

# International Poultry Production

Volume 25 Number 8 (2017)

Practical information for progressive poultry professionals

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Minimising condemnations  
and protecting profits

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# STRESS MANAGEMENT IN POULTRY PRODUCTION

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STRESS PERCEPTION  
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# editor's perch

Are our industry's certification schemes fit for purpose? If they are, how did the Fipronil in eggs saga occur in the Netherlands/Belgium this summer and what about the relabelling of poultry meat at a UK processor that recently took place?

The former would not have arisen if only licensed products had been used in the treatment of the birds – as stated in most schemes.

Either farmers were using the product and knowingly failed to declare it or those in the inspectorate who checked the documentation had not done a thorough enough job.

The latter resulted in a major poultry meat processor losing several valuable days of processing time after they voluntarily closed their plant to retrain staff.

Just these two episodes give us adequate reason to highlight two very basic issues. One, the farmer needs to know what he has to do and to correctly record it. Two, those monitoring key parts of the scheme must be competent to do so and must have an effective way of initiating corrective action after detecting a non-compliance.

How can management and enforcing agents be satisfied that these are occurring?

Are these schemes failing us because they place too great an assumption on the honesty of staff and their employers?

Could this be overcome by schemes requiring some type of rotation of QA/QC; or internal or external spot audits so that if a misdemeanour is occurring it will be detected?

Where is the real reason for these problems arising? Does it lie in the fact that the schemes are too complex and staff/management do not have the time or resources to fulfil their obligations?

Are there too many schemes? Is there a lack of senior management support? Are the financial margins in our industry such that this motivates management to cut corners and not pay the attention or allocate the staff and resources needed to ensure continuous compliance to all of these schemes?

Do we have individual staff members working outside their capabilities? Or do we have some black sheep in our industry? ■

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Focusing on quality  
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# worldfocus

An executive summary of key international issues

## Trust

### Poultry's buzzword for 2018!

The definition of trust is a firm belief in the reliability, truth or ability of something or someone. In 2018, this is something that we must retain in relation to how the public sees our industry and the whole range of products we produce. Consumer trust in us took a lot of knocks in 2017 – with salmonella in Poland, avian influenza in many countries and the mislabelling of poultry meat in the UK. How do we keep the public's trust? First of all we must minimise negative events and, if they do occur, we must be seen to quickly respond to control the situation. One reason for this not working as well as it used to is that a growing number of the public perceive us more negatively than they once did!

## Negativity

### Don't let it become the noose around our necks!

Severe negativity can greatly damage your standing in the public eye and once a certain point has been reached it can be very difficult to stop the rot. We can counter this by removing the negative factors in any scenario and by boosting the positive attributes that are present. Alternatively, we can do everything possible to avoid getting into the problem in the first place. One thing that helps is to increase the positivity surrounding the company and its products as this will increase the time you have to effectively counter a problem if it arises. Positivity needs to come into our everyday culture and we must share it with the public and our customers!

## Transparency

### The magic cure for corporate negativity!

Human nature dictates that if we can not see something we think it might be hidden from us and, if this is the case, we wonder if something might be wrong. What is the answer to this conundrum? Surely, this must lie in transparency and letting everyone see what is really happening. Yes, we could take the public to see our birds but that would be a biosecurity risk. Why not use social media to show the world what you are doing? Examples could be video clips showing the latest arrival of day-olds on to the farm, all chicks being fed and watered, a routine veterinary inspection, the skills of your butchers and the fact that your test kitchen is always looking for new and exciting poultry based recipes!

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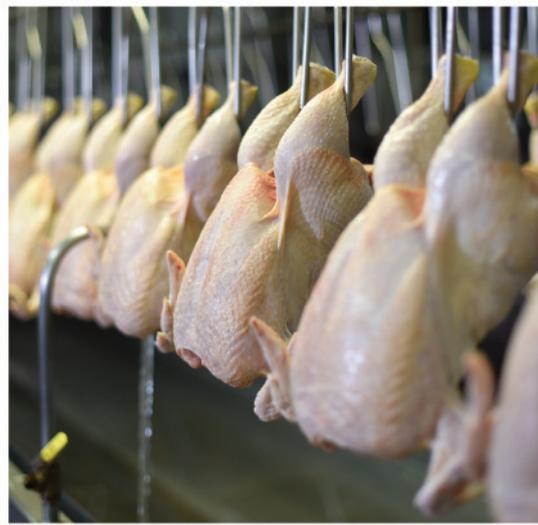
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# Minimise broiler condemnations and protect profits

Recent data has shown broilers supplemented with HMTBa (2-hydroxy 4-(methylthio) butanoic acid) as a methionine source exhibited fewer condemnations and higher livability consistently. Broiler producers know that to achieve their best profit margins, every aspect of the process from live production to processing must be optimised, but many producers find that even through careful management, condemnations cut their profits time after time.

by Frances Yan,  
Research Sr. Scientist, Poultry Nutrition,  
Novus International Inc.  
[www.novusint.com](http://www.novusint.com)



Producers and animal scientists have been seeking effective ways to combat condemned birds for decades, and HMTBa could support these reduction efforts.

HMTBa (sold as Alimet feed supplement) could be an economical option for many producers to maximise their production efficiency and profitability by minimising condemnations and helping to improve livability.

## Broiler condemnations

With narrow industry margins and a shift away from in-feed antibiotic use for growth promotion and disease prevention,

producers are investing in greater protection from condemned birds. Total or partial carcass condemnation can cause significant economic loss across the supply chain, limiting opportunities for business expansion and growth long term.

There are several general reasons for birds to be declared condemned at processing including disease, bruising, tumors, contamination and over-scalding. Among these, several are health related such as disease and tumors, and could be at least partially addressed by nutrition management.

In the US broiler industry for example, septicaemia/toxaemia is one of the most common causes of condemnation and occurs when bacteria enter the bloodstream causing systemic changes within the bird.

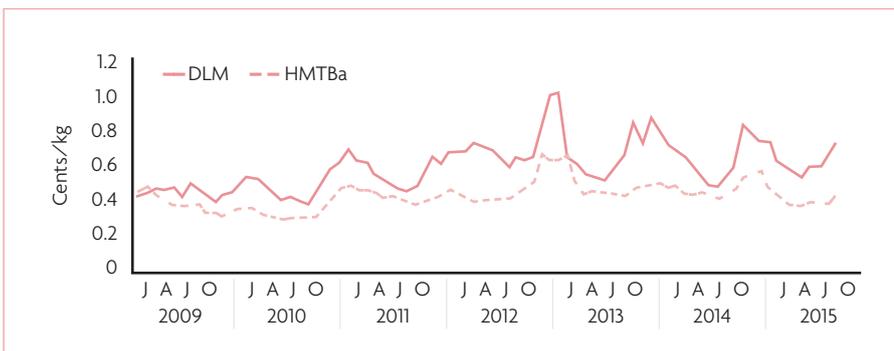
Airsacculitis is also a leading cause of condemnation that stems from environmental stressors like improper temperatures, water management, litter management or low air quality. This disease causes virus-like symptoms and respiratory distress.

Inflammatory process is another disease that can lead to condemnation. This refers to inflammation of connective tissue with severe inflammation of the dermal and subcutaneous layers of the skin due to bacterial infection.

As a naturally occurring methionine precursor, HMTBa is an organic acid, making it easy to be absorbed and available for use by the animal. Because HMTBa is an organic acid with a pH of less than 1, it can lower bacteria and mould load during feed storage and support better gut health in vivo.

This, in turn, helps lower the incidence of these infectious diseases, which can reduce costly condemnations.

**Fig. 1. Monthly condemnation costs of US broilers as affected by dietary methionine source.**

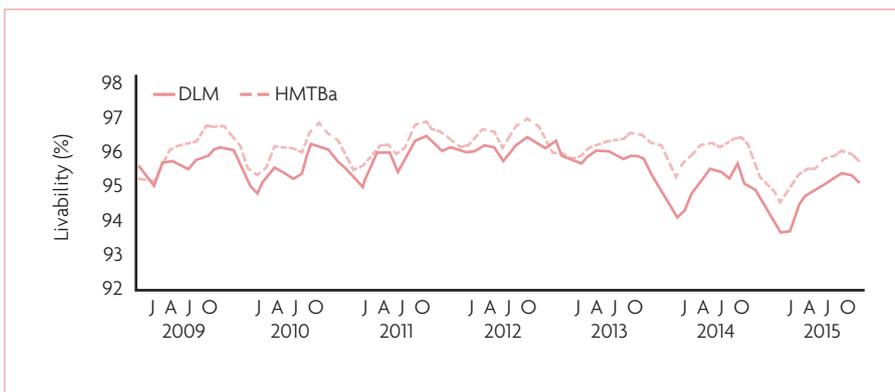


## Different acids, different results

Data from an independent industry benchmarking organisation was evaluated for differences between carcass performance and condemnations between birds fed two different methionine sources, DL-methionine and HMTBa.

All data available to the benchmarking organisation were included, which covered 50 billion broilers from 2009 to 2015,

*Continued on page 8*



**Fig. 2. Monthly livability of US broilers as affected by dietary methionine source.**

Continued from page 7

representing the majority of broilers raised in the United States during this period.

Among the 50 billion broilers raised, 38 billion were fed HMTBa supplemented diets and 12 billion were fed DL-methionine supplemented diets. While both provide methionine activity, each has a different chemical structure which affects the end result of supplementation in performance, including effects on condemnations and livability.

The data showed economic loss due to condemnation of approximately \$0.11 USD per kilogram lower for birds fed HMTBa when compared with DL-methionine

supplementation (Fig. 1). The economic value would be more than \$3,000 per one million birds with an average body weight of 2.77kg, as reported in the data.

The saving is greater in heavier birds, which have been the market trend in recent years.

For the 38 billion HMTBa-fed birds included in the data, this equals a saving of \$115.8 million in condemnation reduction.

Known as the standard measure for poultry that not only indicates what percent of the flock survives, but also serves as an indicator of profitability for the producer, livability is a key indicator of a supplement's effectiveness.

This data concluded that birds with HMTBa supplemented rations had consistently higher livability compared to those fed DL-methionine over the course of five years (Fig. 2).

The increased livability was worth approximately \$0.06 per kilogram or \$63.2 million for the 38 billion HMTBa supplemented birds, giving even greater peace of mind to the producer that his investments will reap returns.

As methionine is the first limiting amino acid in poultry, birds can not grow efficiently without adequate intake. Supplementation of synthetic DL-methionine or HMTBa has long been the most economical way to meet the bird's methionine requirement. But now, as diseases like septicaemia, airsacculitis and inflammatory process become more difficult and costly to eradicate, producers can also look to HMTBa, provided as Alimet, for insurance against condemnation losses.

With the fear of disease outbreak and widespread losses increasing in many parts of the world, utilising HMTBa to help more broilers to survive until processing on a regular basis is one aspect producers should not overlook. ■

References are available from the author on request

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# How to manage stress factors in poultry production

In modern and large-scale broiler and/or poultry egg production, domestic birds are subjected to frequent stress factors impacting negatively both bird performance and health. An effective management program should start with both the identification and classification of these stress factors.

by **Jean-François Gabarrou, Poultry Market Manager, Business Unit Animal Care, Laboratoires Phodé, France.**  
www.phode.com

Furthermore, the understanding of the physiological mechanism of the stress pathway makes the feed additive industry, and particularly Laboratoires Phodé, able to investi-

gate new areas based on unsuspected innate sense and to select a specific blend of functional molecules as a single and efficient solution to prevent stress in animal production.

In this article, common causes of stress in poultry production, their physiological mechanisms and main indicators in birds are presented.

## What is 'stress'?

Generally the term 'stress' is used to describe the detrimental effects of a variety of factors on the health and performance of poultry.

Birds are characterised with very limited body resources for growth, reproduction, response to environmental changes and defence mechanisms compared to other

mammals. Thus, any slight deviation from normal conditions leads to the rapid redistribution of body resources including energy and protein, at the expense of growth, reproduction and health.

When these challenges come in more intense forms or more frequently at any given time, that serious chemical and physical changes take place within the bird with far reaching consequences, birds become fatigued and weak. These conditions may lead to starvation and infectious disease.

## Types of stress

It must be acknowledged that there are common sources of stress, which can be grouped under one or more of the categories defined by Rosales (1984).

These are summarised in Table 1.

## Focus on climatic stress

High ambient temperature in the tropics accompanied by high relative humidity is one of the most important stressors.

Birds are more susceptible to high environmental temperature than low environmental temperature due to the absence of sweat glands in the feathered body, fatty nature and high body temperature (40.1°C to 41.6°C).

The degree of susceptibility to tropical heat stress is higher in broilers than layers.

Among broilers, males are more susceptible to heat stress than females. Good layers housed in cages are more susceptible than poor layers reared on deep litter.

In addition to the categories of stress, all the possible types of stressors can be broadly classified under two categories (a) avoidable stressors (b) unavoidable stressors as presented in Table 2.

If the avoidable stressors can be completely eliminated under efficient management conditions, the unavoidable ones can be only minimised, highlighting that stress is an inevitable event in poultry husbandry.

## Physiological mechanism of stress regulation

The knowledge of the successive physiological stages happening within an organism/animal cells under stress is very important to develop and/or propose several solutions that could be combined into effective stress management (see Fig. 1). There are three levels of reaction to stress:

### ● Short-term regulation of stress (stage of alarm reaction – neurogenic system):

Also called the 'fight or flight' stage, it lasts only a short time and takes place within sympathetic (post ganglionic) nervous system and adrenal medullary tissue. It controls the rapid response of the animal, following an abrupt increased rates secretion of the catecholamine (dopamine, nor-/adrenaline) from the adrenal medulla.

These neurohormones induce a rapid release of glucose in the blood, depletion of liver glycogen, increased peripheral vasomotor activity, altered ventilation rate and increased neural sensitivity.

### ● Long-term regulation of stress (stage of resistance or adaptation – endocrine system):

This feedback involves the hypothalamus-pituitary adrenal axis (HPA). It is characterised by adrenal cortical hypertrophy and increased synthesis and release of adrenal glucocorticoids – corticosterone in the bird.

This hormone is responsible for the formation of glucose from the body's reserve of carbohydrates, lipid and proteins. Corticosteroids also contribute to many of the diseases associated with long-term stress, such as cardiovascular and gastrointestinal disease, hypercholesterolaemia, metabolic rearrangements and antibody suppression.

### ● Stage of exhaustion (full depletion of body reserves and/or complete sensitivity of infection agents):

When the stress factor lasts too long and exceeds body reserves or

*Continued on page 11*

**Table 1. Most common causes of stress and their categorisation.**

Category	Causes
Climatic	Quick weather variation. Temperature extremes (extreme heat and cold, high humidity).
Environmental	Poor brooding conditions (low temperatures, cold water). Inadequate ventilation (deterioration of the air quality). Poor litter conditions (wet and cold). Bright and too long light program.
Nutritional	Feed quality problems (variation in nutrient content). Quantitative feed and water restrictions [long or uneven feed distribution (split feeding) frustration, hunger]. Sex separate feeding (pressure to restrict body weight gains).
Physiological	Rapid growth, process of maturing sexually (strict nutrient demand). Sexual maturity and onset of egg production (drastic stimulation with feed and light).
Physical	Catching, immobilisation, handling, weighing, injections, vaccination, grading and transport. Beak trimming.
Social	High stocking density (limited feeder and drinker space). Lack of body weight uniformity (magnified differences in the packing order).
Psychological	Human fear. Harsh care takers (poor husbandry workforce).
Pathological/ immunological	Contaminated premises (built-up litter, early exposure to various disease agents). Exposure to infectious agents (clinical or subclinical diseases). Post-vaccinal reactions (fever, reduced feed intake).

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Continued from page 9  
almost depresses the immune system, the third or exhaustion phase leads to fatigue of the homeostatic mechanisms and death.

