic bacteria. To reduce the number of pathogenic bacteria the composition of the microbiota can be modified by the use of feed additives such as probiotics.

This Romanian trial (**Sci. Paps.: An. Sci. and Biotech. 50 34-40**) was undertaken to assess the impact of an additional level of probiotics on the intestinal microbiota of the broiler chicken.

Probiotics administration (*Lactobacillus paracasei* JR, *Lactobacillus rhamnosus* 15b, *Lactobacillus lactis* y and *Lactobacillus lactis* FO) were made in different combinations between hatching and 42 days and in the last week of growth.

In addition, two of the groups also received L-threonine and DL-methionine.

At the end of the trial, caecal contents were taken and their bacterial DNA was extracted to determine the differences between the groups with and without probiotics. Samples were also taken at the outset to determine the dominant bacteria. It was found that the use of probiotics caused changes in the composition of the intestinal microbiota.

Clostridium perfringens in poultry feeds

This Indian study (**An. Nut. 3 309-312**) looked into the occurrence of *Clostridium perfringens* and their antibiograms in poultry feed ingredients in 298 feed samples.

A total of 101 *Clostridium* isolates were obtained at an overall positivity rate of 33.39%. The highest levels were found in meat and fish derived ingredients. In general, these isolates had

high levels of sensitivity to commonly used antibiotics.

Effects of oregano

This Polish Study (**Med. Wet. 73 781-785**) looked at the effects of feeding dried oregano from different places around the world (Egypt, Turkey and Poland). Production results, the bird's

selected organs, digestive tract pH and morphometric characteristics were then assessed.

The bodyweight of broilers at 41/42 days did not differ significantly between the groups. The Egyptian oregano significantly lowered stomach pH, whereas the Turkish oregano increased caecal pH.

Compared to the control, birds fed Turkish or Egyptian oregano had significantly shorter ileum and large intestines. Addition of 2% oregano to the feed had no impact on body weight.

Pre-transportation supplementation of broilers

In this Australian trial (**Liv. Sci. 205 16-23**) broilers were exposed to high cyclical summer temperatures (28-29°C for nine hours and 22-24°C for 14 hours) or a lower winter temperature (14-18°C).

The test groups were supplemented with electrolytes and betaine. In the summer half of the trial electrolytes supplementation affected some meat quality parameters, but not others. However, in birds from the winter half of the trial, supplementation produced meat quality improvements, but the value of these commercially could not be assessed.

Clearly, it must be **something** in the water



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Effect of humic substances on broilers

This Slovakian research (*Sci. Paps.: An. Sci. and Biotech. 50 100-104*) was undertaken to assess the effects of humic substances (garlic, wormwood and walnut) on growth and mortality in broilers.

Total mortality was better in the walnut group, whereas the wormwood group had better weights at 42 days.

Alternatives to AGPs

This American review (*An. Health Res. Revs. 18 26-45*) describes the potential for various alternatives for antibiotic growth promoters (AGPs) to help poultry perform to their genetic potential under commercial conditions. The alternatives described include probiotics, prebiotics, synbiotics, organic acids, enzymes, phytochemicals, antimicrobial peptides, hyperimmune egg antibodies, bacteriophages, clays and minerals. A brief description of the mechanism of action, efficacy and their advantages and disadvantages are given

Lead, cadmium and copper in table eggs

This Egyptian study (*J. of Adv. Vet. Res. 7 66-70*) looked at the levels of lead, cadmium and copper in fresh table eggs. Some 100 pooled samples of five eggs (50 purchased from the farm gate and 50 from a variety of retail outlets) were tested.

Copper and lead were found in almost all the samples, whereas cadmium was found in 12% and 32% of the farm and retail eggs respectively. Over 90% of eggs had lead levels above the MPL, whereas all eggs had cadmium and copper levels below their respective MPLs.

Disease awareness in Nigeria

This study (*Nig. Vet. J. 37 230-235*) was carried out to determine the awareness of disease and management practices by poultry farmers in one locality and was based on 94 completed questionnaires. The findings are summarised in the table below.

| | % |
|---|-------|
| Keep layers | 50.00 |
| Same source of birds | 36.17 |
| Partial vaccination of birds | 62.77 |
| Intensive system of management | 82.98 |
| Commercial feed given | 86.17 |
| Birds fed twice daily | 54.26 |
| Conversant with Newcastle disease | 25.53 |
| Aware of chronic respiratory disease | 3.19 |
| Aware of ectoparasitism | 3.19 |
| Feed seen as a management constraint | 62.76 |
| Disease seen as a management constraint | 24.47 |

Toxoplasma gondii in poultry meat in eastern China

This Chinese study (*Inf. Genetics and Evol. 55 172-174*) took place between August 2015 and September 2016.

