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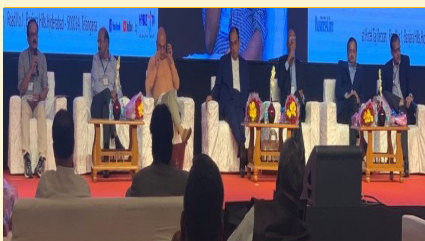
October 2021

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Evaluating Protease Enzymes

GROWING MANAGEMENT OF COMMERCIAL PULLETS



Multiple Mycotoxins and the Indian Poultry Industry



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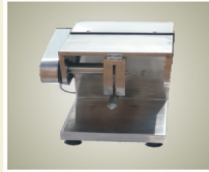
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The Rs1.50 lakh crore Indian poultry industry asked the Centre to set up a body like MPEDA to boost its exports

Productive and profitable layers begin with good quality pullets. Having the correct body weight and body type at the start of egg production will enable pullets to achieve their genetic potential.



Dear Readers,

The October 2021 issue of **Poultry Fortune** is in your hands.

In the News section, you may find news about –

The Compound Livestock Feed

Manufacturers Association of India predicts 6.09% growth for the domestic feed sector between 2019 and 2025, regardless of the second wave of Covid-19 and the soaring prices of raw materials. India's animal feed market is expected to grow at a compound annual growth rate of 6.09% over the forecast period to reach a market size of US\$ 16.653 billion in 2025 from US\$ 11.677 billion in 2019, according to Mr Neeraj Kumar Srivastava, Chairman, CLFMA.

The poultry industry, with a size of over Rs1.50 lakh crore, has asked the Centre to set up a body on the lines of MPEDA (Marine Products Exports Development Authority) for poultry industry to boost its exports. MPEDA has worked hard and was instrumental for the large export of Shrimps and other species in aquaculture sector.

Central Poultry Development Organization & Training Institute under Government of India, Ministry of Fisheries, Animal Husbandry & Dairying, a premier Institute located at Hessarghatta, Bengaluru organized a one day online discussion forum – on Trends in Poultry Health, Season-2 organized by CPDO&TI in association with Indian Federation of Animal Health Companies on September 16.

Natural is future 2.0 is a webinar series organized by Natural Remedies Pvt Ltd where they invited eminent speakers across the globe to share their thoughts on the most relevant

topics of the animal health industry. Dr Sudheer B. Rukadikar, Veterinary Pathologist and Poultry Health Consultant and Dr Chandan Chatterjee, Group Product Manager at Natural Remedies Pvt Ltd, discussed on understanding and providing practical solutions to the respiratory challenges in poultry faced during high humidity conditions.

Aviagen India recently launched a new App giving its Ross customers throughout the country instant and easy access to the latest Parent Stock (PS) and broiler management information along with other beneficial reference and monitoring tools. Ferry Monné joined Aviagen India as Head of Sales and Marketing. In an ongoing effort to strengthen service to customers and drive the growth of the increasingly popular Ross 308 AP broiler breeder, the company has appointed Mr Ferry Monné as Head of Sales and Marketing, effective on September 1. Ferry will report to Marc Scott, Aviagen India Business Manager.

In the Articles section -- Article titled **Growing Management of Commercial Pullets**, written by Team Hy-Line International highlighted that Productive and profitable layers begin with good quality pullets. Having the correct body weight and body type at the start of egg production will enable pullets to achieve their genetic potential. Problems that develop during the growing period cannot be corrected after the egg production begins. This paper will highlight the components of a good pullet development program.

Another article titled **Evaluating Protease Enzymes**, written by Dr Koushik De highlighted that it's very important to optimise the commercial value from adding enzymes in feed. The more accurate feed formulation, the more consistent response from the enzyme. Measuring values of enzyme in commercial units can be done in a controlled way. One principle to bear in mind that good enzyme always works.



Poultry Fortune

Our Mission

Poultry Fortune will strive to be the reliable source of information to poultry industry in India.

PF will give its opinion and suggest the industry what is needed in the interest of the stakeholders of the industry.

PF will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

PF will recognize the efforts and contribution of individuals, institutions and organizations for the development of poultry industry in the country through annual Awards presentation.

PF will strive to maintain quality and standards at all times.

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The other article titled **Multiple Mycotoxins and the Indian Poultry Industry**, written by Dr S. K. Maini of Vesper Group highlighted that Mycotoxins are the secondary metabolites of a variety of fungi like the Fusarium, Penicillium etc. Multiple mycotoxins can generate additive or synergistic effect, interfere in nutrients digestion, absorption, assimilation and metabolism, cause damage to the Intestinal tract and disturb the normal microbiota of the intestine, all causing negative impact on the bird's performance.

Article titled **Going for growth; improving healthy broiler performance from week two onwards**, written by Dr Ceinwen Evans, Global Technical Services Manager, Danisco Animal Nutrition, highlighted that research has shown that achieving maximum degradation of phytase is also a key factor in the release of 'extra- phosphoric' nutrients (for example amino acids and energy). Spore forming probiotics such as Bacillus spp are particularly favoured for inclusion in animal feed because of their proven stability in feed production and through the digestive process. Feed additive science will continue to offer producers new opportunities to develop larger, more healthy and uniform birds in less time and at a lower cost.

Another article titled **Selection of Organic Trace Minerals** play an important role in the body. Though required only in small quantities as compared to other nutrients, their deficiency may cause poor health and impaired performance. A trace mineral efficiency in the diet can reduce production efficiencies by 20 - 30%. As a result, trace element supplementation in animal diets has long been used to ensure rapid development, enhanced reproductive health and improved immune response.

Over the years trace elements have been supplemented in animal feeds as inorganic salts such as sulphates and chlorides. However, the bioavailability of trace elements from these inorganic sources is relatively lower than that of minerals from feed and fodder sources (Spears., 2003). Recent studies in mineral research indicate that absorption and utilization of trace elements is higher if they are supplemented in an organic form.

Readers are invited to send their views and comments on the news, special feature and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of poultry sector. Keep reading the magazine *Poultry Fortune* regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
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India's Feed Sector to Grow 6% by 2025; Industry Monitoring Evolving COVID-19 Situation



Neeraj Kumar Srivastava,
Chairman, CLFMA

The Compound Livestock Feed Manufacturers Association of India (CLFMA) predicts 6.09% growth for the domestic feed sector between 2019 and 2025, regardless of the second wave of COVID-19 and the soaring prices of raw materials. "India's animal feed market is expected to grow at a compound annual growth rate of 6.09% over the forecast period to reach a market size of US\$16.653 billion in 2025 from US\$11.677 billion in 2019", Mr Neeraj Kumar Srivastava, chairman at CLFMA, told Feedinfo. "We expect to achieve pre-covid feed demand and feed production levels by the end of FY22 only and this is very much dependent upon the recovery of B2B sales in restaurants, hotels, QSR chains and eateries", Mr Srivastava added. "However, we are yet to achieve the pre-COVID demand levels for livestock products and livestock feed as B2B demand from

restaurants and QSR chains has not recovered and feed raw material prices like soybean have increased drastically by more than 40%."

The CLFMA chairman went on to say that the lockdowns and restrictions India is witnessing due to the second severe wave of COVID-19 in the country will "certainly impact the demand of livestock products and feed production adversely." Mr Srivastava added that a lot of efforts were made by the industry, supported by the Ministry of Agriculture to increase consumer confidence and consumption of poultry and cattle products. "By the end of Q2 FY21, the poultry sector bounced back with as much as 70% consumption in comparison to pre-COVID times," he said. "The cattle feed industry also improved due to an increase in global prices of skimmed milk and domestic demand to the tune of 70-80%." However, he added that the demand for poultry products crashed with the outbreak of bird flu at the beginning of 2021. "The bird flu outbreaks in a few parts of the country caused consumers again to refrain from poultry product consumption, and that led to a crash of the market in January-February 2021", he told Feedinfo. When asked about the

recent surge of new COVID-19 cases in India and the impact on the industry, Mr Srivastava said that the feed sector will continue monitoring the evolving situation.