### Physiological indicators of stress in poultry

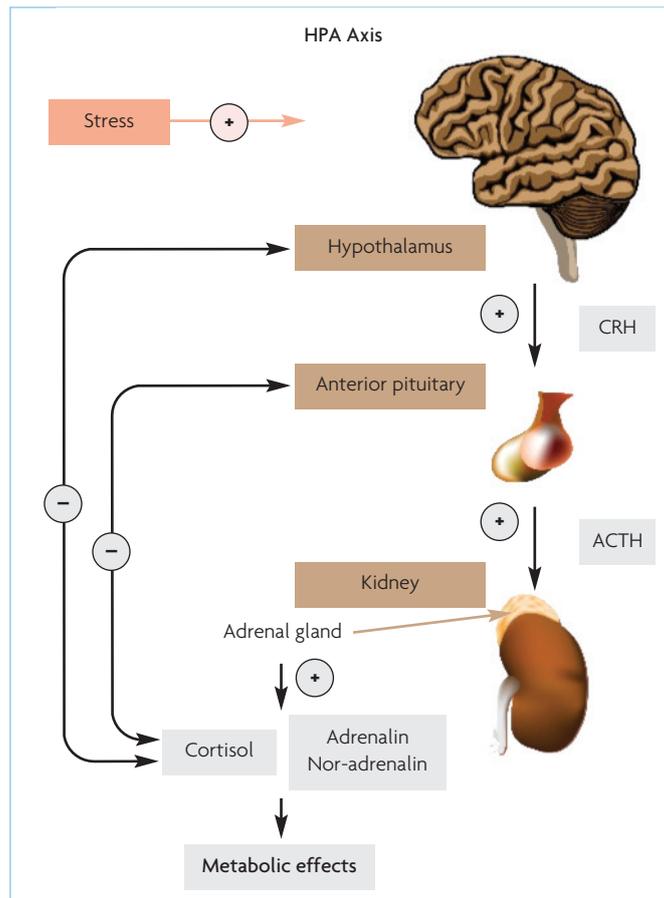
Several workers have reviewed the effect of stressors in fowl and the following indicators of stress in birds have been highlighted:

- Atrophy of the thymus and atrophy of the bursa of Fabricius in young birds, enlargements of the anterior pituitary and the adrenal glands.
- Depletion of the adrenal cholesterol. An increased level of plasma corticosterone, insulin or glucagon.
- Increased reliance on glucose as an energy source.
- Hypoglycaemia (increased glucose utilisation).
- Decreased growth and increased muscle degradation.
- Release of acute-phase cytokines (monokines and lymphokines)
- Impaired growth of cartilage and bone.
- Synthesis of specific heat shock proteins.
- Decreased voluntary feed intake (anorexia).
- Increased body temperature.
- Changes in the level of plasma metabolites (for example glucose, tryglyceride, non-esterified fatty acids and lactate).
- Epinephrine content in yolk of donor hens.
- Changes in the number of circulating leucocytes profiles (heterophil: lymphocyte ratios and basophil and eosinophil numbers).
- Immunosuppression.
- Excess fat deposition in the abdomen (abdominal fat pad).
- Ascites (water belly) in high producing broilers.

Most of the research work on stress and its management in poultry

**Table 2. Avoidable/unavoidable stressors.**

Avoidable stressors	Unavoidable stressors
Overcrowding	Extreme weather
Poor ventilation	Handling
Wet litter	Vaccination
Toxins in feed	Transportation
Starvation	Rapid growth breed
High ammonia level	Debeaking
Dehydration	Lighting
Poor management	Medication
Abrupt or sudden changes	Hormonal changes



**Fig. 1. Biological responses to stressors (HPA: Hypothalamic-Pituitary – Adrenal Axis, CRH: Corticotropin-Releasing Hormone, ACTH: Adrenocorticotropic Hormone).**

try has been conducted in temperate climatic conditions. Reports are also available on stress management in tropical climatic conditions. The following works have been done in this regard:

- Work carried out by Moudgal et al (1991) indicated that immobilisation stress for 30 minutes daily caused apparent decline in egg production.
- They also established the inter-relationship between the

duration of rapid growth of ovarian follicles and egg production under conditions of stress and during advanced age.

- Effect of starvation and high cage density on semen characteristics of healthy broiler cockerels was investigated by Mohan et al (1993).

They investigated that semen volume, sperm concentration and angiotensin-converting enzyme activity (ACE, EC. 3.4.15.1) showed a significant ( $P < 0.05$ ) decrease on the seventh day followed by cessation of semen ejaculation on day 15 of starvation.

The influences of high cage density on sperm concentration and ACE activity were not detected by 24 weeks of age.

However, these parameters reduced significantly ( $P < 0.05$ ) at 27 and 30 weeks of age in comparison to control birds.

Thus, both starvation and high cage density were found to be associated with the deterioration of semen quality.

- Catecholamines have been well implicated in mediating stressful conditions. Alteration of catecholamines metabolic biosynthesis through dietary L-dopa fortification in laying quails and then observa-

tion on its production traits were assessed. Increased level of L-dopa showed trends of lowering adrenal and liver weight, but increasing dopamine, nor-epinephrine and epinephrine concentration in egg yolk as well as egg number.

Under efficient managerial conditions, avoidable stressors can be eliminated. Genetics has increased potential productivity but still the attention should be directed on unavoidable stressors in poultry husbandry in order to minimise their impact on production performance.

### Innovative development

Laboratoires Phodé have designed VeO, an innovative neuro-sensory feed additive that reduces broilers' stress perception and thus induces behavioural and physiological adaptations when facing stressors throughout their life cycle.

Mainly composed of a specific vegetal extract from the rutaceae family well-known for its anti-stress benefits, VeO has been tested in various stress situations found in breeding environments: stress caused by heat, handling, re-grouping, response to vaccinations, etc.

Intensive broiler production needs a high stocking density for barn productivity, but this lead to a high level of stress perception.

In a high stocking density stress experiment (Chonbuk University of Korea), at week five, the feed intake decreased and the growth performance was lower as a consequence of this high level of stress perception. Indeed, preening behaviour at week four showed a high level of stress with decreased activity.

In the situation of high stocking density, VeO allows better preening behaviour to be exhibited. VeO also allows better feed intake and significantly higher growth performance to be achieved.

This experiment demonstrated the relationship between stress and performance. Stress always reduces performance, but the addition of VeO reduces the perception of the stress allowing the main part of the performance to be recovered.

The goal of poultry scientists should be to strike a balance between hypo- and hyper-stress, to find as much eustress as possible and to minimise distress. The ultimate aim of successful poultry husbandry is not to eliminate stress but to maintain it at an optimum level for good production efficiency.

Laboratoires Phodé focuses on modulating stress perception through good functional sensory solutions. ■

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# Poultry Africa focuses on antimicrobial resistance challenge

In October, VNU hosted their first event in Sub-Saharan Africa. It was called Poultry Africa and was held in Kigali, the capital of Rwanda. In addition to a successful exhibition, our poultry titles, in association with the World Veterinary Poultry Association, hosted two half day technical conferences that covered four topical themes and had speakers from five continents.

In this issue of International Poultry Production we focus on the first session that looked at antimicrobial resistance.

## Separating facts from fiction

Edir Nepomuceno Silva from Brazil looked at some of the ‘facts and fiction’ of antimicrobial resistance (AMR) in poultry production.

He cited the recent statistical prediction that by 2050 there will be some 10 million human deaths per year associated with AMR, which equates to a death every three seconds, if the issue of AMR is not effectively tackled today.

There is an on going debate as to whether the AMR issues in man can be blamed on the use or misuse of antibiotics in food animals. However, it is now generally accepted that the use of antibiotics is the primary driver of AMR infections in humans.

However there have been some puzzling recent findings including the situation with

**Table 1. Statement from the AAAP on the use of antibiotic feed additives by the poultry industry.**

Antibiotic growth promoters (AGPs) as feed additives for commercial poultry ensures:

- Good enteric health by controlling *Clostridium perfringens*.
- Less environmental pollution because of less excretion of nitrogen, phosphorus, etc.
- A safer product for the consumer because of less salmonella shedding.
- Better bird performance through improvements in growth rates and FCRs.

- Increased detection of *Clostridium perfringens* and its toxins.
- Increased incidence of salmonella and campylobacter in the EU.
- Increased use of therapeutic antibiotics.
- No impact on improving antibiotic resistance.
- Adverse effects on poultry health and productivity.

**Table 2. Initial consequences for the EU of banning AGPs.**

regards to the emergence of colistin resistance.

This was first reported in November 2015 by the Chinese with the emergence of a new resistance gene (*mcr-1*) to polymyxins – one of the so called ‘antibiotics of last resort’.

This gene apparently arose on Chinese farms between 2011 and 2014 and became widespread in animals with just a few isolations of it from humans.

The *mcr-1* gene is located on short free floating strands of DNA which can be easily copied and shared among bacteria. It is this which probably accounts for its fast spread in China and the world. In 2016 the gene appeared on farms in the USA and in the same country and year the first known *E. coli* infection resistant to colistin was reported.

A similar picture is seen in South America where the *mcr-1* gene is found in animal, human and environmental bacteria.

A retrospective study of enterobacteriaceae from the same three sample types collected between 2000 and 2016 showed that this particular resistance gene had been in South America from at least 2012.

Why did the *mcr-1* gene emerge on three different continents at the same time?

Edir then went on to consider the four ways antibiotics are used in poultry production, namely therapy, prophylaxis, metaphylaxis and as antibiotic growth promoters (AGPs).

In 2008 the AAAP issued a position statement on the use of antibiotic feed additives by the poultry industry (Table 1).

In Europe, AGPs were banned in the mid 1990s, and the consequences that occurred in the early years after the ban was introduced are shown in Table 2.

However, AAAP changed its stance in 2016 and issued a revised position statement which stated ‘...antibiotic use must be minimised through carefully planned and well executed preventative practices’ and ‘there is a growing trend for some food retailers and restaurants to only offer poultry products from flocks raised without antibiotics’.

## Consumer demand

The situation in many countries now is that antibiotic free production of poultry has become increasingly popular due to the consumer perception that antibiotic free poultry is superior to conventionally reared poultry, despite the higher price.

However, in terms of animal welfare, food safety and sustainability the following three questions are worthy of reflection:

● **Welfare:**  
Do flocks get sick more often?

● **Food safety:**  
Are the products safer for human consumption?

● **Sustainability:**  
Is the cost of production higher?

All this has resulted in a lot of effort being put into the search for alternatives to antibiotics.

For some groups of product benefits have been found. For example, probiotics have been shown to have a preventative effect against salmonella and to improve bird performance.

This ability of probiotics to improve performance appears to be related to them being able to:

- Modify the gut microflora.
- Produce antibacterial substances including bacteriocins, colicins and others.
- Modulate immune responses.
- Specifically compete for adhesion receptors on the epithelium of the gut.

Another group is the prebiotics which exert their influence by serving as a substrate for beneficial bacteria in the gastrointestinal tract.

*Continued on page 14*

Continued from page 13

Prebiotics are thought to work by producing short chain fatty acids and they can have a symbiotic relationship in the gut with probiotics. Some of the other groups of substances fall under the umbrella of 'eubiotic nutrition' and include enzymes and organic acids and the previously mentioned probiotics and prebiotics.

One definition of eubiotic nutrition is the combination of modern nutritional technology with the use of non-antibiotic feed additives to maximise feed utilisation by modulating the gut flora to hinder the proliferation of undesirable organisms in the gut.

Edir also forecasts that the global

prebiotics market will soar from US\$ 3.0 billion in 2014 to US\$ 5.4 billion in 2020. Over a similar time span the global probiotics market is predicted to reach US\$ 4.71 billion by 2021.

### Chicken as a reservoir of AMR

In the second presentation on antibiotic resistance, Dr Mohammad Rafiqul Islam from Bangladesh highlighted some interesting facts on the subject.

For example, compared to a global mean of 66g per tonne of animal feed produced, the USA and China exceeded the figure with 74 and 86g respectively, whereas the

EU was significantly less at 52g per tonne. By looking at the domestic consumption of chicken meat over recent years – 2013 to 2017 – he highlighted the potential important role for chicken as a reservoir and source of antimicrobial resistance.

This will be stronger in Asia where antimicrobial consumption by chickens is expected to grow by 124% by 2030. In India alone, intensive production of chickens at 30kg per m<sup>2</sup> is expected to grow by 312% by 2030.

This could well be of concern considering >50% of pathogenic E. coli are resistant to five key classes of antibiotic, whereas in the UK, Australia, the USA and South Africa, it is only one class of antibiotic.

He also highlighted the fact that many in the consumer lobby overlook that AMR does not have to come from meat and eggs. In Bangladesh multiple drug resistance was seen in 98% of bacterial isolates from raw vegetable salad samples.

### Strategy for containment

In Bangladesh the National Strategy for AMR containment has the following as its key features:

- Establishing a multi-sector approach for planning and coordination of activities related to AMR.
- Promoting and ensuring rational use of antimicrobials.
- Promoting and strengthening infection prevention and control measures.
- Promoting and strengthening biosafety and biosecurity principles and practices and containment measures.
- To review, update and strengthen regulatory provisions.
- Institutionalising a surveillance system for AMR containment.
- Promoting operational and basic research.
- Continuing education in the area of AMR.
- Establishing advocacy, communication and social mobilisation (ACSM).
- Developing new antimicrobials and vaccines.

To address AMR, a tripartite approach was developed by OIE, WHO and FAO that has five strategic objectives:

- Improve awareness and understanding of antimicrobial resistance through effective communication, education and training.
- Strengthen the knowledge and evidence base through surveillance and research.
- Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures.
- Optimise the use of antimicrobials in human and animal health.
- Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions. ■

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# Unique integrated organic turkey production concept in Germany

The integrated poultry production company 'Freiland Puten Fahrzenhausen GmbH' specialises in organic turkey growing. The company was founded in 1997 by Dr Marin Bohn, Paul Kelly and Henk Coolen.

---

by Daniel Willnat and  
Geert-Jan Camps,  
VDL Agrotech, Germany.  
[www.vdlagrotech.nl](http://www.vdlagrotech.nl)

---

Their three major goals were: sustainable farming, animal welfare and high quality premium poultry meat. What started as an experiment in keeping coloured turkeys near a forest developed over 20 years into a specialised integration for organic poultry meat.

## Fully integrated

To achieve the company goals it was necessary to control all steps in production. The start was not easy but, step by step, the company grew in production capacity. At the moment they produce 120,000 turkeys and 650,000 organic broilers per year.

## Feed mill

Organic turkey production starts with the production of organic feed. The company has its own organic feed mill which collects and processes raw materials like corn and

soya mostly in the region. The preparation of organic feed is more difficult than regular feed. Different protein/starch/fat contents of the ingredients, but also the limited allowance of probiotic additives, are a daily challenge.

## Hatchery

The KellyBronze genetics come from the UK. This coloured turkey breed is ideal for the organic free range growing method. Strict limitation in bird transport from the hatchery to the rearing farm to the fattener farm avoids spreading diseases and stress among birds.

## Farms

Production is done at approximately 40 contract farms. The maximum amount of birds per farm is limited to avoid an industrial character but also biosecurity risks. The turkeys remain on the farm and the houses are a combined design for rearing and fattening. All farms are under NGA controls like the German Öko-Anbauerband and the EU Bio-organisation, which gives the consumer the maximum of transparency.

## Processing

Processing is done by smaller processing plants with less automated processing lines. The maximum transport time is eight hours.



## Market

The company has two ranges of turkeys: organic turkeys and premium organic forest turkeys. The meat is sold by exclusive selected retailers, to restaurants, to catering and also on the company's web-shop portal.

## Facts and figures

- Maximum transport time between hatch rearing farm is eight hours.
- Regional rearing farms spread over Germany.
- Maximum 1,600m<sup>2</sup> production area.
- Free-range required 10m<sup>2</sup> per turkey.
- Rearing period until six weeks.
- Fattening period females 6-20 weeks.
- Fattening period males 6-25 weeks.
- Total annual production: 120,000 turkeys/650,000 broilers.
- Total employees: 25.
- Total contract farms: 42.