In total, 414 meat samples were collected (257 chicken, 115 duck and 42 geese).

These samples were then tested for the presence of *Toxoplasma gondii* and the positives were genotyped at 10 nuclear loci (SAG1,

alternative SAG2, 5' and 3'-SAG2, SAG3, L358, BTUB, c22-8, GRA-6, c29-2 and PK1) and an apicoplast locus (Apico) by multi-locus PCR-RFLP technology.

Of the 44 samples, 7.37% were *T. gondii* positive (chicken 8.17%, duck 7.83% and geese 4.76%).

Only one genotype (ToxoDB#9) was identified. This was the first report of ToxoDB#9 genotype in China in all animal species, including man.



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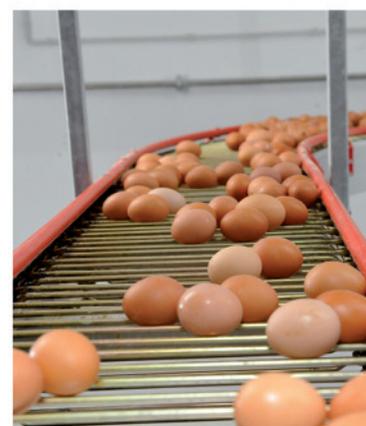
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Advanced dosing portfolio

 Perstorp now offers a new solution where a broad range of organic acid based additives can be combined with highly accurate dosing equipment.

This unique combination, called Perstorp Perfect Mixx, can help to:

- Optimise pellet quality.
- Maintain the quality and safety of the feed.
- Improve gut health and animal performance and results on the farm in general.

"One of the most interesting elements of the Perfect Mixx solution is the Cibodoz. This dosing equipment can be used with different organic acid based additives, enabling feed quality and animal performance," Marc Kinjet, Perstorp's Director Preservation, told International Poultry Production.

"This unique machine enables more precise dosage of organic acids, simultaneous dosing of water and acids, dosing of more than one additive and precise mechanical calibration. The Cibodoz is a robust

machine that is easy to use, clean and maintain."

All liquid organic acid based additives can be dosed with the Cibodoz, however Perstorp recommends solutions using esterified organic acids for optimal results. Esterified organic acids have many benefits, not the least of which is its surface tension reducing properties which promote a perfect homogenous spread across the feed for optimal reliability.

"ProSid Pellet Pro for example is a solution that uses the properties of esterified organic acids to their full advantage," added Marc.

"You dose it alongside water to standardise the water content of your feed pellets.

"This makes sure that this optimal moisture balance does not result in an increased chance of mould formation. The result of combining ProSid Pellet Pro with the Cibodoz dosing equipment is a balanced moisture content and increased feed quality."

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Nutritional seminar held in Asia



Huvepharma recently hosted its 2nd Nutritional Seminar Asia dedicated to gut health management and nutrition of high performing animals. The seminar, held in Bali, Indonesia, gathered more than 150 participants from countries across Asia Pacific, Turkey and South Africa.

Over the two days international guest speakers shared their latest research, covering topics from fibre degradation to gut health management.

Dr Peter van Horne (Wageningen University) guided the audience through latest trends and developments in the poultry meat and eggs markets, Dr Margie Lee (Georgia University) gave an energising lecture on chicken microbiome, Dr Nuvee Prapasarakul (Chulalongkorn University) showcased tools for enteric diseases prevention, Dr Peter Ferket (North Carolina State University) brought insights on the use of phytase with alternative raw materials and superdosing and Dr Budi Tangendjaja (IRIAP) discussed the nutritional challenges in the era of the AGP ban.

The Huvepharma Global Product Management team contributed with lectures on managing gut health with probiotics, by Veerle Hautekiet, and enzyme solutions for modern animal production, by Natalia Soares.