"CLFMA is very much concerned by these developments and having a close look at

the evolving situation. We will continue to work with the government and various other stakeholders in policy-making to support the animal feed industry during these unprecedented times", he further informed.

Source: Lady IFFAT-Fatima for feedinfo India, Animal

Online Discussion Forum on Trends in Poultry Health, season-2 Organised by CPDO&TI in Association with INFAH

Central Poultry Development Organization & Training Institute under Government of India, Ministry of Fisheries, Animal Husbandry & Dairying, a premier Institute located at Hessarghatta, Bengaluru organized a one day online Discussion forum – on TRENDS IN POULTRY HEALTH, SEASON-2 ORGANISED BY CPDO&TI in association with Indian Federation of Animal Health Companies, on September 16.

Poultry sector in India is a techno-commercial sector with contribution of nearly 1.5 lakh crores to the GNP with about 6 million people being employed directly or indirectly. Poultry Farming Practices in India are one of the best in the world. The Science adopted in Genetics, Nutrition, Management and Disease prevention are one among the best in class matching Global Standards. Presently it is estimated that 4.5

billion broiler population, 250 - 300 million layers and about 3.5 to 4.0 crore broiler breeders are being reared in India. The health specialists have achieved huge task in disease prevention and health management in the country. However, poultry health is a dynamic, ever evolving entity among poultry farming. It is always required to get abreast with the latest knowledge and tips for poultry health management. Hence, this discussion forum is envisaged to outline the present trends in poultry health. Since poultry health is a vast subject, it has been envisaged to conduct in series wise as Season-1, followed by many. This event was organized in association with Indian Federation of Animal Health Companies (INFAH) under the leadership of Mr Vijay Teng, President and Dr Vijay Makhija, General Secretary along with poultry expert members of INFAH.

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The Online Discussion Forum started sharp at 10.30 am on 16th September 2021 by opening remarks from



Dr Mahesh P.S., Joint Commissioner & Director, CPDO&TI. He briefed about the legacy of CPDO&TI being an organization built over six decades (1960). Dr. Mahesh appraise the delegates that speaker have joined from different parts of country & overseas as well. The online discussion forum is streamed on Zoom link & also on YouTube channel of CPDO&TI. The topics of the Online Discussion Forum focused on the Immunity, Data management & Traceability, Food Safety, One Health approach to tackle AMR. Further he elaborated that digitalization, consumerism, focus on safe food and health would create more demand for protein foods like eggs and chicken in India with a priority preference for safe and certified traceable products. Hence, he advised to adopt latest software's for data collections in various poultry operations.



Dr Vijay Makhija,

General Secretary, INFAH, made a presentation from Mumbai, Maharashtra digitally about activities of the Organization which is formed in 2012. At present, it has 52 members representing more than 85 percent of Animal Health Markets turnover in India. INFAH is celebrating its 10th anniversary this year & is one of the largest animal health organization across the globe. He mentioned about INFAH's moto being **"Healthy Animals, Healthier India"**. INFAH is invited in all major decision making pertain to Animal health sector and is considered as a voice of Industry. INFAH has focused approach via sub committees on various aspects of health issues related to scientific research in veterinary field. This organization has set out guidelines and working in liaison with government in various committees. This online discussion forum is organized by members of Biologicals & Biosecurity sub-committee of INFAH.



Vijay Teng, President, INFAH in his inaugural address through online from Ahmedabad, Gujarat, appreciated the efforts of CPDO&TI organization under Government of India for conducting such innovative programmes through digital gateway. He elaborated on changing preferences in food habits

with more focus on protein foods like egg and chicken recipes. He assured to extend full cooperation and support to CPDO&TI for conducting many more seasons under Poultry Health series.



Dr Roel Mulder Secretary General of World Poultry Science Association (WPSA) joined online from Netherlands. He thanked INFAH for inviting him to this online discussion forum. He shared that WPSA is the "The leading global network for poultry science and technology". Its motto is Working together to feed the world. The WPSA is a long established (estd 1912) and unique organization that strives to advance knowledge and understanding of all aspects of poultry science and the poultry industry. Its mission is to facilitate sustainable and socially equitable poultry production worldwide by encouraging and liaising research scientists, educators and those working in the many sectors of the industry. With a large and truly international membership of 8000, the organization's objectives are promoted in various ways. These range from high-profile international congresses and conferences to the many diverse meetings organized by WPSA national branches (of

which there are about 80), two federations of branches, in Europe and in the Asia Pacific region and two networks, the African Poultry network and the Mediterranean Poultry network.

The World's Poultry Science Journal, the official organ of the WPSA, has developed a highly international reputation for its content, which covers virtually all aspects of production and science in the poultry industry. He shared Co-operation with other associations and organizations & is looking forward to explore collaboration with INFAH.



Dr Jayaraman K. Poultry Expert joined from Coimbatore spoke on the topic **"Immunity Simplified"**. In his presentation he elaborated in detail about the concept of Immunity development post vaccination. He emphasized the significance of strong gut health. In addition he shared practical experiences with regards to basics of immunity, how to devise optimal vaccination schedule, understanding vaccination failures & tips for better immunization. His key take home messages were , Understand basics to device good schedule and understand failures , combined approach of correct spacing , combination of live, killed

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and supported by immune modulator gives good result ,latest technology vaccines are good but world of caution ,use with judicial schedule and health status ,take note of variants and emerging disease , don't plan for best immunity , but plan for optimal immunity . It come with cost. His detailed presentation can be viewed through CPDO&TI YouTube channel: **CPDO&TI TRAINING**



Dr Ajay Deshpande

Poultry Entrepreneur presented online from Pune, Maharashtra about the topic Data Management & traceability. In his address he narrated simple practical elements of importance of data management and traceability for efficiency enhancement. His key take home messages were : Poultry industry over the years has evolved into a modern state, the traditional farming systems without proper data keeping, data analysis and traceability doesn't exist now a days, the organization can't grow without having its data system in place, Livestock farmers, feed mills, slaughter houses, hatcheries and all departments of a poultry company are becoming more and more adept at capturing data, True value is generated from the information that can be

obtained from the analysis of these data. When data is in its place, the quality of your decisions improves drastically. By nature, people have different ways of processing information, but a centralized system ensures a framework to plan, organize and delegate, If your organization is looking to stay ahead of the curve, it requires a good data maintenance system in place.



Dr Javeed Mulani

working with OSI Vista Processed Foods Pvt Ltd joined online from Coimbatore Tamandu . He addressed on the topic **"Food Safety in Chicken Meat Production"** and gave overview of Food Safety in Indian Poultry, Food Safety Hazards in Chicken Meat, Transparency Requirement in Poultry Supply Chain, Food Safety Key Considerations at Broiler Farm , Critical to Quality and Safety Points at Poultry Processing Plan and Role of Government Agency. His key take away messages were as follows: **Innovative Farm Best Practices:** follow new innovative best practices to ensure food safety at each stage of Poultry supply chain and make sustainable poultry farming. **Modern Poultry Processing Plant:** Growing demand of safe and good quality chicken meat processed

at HACCP base modern poultry processing plant.

Traceability: It increase transparency in poultry supply chain and increase confidence about safety of chicken meat.

Guideline for Wet Market: Formalize regulation/ guideline to improve GMP practices in wet market which contribute > 90% in Indian poultry Industry.

International STD and FSSAI regulation: Follow stringent international standards and FSSAI food safety regulation to lead in world.

Consumer awareness: Increase awareness about safe and good quality of chicken meat and increase the consumption of chicken meat in country.

Question and Answers with the speakers was conducted by Dr. Vijay Makhija. The details can be accessed through Youtube / Facebook link of CPDO&TI and LinkedIn of INFAH. The final session of the day was Panel Discussion with three regulatory & technical personnel's namely,



Dr D.J. Kalita



Dr N. C. Prakash Reddy



Ritesh Patel

of INFAH Biological & Biosecurity sub-committee. They shared insights on One Health approach to tackle AMR, role of vaccines, Biosecurity & Diagnostic to address AMR and key initiatives of INFAH with regards to addressing the issues of AMR. Elements of National Action Plan on AMR were discussed in brief. INFAH promotes judicious and prudent use of antimicrobials and impart continuous education on following the withdrawal periods.