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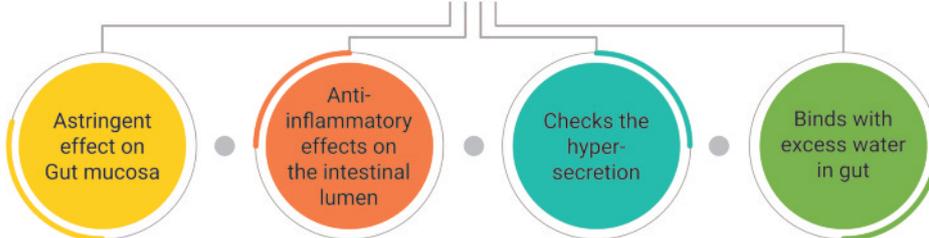
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# Protecting the welfare of chickens farmed for meat – an African view

The welfare, especially of farmed animals, is fast emerging as an important concept that allows African society to express its ethical concerns regarding inhumane treatment of animals.

The World Animal Health Organization defines animal welfare as 'how an animal is coping with the conditions in which it lives' (OIE, 2011).

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An animal is said to be in a good state of welfare if it is healthy, comfortable, well nourished, safe, able to express innate behaviour and if it is not suffering from unpleasant states such as pain, fear and distress.

Good animal welfare therefore requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/killing.

Animal welfare significantly contributes to the animal's health and ultimately its productivity. This is mainly because research has determined that animals are generally more sensitive and vulnerable to stress and suffering which predisposes them to diseases.

A farm animal is constantly challenged by an array of factors that

may evoke stress responses. Overcrowding, extreme temperatures, social disruption, unfamiliar sounds, unfamiliar or uncaring handlers, feed and water restriction, immunisation and disease are common environmental factors that may lead to stressed animals.

Broiler chickens are specialised chickens reared for their meat. Sixty billion chickens are reared annually for their meat compared to 1.5 billion pigs, half a billion sheep and 300 million cattle.

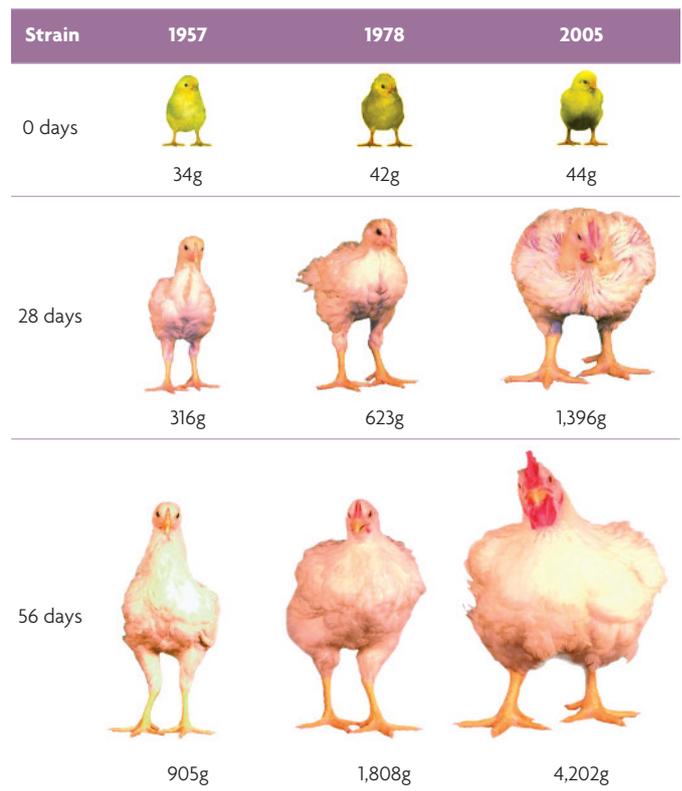
The global chicken meat production was estimated at 96.3 million tonnes with Africa contributing around 4.8 million tonnes (FAO, 2016). Between 2000 and 2011, chicken meat production in Africa increased by almost 5% per year to 4.62 million tonnes, while the global growth average during the same period has been slightly below 4%, hence Africa has increased her total global contribution from 4.7 to 5.1% (Table 1).

The demand for chicken meat has risen steadily over the past decade due to an increase in the human population and a decline of the available arable land due to rapid urbanisation and impact of climate change especially in Africa.

For instance, the global population rose by 12.6% from 6.12 billion to 6.90 billion between 2000 and 2010 and is expected to reach 8.0 billion by 2025, while the African population grew by 26.0% from 811.1 million to 1,022.2 million and is expected to reach 1.3 billion by 2025 (Table 2).

**Table 1. Indigenous chicken meat production (million tonnes). Meat from the slaughter of birds originating in a particular country, plus the meat equivalent of any such birds exported live (Adapted from T. Evans, 2013a).**

Region	2000	2006	2007	2008	2009	2010	2011
Africa	2.8	3.4	3.7	4.0	4.2	4.5	4.6
Americas	27.1	33.7	35.0	37.4	36.7	38.6	39.9
Asia	18.6	23.5	25.0	26.2	28.0	29.1	29.8
Europe	9.3	10.8	11.6	12.1	13.3	13.9	14.6
Oceania	0.7	1.0	1.0	1.0	1.0	1.1	1.2
World	58.5	72.3	76.2	80.6	83.3	87.2	90.0



**Fig. 1. Age-related changes in the size of University of Alberta meat control strains unselected since 1957 and 1978, and Ross 308 broilers (2005). Within each strain images are of the same bird at 0, 28 and 56 days of age (Adapted from M. J. Zuidhof et al, 2014).**

The consumption of chicken meat is greatly influenced by the human population growth rate and an increase in the availability of chicken. Hence while the global

average chicken meat uptake per person rose by 2.5kg or 23% from 11.1 to 13.6kg between 2000 and 2009, the total volume consumed rose by

*Continued on page 19*

**Table 2. Global human population (millions). E = Estimate (Adapted from T. Evans, 2013b).**

Region	2000	2010	2015	2020E	2030E
Africa	811.1	1,022.2	1,145.3	1,278.2	1,562.1
Americas	834.7	934.6	982.1	1,026.6	1,103.3
Asia	3,719.0	4,164.3	4,375.5	4,565.5	4,867.7
Europe	726.8	738.2	742.1	744.2	741.2
Oceania	31.1	36.6	39.4	42.5	47.1
World	6,122.8	6,895.9	7,284.3	7,656.5	8,321.4

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Continued from page 17  
26.5 million tonnes (39%) from 68.6 million to 95.1 million tonnes. However, the greatest consumption rate was observed in Sub Saharan Africa and Asia as shown in Table 3.

This demand has led to intensification of chicken farming systems globally, a trend that is currently establishing in Africa. Intensification of the production systems can improve the welfare of the chickens, due to improved housing, nutrition and health leading to a significant improvement in the chicken's productivity. As the farming systems have changed the chickens have also been forced to change.

International breeders through genetic selection have produced chickens capable of reaching their slaughter weights in under six weeks compared to a slower-growing chicken which would reach its slaughter weight in 8-12 weeks under similar conditions. This extreme growth rate is appreciated when comparing the appearance of chicken over time as shown in Fig. 1.

The intensification of the chicken farming system and changes in the chicken itself has led to various concerns on the welfare of the chicken.

### Growth rate concerns

Broiler chickens are slaughtered for meat typically at around six weeks of age but even before then they suffer from high rates of painful lameness and heart disease. This is mainly because they are selectively bred to grow so fast that their legs cannot support their rapidly increasing body size due to abnormal skeletal development.

Similarly, their hearts and lungs cannot keep up with their bodies' fast growth rate leading to frequent heart failure and ascites. It is estimated that a lame broiler will spend up to 80% of their time lying down and hence may not reach the feeders and drinkers leading to malnutrition which depresses their productivity.

Acute heart failure (Sudden Death Syndrome) kills up to 3% of broilers, while chronic heart failure (ascites,



waterbelly) affects nearly 5% of broilers worldwide.

Beyond genetic selection it is important to understand that genetic selection accounts for 85-90% of the progress in growth rate with improvements in diets accounting for the remaining 10-15%.

In Africa there are serious challenges with the quality of feeds available for utilisation by intensively farmed chickens which at certain instances leads to decreased productivity.

### Environmental concerns

Most intensive farming systems are barren environments which prevent chickens from behaving naturally as they provide few opportunities for the chickens to perch, forage, explore or dustbathe. With these natural activities denied, chickens suffer from stress due to inactivity. This means chickens spend most of their time lying down leading to physical problems like lesions on their skin like breast blisters.

The lives of intensively farmed chickens are made worse by the quality of the litter covering the floors of the sheds. In most African farms the amount of litter placed in the shed is usually inadequate and within a short time (by week three) becomes wet, caked and dirty with ammonia-rich chicken droppings. This prevents the chickens from being able to scratch or dustbathe while causing painful lesions on the chicken's feet, legs and breasts. The situation is further compounded by the harsh ammonia fumes causing

lung and eye problems in sheds with poor ventilation.

The light intensity in the house is also critical as bright and natural light is important for the visual acuity of birds leading to increased activity and ground pecking.

A substantial period of darkness is also required for proper sleep which aids in physiological recuperation in terms of energy conservation, tissue regeneration and growth.

### Stocking density concerns

Another critical welfare concern in broiler production is the high stocking density in broiler units. A typical shed in intensive farming systems can host thousands of chickens. Crowded broiler units lead to wet litter, increased air pollution from ammonia and dust particles and poor temperature and humidity control, all of which damage the broilers' health.

This leads to increased lameness, breast blisters, foot-pad dermatitis, hock burns and infections that leads to low productivity and poor returns as the affected carcasses are down-graded or rejected at the processing plant.

### Transportation concerns

Finally, catching of the birds when they are being removed from the shed for slaughter can result in unacceptably high levels of bruises, fractures and other traumatic injury, while poor transportation conditions can lead to 'dead on arrival' at the slaughterhouse due to thermal stress or suffocation as a result of crowding on the transporter.

### Slaughter concerns

The slaughter process, when the conscious broilers are hung upside down in 'shackles' and stunned by dipping in electrified water baths, is also cause for concern. Broilers often experience pain and struggle while hung in shackles, and they may suffer during the slaughter process. It is essential that sufficient

stunning current is used and that both carotid arteries are cut to reduce the risk of birds regaining consciousness during bleed-out.

### Key requirements

The welfare concerns described above are unacceptable and unnecessary, particularly when higher-welfare indoor systems are already available. These higher-welfare systems let chickens behave like chickens. They provide a good balance of animal welfare benefits and commercial viability. The key welfare requirements that the industry needs to institute include:

#### ● Slow growth:

Chickens farmed on high-welfare indoor farms are allowed to grow at a slower, more natural rate. This reduces the strain on their hearts, lungs and legs. It means they can move around more easily and this reduces lameness and heart failure.

#### ● Enriched environments:

High-welfare farms provide the chicken with deep, dry, good quality litter which allows chickens to rest in comfort and perform natural behaviour such as scratching, pecking and dustbathing.

To maintain good litter quality, it is important to have lower stocking densities and appropriate management. Good litter helps to reduce the occurrence of painful skin lesions on chickens' feet, legs and breasts and reduces respiratory and eye problems. High-welfare farms also include various forms of enrichment for the chickens. These are simple additions, such as hay-bales and perches, which encourage movement and natural behaviour such as perching. Natural lighting is also critical for high-welfare indoor farms as it not only encourages the chickens to move around but the dark periods allow them to rest. Chickens which behave more naturally suffer less stress and have fewer physical problems such as lameness and skin lesions.

#### ● Reduced stocking density:

Chickens kept in higher-welfare indoor systems have more space. This increases their comfort, reduces their stress and encourages them to move, scratch, peck and dustbathe. It is clear from chicken behaviour and leg disorder studies that stocking density must be 25kg/m<sup>2</sup> or lower for major welfare problems to be largely avoided and that above 30kg/m<sup>2</sup>, even with very good environmental control systems, there is a steep rise in the frequency of serious problems. ■

References are available from the author on request

**Table 3. Changes in global chicken consumption from 1996-2016 (Adapted from OECD FAO (2016)).**

Region	Increase in chicken consumption per person	Amount (kg)
Europe	+38%	From 16.9 to 23.3
Sub Saharan Africa	+85%	From 1.3 to 2.4
China	+89%	From 6.2 to 11.7
India	+183%	From 0.6 to 1.7

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### A complete approach to mycotoxin management

Wisium has developed a global expertise in mycotoxin contamination management, a complex and always moving issue for animal production. Thanks to its worldwide database of analyses, Wisium has identified a global rise of contamination levels in a multi-contamination context. In this more and more challenging environment, using a simple binding solution is not sufficient.

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The Wisium investigation starts in raw materials and ends in the animal. As every raw material can be a source of contamination, their overall approach starts with specific analyses. The first key success factor for mycotoxins analysis is to sample the right raw material at the right time to have a comprehensive under-



standing of the global contamination, through a precise quality control plan. The implementation of this process requires very specific knowledge and takes into account the situation of each feed plant.

The second step is the collection of samples and analysis with quick analysis kits and large spectrum chemical analyses (48 mycotoxins). Wisium offers a full package of services including a quality control plan, analyses, technical support and monitoring tools, combined with a high-end technical product: T5X. Much more than a toxin binder, T5X is the result of 20 years of development in 11 worldwide research centres. T5X contributes to the production of natural detoxification enzymes and supports the animal's natural defences.

### Recognition of gut health as a key driver of poultry performance

One of the most important changes in livestock production over the past two decades has been the recognition of gut health as a key driver of animal performance.

This phenomenon has been accelerated by increasing awareness of the impact of animal health and disease prevention on livestock profitability.

[nutriad.com](http://nutriad.com)

The number of recent animal studies have clearly demonstrated that mycotoxins are able to compromise several key functions of the gastrointestinal tract. These include impaired nutrient absorption, decreased surface area available for nutrient absorption, modulation of nutrient transporters, and loss of barrier function.

Intestinal cells are the first cells to be exposed to mycotoxins at higher concentrations than other tissues. The toxic action of mycotoxins can result in necrosis of oral, gastric and intestinal mucosa altering the barrier function of the intestinal

epithelium. As such, mycotoxins can be an important predisposing factor for Clostridium perfringens-related necrotic enteritis and other gastrointestinal diseases.

In that context, the use of feeding programmes that not only target gut health support but also include mycotoxin stress management, have gained special attention from animal producers worldwide.

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### Protecting the gut integrity of your birds

There are more than 400 different kinds of mycotoxins. All of these have one thing in common; they are all immunosuppressive. Due to this immunosuppressive effect they make poultry more susceptible to infectious diseases.

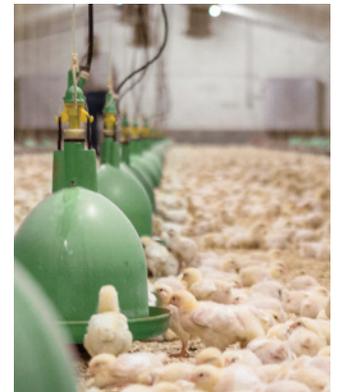
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Even at concentrations below the detection limit, mycotoxins result in huge production losses. They mainly act on decreasing gut integrity, resulting in a leaky gut and hence are a predisposing factor for opportunistic bacteria and secondary infections.

Most raw materials are contaminated with mycotoxins, so animals will ingest mycotoxins, hence preventing absorption in the gut is advised. It is very important to have a broad range of activity against multiple mycotoxins. Elitox is developed based on scientific proof using biomarkers to be active against a wide range of mycotoxins. The efficacy of Elitox is extensively tested in vivo to prove its

immunomodulating properties, helping the animal to overcome mycotoxicosis and hence preventing secondary infections from being manifested.

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Effective mycotoxin management involves seeing the whole challenge. From the farm to the feedmill and from risk assessment to feed management, the Alltech Mycotoxin Management program can help you safeguard the health of your flock, the quality of their feed and the security of our food supply.

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Including Mycosorb A+ reduces the threat of mycotoxins and the unique technology behind it makes it one of the most advanced mycotoxin binders on the market.

Mycosorb A+ reduces mycotoxin absorption within the animal, thereby negating the damaging effects of mycotoxins on its health. Its superior binding capabilities, broader adsorption profile and increased mycotoxin sequestration efficacy sets it apart from other products.

As well as containing yeast,

Mycosorb A+ also contains algae. The algae are heterotrophic and are also grown under specific conditions to produce specific carbohydrates for the adsorption of mycotoxins. Alone, algae has adsorption properties, however it is capable of targeting different mycotoxins to the yeast. Therefore, by combining the two, an even larger range of mycotoxins are able to be adsorbed.