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Scientific know-how and expertise

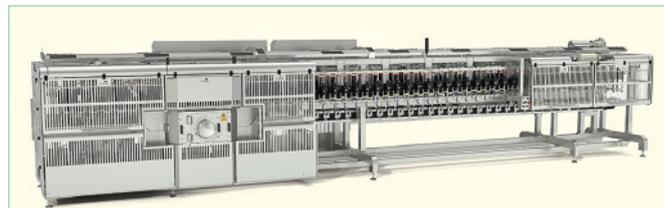


Herbonis AG, a pioneer in developing natural products to support vitamin D functions, has acquired its long time worldwide distributor Robert Aebi Feed Additive Technologies Sarl (FAT).

Herbonis wants to advance the market presence of its unique natural, plant-based Panbonis, which contains the metabolic active form of vitamin D.

This investment combines FAT's great expertise in applied nutrition and global presence with Herbonis' extensive scientific knowledge regarding the influence of vitamin D metabolism on animal welfare and performance.

The acquisition allows both companies to expand their



Foodmate BV has developed the Ultimate Whole Leg Deboning System, capable of processing up to 6,000 legs per hour. With its patented X-ray measuring system, the Ultimate can handle different size legs without any changes to the machine. The X-ray system accurately measures the position of the kneecap and the length of the drum and the thigh bone. This information is relayed to the automatic adjusting system to ensure a precise cut along the kneecap. Legs are input into the machine with or without the skin and the finished product is output with the whole leg meat deboned and the knee cap still attached at the knee joint. By processing the legs this way, there is less trimming after the leg runs through the machine; thus reducing labour. The Ultimate can be set up for left, right or left and right leg processing. It makes a precut on the tendons which helps prevent pinbones in the meat.

foodmate.nl

scientific and market capabilities to meet customers' needs around the world and pursue the joint mission of growing sales.

herbonis.com

Creating a win-win situation



Waterschoot HQ-Line bvba produce and supply dosing pumps, drinking systems and installation materials for the poultry sector. In the last 10 years they have specialised in 'water knowledge' and this, in combination with practical experience, has led to a total range of water treatment systems.

Following requests from a number of their international customers, the company have developed, in close cooperation with an animal nutritional partner company, a number of new products. These include a natural water soluble product for clostridium treatment in poultry, red mite treatment in water

and feed, emulsifiers, and HQ-GB (gut balance) – a natural product that combines acidification and antibacterial activity with balancing of the gut.

The company's HQ-Easymix range of products include dosing pumps, an in-house developed control system and water purification and water treatment systems.

In addition, they have powder dosing systems such as the HQ-Flexdoser – a micro dosator to use on a dry feed installation or flex augers. They also offer more than 20 years' experience to advise customers in choosing the right installation for their situation.

The Waterschoot HQ-Line delivers user friendly installations that offer specific solutions for specific situations.

hq-line.be

Information and trade exchange



Thai Feed Mill Association (TFMA) and Korea Feed Ingredients Association (KFIA) recently signed a memorandum of understanding (MoU) in Bangkok, Thailand during Victam Asia. The MoU is about trade and information exchange of feed and feed ingredients between Thailand and South Korea. This is a big step in the feed ingredients sector to start a new trade gateway and open new opportunities to link the two countries.

vnuexhibitions.com



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internationalnews

Combat intestinal parasites

Following a positive opinion from the Committee for Medicinal Products for Veterinary Use (CVMP), the European Commission has granted MSD Animal Health an expanded indication of a marketing authorisation for the veterinary medicinal product PANACUR AquaSol (fenbendazole 200mg/mL) for use in chickens. The addition of a new therapeutic indication to the product's label in the European Union will combat the intestinal parasite, *Capillaria* spp. (L5 and adult stages). PANACUR AquaSol is a highly stable, farm-friendly, water-administered, oral suspension

product produced with an innovative wet-milling technology. It is currently available in a number of countries around the world.

"The product has a long history of proven results as a leading dewormer and we are excited to bring this additional indication to chicken farmers throughout the European Union," Taylor Barbosa of MSD Animal Health, told International Poultry Production.

"Managing intestinal health results in better, overall performance for layers, breeders and broilers. If not managed with proper parasite control, farmers could experience an economic impact when there is a drop in production or a loss due to worm infestation."