Dr Mahesh, P.S., Joint Commissioner & Director, CPDO&TI mentioned that Team CPDO&TI would conduct many such programmes in the coming months. The programme was conducted live on zoom, YouTube channel of CPDO&TI along with recordings posted on Facebook: cpdoti. Bangalore, on youtube: CPDO&TI TRAINING and LinkedIn of INFAH. All are requested to download "Latest App of CPDO&TI" from Google Playstore by typing "CPDO&TI" for Android Version.

S.M. Anwar Basha, Senior faculty of CPDO&TI executed the job of Admin of conducting Discussion Forum very effectively and proposed vote of thanks for the delegates. The other team members of CPDO&TI worked hard in making this programme successful. Team CPDO&TI thank all the viewers participated through Zoom and Youtube. It is also acknowledged that Print Media extends great support by wide coverage of all online events of CPDO&TI across the country.

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Respiratory Challenges in Poultry during Humid Conditions - An Overview and Solution

Dr Raina Raj, Head of Marketing, Natural Remedies Pvt Ltd

Natural is future 2.0 is a webinar series powered by Natural Remedies PVT Ltd, where we invite eminent speakers from across the globe to share their thoughts on the most relevant topics in the animal health industry. In August, we had the privilege of hosting two speakers, Dr Sudheer B. Rukadikar, veterinary pathologist and poultry health consultant and Dr Chandan Chatterjee, Group Product Manager at Natural Remedies Pvt Ltd. The focus of their discussion was towards understanding and providing practical solutions to the respiratory challenges in poultry, faced during high humidity conditions. Dr Rukadikar started his talk by pointing out the increased incidence of respiratory diseases worldwide in recent days due to the intensive rearing methods followed. He has used the term respiratory disease complex (RDC) as acute respiratory diseases caused due to several etiologies characterized by respiratory distress, depression and increased mortality in poultry. Dr Rukadikar mentioned that each year, India faces losses of millions of rupees due to poultry sickness caused by viruses, bacteria and fungi. Microbial illnesses in poultry are a huge concern, despite the widespread use of antibiotics and the best vaccinations available. The large bioburden is



Dr Sudheer B. Rukadikar one of the explanations. Bioburden is the presence of disease-causing organisms in the shed, which are passed down from one flock to the next. Dr Rukadikar brought to notice that there has been growing concern about the presence of residual antibiotics in poultry meat in recent years. This puts pressure on poultry rearing practices to limit antibiotic use in poultry to therapeutic rather than prophylactic or growth-enhancing purposes. Also, the emergence of new multi-drug resistant (MDR) bacteria is a reason why we must use antibiotics at the lowest levels possible. **Clinical symptoms of RDC** in chickens are sneezing; open mouth breathing; head shaking; ruffled feathers; gurgling breathing sounds; discharge from nostrils and eyes; eye swelling. **Why is the poultry respiratory system more susceptible to infections as compared to mammals?** While discussing the anatomy and physiology of the chicken respiratory system, Dr Rukadikar pointed out that, unlike mammals, the chicken respiratory system is not limited to the thorax but extends throughout

the body. As a result, maintaining the integrity of the system is crucial. The invasion of the respiratory tract influences the overall performance of the birds. Nostrils, trachea and bronchi form the upper respiratory tract (URT). The lower respiratory tract is made up of the lungs and air sacs (LRT). The URT also acts as the first line of defense in the body, preventing pathogens from entering. **Air sacs** are very thin-walled expansions of the bronchi that are only seen in avian species. They are found all over the bird's body and they create **pneumatic bones** when linked to long bones. Any damage or infection to the air sac can cause the bones to get infected. **The cleft in the hard palate** is another unusual aspect of the bird's anatomy. **The respiratory system is also a part of the immune system.** Putting the immune system in the spotlight Dr Rukadikar explained that the avian immune system is comprised of various branches, including gut immunity linked with gut-associated lymphoid tissue (GALT) and respiratory immunity related to bronchial associated lymphoid tissue (BALT). The BALT works by eliminating inhaled particles and keeping the airways clean, preventing or inhibiting the entry of disease-causing pathogens from the air. Several supplements can be used to promote BALT

function and immunity by strengthening the respiratory tract's immunity and defending the body against disease-causing germs.

Challenges in the monsoon season

Birds can withstand relative humidity (RH) levels of 50 - 70 percent. However, due to increased air humidity during the monsoon season, dampness in the shed is high. Higher humidity always adds pressure to the respiratory system and birds cannot breathe properly.

Ventilation: Poultry houses should be well ventilated. Sufficient aeration is necessary to eliminate dangerous gases such as ammonia, carbon dioxide and carbon monoxide from the shed. Gases such as ammonia accumulation can lead to damage to the ciliated epithelium in the trachea, which is known as the first line of defense in the respiratory system. When ammonia levels reach 25 ppm, it will lead to **ciliostasis**, where cilia stop moving, and at levels of 40 ppm, it leads to **de-ciliation**, which is the loss of cilia. Weakening of the first line of defense will lead to the entry of pathogenic organisms into the LRT, causing serious diseases. Hence, it is important to keep ammonia at the lowest level with proper ventilation. Dr Rukadikar provided evidence through autopsy images showing disease changes noticed, to emphasize the damage caused.



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Filthy litter: About 80 percent of the water consumed by birds is added back to the barn through respiration and excreted as faeces. Due to high humidity, the litter may not dry quickly; care must be taken to remove caked litter.

Vaccination Reactions:

Dr Rukadikar mentioned that vaccinations have, without any doubt, contributed significantly to the health and welfare of birds in poultry farming. But live virus vaccines can sometimes lead to vaccine reactions. Certain vaccine viruses replicate in the intestinal (Newcastle disease (ND), infectious bronchitis (IB) and IBD vaccine viruses) and / or respiratory tract (ND and IB vaccine viruses). But due to replication in the respiratory tract, ND and IB vaccines provoke respiratory distress. In combination, ammonia build-up with poor ventilation in the shed leads to a weakened respiratory immune system. Hence, efforts must be made towards avoiding vaccine reactions too.

Bringing the focus on the current known **respiratory diseases** in chickens, Dr Rukadikar listed infectious coryza, infectious laryngotracheitis, IB, ND, avian influenza (AI) and chronic respiratory diseases, which are primarily diseases of the respiratory system. But diseases, such as fowl cholera, aspergillosis and fowl pox (diphtheritic form), may also affect the respiratory organs. He then explained the **strategy** to be followed to overcome respiratory distress.

- ♦ Firstly, one must target **improving respiratory immunity**, aiming at keeping airways patent and reducing stress on the respiratory system.
- ♦ Secondly, one should try to increase hemoglobin levels in birds so that oxygen-carrying efficiency is improved.
- ♦ During the high-risk period, such as the monsoon season, one should use products that can remove excess mucus in the bronchi such as bronchodilators and expectorants.

General principles to be followed to prevent RDC:

- ♦ Cleaning and disinfection of the poultry shed between flocks to reduce bioburden.
- ♦ Avoid immune suppression in birds.
- ♦ Continuous disinfection by spraying.
- ♦ Keeping the shed aerated, dust-free and the birds stress-free.
- ♦ **As prevention of RDC**, one can use herbal products that act as expectorants and bronchodilators; expand the capacity of the lungs to ease respiratory distress.

Dr Chandan Chatterjee, group Product Manager at Natural Remedies Pvt Ltd, took over the session and talked about a natural way to boost the natural immunity of the respiratory system. He put forth the concept of positively modulating immunity by enhancing immunity and negative modulation by reducing inflammation. He introduced the product **Respease** which is an herbal liquid consisting of Glycyrrhizin, Vasicine, Rosmarinic acid, and the essential oil Carvone. Respease **improves respiratory immunity and**

boosts oxygenation of the cells through its hematinic activity and respiratory soothing effect.