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For more than a quarter of a century the founders of Special Nutrients have been closely involved in the animal feed-additive business through the manufacturing of mycotoxin adsorbents produced in Texas, USA and shipped to most continents around the globe.

[mycotoxin.com](http://mycotoxin.com)

Mycoad and Mycoad AZ have continuously demonstrated their efficacy against several mycotoxins in broiler chickens, commercial layers, breeders and ducks in trials performed in prestigious and independent universities and laboratories in the USA, Brazil, Mexico, and Asia.

The quality of both products is assured by issuing a certificate of analysis in the manufacturing plant, which includes physical and chemical tests, as well as x-ray diffraction with the objective of confirming that the same clay is used

every time the product is manufactured. In the case of Mycoad AZ, each shipment is tested in vitro by Trilog, Missouri, USA, against zearalenone, fumonisin, and ochratoxin to demonstrate the efficacy against these mycotoxins.

This type of testing represents one of the highest quality control standards in this industry for this type of product.

Besides offering unique anti-mycotoxin adsorbents, one important goal of the company is to train customers and distributors on how to differentiate if their flocks are affected by mycotoxins or by other pathological agents, with the final objective of making these companies more efficient and profitable.

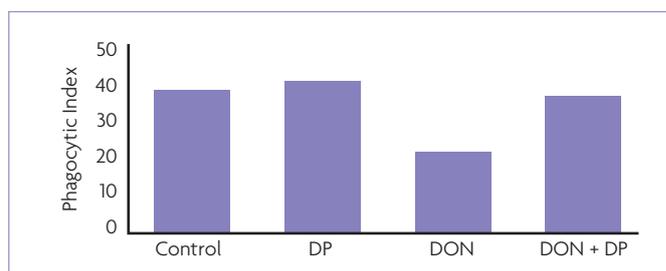


Fig. 1. Immunosuppression by DON expressed in terms of phagocytic index.

### Second generation mycotoxin deactivators

Mycotoxins are ubiquitously present in worldwide feed and feed raw materials having negative impacts on animal health and performance. Therefore, mycotoxin reduction strategies, such as the addition of mycotoxin deactivating agents based on adsorption, bio-transformation or biodegradation, must be implemented.

[drbata.com](http://drbata.com)

Deoxynivalenol (DON) belongs to the trichothecene group and has a highly frequent occurrence.

Immunosuppression is one of the fundamental problems in animal husbandry that may manifest in health related problems and, as a result, a decrease in production parameters. Measuring the impairment of the immune system can be performed by determining the phagocytic index as a characteristic parameter of immunosuppression.

To prove the immunosuppressing potential of DON a laboratory in vivo trial was performed with 40 turkey poult receiving 160ppb DON in the starter and 240ppb DON in

the growing diet. The phagocytic index was measured at 12 weeks old. The immunosuppressing effect of DON was neutralised by the addition of Detoxa Plus, a second generation mycotoxin eliminator at 0.5kg/t dosage (Fig. 1).

The results indicated, that in the presence of DON, the phagocytic index was reduced by 46.2%, while the decrease in the phagocytic index with the addition of Detoxa Plus at 0.5kg/t was only 2.6% (DON + DP group). The addition of 160ppb DON followed by 240ppb DON to the diet had no significant effect on the production parameters, however significantly decreased the number of the phagocytic index indicating immunosuppression.

Detoxa Plus, a second generation mycotoxin eliminator effectively biotransformed the added mycotoxin and therefore no immunosuppression was observed.

With the addition of mycotoxin eliminators, such as Detoxa Plus, successful mycotoxin management can be achieved and mycotoxin related immunosuppression can be minimised.

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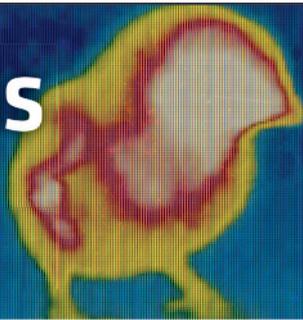
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# Heat stress therapy



## Remarkable effect in broilers

Broiler performance	Day 1 to day 21 Thermo neutral period		Day 22 to day 35 Heat stress period	
	Control	ProtectOx DW	Control	ProtectOx DW
End weight, g	822	837	<b>1686</b>	<b>1968 ***</b>
ADG, g	37.2	37.9	<b>61.7</b>	<b>80.8 ***</b>
Index, ADG	100	101.9	100	130.9
Feed: Gain, kg/kg	<b>1.19</b>	<b>1.13 ***</b>	1.31	1.27
Index, FCR	100	94.4	100	96.9
Daily water intake, ml	128	131	446	440

University trial 2016. Broiler growth performance with 0.2% ProtectOx DW in drinking water.  
Level of significance: \*\*\*( $P \leq 0.001$ )



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### Multi-factorial approach to protect and support against toxins

Escent S is a wide spectrum mycotoxin control program and liver protection package combined with a professional risk assessment service.

[innovad-global.com](http://innovad-global.com)

It is a well-researched complex of different active ingredients that ensure a multifactorial approach to protect and support against toxins in five different ways:

- Reduction of immunosuppression. A reduced status of the immune-system is alleviated by the use of Beta-glucans and well selected plant extracts.
- Reduction of oxidative stress. The presence of mycotoxins plays an important role in lipid peroxidation at cell level. Both synthetic and natural antioxidants avoid further action of free radicals



towards intestinal microflora, tissues and cells, protecting the natural pathways of biotransformation of mycotoxins.

- Organ functioning support. The liver and kidneys are crucial organs in the detoxification and elimination of toxic principles in the blood. Several mycotoxins have a well-known impact on the functioning of these organs.

- Mycotoxin adsorption. Both highly adsorbent mineral clays and yeast extracts rich in gluco-mannans are used to adsorb mycotoxins.

Their role is to adsorb mycotoxins efficiently, selectively and quickly, reducing the bio-availability for the organism.

- Mould inhibition. In order to eliminate further mould development, and by consequence potential mycotoxin production, a selected mould inhibitor makes Escent a well balanced mixture of support, protection and prevention.

The recommended dose in feed is 0.5-2.5kg per ton depending on the challenges

### Countering fumonisin and T2 toxin and supporting the liver

Next to its highly efficient mycotoxin adsorbance capacity, Vitafix Ultra from Nuscience is supplemented with natural antioxidants to reduce oxidative stress and betaine to support the liver.

[nusciencigroup.com](http://nusciencigroup.com)

The liver is the most important organ for detoxification of mycotoxins in the animal's body. Table 1 clearly shows that mycotoxin exposure typically results in an enlarged liver. With Vitafix Ultra however, the relative liver weight was exactly

the same as in the negative control group without mycotoxins.

Sphinganine (SA) and sphingosine (SO) are two important intermediates in sphingolipid metabolism.

From scientific literature it is known that an increase of the SA/SO ratio in the blood is specifically related to increased exposure to fumonisin.

In this trial, fumonisin exposure indeed resulted in a significant increase of the SA/SO ratio. The addition of Vitafix Ultra however, resulted in a significantly lower SA/SO ratio.

**Table 1. Effect of mycotoxin exposure on the liver.**

	Negative control	50,000ppb Fumonisin + 1,000ppb T2	50,000ppb Fumonisin 1,000ppb T2 + Vitafix Ultra
Relative liver weight (%)	2.89	3.02	2.89
SA/SO ratio	0.55 <sup>c</sup>	1.25 <sup>a</sup>	1.03 <sup>b</sup>

### Protect from losses due to exposure to mycotoxins

Mycotoxins are toxins produced by moulds. If maize or grain is badly stored, fungus may grow on it and may produce mycotoxins. If this contaminated grain or maize is fed to animals, it may cause severe problems (death, fertility problems etc).

[ayurved.com](http://ayurved.com)

Mycotoxins are a big problem in agriculture. Over 25% of the world's agricultural production is contaminated by mycotoxins. They often grow on crops like corn, wheat and peanuts. The mycotoxins can then end up in feeds. Even after heat treatment some low level of mycotoxins remain in feed.

Mycotoxicosis in poultry is difficult to diagnose as it can affect more than one organ and the symptoms are very common.

The mycotoxins in feed may not kill the bird but will reduce performance resulting in losses to the broiler and layer farms. Different types of mycotoxins interact and act synergistically to bring about a deleterious effect that is more profound than a single mycotoxin.

The main harmful effect that directly effects the poultry grower is that it suppresses the immune system resulting in failure of vaccination and there is increased susceptibility to diseases. There is poor egg production, eggs are deformed, poor hatchability, poor weight gain and, as a result, the final live weight is much lower than expected.

More feed is required to gain the same amount of weight as the liver is directly affected and its efficiency in metabolising is greatly affected.

It is imperative to look for solutions that provide protection against multiple mycotoxin infection and, at the same time, help to maintain optimum productivity.

One such product is Toxiroak Gold formulated from different herbs along with added MOS, HSCAS and copper sulphate.

Toxiroak Gold has a multipronged action through which it protects against mycotoxins. First it checks the growth of fungus; secondly it inhibits biosynthesis of mycotoxins by the fungus. Inside the gut it inactivates mycotoxins by chemisorption; inside the liver it bionutralises the mycotoxins.

The benefits of the product is due

to the synergistic action of the ingredients.

The herb *Azadirachta indica*, which is present in the product, inhibits synthesis of aflatoxins, it is anti-inflammatory and hepatoprotective. *Solanum nigrum* is a mycotoxin inhibitor, hepatoprotective and a good antioxidant.

The herb *Andrographis paniculata*, which is present, protects the liver, is useful in digestive disorders, and protects against ulcers.

MOS (mannan oligosaccharides) is also present in Toxiroak Gold. It increases the surface area for binding of the toxin and absorbs harmful bacteria and prevents them from attaching to the gut wall. It also helps in improving the immune system of the birds.

Hydrated Sodium Calcium Aluminosilicate (HSCAS) has great affinity for mycotoxins. It makes a complex chemical bonding, thus it prevents mycotoxins from being absorbed in the gut. It also prevents caking in feed.

Copper acts as a fungicide and mould inhibitor. Toxiroak Gold, in addition, protects the liver from the harmful effects of mycotoxins. It prevents fatty liver syndrome. Thus the FCR improves and there is better body weight gain. Egg production and hatchability is improved.

Together, these ingredients increase the efficacy of Toxiroak Gold. Regularly using the product will protect the birds from mycotoxins and also help to optimise production.



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# Optionsfor

## Innovative and comprehensive solution to support animals

Multiprotect is an innovative and comprehensive solution developed by MiXscience in order to support animals facing feed mycotoxin multi-contaminations.

[mixscience.eu](http://mixscience.eu)

Multiprotect binder has been selected after various and challenging in vitro screenings to target the widest binding spectrum.

It is also composed of ingredients that stimulate the weakened

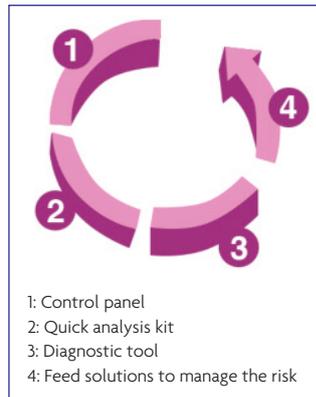
immune system under mycotoxins challenge, protect gut and liver cell integrity and stimulate the liver detoxification system.

Finally, the protection against oxidation is enabled thanks to an association of components that limit the pro-oxidant effects of mycotoxins on the tissues.

It is a part of MiXscience's Mycotoxin Risk Management Program – a 4-step program to reduce the risk. Indeed, in order to offer a global solution to its customers, MiXscience experts developed Mycoscope, an innovative application to assess the mycotoxin risk in raw materials or feed.

According to the feed mycotoxin contamination levels and thanks to a specific master database, Mycoscope recommends the most adapted product and the dose required for an efficient and cost-effective control of the identified mycotoxin risk.

MiXscience also provides some advice to set-up control plans and offers an analysis kit to quickly and cost efficiently determine the presence of mycotoxins in raw materials directly in the field.



## The latest in mycotoxin risk management

Mycotoxin contamination of feed is a known problem that costs the poultry industry billions of dollars worldwide. A multi-pronged approach is needed to protect flocks against numerous mycotoxins that impair poultry performance and health.

[mycofix.biomin.net](http://mycofix.biomin.net)

Mycofix, from Biomin, is an innovative, all-in-one feed additive that uses three modes of action to deliver absolute protection against mycotoxins:

- Adsorption. Mineral adsorbents selectively bind adsorbable mycotoxins such as aflatoxins, ergot alkaloids and endotoxins.
- Biotransformation. A unique combination of patented, specific enzymes and biological components converts mycotoxins into non-toxic and safe metabolites. This

mode of action targets fumonisins, trichothecenes, zearalenone and ochratoxin A.

- Bioprotection. An innovative mix of natural ingredients provides immune support, maintains the intestinal barrier function and counters the toxic side effects caused by mycotoxins.

Mycofix represents a genuine innovation in the combat against mycotoxins in five ways. First, it acts against a broader range of toxins. Second, it contains the only three EU authorised feed additives proven to deactivate mycotoxins. Third, it offers enhanced bioprotection. Fourth, it provides endotoxin protection. Last, scientific and field trials in poultry demonstrate its effectiveness and ability to generate meaningful return on investment.

Mycofix comprises the most complete mycotoxin risk management solution to date.

## Support flock health and efficiency by counteracting mycotoxins

Poultry producers worldwide depend on Celmanax and its Refined Functional Carbohydrates (RFC) in the battle against mycotoxins. The RFCs in Celmanax are the components harvested from yeast cells (*S. cerevisiae*) using a specific enzymatic hydrolysis process.

[ahanimalnutrition.com](http://ahanimalnutrition.com)

These compounds are naturally present in all yeast cells, but are not readily bioavailable.

The processing method used to refine the yeast cells influences the size and structure of these liberated components, which affect bioavailability and functionality, like taking on mycotoxins.

Adding Celmanax to poultry diets supports flock health and efficiency by helping to counteract mycotox-



ins and certain pathogenic bacteria. Research shows that RFCs irreversibly bind several mycotoxins, and prevent them from being absorbed through the gut and into the blood circulation.

Celmanax assists the bird's immune system in reaching a state of readiness and optimises productivity. At the same time, it increases performance by supporting feed

intake and feed efficiency, while enhancing beneficial intestinal tract bacteria. In addition, immune suppression caused by mycotoxins can be reversed by the beta 1,3/1,6 glucans and mannans present in RFCs, allowing a bird to further protect itself against pathogens. As a result, nutrient uptake is maintained, leading to better feed efficiency and poultry performance.

## Efficient protection to optimise poultry performance

Losses in performance and the increased incidence of diseases due to mycotoxins have a great economic impact on poultry farms.

[olmix.com](http://olmix.com)

Research suggests that toxic effects can also occur at much lower mycotoxin contaminations than those described in the literature. The probability of having a multi-contamination on one raw material is very high. Fusarium toxins (DON, T-2/HT-2, ZEA, fumonisins) are considered the most frequent worldwide but also the most difficult to bind.

As a consequence, it is very important to protect animals from mycotoxin contamination in order to avoid this economic loss.

Olmix, a specialist in mycotoxins expertise, has developed efficient

solutions to optimise protection of animals. In two products, MT.X+ and MMi.S, each one is adapted to the different needs of the producer.

MT.X+ is a powder product and its efficacy has been demonstrated in different trials with fusarium poly-contamination.

MMi.S is a microgranulated product that guarantees a homogenous intake of the toxin binder for maximised efficacy.

MMi.S particles have an average medium size, corresponding to the most represented particle size in mash feeds, and one of the most preferred particle size for laying hens.

This allows MMi.S to be continuously ingested with the feed, and therefore permits a simultaneous intake of the mycotoxin binder and the cereals for optimum efficacy. Improved protection equals improved performance.



## A range of solutions for better control of the mycotoxin risk

When present at a high level in feed, mycotoxins may have an acute toxicity, but more frequently they result in chronic toxicity. With more insidious effects, this toxicity often leads to an overall performance decrease, especially in poultry as these species are particularly sensitive to mycotoxins.

[feedexpertise-techna.com](http://feedexpertise-techna.com)

Techna group is aware of this worldwide concern regarding feed contamination by mycotoxins.

Therefore their expertise in animal nutrition and know-how in innovative ingredients has led them to create a range of solutions for better control of the mycotoxin risk.