The MSD Animal Health commitment extends to key products in their global poultry portfolio. These include INNOVAX-ND-IBD, the first-ever, live vaccine made with biotechnology, which protects against three highly infectious diseases in poultry – Newcastle disease, infectious bursal disease, and Marek's disease – and EXZOLT, a breakthrough prescription product for the treatment of Poultry Red Mite infestations.

msd-animal-health.com

2019 Latin American Poultry Summit

The International Poultry Expo (IPE), part of the International Production and Processing Expo (IPPE), has announced the dates for the new 2019 Latin American Poultry Summit, to be held 11-12th February 2019.

Set to debut at the 2019 IPPE in Atlanta, Georgia, USA, the summit will exclusively feature leading industry experts who will address technical topics covering live production and processing issues of greatest priority to Latin American poultry and egg professionals.

The sessions will cover broilers and layers, addressing topics such as welfare in poultry production, data management in a poultry farm, advancements in vaccination and health, biosecurity, gut health/microbiome, robotics in poultry production, new technology in feed manufacturing and storage, water as a nutrient source, and more.

ippexpo.org



Huvepharma recently hosted a gut health workshop in Ghent, Belgium for poultry veterinarians, nutritionists and poultry producers from 15 European countries. It focused on the consequences of coccidiosis, diagnosis and monitoring of the disease, and applying the appropriate coccidiosis control programme, using anticoccidial products and vaccines (HuveGuard range). The theory was followed by a practical session, which took place at the Faculty of Veterinary Science at the University of Ghent. Participants were trained to evaluate coccidiosis and dysbacteriosis lesions in broilers and turkeys, as well as to score foot pad lesions in broilers. Training was also offered on coccidiosis diagnostics by microscopic examination of faecal samples (oocyst counts).
huvepharma.com

De Heus acquisition in Slovakia



De Heus recently acquired a grain silo and compound feed factory in Kendice in Slovakia in order to provide its customers with an optimal service. De Heus is keen to base its production locations as close as possible to its livestock farmers and with this acquisition are now in an even better position to respond to the need for high quality animal feed of its growing number of customers in Central and Eastern Slovakia and Northeast Hungary. To fulfil the high quality standard set

by De Heus, the production process in the acquired factory will be totally rebuilt and provided with the most advanced and modern production techniques. These investments are expected to be completed in mid-2019. From that moment on, the factory will start production. In anticipation of this, the existing grain silos will be used to store grain harvested from July 2018 onwards. This grain will then be used as an ingredient for the animal feed produced at existing locations in the Czech Republic.

deheus.com

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At the recent UK Pig & Poultry Fair Joe O'Gorman of Whitaker Poultry, Cork, Ireland, signed a contract to purchase a day-old chick vehicle from Gerrit Polman of Czech company Veit Electronics.

veit.cz

Poultry farm monitoring



Wisium, Neovia's international premix brand, has signed a partnership agreement with Aniprev for the marketing of its mobile application, which combines all the relevant functions for remote poultry farm management, and also enables simultaneous sharing of production data with all industry stakeholders, including specific features for each of them.

For the farmer, Aniprev is a connected farming logbook which centralises and saves all farming documents and records in one secure space.

Very simple to use, it provides peace of mind to the farmer who, with a click of their smartphone or computer can, among other things, compare their results with previous

batches, with the standard for the strain, or with national averages, analyse their data (feed/gain ratio, animal weights, production rates, etc), receive deviation alerts, share their calendar with their partners for event organisation (sampling, animal departure, etc) or schedule animal procedures.

For the technician, Aniprev provides a tool for communicating with producers, whether to view performance, make notes, compare different batches, add events to the calendar, or transmit documents (prescriptions, feed deliveries).

Developed in 2016 by Pierre Lanckriet, Aniprev is a decision-support tool designed and developed by a farmer for farmers and is now used by many operators. wisium.com

APPOINTMENTS

PRINCESS CORTEZ

Hy-Line International
Technical Service Specialist
www.hyline.com

DEBBIE FISHER

Aviagen
Technical Service Manager, ANZ
www.aviagen.com

ALAN THOMSON

Aviagen UK Ltd
General Manager
www.aviagen.com

ERIK LEOW

Cobb-Vantress Inc
Planning director for the Asia-Pacific region
www.cobb-vantress.com

JOHN MCGRELLIS

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www.aviagen.com

ALFRED BLANCH

Hamlet Protein
Global Poultry Segment Manager
www.hamletprotein.com

ERIK HELMINK

Hotraco Group
Director of Hotraco Agri Division
www.hotraco-agri.com

MARCELO SILVA

Aviagen
Head of Global Nutrition Services
www.aviagen.com

Innovating for success



During VIV Europe Ceva will host a symposium: 'Innovating for your success starts in the hatchery', which will be held on the afternoon of 21st June 2018 in Jaarbeurs Event Center, Media Plaza.