He showed histopathological slides with evidence of **increased BALT area** in chicken lungs after supplementation with Respease. The **anti-inflammatory** property of Respease was tested for its effect on COX2 and PGE2 inhibition. Both COX2 and PGE2 are inflammatory mediators. Respease also exhibits properties of a mucolytic, expectorant, bronchodilator, anti-oxidant and anti-spasmodic.

Supplementation with Respease in a field trial consisting of 30,000 broiler birds showed improved FCR, increased body weight gain, lower mortality and improved bird activity as compared to the untreated control group. Respease has been extensively assessed and has scientific backing for its ability to improve respiratory immunity and attenuate respiratory distress. The questions addressed during the session are below:

How do we take care of respiratory challenges in layers? Is week-a-month antibiotic therapy sufficient?

Dr Rukadikar: With the growing concern about the residual antibiotics in chicken meat, it is not advisable to follow the week-a-month schedule of antibiotics for prophylactic purposes. Management tools such as clean environment, stress-free,

dust-free, good ventilation and clean sheds. Also, when going for the live IB and ND vaccines, farmers should supplement the birds with products that minimize stress on the respiratory tract to avoid vaccine reactions.

Any change in the vaccination schedule required to control respiratory infections?

Dr Rukadikar: There is documentation that administering a live LaSota vaccine in the presence of avian influenza (AI) can lead to respiratory reactions. Hence, it is better to go for clone vaccines which do not show vaccine reactions.

Can Respease be used in treatment also?

Dr Chandan: Respease has been designed to be used for prophylactic purposes, but it can also be used for treatment purposes.

What kind of management improvisations helps in reducing respiratory challenges in humid conditions?

Dr Rukadikar: Avoid overcrowding. If humidity is high and no natural air movement is present in the shed, then fix high-speed fans to help air circulation.

Does Respease react with any other medicine or supplements when added to water?

Dr Chandan: Respease is a very inert herbal product and it is a natural product. Hence, it doesn't react with other medicines or supplements. It is very safe to add to water.

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Even though a bird's respiratory system is advanced in comparison to that of humans and very effective, it is more prone to respiratory infection. Why?

Dr Rukadikar: The avian respiratory system is advanced, but also delicate. The bird's respiratory system is not restricted to one part of the body. It is spread throughout the body and any minor insult to any part of the system will spread all over.

CRD is a common problem in the field. How can we manage the situation?

Dr Rukadikar:

- a. CRD is vertically transmitted from parents to offspring, hence purchasing the chicks from a known vendor where the parents are not infected.
- b. Preventive Treatment: Tylosin and Tilmicosin

can be used according to the prescribed dosage.

- c. If there is a doubt about mycoplasma infection, then the flock must be vaccinated for IB and ND at a young age. In spray vaccination, the size of the vaccine must be very critically managed.

What is the main point of cleaning with disinfection to protect against respiratory problems?

Dr Rukadikar: Cleaning must be done well before introducing a new flock. This is not just for the prevention of respiratory diseases, but also for other diseases. Cleaning should be done well with no residues of organic matter. This should reduce the bioburden to a great extent. And disinfection with the recommended concentration has a good effect.

New Ross App Puts Valuable Management Tools at Fingertips of Aviagen Customers

Useful app joins the company's growing catalogue of resources for chicken producers



Udumalpet, India. – Aviagen India recently launched a new app, giving its valued Ross customers throughout the country instant and easy access to the latest Parent Stock (PS) and broiler management information, along with other beneficial reference and monitoring tools. With the introduction of the new app, these helpful tools and capabilities are

now just a click away:

- ♦ Ability to benchmark flocks against PS and broiler Performance Objectives
- ♦ Access to newly published PS Performance Objectives
- ♦ Broiler and PS Nutrition Specifications
- ♦ Date finder to match calendar dates with flock age for easy performance tracking
- ♦ Quick calculation of meat yield and Production Efficiency Factor (PEF)
- ♦ Scoring tool to count birds in up to five subgroups (expressed in %)
- ♦ Unit converter to switch between global

measurement systems. Users may tailor the app to their preferred languages, regions and measurement systems.

"We care about our customers, and are always looking for ways to better serve them," commented Aviagen India Business Manager Marc Scott. "With this new Ross app, customers have convenient access to vital information to help improve the health,

welfare and performance of their birds, anytime and from anywhere". Available in 16 languages (soon to be more), the handy tools can be downloaded to Android or Apple mobile phones or other devices from these links: Android: <https://play.google.com/store/apps/details?id=com.aviagen.ross> iOS (Apple): <https://apps.apple.com/us/app/ross/>

Ferry Monné joins Aviagen India as Head, Sales and Mktg



Ferry Monné

Udumalpet, India: In an ongoing effort to strengthen service to customers and drive the growth of the increasingly popular Ross 308 AP broiler breeder, Aviagen India has appointed Ferry Monné as Head of Sales and Marketing, effective September 1. Ferry will report to Marc Scott, Aviagen India Business Manager.

Background of industry, business development expertise

A sales professional, Ferry joins Aviagen with a proven track record and a wealth of senior sales and sales operations experience in the poultry, automotive and IT industries. Prior to joining Aviagen India, he partnered with a poultry equipment distributor in Southeast Asia. Before that, he served as Business Development Manager, Asia and Oceania, for HATO Agricultural

Lighting, where he successfully built up new markets, improved dealer performance and raised awareness of poultry-specific lighting equipment and technology. Originally from the Netherlands, he has spent the past 17 years working in India and Southeast Asia.

Welcoming him to the Aviagen India family, Marc said, "We are delighted to have Ferry on board, leading our drive to enhance the success of our valued customers and grow our business. He joins at a very exciting time for the India poultry industry – a time of rapid advancement, and Ferry and his sales team will be at the forefront. Promoting the best breed and best practices to benefit all our customers".

"I am passionate about team work, serving customers and striving daily to implement continuous improvement for their benefit. I look forward to joining Aviagen India and working with my team to promote the health, welfare and performance of our customers' birds and further improving the bottom line of their businesses," added Ferry.



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Poultry Industry calls for MPEDA - like body

CLFMA holds its 54th AGM and 62nd National Symposium



Tarun Sridhar, IAS (Retired), Former Secretary, Dept of AH&D, Ministry of Fisheries, AH&D, GoI; B. Soundararajan, B.S. Yadav, Bahadur Ali, Dr T. Krishnaiah, IAS (Retired) and Rahul Kumar during Panel Discussion at CLFMA's 62nd National Symposium held on 24 & 25 September 2021 at Hyderabad. K.V. Kurmanath, Senior Deputy Editor, The Hindu Business Line moderated the discussion.

Hyderabad: CLFMA of India organized its 54th Annual General Meeting and 62nd National Symposium on 24th & 25th September 2021 at Hotel Taj Deccan, Hyderabad, India. The theme of the event was "Feeding the growing livestock population: Current and future challenges".



Parshottam Rupala,
Minister of Fisheries, Animal Husbandry
and Dairying, GoI

Union Minister for Fisheries Parshottam Rupala has stressed the need for creating awareness among the livestock farmers about the importance of providing quality feed to the animals. Inaugurating

the two-day CLFMA of India national conference, he said it was important to explore tapping of alternative feed options such as stubble which is abundantly available in some areas.

"It will offer a cheaper option for farmers in places where they face shortages," he stated.

They would also need proteins which would require more number of livestock population, he added.

Mr Balram Singh Yadav, Managing Director, Godrej Agrovet Ltd, in the 62nd National Symposium organized by CLFMA presented the special address on Sustainability & Future of Online Sales of Poultry Products. Mr B. S. Yadav, stated that "The government formed MPEDA and ensured the marine products space became end-to-end competitive. How do they do that? They ensure that we get the right germ plasm. Then, they also conducted training programmes for farmers on better management practices"

He told the government also equipped the processors with relevant skills,

provided them with market access and gave them subsidies. "We need something like this. There is a huge market for our poultry products abroad, particularly in geographies like the Gulf", he said. "They will make us competitive by helping us manage the diseases better. The entire value-chain management will happen in coordination with the government", he added.