Vitalprotect comes in three products suited to all needs.

Thanks to its anti-microbial action, Vitalprotect Mold enables fungi development to be limited during raw materials and feed storage.

Vitalprotect Initial is particularly suitable for preventive and cost-

effective use. It reduces mycotoxin contamination in feed (an in vitro trial showed 93% of aflatoxin B1, mycotoxin adsorption) and maintains digestive tract integrity.

Vitalprotect Secure is completed by a unique combination of plant extract for a wider action in order to maintain zootechnical performance, DON, fumonisin, zearalenone in broiler feed.

Techna group experts can assist you in assessing your mycotoxin risk through analysis; they will provide you with the relevant advice and affordable solutions to secure poultry performance.



## The ideal mycotoxin management and mitigation program

Mitigating the effects of mycotoxins in animals has become increasingly complicated over the years. More and more, fusarium mycotoxins like T2, zearalenone and deoxynivalenol are posing serious threats with their widespread incidence.

[globalnutrition.com](http://globalnutrition.com)

The effects of DON in poultry have been previously overlooked, but new studies have shown that it negatively impacts immune response and gut health in poultry. This can result in vaccination breaks and higher susceptibility to necrotic enteritis. Unlike polar mycotoxins, deoxynivalenol has been difficult to mitigate and control with traditional binding agents.

For the past 15 years, Global Nutrition has researched and developed the ideal mycotoxin management and mitigation program.

Starting with Globafix in 2003, it has now introduced Globafix Plus, its premium mycotoxin manage-

ment and mitigating product.

Thanks to the synergistic activities of a unique montromorillonite, a select yeast cell wall and pyrrolizone vegetative carbon, Globafix Plus has been shown to effectively bind DON both in vitro and in-vivo.

It has been shown to reduce DON accumulation in blood and tissues of animals fed DON-contaminated feed. More than just binding a range of mycotoxins, it has proven to have much deeper effects as well.





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### Benchmark study of commercial mycotoxin preparations

For more than five years Orffa has been working on a complete mycotoxin binder composition, tailored to the co-occurrence of multiple mycotoxins in feed, and reducing the negative impact on the health status of production animals.

[orffa.com](http://orffa.com)

Multiple in vitro trials were performed to assess the binding capacity of single ingredients and this formed the basis for the development of a commercial preparation, Excential Toxin Plus, consisting of five ingredients.

This composition was benchmarked against 19 commercially available preparations (including six premium global brands) for binding capacity and biotransformation of the 12 most pronounced mycotoxins.

Results indicated that there are clear differences between commercial mycotoxin binders for feed applications and some binders have

a higher binding efficiency towards specific mycotoxins. Excential Toxin Plus matched the overall binding properties of the top products available on the global market.

The in vitro experiments were designed in close collaboration with MYTOX and carried out by the Laboratory of Food Analysis (Ghent University, Belgium).

Excential Toxin Plus, manufactured by Orffa, is being sold and marketed on a global basis.



### Wide spectrum intestinal toxin binder

Contamination of feed with mycotoxins is still very frequent worldwide. Its ingestion may cause immunosuppression in broilers and thus more susceptibility to disease and a decrease in production results.

[livisto.com](http://livisto.com)

To control mycotoxins it is necessary to improve grain storage conditions, use antifungal products and have good silo hygiene practices.

Nevertheless, these measures are often not enough and the use of an intestinal mycotoxin binder is then necessary.

The presence of several types of mycotoxins at the same time as contaminants is frequent and therefore mycotoxin binders should provide wide spectrum activity.

Hi-Sorb provides wide spectrum activity and is active against the main mycotoxins that affect poultry: aflatoxin, ochratoxin, DON and T2-toxin. Among its ingredients, bentonite C and mannan-oligosac-

charides (MOS) irreversibly adsorb toxins, which are then eliminated through the faeces.

β-glucans and MOS improve the immune status of animals and also protect the intestinal wall by avoiding colonisation by pathogenic bacteria.

Hi-Sorb is a useful tool to control mycotoxins and avoid economic losses. As a premix, it is added to the feed in low doses, which vary depending on the level of mycotoxin contamination (0.5-3kg/Tn).



### The importance of understanding the mycotoxicosis risk

The adverse effects of mycotoxins on poultry are numerous. They affect organs including the gastrointestinal tract, liver, and immune system, resulting in reduced productivity.

[cargill.com](http://cargill.com)

Understanding the occurrence and prevalence of mycotoxins is imperative as research shows that mycotoxins are found in the vast majority of feed ingredients.

The mycotoxicosis risk depends on the level of mycotoxins in the feed. An effective control plan is key to deal with mycotoxin contamination and is dependent on two pillars:

- Testing of mycotoxins on site and/or using a unique online pat-

tern database, Notox-Online, showing the potential risk of mycotoxins. As mycotoxin load in the raw materials increases, Notox-Online provides a chance to quickly adapt the inclusion rate of anti-mycotoxins additives (AMA).

- Adoption of a product whose effectiveness has been proven against the detected mycotoxins, such as those from the Notox range, and used at a relevant inclusion rate (at least 1.0-1.5kg/mT as 0.5kg of any currently on the market will not solve the issue).

Notox-Online enables customers to take control of potential mycotoxin threats for a cost of less than \$0.6 per metric ton.

When used in combination with Notox products, cost savings can be as high as \$1.5 per metric ton.



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# Poultry Focus Asia 2018

## DAY 1

Keynote session jointly held with Pig & Dairy Focus Asia 2018

9:45	Opening ceremony	
10:00	Putting science into biosecurity	Ricardo Munoz, Neogen – Food Safety, USA
10:30	Managing the unknown? Mycotoxin risk assessment in feed production	Philipp Gruber, Romer Labs, Austria
11:00	Turning big data into smart data – Vision from a field veterinarian	Maarten de Gussum, Vetworks, Belgium
11:30	Prudent use of antibiotics	Alex Eggen, Director AEVC, The Netherlands
12:00	Lunch	
13:00	Antibiotic stewardship – Asian poultry production's contributor	Chris Morrow, Bioproperties Pty, Australia
13:30	Alternative strategies for gut health	Gangga Anindito Widyaanugraha, Biomin, Indonesia
13:55	Yeast solutions to alleviate heat stress in poultry	Laurine Faivre, Phileo-Lesaffre, Singapore
14:20	Efficient and sustainable poultry	Dominic Elfick, Aviagen, Australia
14:45	Break	
15:15	Cost effective production of premium quality table eggs	Ron Eek, Lohmann Tierzucht GmbH, Germany
15:45	Effect of zinc on intestinal health of poultry	David Mathé, Animine, France
16:10	Think efficiency and health – Think MCFA	Manu De Laet, Nuscience, Belgium
16:35	In ovo and LaserLife – A superior combination	Chalermchai Skulphuek, Ceva, Thailand
17:00	Modulating the immunity with marine sulphated polysaccharides	Matthieu Le Goff, Olmix, France

## DAY 2

8:30	Phylogenetic strategies to improve poultry farm profits	Prafal Kumar, Ayurvet, India
9:00	Diformates – A most suitable replacement for antibiotics	Anant Deshpande, Addcon Asia Ltd, India
9:25	Optimisation of nutrient digestion and absorption	Wookyun Kim, EASY BIO, Inc./University of Georgia, USA
9:50	Biocheck.UGent®: Biosecurity as an aid to reduce antimicrobials	Bo Vanbeselaere, CID LINES, Belgium
10:15	Break	
10:45	Influence of phytase on amino acid digestibility	Mike Bedford, AB Vista, UK
11:15	Enzyme selections to work on corn based feeds	Erik Vanderbeke, AVEVE Biochem, Belgium
11:40	Are you ready for an AGP-free poultry production	Rolando Valientes, DSM, The Philippines
12:15	Lunch	
13:00	Mycotoxigenesis in poultry	Astrid Koppenol, Impextraco NV, Belgium
13:30	Thermostable acidifiers combined with probiotics	Andreas Lewke, Dr. Eckel Animal Nutrition GmbH & Co. KG, Germany
13:55	Insoluble fibre to optimise poultry performance	Chang Mong Hoon, JRS, Malaysia
14:20	Probiotics as nutritional health solution for broilers	Marion Bernardeau, DuPont, France
14:45	Break	
15:15	Efficiency and quality from housing happy hens	Peter Schreurs, Vencomatic, Thailand
15:45	The true cost of mycoplasma infections in commercial layers	Khaled Hussein, ECO Animal Health, UK
16:10	Live salmonella vaccines in food safety programs	Thanakrid Luupnyalerd, Elanco Animal Health, Thailand
16:35	Looking to improve gut health? Tributyrin can help	Devendra Verma, Perstop, The Netherlands

## DAY 3

8:55	Improving broiler efficiency through genetics	Raul Lopez, Cobb Asia Pacific, The Philippines
9:25	Effectively counteracting the effects of fusarium mycotoxins	Glen Alfred S. Ferriol, Nutriad, The Philippines
9:50	Immunomodulation – Feeding the stressed immune system	Klaus Hoffmann, Chemoforma AG, Switzerland
10:15	Break	
10:45	Recent insight into trace mineral nutrition	Irene Eising, Orffa Additives BV, The Netherlands
11:10	Gram positive bacteria vs. the poultry industry	Jozsef Gyenis, Dr Bata, Hungary
11:35	Wood lignans – Effects on gut health and performance	Arthur Kroismayr, Agrocon Consulting, Austria
12:15	Lunch	
13:00	Pathogen risk control – Restoring sensitivity to antibiotics	Hilary Pavlidis, Diamond V, USA
13:30	Natural betaine supports efficient broiler production	Ana Gavräu, Agrana, Austria
13:55	Profit from an efficient layer breeding program	Julien Fablet, Hendrix Genetics, France
14:20	Feed efficiency and feeding behaviour in Pekin ducks	Hans-Heinrich Thiele, ORVIA, France
14:45	Break	
15:15	Marek's disease control and in-ovo vaccination	Tarsicio Villalobos, Zoetis, USA
15:40	Physiological nutraceuticals – The new frontier in immunostimulation	Farzin Faraji, Tecnozo, Italy
16:05	Feed cost saving in layer formulation	Xabier Arbe Ugalde, H&N International, Spain

Programme correct at time of going to press - for the latest programme see our website

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# Reducing antibiotic use in poultry – turning change into opportunity

Phileo Lesaffre Animal Care recently hosted a highly successful symposium dedicated to poultry and pigs in Rome, Italy. Nearly 300 participants from 45 countries attended the event, which focused on the central theme of reducing antibiotic use and embracing the opportunities presented by a global market that is evolving rapidly on this topical issue.

In the heart of Rome, the eternal city, the first afternoon's plenary session helped to set the scene on the world stage: "Our challenge is to produce more with less, and humans are at the heart of our concern," clarified Frédérique Clusel, General Manager of Phileo Lesaffre Animal Care, opening the symposium.

## A global concern

The Rome Symposium yielded the crucial observation that there is increasing global awareness of the importance of reducing antibiotic use, and the 20 or so international speakers who addressed the event over the two days demonstrated this clearly by their presentations on economic, technical and scientific topics.

On the economic front, the first afternoon's plenary session gave the floor to the Brazilian consultant Osler Desouzart, who emphasised the importance of Asia, and China in particular. "Asia will account for more than half of the increase in global meat production expected by 2026, with China as the driving force," he said.



According to Desouzart, food animal production will face a global shortage of land and water in the future.

"Some 75% of poultry production will be concentrated in 26 countries by 2026," added the Brazilian consultant, who believes it will be possible to produce without antibiotics thanks to advances in science and biotechnology.

"Food safety is a growing concern for the Chinese authorities, who are currently introducing a system to monitor the use of antibiotics," reported Chinese consultant Dr Rongsheng Qiu in a later contribution. According to Dr Qiu, the China Consumers Association has a strong voice in the scientific debate, and farming professionals are increasingly turning to alternatives to antibiotics, especially enzymes, an expanding market in China.

This theme was continued later by American researcher Shawn Bearson, who described the efforts undertaken by the USDA since January 2017 to develop alternatives to antibiotics which promote the animals' immune response and human health. She also stressed the importance of pro- and prebiotics.

## A corporate reality

The Rome Symposium also gave a voice to several companies in the livestock industry and distribution sector for which reducing antibiotic use is an everyday reality.

"Italy is the third largest consumer of antibiotics for farm animals in Europe, and last May Coop Italia started selling its first products from farms wishing to reduce or even eliminate antibiotic use," commented Chiara Faenza, Sustainability and Innovation Manager at Coop Italia, a

leading Italian distribution group representing nearly 19% of the supermarket and hypermarket sector.

## The promise of science

Science was also at the heart of the Rome Symposium, both in the plenary sessions and in the sessions devoted to poultry. The latter were simultaneously interpreted into six languages (English, Italian, Spanish, Mandarin, Russian and French).

"We are only just beginning to learn about the gut microbiota, which is deeply and permanently affected by the use of antibiotics," explained Professor Jan Suchodolski of the USA.

In a very clear and detailed contribution, Professor Elizabeth Santin of the Federal University of Paraná (Brazil) stressed the importance and difficulty of using earlier indicators of digestive health than macroscopic lesions to monitor digestive health in livestock on a scale suited to the field. This is crucial to better assess gut health in poultry and develop a preventive approach, leading to reduced antibiotic use.

## Maintaining gut integrity

The session on poultry began by stressing the importance of a good start to the chick's later performance. "Early feed and water intake after hatching improves the chick's gut development and immune system," explained Erik Helmink, Director of Marketing at the Dutch HatchTech group. His presentation was complemented by that of Aziz Sacranie, Technical Director of Global Poultry Services (UK), who stressed

*Continued on page 33*

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# Poultry scales

Continued from page 31

the importance of the first seven days of a chick's life for its subsequent growth.

Another key factor in reducing antibiotic use is the introduction of effective vaccination management on farms. Dr Sarah Tilley, Director of the Poultry Health Service at Fieldale Farms, one of the largest integrated poultry producers in the United States, shared her experience of good vaccination practice intended to improve animals' resistance to pathogen challenge.

However, Dr Tilley stressed that an effective vaccination plan must be combined with a high level of biosecurity if we are to succeed in using fewer antibiotics in poultry production.

Michael Czarick, Associate Professor at the University of Georgia, USA, explained that 'optimised ventilation management will provide greater comfort for animals and benefit their health'.

Air extraction capacity and heating quality are important to improve ventilation conditions in poultry houses, as are the parameters to be controlled, such as CO2 levels, relative humidity and variations in temperature. Moisture extracted from the building does not end up in the bedding, improving animal comfort and reducing ammonia production.

Maintaining gut integrity was also a key theme of the poultry sessions.

For Spanish poultry consultant Jose



Ignacio Barragan, nutritional strategies help to maintain chicken gut health where antibiotic levels are low or non-existent: check the quantity and quality of soya, check feed energy content, increase crude fibre levels, and use additives such as pre- or probiotics or betaine, which is very effective for intestinal stress.

"Some 70% of the poultry immune system is concentrated in the gut, hence the importance of maintaining gut integrity to ensure good animal performance," explained Alain Riggi, Global Poultry Manager for Phileo, who gave a presentation on the value of Phileo's nutritional solutions (Safmannan, Nucleosaf and Selsaf) in the preventive arsenal against

pathogens, with the key element being rational use of anti-biotics in poultry.

Riggi added that "various trials have demonstrated the effect of Safmannan on the morphology of the intestinal mucosa, improving the ratio of villus height to crypt depth, which is a good indicator of intestinal health."

Riggi also cited the example of Selsaf, a natural source of organic selenium obtained by culturing a specific strain of *Saccharomyces cerevisiae* yeast enriched with selenomethionine and selenocysteine.

"Selsaf protects poultry against oxidative stress thanks to its seleno-active compounds, helping to maintain poultry health and performance," he added. ■

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# Zoonotic pathogens: the current situation in poultry production

Zoonotic pathogens are bacterial, viral, fungal or parasitic agents that cause diseases shared between animals and humans. Infection occurs from the consumption or handling of raw or undercooked poultry products. Infection may also result from direct contact with, or proximity to, live poultry or their environments.