The agenda will include 'Ceva Innovation Areas', 'Zero farm vaccination: is it possible in broilers in Europe?', '10 years of hatchery vaccination services in Europe' and 'Innovative hatchery technologies, Field data as proof of improved performance'.

databadge.net

500 eggs in 100 weeks achieved



A flock of 40,000 Dekalb White layers have become the first commercial layers in Germany to achieve the 500 eggs in 100 weeks milestone.

The Bütter family farm is located in Vrees, Germany and a ceremony was organised to recognise their achievement, along with the contributions of ab ovo, their pullet supplier, For Farmers as feed supplier, Windhaus & Hemne for veterinarian support, Hendrix Genetics as the breeding company and their employee, Yahya Alali.

The results of this Dekalb White commercial flock were exceptional.

The flock was 101.3 weeks of age, production per hen housed was 517.4 eggs and feed intake was 118g. Mortality was 8%, of which 2.5% was due to predators, including foxes and birds of prey in the freerange area. Average egg weight was 61.8g. The flock was producing above 97% for 36 weeks and above 90% for 58 weeks.

hendrix-genetics.com

Coccidiosis prevention tool



Coventry Chemicals have introduced OmniCox as an aid in the prevention and management of coccidiosis and cryptosporidium in poultry.

OmniCox has been independently tested by the University of Cambridge, Dept of Veterinary Clinical Medicine, and the University of Zaragoza, Department of Animal Pathology of the Faculty of Veterinary Medicine.

OmniCox is biodegradable and works in the presence of organic matter. It does not contain added phenols.

It should be applied at the recommended dilution rates to clean, dry surfaces following the thorough cleaning and disinfection of the building.

coventrychemicals.com



6th Mediterranean Poultry Summit

18-20th June
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www.wpsa.com

Broiler Health 2018

19th June
Utrecht, The Netherlands
www.positiveaction.co.uk

VIV Europe

20-22nd June
Utrecht, The Netherlands
www.viveurope.nl

WVPA Symposium: Big & smart data

21st June (at VIV Europe)
Utrecht, The Netherlands
www.wvpa.net

Dairy, Livestock & Poultry Expo

20-22nd June
Nairobi, Kenya
www.dlpexpo.com/africa

IndoLivestock

4-6th July
Jakarta, Indonesia
www.indolivestock.merebo.com

2nd International Conference

on Necrotic Enteritis
11-12th July
Denver, Colorado, USA
www.aap.info

SPACE

11-14th September
Rennes, France
www.space.fr

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

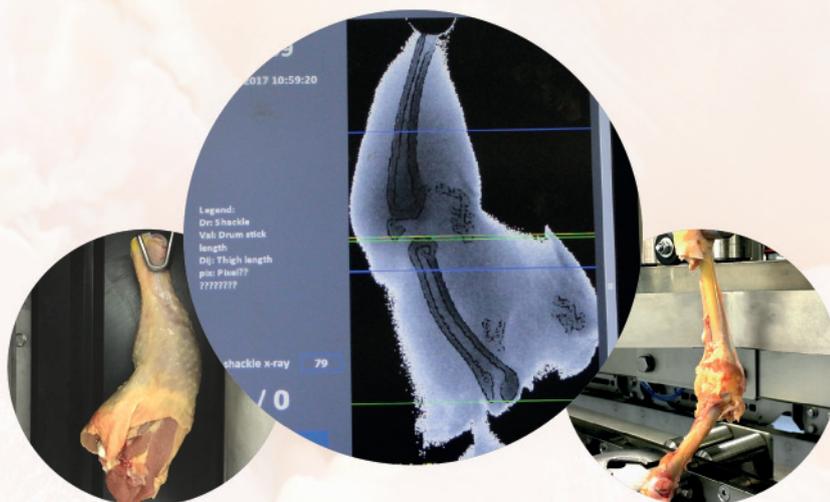
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www.wvpaasia2018.com

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