He mentioned that the export of poultry products from the country was very low at just Rs 435 crore. That was just a fraction when compared to the overall size of the industry in the country.



Balram Singh Yadav,
Managing Director,
Godrej Agrovet Ltd.

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“There is a huge scope. It will be tough for individual players to tap this huge opportunity. If a sovereign country does it, it will be easier”, he told, adding that the industry didn’t want the export subsidies for ever. “We need the government support for a few years. After that industry will be on its own”, he further informed.



Dr O. P. Chaudhary,
Joint Secretary,
Department of Animal Husbandry &
Dairying, Ministry of Fisheries, Animal
Husbandry & Dairying, Govt.

The keynote address was delivered by Dr O. P. Chaudhary, Joint Secretary (NLM / PC), Department of Animal Husbandry & Dairying, Ministry of Fisheries, Government of India. Livestock industry, feed sector in particular, has been quite resilient to the COVID-19 crisis. However, the sector is not free from the implications of post covid challenges. This, coupled with the task of feeding of 536.76 million livestock calls for appropriate interventions at various levels. Animal Husbandry Infrastructure Development Fund is another flagship scheme of this Department promoting entrepreneurship and employment. The scheme may be well exploited by the feed industry to set up diverse livestock feed plants capable of producing conventional / value added feed.



Neeraj Kumar Srivastava,
Chairman, CLFMA of India.

By 2050 the world’s population will likely increase by more than 35%. To feed that population, crop production will need to double and production will have to far outpace population growth as the developing world grows prosperous enough to eat more meat. Trading on this tightrope is not going to be an easy task and it requires a major shift in how we are consuming and producing our food today? We will have 9 billion human population on our planet and additional 2 billion more mouths to feed by mid-century. The spread of prosperity across the world, especially in China and India, is driving an increased demand for meat, eggs and dairy boosting pressure to grow more corn and soybeans to feed more cattle, pigs and chickens. If these trends continue, the double jeopardy of population growth and richer diets will require us to roughly double the amount of crops we grow by 2050.



Divya Kumar Gulati,
Convenor,
CLFMA of India.

For the last 54 years, CLFMA has been proactively working together with the Government of India and other trade bodies making its presence felt both nationally and internationally. The classic example of this is that it was actively involved with the government authorities to solve the Soybean Price Rise issues. The CLFMA delegation conducted multiple meetings and discussions with various Government Ministers in an effort to solve the soybean meal issues. Post which the government made a monumental decision, allowing import of crushed and de-oiled GM soy cake-NLO.

In this year, industry faced a big challenge in producing protein source basically soya meal. Soya Meal prices soared to a high of Rs 90,000/- mt

from Rs 38,000/- mt. A rise by almost 136 percentage. This was also just in a span of 8 weeks.



Vijay D. Bhandare,
President – South Zone & Joint Convenor,
CLFMA of India.

This happened for the first time in the history of Animal Feed Industry. As the market forces act, there was cascading effect on the rise of prices of other protein sources propelling the entire feed industry to panic and confusion. This resulted in the phenomenal increase in the production cost of milk, eggs and poultry meat, hurting the demand and consumer uptake.



Suresh Deora,
Secretary, CLFMA of India.

The Symposium will have deliberations addressing Demand, supply commodity outlook for Corn and Soybean, as these commodities contribute significantly to the compound feed production, sustainability of online sales of poultry products, online trading of Agri commodities and Policies related to imports and exports of corn.

India has one of the largest livestock populations in the world and proper feeding of the livestock faces huge challenges, particularly in the light of growing food demand for human population, diversion of food grains for bio-fuels etc. Also, volatility in prices of food and feed commodities and also constraints of supplies due to scarcity will continue in the coming years and as a consequence, affect livestock production.

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Dr Sanjeev Kumar Balyan,
*Minister of State for Fisheries, Animal
Husbandry and Dairying, Govt.*

I hope that the symposium with the theme “Feeding the Growing Livestock Population: Current & Future Challenges” could play a vital role as a platform in sharing new ideas and techniques for enhancing production and availability of various

feed resources for livestock so as to face the future challenges in feeding the growing livestock in India.

Daniel Bercovici,
Chairman,
International Feed Industry
Federation.

On behalf of the International Feed Industry Federation (IFIF) I would like to thank you for your kind invitation to the inaugural session of your 62nd National Symposium on 24th September 2021.

It would have been an honour for us to attend and join you and the Indian Feed Industry colleagues at this special association. Unfortunately, we are not available on that date as we are holding our annual IFIF meeting with the UN FAO at the same time.

Mr Balram began his career with Godrej in 1990 and over the years, he has handled roles of increasing responsibility across businesses and regions in the company. He became the Head in 1999 when he was asked to establish and lead the Poultry Business.



G. Chandrashekhar, Economist,
Senior Editor & Policy Commentator.

Speakers in CLFMA's 62nd National Symposium

Ms Prerana, Head of Research, Samunnati Agri, has a vast experience of commodity research of more than 25 years. She specializes in Agri Commodity Research. As a part of her vast experience she has done commodity research for various value chain participants like manufacturer, trader, exchange, commodity broker, NBFC and now farmers.

experience of more than 25 years. His skills sets comprise risk management, commodity trading, logistics and supply chain management, building online marketplaces, financial services, hedging and derivative advisories on commodity exchanges, managing large and complex supply chains for integrated textile operations.



Unupom Kausik, President, NMCL.

Mr Unupom Kausik serves as the President at NMCL. He brings in a wealth of experience for having worked in the commodities domain for almost a decade out of his overall

Balram Singh Yadav is the Managing Director of Godrej Agrovet Ltd (GAVL), one of India's foremost diversified agribusiness companies. He also serves as Managing Director of Godrej Tyson Foods Ltd. Besides, he is a Director of numerous firms including ACI Godrej Agrovet Pvt Ltd – Bangladesh, Creamline Dairy Products Ltd – Hyderabad, Astec Life Sciences Ltd and Godrej Maxximilk – Mumbai. He has been the Chairman of CLFMA of India (Twice), an Association of Livestock Industry.

G. Chandrashekhar is a global agribusiness and commodities market specialist with decades of rich experience. He provides policy inputs for the Indian Government through his newspaper columns, talks on business television and personal interaction with policy makers.

Chandrashekhar holds many public positions. Currently, he is:

- Economic Advisor, IMC Chamber of Commerce and Industry.
- Independent Member, SEBI Commodity Derivatives Advisory Committee and SEBI Research Advisory Committee.
- Consultant, UN International Trade Centre, Geneva.



Mrugank Paranjape,
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Mrugank Paranjape is the Managing Director and Chief Executive Officer of NCDEX e Markets Ltd, the Non Executive Independent Director in the Central Board of the State Bank of India, the Chair of the Board of the Mumbai School of Economics and public policy and a Trustee on the Board of Sewa International.

Mr Mrugank has earlier worked with ICICI Prudential AMC, Reliance Logistics, India Infoline, W I Carr, ING Barings, IIT Inves Trust and Citibank. He is an alumnus of IIT Mumbai (B Tech, Electrical Engineering) and IIM Ahmedabad (PGDM with Specialization in Information Systems).



B. Soundararajan,
Founder and Chairman,
Suguna Group.

Born in 1961, **Mr B. Soundararajan** is a first-generation entrepreneur, whose life's motto has always been the same from the beginning, which is to enrich the lives of rural India. Originally hailing from Udumalpet, a town not far away from Coimbatore, Tamil Nadu, he went on to found Suguna Group Companies along with his younger brother Mr G.B. Sundararajan.

He currently serves as the Managing Director at Suguna Holdings Pvt Ltd and as a Director in its subsidiaries including overseas Companies. Under his leadership, Suguna Foods has provided livelihood to 39,000+ farmers and has been ranked 3rd in Asia's top poultry producers list and also ranked as the 9th largest poultry company globally.



Bahadur Ali,
Founder & Managing Director,
IB Group.