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by **Hailu Kinde,**  
**Professor Emeritus,**  
**University of California, Davis, USA.**

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People may also be infected indirectly through environmental pathways, such as the wind, water, produce contaminated with manure or farming practices.

## Salmonella

*Salmonella enterica* subsp. *enterica* consists of over 2,500 genetically different serovars. In poultry, the host-adapted, non-motile *Salmonella gallinarum* and *Salmonella pullorum* cause fowl typhoid and pullorum disease, respectively.

Paratyphoid is the name given to infections of poultry caused by non-host adapted motile salmonellae. Poultry may be affected by many serovars of paratyphoid salmonella among which *S. typhimurium*, *S. enteritidis*, and *S. heidelberg* are of significant economic and public health significance worldwide.

Paratyphoid salmonella in young chickens causes clinical signs of diarrhoea and dehydration with a high mortality rate. In adult hens, the paratyphoid salmonella does not cause significant clinical signs or death.

However, the organisms will localise in the ovary or oviduct and may result in the contamination of egg contents which constitute a risk to public health. If the transovarial infected egg is fertilised salmonella colonises the reproductive tissues of the chick embryo and reach the next generation, while in the unfertilised table egg, salmonella can multiply in the yolk and infect humans if a raw or undercooked egg is consumed.

Most people infected with salmonella develop diarrhoea, fever, and abdominal cramps 12-72 hours after infection. However, in some people, diarrhoea may be so severe that they require hospitalisation. The illness usually lasts 4-7 days, and most people recover without treatment.

The European Union estimates over 90,000 salmonellosis cases every year; the overall economic burden could be as high as €3 billion a year.

In the US the cost of salmonellosis is estimated at \$11.39 billion annually surpassing the cost of other bacterial foodborne infections and making non-typhoidal salmonella the costliest zoonotic pathogen regarding health outcomes with a loss of \$3.7 billion.

In the European Union in 2015, 21.2% of the human cases of salmonellosis associated with a known food source were linked with eggs and egg products, and 9.2% with broiler meat. Salmonella was most frequently detected in broiler meat (6.5%), turkey meat (4.6%), and table eggs (0.9% in single samples).

*S. infantis*, *S. enteritidis*, and *S. mbandaka* were the most frequent serovars from broilers, accounting for 38.7%, 11.6% and 7.2% of the isolates, respectively.

In laying hens, *S. enteritidis* and *S. typhimurium* were the two most frequently reported serovars accounting for 41.2% and 11.1% of the isolates, respectively.

## Recent outbreaks of human salmonellosis due to *S. enteritidis*

*S. enteritidis* was most frequently reported among the top 20 serovars that caused human salmonellosis in the EU/EEA for the period 2013-2015 representing, 39.5%, 44.4%, and 45.7%, respectively.

In 2015, outbreaks of human salmonellosis due to *S. enteritidis* associated with the consumption of egg and egg products represented 29.3%.

In 2014, an outbreak of salmonellosis associated with eggs from a German producer was linked to *S. enteritidis* phage type 14b in the UK and several other European countries on trace back investigation. Molecular characterisation of the *S. enteritidis* of the outbreak strain

(MLVA profile of 2-11-9-7-4-3-2-8-9), or a single locus variant thereof (the MLVA outbreak profile) from the German producer (eggs, environmental samples), food trace back in several premises were highly similar.

In 2016, a multi-country outbreak of *Salmonella enteritidis* phage type (PT) 8 with multiple locus variable number tandem repeat analysis (MLVA) profiles 2-9-7-3-2 and 2-9-6-3-2, was linked to the consumption of table eggs.

From 1 May 2016 to 24 February 2017, 14 EU/EEA countries have reported 218 confirmed cases belonging to two distinct whole genome sequence (WGS) clusters, and 252 probable cases sharing the *S. enteritidis* MLVA profiles 2-9-7-3-2 or 2-9-6-3-2. Authorities have identified eggs originating from three Polish packing centres as the vehicle of infection.

They have also found 18 *S. enteritidis*-positive laying hen farms in Poland. Most of these farms, as well as the three packing centres, belonged to the same Polish consortium and were considered to be interlinked.

Egg recalls, and trace back investigations following an outbreak of egg associated human salmonellosis can do extensive damage to the brand and the company, affecting future sales. It is very likely that both outbreaks related to table eggs originating from German and Polish layer farms and were a result of a breakdown in biosecurity and hygienic procedures.

A successful biosecurity program has many components. It includes movement control of people and equipment, cleaning and disinfecting as well as securing buildings from pests (rodents/insects) and wild birds. Salmonella free feed, managing moisture of litter and continuous education of staff should be part of the overall biosecurity plan.

## Other zoonotic diseases from direct contact with poultry

### ● Erysipelas

*Erysipelothrix rhusiopathiae* is the causative agent of erysipelas in animals. The disease is seen most commonly in pigs and poultry. In

*Continued on page 37*

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humans it causes a skin rash (erysipeloid). The disease is known to occur regularly in abattoir workers, and there have been many cases associated with poultry plant personnel.

The organism enters most commonly through skin wounds and creates a local infection that may spread to the draining lymph nodes and create a lymphadenopathy.

#### ● **Ornithosis**

Ornithosis, caused by *Chlamydophila psittaci* is an often unapparent infection in more than 400 species of birds, except in turkeys where it is manifested as a mild respiratory infection.

In humans and other birds, the disease may be unapparent because there are several genotypes of *C. psittaci* which tend to infect only certain species and these species-specific genotypes vary in their virulence.

Infection is acquired in turkeys or humans through inhalation of contaminated aerosols. There is a very high rate of human infection, with up to 70% of turkey slaughter plant employees being seropositive.

#### ● **Newcastle disease**

This is another viral disease which has a zoonotic potential, but is much less severe in humans, causing mild conjunctivitis and mostly self-limiting.

Newcastle disease in poultry is classified based on clinical signs and lesions vary in virulence and severity from mild subclinical infections to velogenic strains where mortality approaches 100%.

### **Emerging pathogens with potential transmission through poultry products**

This refers to potential zoonotic pathogens for which transmission through poultry products has not yet been established, or identified as previously emerged or potential emerging hazards to the poultry industry.

These potential zoonotic agents, which may be transmitted through the consumption of poultry products, include *Arcobacter butzleri*, *Clostridium difficile*, *Helicobacter pullorum* and multi-drug-resistant *Staphylococcus aureus* (MRSA) (dermal transmission) (and *Staphylococcus aureus* food poisoning via cross-contamination during food preparation).

Potential zoonotic agents that can be transmitted from direct contact with poultry or handling poultry products are *Erysipelothrix rhusiopathiae*, *Chlamydophila psittaci*, Avian influenza virus, and Avian Paramyxovirus serotype 1.

#### ● ***Arcobacter butzleri***

The genus *Arcobacter* is relatively new and

encompasses a group of organisms formerly known as aerotolerant campylobacter. The genus *Arcobacter* has 25 species with different genetic diversity that are identified from chickens and various domestic animals.

*A. butzleri* is the most prominent of the group and more often associated with persistent, watery diarrhoea than bloody diarrhoea.

*Arcobacter* is an emerging foodborne pathogen causing gastroenteritis, diarrhoea, bacteraemia, endocarditis, and peritonitis and is primarily transmitted to humans through contaminated food and water sources.

*Arcobacter* has never been confirmed to be a zoonotic agent, but the organism was isolated from meats including raw chicken, pork, beef, and lamb, with the highest prevalence among them in chicken.

*Arcobacters* are recoverable from throughout poultry processing plants and are present on birds before evisceration.

Implementing biosecurity measures at the farm, hygienic practices in poultry processing plants, and at home during cooking as well as general awareness about the route of transmission of *arcobacter* will eliminate contamination.

#### ● ***Clostridium difficile***

*Clostridium difficile* has been isolated from the faeces of production animals, retail meats, poultry, seafood, and vegetables.

Some, but not all, molecular studies have found similar strains in humans and animals, suggesting zoonotic transmission or a shared environmental reservoir.

*C. difficile* infection has been recognised as a cause of diarrhoea in patients and persons with no obvious contacts with health facilities or health workers.

Recent studies have demonstrated the isolation of *C. difficile* from foods in the US, Canada, and Europe and meat products intended for consumption by pets.

However, the foodborne transmission of this pathogen to humans through consumption of contaminated products is yet to be established.

#### ● ***Helicobacter pullorum***

*Helicobacter pullorum* is an emerging zoonotic pathogen which commonly causes gastroenteritis in poultry.

The organism is transmitted to humans through the consumption of poultry meat and has been associated with colitis and hepatitis.

*H. pullorum* has been isolated from human diarrhoeal samples with a 6% prevalence rate, and 4.3% prevalence in faecal samples from patients with gastroenteritis compared to clinically healthy individuals.

Variable prevalence rates of *H. pullorum* have been recorded from various parts of the world; 23.5% from fresh chicken meat samples, and 57.1% (free range farm birds) and 100% (broilers, layers, and organic chickens) were infected with *H. pullorum*.

Despite the high prevalence of *H. pullorum* observed in poultry, little is known about the mechanisms by which the bacterium establishes infection in the host and its virulence determinants.

#### ● **MRSA and *Staphylococcus aureus***

*Staphylococcus aureus* is the second most common cause of foodborne diseases worldwide. *S. aureus* may be transmitted to humans from meat products by the handling of contaminated poultry products or by the cross contamination of household surfaces (such as countertops and sinks), which are then touched by family members.

*S. aureus* food poisoning usually causes mild gastroenteritis but, depending on the amount of toxin ingested, the condition resolves within one or two days.

In contrast, invasive methicillin-resistant *Staphylococcus aureus* (MRSA) is a serious and emerging public health threat with potential but unconfirmed foodborne exposure. MRSA can cause skin and wound infections, or illnesses such as pneumonia and septicaemia.

MRSA has been found in broilers, isolated from raw chicken meat or carcasses in Korea and Japan; however, these strains were human-associated and not the livestock-associated strains.

The possibility of human contamination of poultry carcasses by slaughterhouse employees cannot be ruled out, and livestock may become a primary source of community acquired MRSA.

In recent years, livestock-associated *S. aureus* has been recognised as an emerging category of *S. aureus* throughout the world. However, these strains appear to be less likely to cause infections and spread person-to-person than the typical strains.

#### ● **Avian influenza virus**

Avian influenza A viruses do not normally infect people, but sporadic infections in people have occurred with some avian influenza A viruses.

Most infections in humans were caused by high pathogenicity avian influenza virus in The Netherlands (2003) and Asia (1997-2005), and later in Africa and the Middle East.

Contact with live or dead birds, their respiratory secretions, blood, faeces, organs, or their environment is believed to be the primary risk factor for human infection, with a few cases also linked to consuming food made from raw poultry blood.

Avian influenza or look-alike diseases in poultry are promptly reported to the regulatory authorities. The first line of defence is early detection of disease outbreaks followed by a rapid response.

High level of awareness among veterinarians and poultry producers and high-quality veterinary infrastructure is essential for the successful control and eradication of the disease.

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Biosecurity, education, and training of employees are critical for all zoonotic diseases.

## Strategies to control salmonella

To eliminate salmonella contamination in the food-chain, control strategies should focus on the breeding farm, broiler farm, catching and transport, slaughterhouse, retail store and the consumer's kitchen or restaurant.

### ● Biosecurity measures:

The biosecurity program should encompass people movement control, access to shower and changing room facilities for employees and visitors. Personnel should wear clean clothes and use foot baths and exercise personal hygiene. Equipment should not move between different houses. Surfaces of fans, cooling pads, and equipment should be cleaned and disinfected properly. Vegetation around buildings should be removed to discourage rodents and houses should be cleaned and sanitised after each production cycle.

### ● Salmonella-free, day-old-chicks and replacement pullets:

It is essential that the overall biosecurity plan should include a salmonella-free breeding flock. Day old chicks and replacement pullets are obtained from salmonella-free flocks and hatcheries.

The use of an all-in/all-out system for raising birds and appropriate lag times between flocks is essential. The overall management plan should include rodent and insect vector control measures as well as minimise access of wild birds and visitors to the farm.

### ● Salmonella-free water and feed:

The goal of pathogen control in feed should be to ensure that feed contaminants are below a threshold level that will minimise the risk to public and bird health. This can be achieved by following a salmonella monitoring program, good manufacturing practices, and application of intervention strategies such as chemical and physical treatments to control pathogens in feed. The use of competitive exclusion products, mannan-oligosaccharides and organic acids, are proven to reduce colonisation of salmonella in the gut. Drinking water should be appropriately sanitised.

### ● Vaccination

The goal of vaccination in the broiler breeder farms is to reduce the vertical transmission of Salmonella spp. to the hatching progeny and ultimately to reduce the incidence of the organisms being carried into the processing plant.

In order to reduce salmonella shedding and egg contamination, both inactivated

and live vaccines can be used throughout the life of the birds except during the withdrawal period before slaughter.

Vaccination in broilers presents a unique challenge to those that have a short life span (5-6 weeks) as their immune system is not fully developed. There are no registered vaccines available for broilers or turkeys at the moment in the EU.

### ● Farm and farm environment

Flocks should be regularly monitored through environmental samples throughout the production cycle as specified by the regulation. The poultry litter should be managed to reduce the emission of ammonia by modifying the litter pH, and kept dry as much as possible. Studies found that salmonella found on broiler litter was a reliable indication of both flock infection and carcass contamination. Another study revealed that the same salmonella serotypes in litter samples at broiler farms were found on carcasses during processing.

### ● Take prompt action against salmonella when detected:

Determining the source of infection and taking quick action is critical. Flocks at the end of the production cycle are sent for slaughter or destroyed, and potentially contaminated poultry waste should be disposed of safely.

Proper cleaning and disinfection should be carried out; samples for salmonella testing should be performed routinely and ample lag time allowed before the house is restocked again.

### ● At the processing plant:

The flocks to be slaughtered are tested at the farm to determine the status of salmonella. Feed should be withdrawn from birds 8-12 hours before slaughter time to reduce the amount of defecation and contamination of the carcass. It has been shown that salmonella positive broilers result in carcass contamination.

Defeathering, evisceration, scalding and chilling are critical control points of the processing stages where cross contamination may occur.

Insufficient scalding temperature (50-52°C), crop leakage and intestinal content contamination from salmonella positive birds may contribute to carcass and equipment contamination leading to cross contamination of carcasses of subsequent flocks. To prevent cross-contamination, flocks proven to be salmonella negative are slaughtered before those found to be salmonella positive.

Fresh broiler meat is rapidly chilled, and average storage temperature does not allow salmonella outgrowth. Only when temperate abuse above 10°C takes place may salmonella be able to multiply.

### ● At retail and in the consumer's kitchen

Product transport by the consumer and storage temperature at home are critical

points in the food chain. Poultry meat should be separated from other foods, grocery bags, kitchen, and refrigerator.

Under-cooked poultry meat and cross-contamination in the kitchen/restaurants are the two venues that the consumer can acquire salmonella infection from contaminated broiler meat.

Thus the preventive measure to avoid infection in humans in the kitchen should include proper storage conditions and to adequately cook products.

Basic hygienic exercises such as washing hands, kitchen work surfaces, cutting boards and utensils with soap and hot water immediately after they have been in contact with raw meat or poultry before and between handling different food items will reduce contamination. Raw poultry should not be rinsed in the sink as it allows bacteria to spread. Bacteria in raw poultry can only be killed when cooked to a safe internal temperature (74°C).

### ● Table eggs

At the farm, crates that are used to transport shell eggs should be thoroughly washed and sanitised. Eggs as soon as they are laid should be refrigerated to lower internal temperature to 7.2°C or lower to prevent *S. enteritidis* multiplication from potentially infected flocks.

At home table eggs should always be refrigerated and any cracked and dirty eggs discarded. After handling eggs wash hands and utensils with soap and water. Avoid eating raw eggs (as in homemade ice cream).

### ● Staff education – preparing food

Kitchen staff should be required to wear disposable gloves, aprons, and headwear to protect food from outside contaminants.

Foods should be prepared on clean, separate surfaces to prevent cross-contamination. Staff should wash their hands thoroughly, especially before and after handling raw foods. Sick employees should be given ample time to recover before handling foods again.