A man of the people, **Mr Bahadur Ali**, has been a visionary leader, successfully leading IB Group through its capricious journey. He was called as a "Father of Modern Indian Poultry". He envisioned the easy availability of Protein as an eminent source of nutrition at an affordable price to Indian population. Mr Ali has led IB Group through numerous business expansion plans and International Partnerships.

He conceived the importance of quality feed for their better growth and performance thereby entering into Poultry Feed business. His journey from once a remote village of Rajnandgaon as a small-scale poultry merchant to the protein and agri conglomerate which is globally recognized and has put Rajnandgaon and Chhattisgarh state on a Global map supported agriculture and rural development not just in Chhattisgarh state but all across India.



Rahul Kumar,
Managing Director,
Lactalis India.

Mr Rahul Kumar is working as a Managing Director of Lactalis India and managing 3 companies, tirumala, anik and prabhat. Lactalis is the largest dairy group in the world having annual turnover of 23 billion USD. Previously he has worked as a Managing Director, Amul Dairy for 11 years from 2003 till 2014. Mr Rahul has versatile experience of 29 years in Dairy. After graduating with a degree in chemical engineering from Indian Institute of Technology, roorkee, he was chosen for a management course at the Institute of Rural Management Anand, after which he joined Amul.



Tarun Shridhar, Retired IAS,
Former Secretary, AH & D.

Tarun Shridhar was a Senior Adviser with the NCDC for about eight months. Subsequently, he has been appointed as a Member of the Central Administrative Tribunal (CAT); He is posted in Allahabad these days. He is also a former IAS officer of the 1984 batch of Himachal Pradesh cadre.

Presently he is a Member of Central Administrative Tribunal. More than 35 years experience in high positions of policy making and implementation. Prior to holding the position of Secretary, government of India, he was Additional Chief Secretary in the Government of Himachal Pradesh. As Additional Chief Secretary, he looked after diverse sectors and departments such as power, personnel, revenue, environment and forest, animal husbandry, fisheries etc.

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Dr Beeda Masthan Rao,
*Founding Chairman and Managing
Director, BMR Group.*

Dr B. M. Rao, the founding Chairman of BMR Group of industries is a man of humble beginnings. Fondly known as BMR, Mr Rao began his seafood journey in 1991 in his hometown,

iskapalli with “Seed Culture”. Today, almost 30 years later, the group has expanded into a conglomerate of Multiple Seed Hatcheries, shrimp processing facilities, feed manufacturing facilities and exports to major international cities.

Mr Rao was awarded the Doctorate (Aquaculture) by the International University of Contemporary Studies for his extraordinary contribution to Aqua Industry in the year 1998. He was also awarded the “Indian of the year Award” in the year 2017 in recognition of his achievements that have contributed towards building the reputation of our Country.

(As Dr B. M. Rao was not present, Dr T. Krishnaiah, Advisor, SFMA represented on his behalf in the 62nd National Symposium 2021).

a small company with a modest turnover of Rs 12 lakh per annum and in 25 years it became among the largest company in India in the space of Animal Health and Speciality Nutrition with a turnover of Rs 360 crore at the time he handed over the charge, in September 2009.

Mr Bharat became the first Chairman of Livestock Industry Association- even though he was not from a ‘Feed Manufacturing Company’.

Currently, Mr Bharat is the Founder / Chairman of Fibroheal Woundcare () Ltd (FWPL). The company has several patents in hand and in the pipeline all related to silk in non-textile applications. He received CLFMA Life Time Achievement Award.

CLFMA Award Winners

Dr Subhash V. Vaidya, Chairman,

Noble VetScience LLP is a graduate in Veterinary Science from Nagpur Veterinary College, post graduate from Jabalpur Veterinary College and Ph.D. in Poultry Science from IVRI, Izatnagar, Uttar Pradesh. He joined the Poultry sector of the industry in 1975.

In 1977 he joined Hindustan Lever Ltd as Assistant Development Manager. It was in this company that his Professional Career blossomed. He later joined Pranav Agro in 1993 as Chief Executive and rose to become Managing Director by 1998.

It was in this assignment in Pranav Agro that Dr S. V. Vaidya with his inputs made remarkable contribution in the field of Poultry Nutrition. Although there were quite a few nutritionists who were trying to use soya-based feed, it was him who made it possible on a very large scale.

Dr S. V. Vaidya started his contribution in CLFMA by making technical presentations and presenting them to various Government Departments. He worked as a Secretary, Deputy Chairman in CLFMA. He became

Chairman of CLFMA during 1999 and 2000. He received CLFMA Life Time Achievement Award.



Bharat Tandon,
*Past Chairman, CLFMA of India,
Founder / Chairman of Fibroheal
Woundcare (P) Ltd (FWPL),
MD, Healthline Pvt Ltd (Sericare Division).*

Mr Bharat Tandon started his career international pharma and worked for seven years in Pharmaceutical Company, which is now named Astra Zeneca Pharma Ltd. In 1984 he ventured out to start an Animal Health / Nutrition Company.

Mr Bharat was the Managing Director of Vetcare Group of Companies, Vetcare Organics and Tetragon Chemie Pvt Ltd. He started VETCARE,

V. Ramasubba Reddy is a Retired Professor (LPM Avian), BVSc & AH from SV University, Tirupati in 1964, MSC (Vety.) from AP Agricultural University in 1970 and Ph.D. from Agra University in 1976.

He got during his academic career OPGA of 4.00 out of 4.00 during Masters Program and best teacher and meritorious teacher awards. Also, he was the principal investigator in several research programs. He was rated as a good teacher for UG and PG students.

He was involved as a major and associate guide for 32 students and published 185 papers including 68 Research Publications.

He worked in State Department of Animal Husbandry, Andhra Pradesh; IVRI and CARI, Izatnagar; APSMPDC, Andhra Pradesh; and Agricultural University, Andhra Pradesh. He is having 57 years of experience in livestock, poultry and aqua production. He says that his efforts for Animal Food Production and for nutrient economy during Livestock Production will be continued throughout his life. He received CLFMA Award.



**Dr V. Sridhar, General Manager,
National Dairy Development Board.**

Dr V. Sridhar is a professional in the field of Animal Nutrition with experience of more than 23 years in applied dairy nutrition. He obtained his M.V.Sc degree in Animal Nutrition from the Andhra Pradesh Agricultural University, Hyderabad and a full-time M.B.A in General Management from the Sri Sathya Sai Institute of Higher Learning. Subsequently, Dr Sridhar underwent training in advanced dairy nutrition in the USA and Europe.

Over the past two and a half decades, Dr Sridhar has visited ten nations – counted as advanced nations in dairying – for understanding best practices in animal nutrition, dairy herd management and feed manufacturing. He has also participated in international conferences and symposia in the US, Europe, Asia and Brazil on topics ranging from climate change to feed quality management.

Currently he heads the Animal Nutrition Group at NDDB and is tasked with the development of scientific and practical solutions to the challenges faced by the dairy farmers in matters relating to feed and fodder. He is also a member of the FAD Council of the Bureau of Indian Standards (BIS) as well as the convener of the expert panel on feed ingredients. His work experience includes stints in the private and public sectors

handling responsibilities ranging from applied R&D, technical services, product management and handling a feed manufacturing unit with P&L responsibility. He received CLFMA Award.

Dr A. Natarajan, MVSc., Ph.D is a Professor and head in Animal Feed Analytical and Quality Assurance Laboratory, Veterinary College and Research Institute, Namakkal, Tamil Nadu Veterinary and Animal Sciences University.

Graduated in 1987, he mastered in Animal Nutrition (1991) and obtained his PhD (1998), from Madras Veterinary College, Chennai. He is totally involved in upgrading the 10% self-financed Animal Feed Analytical and Quality Assurance Laboratory in testing of feed and feed ingredients for livestock and poultry, since 1996, on cost-effective basis, in line with University Directions.

Started in 1994, in nation's biggest poultry belt, during the time of no

facilities for testing, the laboratory, has gone miles to create infrastructure to analyze huge number of tests in shortest possible time with validated results being quickly dispatched in every possible way using its own software-oriented LIMS, meant to accommodate data on customers, results, accounts and so on.

He and his team facilitated obtaining the prestigious ISO / IEC 17025: 2017 NABL accreditation in 2017, the first institute to do so for the University. His perseverance with Service Tax department resulted in inclusion of exemption of Service Tax to feed testing in 2013 for entire nation. He is Principal Member of FAD5 of Bureau of Indian Standards. His focus is to move forward to expand the residue testing facility.

His aim is always to upkeep the integrity with impartiality in every aspect surrounding the analyses. He received CLFMA Award.

Ashish Gupta Passes away



**Ashish Gupta,
Managing Director, Sampoorna Feeds
Pvt Ltd**

A Loving, Caring, Enthusiastic, Dynamic friend and Business partner. We cannot express in words the sorrow we faced. A great human who walked an extra mile to make a difference. Shri Ashish Gupta, Managing Director, Sampoorna

Feeds Pvt Ltd and an active member who worked tirelessly for the welfare of North India Poultry Farmers. As we reflect upon the high standards he espoused, we are reminded of the many benefits we enjoyed being with him through his journey. Your contribution to the industry has been impeccable and your position is irreplaceable. Aviagen India family unite in offering our condolences to the family of the bereaved. May god give strength to his Wife Ritu, Son Rishab and Daughter Riya and Mother to traverse through this difficult times. We extended our support to the Sampoorna Family and pray for the departed. May his Soul rest in peace, Aviagen India said in its Condolence message.

GROWING MANAGEMENT OF COMMERCIAL PULLETS

venugopal.adigonda@shgroup.in

Team Hy-line International

Highlight Points

Productive and profitable layers begin with good quality pullets. Having the correct body weight and body type at the start of egg production will enable pullets to achieve their genetic potential. Problems that develop during the growing period cannot be corrected after egg production begins. This paper will highlight the components of a good pullet development program.

House Preparation:

The brooder house should be cleaned and disinfected well in advance of chick delivery. A minimum of 3 weeks “down-time” between flocks should be scheduled for house preparation. Before cleaning and disinfection, all manure and feed should be removed and a rodent control program implemented (or preferably the ongoing program should be continued). This is the time to make necessary repairs to the house and equipment. The house should be cleaned with a high-pressure wet wash with detergent to remove all organic matter.

Washing should move from the ceiling downwards through the cages or system equipment to the floor and finally, manure pit. After thorough cleaning, the house should be sprayed or foamed with an approved disinfectant. Increasing the temperature inside the house will improve the effectiveness of the disinfectant. Additionally, fumigating the house within 5 days of chick delivery will help ensure sanitary conditions. The effectiveness of the cleaning, disinfection and fumigation should be checked by environmental testing of the house surfaces for coliform and Salmonella bacteria.

Day	Management Schedule
-21 days	<ul style="list-style-type: none"> Remove old feed and manure Clean and disinfect the growing house Rodent control program Make repairs to equipment (broken drinkers, perches etc.) Wet wash and disinfect grower house
-5 days	<ul style="list-style-type: none"> Fumigate growing house Verify cleanliness by bacterial culture of environment
-2 days	<ul style="list-style-type: none"> Start brooders in cool and cold climates Clean and disinfect water system Place paper inside cages

-1 day	<ul style="list-style-type: none"> Start brooders in hot climates Ensure that the proper brooding house temperature is provided (see table on p. 2) Minimum humidity of 40% Set lights for 20 hours of light at 30 lux Fill feeders to their highest level with fresh starter feed Adjust feed guards Adjust drinkers to proper level Flush water lines and check that all drinkers are working
+1 day	<ul style="list-style-type: none"> Fill cup drinkers or let nipple drinkers drip to stimulate water consumption Add vitamins and electrolytes to drinking water Place starter feed inside cage on cage paper (in front of feeders) Fill feeders to their highest level; floor rearing use brooder rings or partial house Brooding with paper on the floor area with supplemental chick feeders and drinkers

Before Chicks Arrive:

The house preparation should be completed 48 hours before delivery of the chicks. Allow enough time for the temperature of the air and equipment in the house to be brought to the proper brooding temperature. Be aware that air temperature rises faster than the temperature of concrete floors, litter, system equipment and water in the house.

Set the light clocks to 20 hours of light at 30 lux of intensity. Lights in the red-orange wavelength (warm fluorescent) are appropriate for growing and laying birds. An intermittent lighting program for chicks should be considered. Use a well -balanced light (3500K) or a cool light (>4000K) in growing birds. To improve growth, cool light in the green-blue spectrum is preferred as it improves weight gain and helps calm birds.

Feeders should be filled to the highest level with fresh, good quality starter crumble. Adjust the feed guards to allow chicks to access feeders from day one. Ensure that all drinkers are working properly. Adjust the drinkers to the proper height to facilitate drinking by the newly arrived chicks.

The birds' drinking water should contain vitamins and electrolytes to replace losses during delivery. Feed

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should be placed on the cage paper before chick arrival or immediately after they are placed in the cages. Chicks brooded on the floor should be provided extra feed trays or be fed off cardboard.

Chick Quality – In The Beginning:

Layer pullet chicks must be sourced from breeder flocks that are healthy and free of vertically-transmitted diseases important for bird and human health. Chicks should possess adequate levels of maternally-derived antibodies for early protection against challenges of infectious bursal disease (Gumboro, IBD), Newcastle disease, infectious bronchitis and other diseases. The chick should be of adequate body weight with a well-healed navel (umbilicus) and free of physical defects.

All chicks should be vaccinated against Marek's disease in the hatchery using the Rispens + HVT strains. In the hatchery, other vaccinations can be administered by using HVT-vectored vaccines containing infectious laryngotracheitis (ILT) or IBD (Gumboro) protective genes. If HVT-vectored vaccines are used, do not combine with another HVT strain vaccine, although Rispens may be used in combination. For more information on vaccination programming, see the "Vaccination Recommendations" technical update. Chicks may also receive an infrared beak treatment in the hatchery

(see the "Infrared Beak Treatment" technical update). The transportation time of the chick delivery from hatchery to farm should be kept to a minimum. Chicks derived from different breeder flocks should be kept separate and mortality records maintained for each breeder source.

Brooding Period – Getting off to a Good Start:

Pullet chicks arriving to the farm from the hatchery should be alert and active. Chicks must be vigorous enough to explore their new environment and quickly find feed and water. Eating feed and drinking water quickly will speed the development of healthy intestinal microflora and build resistance to enteric pathogens such as Salmonella and E. coli. During the first week of life, chicks must be provided with constant attention by the manager to ensure optimized temperature, humidity, lights, feed and water availability. The first 2 weeks of life are when the most significant problems for proper chick development can occur. The newly hatched chick is unable to regulate body temperature and must be provided the proper environmental conditions. Relative humidity during the first week should be above 40% to prevent dehydration, drying of mucous membranes and vent pasting. The use of heaters to maintain brooding temperature will reduce relative humidity.

Recommended Brooding Temperatures

Day of Age	Hy-Line Brown, Silver Brown, Pink and W-80		Hy-Line W-36 and Sonia	
	Cage	Floor	Cage	Floor
1–3	33–36°C (40–60% relative humidity)	35–36°C (40–60% relative humidity)	32–33°C (40–60% relative humidity)	33–35°C (40–60% relative humidity)
4–7	30–32°C	33–35°C	30–32°C	31–33°C
8–14	28–30°C	31–33°C	28–30°C	29–31°C
15–21	26–28°C	29–31°C	26–28°C	27–29°C
22–28	23–26°C	26–27°C	23–26°C	24–27°C
29–35	21–23°C	23–25°C	21–23°C	22–24°C

GROWING SPACE RECOMMENDATIONS FOR CHICKS (0-3 WEEKS) (check local regulations regarding space)

	Colony/Cage	Floor
Bird space	100–200 cm ² /bird (16–31 in ² /bird)	835 cm ² /bird (0.9 ft ² /bird)
Feeder	5 cm/bird (2 in/bird)	5 cm/bird (2 in/bird) or 1 pan per 50 birds
Cups or nipples drinking system	1 per 12 birds	1 per 15 birds
Fountain drinking system, 46 cm (18 in) diameter	—	1 per 125 birds