### ● Legislation

Keeping the food supply free of salmonella is a shared responsibility of farmers, slaughterhouses, veterinarians but also the government and the consumers. The success factors in the EU that are attributed to the reduction of salmonella in broiler meat and table eggs, and consequently in human salmonellosis, are a result of the EU Regulations (Directives 2160/2003 and 1168/2006).

These regulations played a pivotal role to require monitoring for *S. enteritidis* and *S. typhimurium*, initially of breeder and layer flocks and eventually also of broilers and turkeys. ■

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References are available  
from the author on request

## Feed value of insect based protein

In this Turkish review (Kahram. Sütçü İmam Üniv. Doga Bili. Dergisi 19 272-278) the nutrient content of insect based protein sources, digestibility, functional features and possibilities of using in poultry nutrition are discussed.

Today, it is impossible to meet the nutrient requirements of broilers and table egg layers to reach maximum genetic potential with low quality feed ingredients. We need to find new protein

sources with essential amino acid content and high digestibility.

Scientific studies have shown that methionine, lysine and cysteine contents of black soldier fly, common housefly and meal worm were less than fish meal, but the amino acid profile of these three was close to fish meal.

Insect protein sources can be used in poultry feeds but insect production areas provide a potential source of microbial contamination.

Feeds of insect origin can contain toxins that can have allergic and toxic effects in animals.

## Egg quality and storage temperatures

This Chinese study (An. Nut. 1 299-304) was undertaken to assess the effects of various dietary protein sources (soybean meal, cottonseed protein and double-zero rapeseed meal) on the internal quality of eggs stored at 4°C or 28°C.

It was found that the eggs derived from birds fed the diet containing the rapeseed meal had a lower egg quality than the other two when stored at both temperatures. Lower Haugh unit values were observed in eggs from the rapeseed fed birds and birds fed rapeseed meal and 50:50 soybean and rapeseed meals.

Yolk breakage occurred in eggs from the hens given feed containing rape seed only.

The overall results indicated that hens given feeds containing solely either cotton seed protein or rapeseed meal may produce eggs whose quality is adversely affected following storage, but half replacement of the cottonseed protein by soybean may keep egg quality similar to those fed 100% soybean meal.

## Feed form and particle size

Reducing production costs in broilers is key if profitability is to be maximised and therefore issues such as feed form and particle size have assumed importance. Recent studies have also indicated that broiler performance, gut development and nutrient digestibility benefit from providing a pelleted feed.

Feeding pellets promotes feed consumption and improves FCR. It also avoids segregation of feed ingredients and feed wastage. On the other hand, where increasing particle size stimulates gizzard development, finer grinding increases the contact surface between feed and digestive enzymes in the gut. This Bulgarian review (Ziraat Fak. Dergisi, Ulud. Üniv. 30 185-191) evaluates the effects of feed form and particle size on digestive tract development, nutrient digestibility and broiler performance.

## Transgenic soybean meal in broilers

This American study (Poult. Sci. 96 1244-1249) was undertaken to assess the nutritional and safety equivalence of transgenic (DAS-44406-6) and non-transgenic soybean in broilers.

The comprehensive results indicated that transgenic and non-transgenic soybeans are nutritionally equivalent.

## In ovo dextrin-iodinated casein

This American study (Poult. Sci. 96 1478-1484) was undertaken using a commercial Inovoject system to evaluate the effects of in ovo feeding of dextrin and iodinated casein on hatch and post hatch growth in broilers from eggs injected at 18.5 days of incubation. It was concluded that eggs that had been given dextrin + iodinated casein in ovo after 18.5 days of incubation had potentially improved chick quality and post hatch weights by delaying or narrowing the hatch window.



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## L- tryptophan and stress

Stress is a critical factor for gastrointestinal diseases. However, we know little about nutritional strategies to attenuate stress induced intestinal barrier function and the underlying mechanisms.

This Chinese study (**Amino Acids 49 1227-1236**) tested the hypothesis that L-tryptophan enhances intestinal barrier function by regulating mucosal serotonin metabolism in broilers exposed to chronic unpredictable stress. This was done by feeding day old male broilers a basal diet with or without supplemented L-tryptophan in the presence or absence of chronic unpredictable stress.

Stress exposure led to elevated plasma corticosterone, increased intestinal permeability, reduced growth and reduced secretion of mucosal secretory IgA and these effects were largely reversed by the supplemental L-tryptophan. Western blot analysis showed that stress exposure resulted in decreased protein amounts for occludin, claudin-1 and ZO-1 which was attenuated by L-tryptophan. The mRNA levels for *IL-1 $\beta$* , *IL-6* and *TNF- $\alpha$*  were increased, but those for *IL-10* were decreased in the jejunal tissue of the stressed broilers. This effect of stress on cytokine expression was abolished by the supplemental L-tryptophan.

The effects of stress were associated with decreased 5-hydroxytryptamine and reduced mRNA levels for tryptophan hydroxylase 1 and tryptophan supplementation greatly reduced these two stress related substances in jejunal tissues. Collectively these results indicate that L-tryptophan supplementation alleviates chronic unpredictable stress induced intestinal barrier dysfunction by regulating 5-hydroxytryptamine metabolism in the broiler.

### Anion-cation balance in chicks

This Iranian study (**Iran. J. of An. Sci. 48 21-28**) was undertaken to assess the effects of dietary cation-anion balance in the chick's first 10 days of life on performance, tibia bone mineralisation, serum electrolyte levels and intestinal morphology.

The treatments used were 150, 200, 250, 300 and 350 mEq per kg of dietary cation-anion balance.

Feeding birds at the highest level significantly reduced body weight and weight gain during starter and grower periods with concurrent decreasing of feed intake and worsening of FCR.

There was no effect on serum electrolytes.

Reducing dietary cation-anion balance to <300 mEq per kg reduced phosphorus and calcium content at 21 and 42 days of age respectively.

It was concluded that maintaining cation-anion balance during the starter period between 200 and 300 mEq per kg feed was very important if subsequent optimal performance was to be achieved.

### Turkeys and xylanase

This British trial (**An. Feed Sci. and Tech. 229 117-123**) was undertaken to evaluate the effect of xylanase on performance, nitrogen corrected apparent metabolisable energy (AMEn), relative gastrointestinal weights, caecal fermentation and gut microflora profiles of turkeys fed wheat-barley-rye based diets.

It was found that xylanase supplementation improved performance, probably from a better utilisation of dietary energy and the provision of oligosaccharides which specifically encourage proliferation of specific bacterial populations in the caeca.

### Mannan oligosaccharides

This Chinese study (**China Poult. 39 34-37**) studied the effects of mannan oligosaccharides (MOS) on growth performance and mechanisms in broilers. The results are summarised in the table below. It was concluded that MOS had positive effects and the best dose to use was 50mg per kg feed.

MOS supplementation (mg per kg feed)	25	50	75
Feed intake increase over first 21 days (%)	5.04	9.74	20.32
Increase in 21 day liveweight (%)	2.17	15.78	21.99
FCR improvement (%)	–	5.23	1.46

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## Gross lesions of H5N1 HPAI in ducks

In severely affected ducks the gross lesions often seen are those of dehydration, empty digestive tract, enlarged spleen, thymus atrophy and a flaccid heart with excess of fluid in the pericardial sac, pinpoint necrosis in the pancreas, air sacculitis and congestion of a malacic brain.

## Histopathological lesions

The following microscopical lesions are often found in ducks infected with H5N1 HPAI:

- Mild/moderate localised mononuclear cell inflammation of the respiratory tract from the turbinate to the lungs
- Randomly scattered foci of malacia and gliosis accompanied by perivascular cuffing and oedema
- Severe swelling and necrosis of the pancreatic acinar epithelium
- Degeneration of adrenal corticotrophin and chromaffin cells
- Degeneration of individual myofibrils in skeletal and cardiac muscles
- A moderately severe proventriculitis
- A moderately severe lymphoid cell depletion in bursa of Fabricius and thymus
- Mild inflammatory changes in the intestinal mucosa

Viral antigen has been found in many tissues of the duck by staining methods.

H5N1 HPAI virus shedding is primarily by the oropharyngeal route.

## Species effects

In both wild and domestic ducks, the species of duck has been shown to influence the outcome of HPAI H5N1 infection – with some species being more likely to show clinical signs and higher mortality. Muscovy ducks often show a more severe picture.

## Age effects

The age of the duck significantly affects the outcome of H5N1 HPAI infection.

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## First China Tech school

A variety of open forums and field sessions recently brought together operations employees from Cargill's five regions across the world at the first Cobb-sponsored technical school in China.

The week-long event was held at Shanghai and Chuzhou in eastern China. Organisers expect the school to become an annual event aimed at sharing knowledge between the two companies.

David Johnson, agriculture director



of Cargill Meats Canada, said that Cobb had been selected as Cargill's preferred supplier earlier this year.

"This school aims to bring all the Cargill operations together in the same room so we can all learn from Cobb and, equally importantly, learn from each other's experiences," he told International Poultry Production.

"We thank Cobb for organising the school and sharing with us their expertise in poultry production."

"This event helps benchmark performance from these different Cargill regions," added Pelayo Casanovas, general manager for Cobb Asia Pacific.

"It shows the potential performance of the Cobb500 in different parts of the world and highlights the key factors and management practices that make specific operations so successful."

[cobb-vantress.com](http://cobb-vantress.com)



Eagle Vet Tech Co Ltd's Injectable Solution Line (SVP) has been inspected by the German Authority (BGV) and been awarded the EU GMP Certificate. This is the first time it has been awarded in Korea. Eagle Vet is one of the leading manufacturers and exporters of animal health products in Korea. Its injectable solutions, powders, oral liquid, tablet and feed additives are exported to more than 20 countries. Eagle Vet is now ready to diversify markets, including the EU, to supply quality products.

[eaglevet.com](http://eaglevet.com)

## Award for good managers

Natural Remedies continues to add more accolades by receiving the prestigious 'Companies with Great Managers Award'. This award is given to an organisation with the highest aggregate score in assessment done by an external agency across participating organisations in India.

The award ceremony was held in Mumbai and hosted by People Business and Economic Times with 'ET Now'. Anurag Agarwal, CEO & MD of Natural Remedies along with K. N. Reddy, AVP – Sales, received the award on behalf of the organisation.

Natural Remedies is the first organisation in the Indian animal health care sector to receive this honour.

[naturalremedy.com](http://naturalremedy.com)



## Benefits of feeding insects for broilers

Given the increasing demand for poultry meat worldwide, the search for sustainable feed ingredients is urgent. There is growing awareness of the potential contribution of insects as livestock feed to the sustainability of meat production, but facts are lacking at this moment.

A research project will begin in spring 2018, in which researchers and industry join forces to assess the sustainability of feeding insect larvae to broilers.

The Adaptation Physiology, Animal Production Systems, Entomology

and Animal Nutrition groups will conduct the research using a unique, multidisciplinary approach.

The project will focus on the environmental and welfare effects of providing black soldier fly larvae (a non-harmful insect) to chickens and, for the first time, will assess a complete nutrient balance of insects that grow on different waste streams. The project is subsidised by division Applied and Engineering Sciences (TTW) of the Netherlands Organisation of Scientific Research (NWO). In addition, ForFarmers NV, HatchTech BV and Bestico BV have invested in the project.

[wur.nl](http://wur.nl)

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 Pictured at the recent Poultry Africa Leadership Conference with co-chairs Nigel Horrox (centre) and Nduta Mbutia (far left), are six of the seven speakers from the WVPA sessions organised by International Poultry Production. The event was hosted by VNU in Kigali, Rwanda and attracted over 100 senior poultry industry people from across east Africa and further afield.

[positiveaction.co.uk](http://positiveaction.co.uk)

## Breakthrough for turkeys



The drive to market the UK's premium traditional turkey in the United States has taken a major step forward with the granting of a full USDA licence for the Kelly-Bronze processing plant in Virginia. The USDA licence allows Kelly-Bronze turkeys to be sold throughout the US. Until now turkeys from the Crozet plant have only been allowed to retail in the state of Virginia.

Last year the plant was given a provisional licence subject to all the food safety checks and micro work being favourable.

The dry processing surpassed all

expectations and the USDA granted full approval.

"The USDA has been very helpful and has had to make many waivers to allow the dry plucking and hanging process to get USDA approval," Paul Kelly, managing director of Kelly Turkeys, told International Poultry Production. His friend and partner in the business, Judd Culver, spent a huge amount of time and effort to achieve this status.

The facility at Crozet has become the only plant officially licensed in the US to dry pluck and hang turkeys in the way that traditional turkeys are prepared in the UK.

[kellyturkeys.com](http://kellyturkeys.com)

### A full spectrum demonstration



Once Inc (ONCE), developer of animal-centric lighting systems and agricultural-specific technologies, will display animal welfare-friendly lighting solutions for some of the industry's biggest challenges at IPPE in Atlanta in January.

Their full spectrum applications are shown to improve feed conversion rates, reduce mortality and floor eggs, strengthen biosecurity programs and provide a return on investment for all parties.

"We know how important it is to effectively and economically solve the issues driving down profits, while keeping animal welfare in mind," Andrew Flemming, vice president of sales and marketing at ONCE, told International Poultry Production. "We apply full spectrum lighting with photo-biology and optogenetics to influence biological processes in animals, allowing us to naturally optimise results."

"With our new jungle green light spectrum shown to improve feed conversion by replicating a birds' natural habitat and ultraviolet A and

C benefiting poultry health and strengthening biosecurity protocols, there is a solution for everyone."

[once.group](http://once.group)

### Award for Natural Remedies



Natural Remedies has received the 'Best Asian Healthcare Brands of 2017' Award by The Economic Times for excellence in the healthcare sector.

The award ceremony was held in

Dubai as part of India-UAE Strategic Conclave, under the patronage of H. E. Sheikh Nahyan Bin Mubarak Al Nahyan, UAE's Minister of Culture and Knowledge Development.

Vrajesh Jha, GM Marketing Natural Remedies received the award on behalf of the organisation from Navdeep Singh Suri, Indian Ambassador to UAE.

Headquartered at Bangalore, Natural Remedies manufacture and market herbal veterinary products which are scientifically validated, effective, safe and consistent.

[naturalremedy.com](http://naturalremedy.com)



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## In-feed analysis demand



In response to a marked increase in customer requests for in-feed analysis, AB Vista's US laboratory team has relocated to larger facilities in Fort Lauderdale, Florida, close to the AB Vista US regional office.

"Being able to test for correct enzyme dosage and activity is an important part of quality control and assurance procedures," Dr Hadden Graham, AB Vista's Services Director, told International Poultry Production. "This maximises the effectiveness and quality of feed, and ensures consistent animal production. Failure to achieve this can result in significant reductions in animal performance, and subsequent financial loss."

The new facility will mean that AB Vista can provide customers with swift and accurate test results,

ensuring that they, in turn, deliver a quality-assured product to their partners. The ongoing investment in AB Vista's laboratory capabilities and service delivery will mean the company can continue to support its customers in ensuring feeds contain the desired enzyme activity.

This investment includes a robotic system developed to exploit AB Vista's enzyme-linked immunosorbent assays, reducing turnaround time in measuring activity for Quantum Blue phytase and Econase XT xylanase.

The robotic system has been rolled out across AB Vista's laboratories, while additional methodologies include the QuickStix lateral-flow assay for rapid qualitative detection and the QuantiPlate micro-titre well kit for accurate quantification of enzyme activity levels.

[abvista.com](http://abvista.com)



COBOT are to work with Vencomatic BV on the sale of their automatic palletiser M'eggbot. With Vencomatic's extensive dealer network, global coverage will be achieved. The sale of the M'eggbot in the Netherlands will continue to be provided by COBOT Automation. The addition to the sales program is aimed at further automation of egg collection and packing in poultry farms with a processing capacity of up to 30,000 eggs per hour. In combination with the Prinzen packer type PSPC30 and Smartpack, the M'eggbot offers automatic loading of pallets. The system uses the standard plastic tray, divider and pallet. For poultry farmers, the system offers not only labour savings but also a pleasant working environment for the daily task of egg collection. This, in return, contributes to safe transportation of eggs to the consumer.

[vencomaticgroup.com](http://vencomaticgroup.com)

### New Impex plant in Germany



Water is the most precious nutrient for all living creatures. Spilling of it is a loss and may cause serious problems. Therefore the Dutch nipple maker Impex puts a lot of effort into the production of high quality leakage free drinkers for livestock.

With the inauguration of a new factory near Frankfurt, Germany, the company expects to be ready for a sustainable future. This top notch production facility in Aulenhäusen replaces the old Neher factory.

With an investment of more than €20 million, Impex has now one of the most modern and sustainable drinker production plants in the world. Here, it produces more than 30 million pig and poultry drinkers annually.

[impex.nl](http://impex.nl)

based on an extensive knowledge about the *S. c. bouardii* CNCM I-1079 mode of action and its positive effects in the digestive tract, in particular its unique properties supporting a balanced intestinal microbiota and reinforcing natural defences.

Levucell SB offers a new and efficient tool to the poultry industry players that have to implement strict prevention procedures from farm to slaughterhouse and food processing steps.

[lallemand.com](http://lallemand.com)

### Feed additive optimised



Berg + Schmidt has re-focused its phospholipid product group with the re-formulation of the highly concentrated phospholipid complexes sold under the name 'BergaPur' based on the latest research results.

The company has created a natural feed additive designed to improve both the biological performance and the production process in modern feeding strategies.

BergaPur is a high-quality, readily digestible phospholipid complex in powder form, produced by deoiling crude lecithin. In animal nutrition, the addition of phospholipids to the feed eases the process of diges-

tion in the small intestine and ensures a supply of choline, inositol, essential fatty acids and phosphorus. In the production process BergaPur acts as a lubricant, thus increasing the throughput of pellet presses and extruders and reducing abrasion. Furthermore, BergaPur prolongs the shelf life of the feed and improves its stability.

International research findings confirm the positive effect of BergaPur on animal performance and vitality. It is consistent implementation of these results that forms the basis of the innovative BergaPur product line.

[berg-schmidt.de](http://berg-schmidt.de)

### Probiotic feed additive authorised



Lallemand Animal Nutrition's live yeast probiotic strain *Saccharomyces cerevisiae bouardii* CNCM I-1079 (Levucell SB) is the first and only feed additive authorised in the European Union (EU) for the reduction of carcass contamination by *Salmonella* spp. in broiler chickens. This regulatory breakthrough is



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## Nutriad partnerships in Brazil



Nutriad has entered into strategic partnerships with the leading universities in Brazil: Federal University of Minas Gerais (UFMG), Federal University of Goiânia (UFG) and State University of Londrina (UEL).

These agreements allow the science based company to evaluate its product portfolio under tropical circumstances, develop new technologies and seek new applications and solutions to the day-to-day challenges across species.

"Testing our feed additive solutions in different geographies and ensuring their efficacy under different climatological conditions is a strategic focus for Nutriad," Erik Visser, Nutriad CEO, told International Poultry Production.

Current research includes flavours, organic acids and essential oils for application in poultry. Other planned research will focus on products from Nutriad's Digestive Performance platform, such as Adimix Precision and Apex 5.

Specifically, the company will review data on the efficiency of these products to replace antibiotic growth promoters and impact on weight gain and feed conversion.

[nutriad.com](http://nutriad.com)

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Biomin has further expanded its capacity to serve clients in the fast-growing Chinese market and internationally with the opening of a production plant in Wuxi, Jiangsu Province, in China. The latest addition to the firm's global production network encompasses a 5,600m<sup>2</sup> building featuring offices, a warehouse and laboratory designed to provide both quality control and analytical services for customers. The facility has two automated acidifier production lines with a total installed capacity of 32,000 tons per year, and four packing lines. The configuration will produce five products within the Biotronic product line, a family of enhanced acidifiers. Another automated production line with installed capacity of 32,000 tons per year produces the firm's leading mycotoxin-deactivating feed additive, Mycofix.

biomin.com

## Show enriched for 2018

VIV MEA was launched in 2016 as a biennial hub dedicated to serving animal protein providers from the Middle East and Africa to Iran, the countries of the Indian sub-continent and Turkey. In 2018 it returns to Abu Dhabi, the capital of the United Arab Emirates, between 5th-7th February.

Visitors can expect an even richer experience at this second edition, which has expanded into an extra hall at the Abu Dhabi national exhibition centre (ADNEC) to accommodate more exhibitors.

Looking back to that first edition, VIV MEA 2016 exceeded expectations by receiving an audited total of 6,243 visits by people from 109 countries to see the exhibits of 279 companies.

A provisional exhibitor list already contains the names of animal protein industry suppliers and organisations from no fewer than 42 countries.

Notably, the global players in feed, equipment, genetics and animal health are joined this time by nearly 30 companies that have their headquarters in the Middle East, including six from the UAE.

Provisionally, there will be about

40 exhibitors from The Netherlands and over 20 from Italy. Other places with high numbers include France, Spain and China, each contributing 17 exhibitors, while Turkey supplies 15 and both Belgium and India provide 12.

There will also be a full programme of conferences arranged by VIV worldwide in association with numerous industry organisations, covering all animal protein sectors except pork.

"We are determined that the 2018 edition of VIV MEA in Abu Dhabi will build on the great start achieved by the event in 2016," Renate Wiendels, VIV MEA show manager, told International Poultry Production.

"In fact we are forecasting an increase to 8,000 for the number of visits in February, which would mean 28% more than last time. With the purpose of bringing the top people in the industry to Abu Dhabi, at the heart of the Middle-East/North Africa (MENA) region, we have been developing tailor-made programmes to welcome targeted delegations from key countries regionally such as Saudi Arabia, India, Indonesia, as well as Morocco, Iran and Egypt."

vivmea.nl



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Dr. Theresia Lavergne,  
Technical Services Manager – Monogastric,  
Arm & Hammer Animal Nutrition



The Refined Functional Carbohydrates™ (RFCs) found in CELMANAX™ have many benefits, not the least of which is helping to improve bird health. In turn, healthier birds are more efficient at converting feed into gain.

As you may recall, RFCs are the components harvested from yeast cell walls (*S. cerevisiae*) using specific enzymes during a proprietary manufacturing process. This enzymatic hydrolysis yields MOS (Mannan Oligosaccharides), Beta 1.3-1.6 glucans and D-Mannose – all of which are readily bioavailable in CELMANAX due to this proprietary process.

### TURKEY RESULTS

A recent trial examined the effects of CELMANAX SCP on turkey poult performance when they were placed in stressful production environments. During the trial, 204-day-old male turkey poults were distributed in completely randomised replicated pens/treatments.

Treatments included:

- Control (no supplementation).
- CELMANAX SCP (100g/MT) fed continuously.
- CELMANAX SCP (200g/MT) fed only during first week of placement and for a week encompassing each period of transport stress.
- All poults were transported at weeks six, 12 and 16 to mimic industry practice. During weeks of transport, on alternate days, birds were exposed to an environmental challenge of *E. coli* to emulate field conditions.

After analysing the data, researchers found that continuous and intermittent feeding of CELMANAX SCP improved feed efficiency (FE) by 21 and 36 points, respectively; the intermittent feeding significantly improved FE ( $P=0.01$ ) as shown in Fig. 1.

One point to note. In North America, feed efficiency is calculated by dividing feed intake by weight gain. The lower the number, the more efficient the flock in using the feed supplied. In some European countries, feed efficiency is calculated as weight gain divided by feed intake. In that instance, higher numbers represent a more efficient feed conversion. Results shown here reflect North American feed efficiency values.

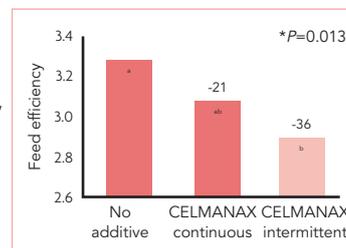


Fig. 1. Effect on feed efficiency (\*<sup>ab</sup> superscripts differing indicate significant difference ( $P<0.05$ )).

### OVERCOMING BROILER CHALLENGES

Additional trials explored how CELMANAX helped broilers improve performance in the face of health and environmental challenges, as well. In this instance, the researchers examined the effects of clean water, mycotoxins and coccidia, as well as CELMANAX SCP (50g/MT), on broilers. The basal diet contained on average 50ppb aflatoxin, 0.4ppm DON and 2.7ppm fumonisin, and treatments included new or used litter, clean or unchanged water and diets that did or did not include a coccidiostat.

Researchers found that:

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

References available on request

To learn more, visit [www.AHAnimalNutrition.com](http://www.AHAnimalNutrition.com)

## APPOINTMENTS

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## Creativity and change



Indian River recently hosted its 7th annual Association meeting in Hong Kong. The Indian River Association continues to attract owners and senior managers from Asia, Middle East and Africa customer companies as it grows and expands its base to 17 countries with an experienced team and excellent breeder and broiler performance package.

The two-day association program gave managers the opportunity to reflect on the past year, compare experiences with other customers and listen to a variety of topics that are important in the current and future poultry industry.

The role of energy and amino acid sources in poultry performance was delivered by a speaker from the US Soybean Export Council and a brand strategist spoke on branding with a focus on retail, proposing 10 key drivers for strong branding. The meeting also covered market share as a key to profitability in the Japanese poultry industry.

The internal speakers presented a review of Aviagen growth, business development and success, an influenza disease update, the financial impact of decision making in poultry production, Middle East and Africa update and an in-depth presentation on genetic developments. [aviagen.com](http://aviagen.com)

### Antioxidant protection



Kemin Industries has been granted a patent for its antioxidant formulation technology which is the basis for the Paradigmox antioxidant brand.

“With the partial suspension of ethoxyquin in European markets, our patent for ethoxyquin-free antioxidant formulation technology is a clear demonstration of the company’s commitment to anticipating trends and innovating valuable solutions for the global feed industry,” Tom Verleyen, Marketing Director for Animal Nutrition and Health, EMEA, told International Poultry Production.

Paradigmox, which uses the novel antioxidant formulation technology, has been available to animal feed for several years. The flagship solution provides equal efficacy to ethoxyquin in diverse feed applications. To ensure the efficacy of their solutions, Kemin offers in-depth technical service expertise.

[kemin.com](http://kemin.com)

### Japan distributor for Agromed



Agromed Austria has signed a distribution agreement with Japan Nutrition (JNC), under which they will actively market OptiCell to the livestock industry in Japan.

“There is significant market potential for OptiCell products in Japan and JNC is a strong local partner for the Japanese market,” Helmut Grabherr, CEO of Agromed, told International Poultry Production.

“With their established distribution network and excellent reputation in the industry, we believe JNC can help us achieve impressive business growth in the Japanese market.”

OptiCell is a natural lignocellulose product which offers proven performance benefits at a cost comparable to other fibre sources. With a well-balanced combination of fermentable and insoluble fibre contents, OptiCell is well recognised as a valuable, high density dietary component for modern feed programmes.

[agromed.at](http://agromed.at)

### IPPE

30th January - 1st February  
Atlanta, Georgia, USA  
[www.ippexpo.org](http://www.ippexpo.org)

### VIV MEA

5-7th February  
Abu Dhabi, UAE  
[www.vivmea.nl](http://www.vivmea.nl)

### Ildex Vietnam

14-16th March  
Ho Chi Minh City, Vietnam  
[www.ildex.com](http://www.ildex.com)

### Poultry Focus Asia

21-23rd March  
Bangkok, Thailand  
[www.positiveaction.co.uk](http://www.positiveaction.co.uk)

### Victam Asia

27-29th March  
Bangkok, Thailand  
[www.victamasias.com](http://www.victamasias.com)

### Livestock Asia Expo and Forum

19-21st April  
Kuala Lumpur, Malaysia  
[www.livestockasia.com](http://www.livestockasia.com)

### Pig & Poultry Fair

15-16th May  
Stoneleigh, UK  
[www.pigandpoultry.org.uk](http://www.pigandpoultry.org.uk)

### PIX/AMC

3-5th June  
Brisbane, Australia  
[www.pixamc.com.au](http://www.pixamc.com.au)

### 6th Mediterranean Poultry Summit

18-20th June  
Turin, Italy  
[www.ppsa.com](http://www.ppsa.com)

### Broiler Health 2018

19th June  
Utrecht, The Netherlands  
[www.positiveaction.co.uk](http://www.positiveaction.co.uk)

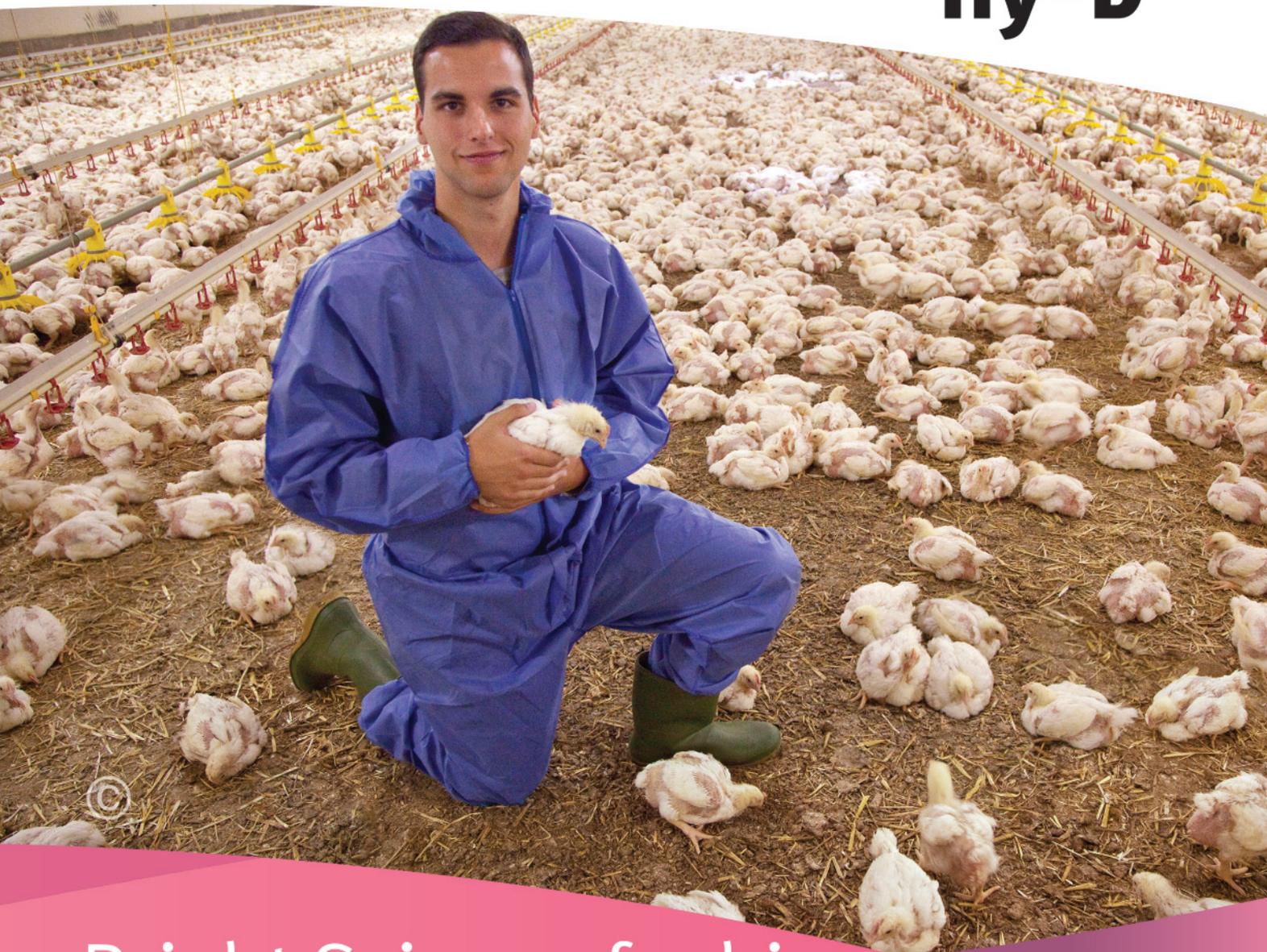
### VIV Europe

20-22nd June  
Utrecht, The Netherlands  
[www.viveurope.nl](http://www.viveurope.nl)

### Dairy, Livestock & Poultry Expo

20-22nd June  
Nairobi, Kenya  
[www.dlpxpo.com/africa](http://www.dlpxpo.com/africa)

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