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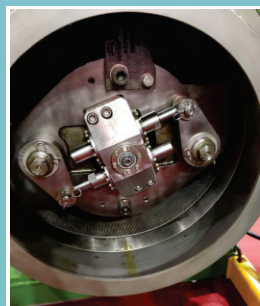


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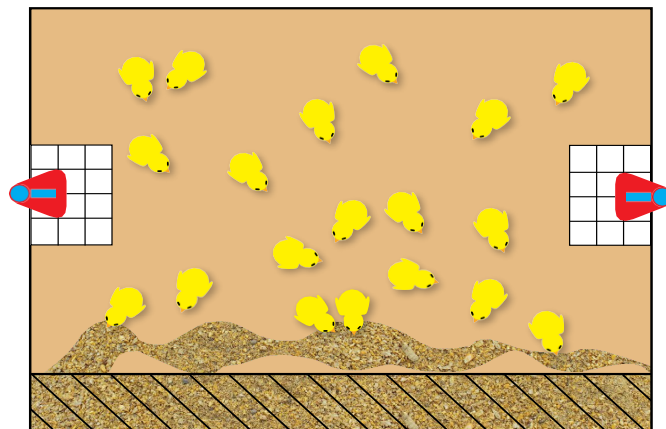
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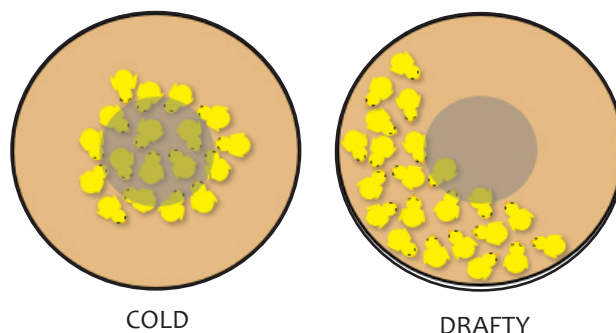
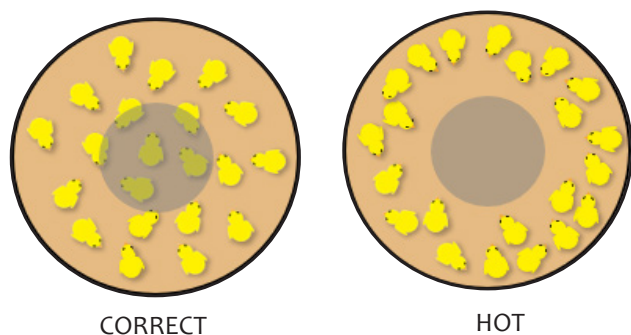
Brooding chicks in cages requires strict management of temperature and humidity as the chicks cannot migrate to an area of comfort like chicks grown on the floor. Chicks started in cages should be placed on paper for 7 to 10 days to help their movement within the cage, temperature control, prevent drafts and allow supplemental feeding on the paper. Feed should be placed in front of the feed trough to train chicks to move toward the permanent feeders.

Place feed in front of automatic feeders:



During the first week, chicks benefit from bright light conditions in the house. Minimum light intensity should be 30 lux with clocks set to 20 hours. Alternatively, if local regulations allow, an intermittent lighting program can be used (4 hours of light followed by 2 hours of darkness, repeated for the first 7 to 14 days). In order to encourage water consumption, keep cup drinkers full of water for the first 3 days or adjust water pressure to cause a hanging drop of water in nipple drinkers. Chicks that fail to adapt to their environment and are delayed in finding feed and water will die at 4 or 5 days of age when the yolk sac is depleted. Chicks raised on the floor in houses heated with brooder stoves or whole-house heating should be confined in brooder rings. Observe chick behavior to determine if the temperature is correct. Chicks should be uniformly distributed in the brooding area. Closely grouped chicks indicate low temperatures or excessive drafts. In cold environments chicks will often chirp with a distressed tone. Chicks that are too warm will appear lethargic and will try to move away from the heat source. Both heat and cold-distressed chicks can have pasty vents.

Brooding Temperature, Floor Brooding in Rings:



Additional Considerations for Floor-Raised Birds

Floor-raised pullets may use pan or chain feeders. For both feed systems, it is important to start chicks by feeding on paper, cardboard or trays that are placed near the feed line. When the chicks first arrive, be sure either the pans or troughs are completely filled to help the chicks find the permanent feed source. Carefully monitor the control panel to ensure that all feeders on the line remain full.

When using brooder rings, there may not be sufficient access to water. Provide supplemental water with chick drinkers for the first week or two or until the rings are opened up to full water access.

If perches are integrated onto the feed or water lines, it is important to minimize manure build up. Water lines with perches should use small or no-drip cups, as large drip cups tend to collect manure from perching birds.

Many diseases affect floor-raised birds more than cage-raised birds. In particular, infectious bursal disease and coccidiosis must be well controlled to ensure good uniformity and weight gain. Veterinarians with knowledge of the local disease burden should be consulted to implement an appropriate control program.

Teach Good Behavior Early

Pullets going into enriched colony, barn or aviary laying environments should be provided growing environments containing perches, water platforms or multi-tiered environments. While chicks are usually started on the floor, it is important to set up the platforms or enriched environment by 3-4 weeks of age. If water platforms are used, it is important that pullets continue to have access to water on the floor until the flock learns to jump.



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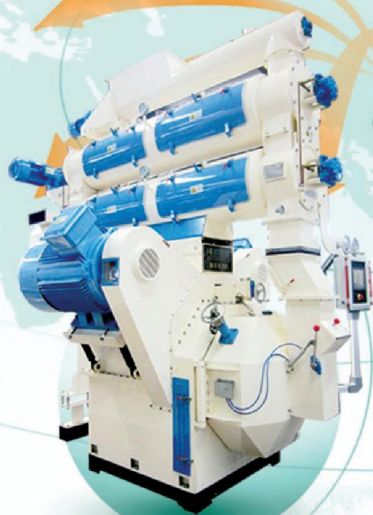
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Complex environments teach pullets jumping and exploratory behaviors. Pullets raised in enriched growing environments adapt better to complex laying environments. By learning to jump and explore at an early age, adult behavioral problems such as piling or not utilizing all levels in a multi-tiered system can be reduced.

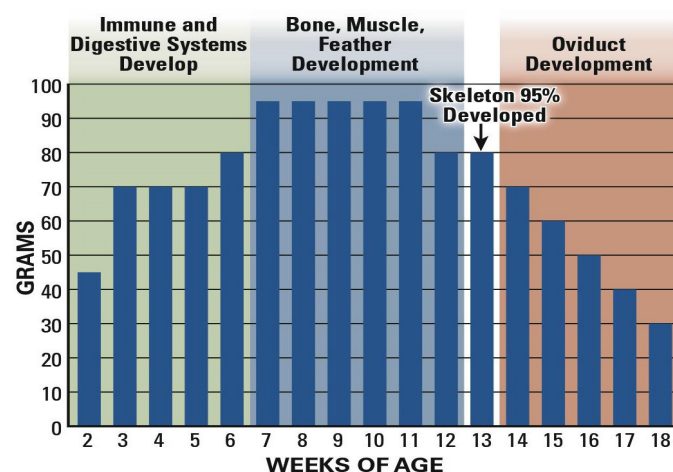
Human contact during the growing period socializes pullets and reduces stress. Walking the house perimeter multiple times daily during the growing period aids socialization and can improve nesting behavior in layers. Using the same type of drinkers in pullet and layer houses improves adaptation in the layer house.

Pullet Development and Weight



The pullet develops according to a well-orchestrated sequence of physiologic events. Pullets reaching or exceeding breed body weight targets during these developmental phases have the best chance to perform to genetic potential as layers. Interrupted growth during any of these developmental phases will result in hens lacking the body reserves and organ function to sustain high production as adult layers.

Weekly Body Weight Gain and Organ Development during the Growing Period:



The growing period can be divided into the following periods:

0 To 6 Weeks of Age

During this period, the organs of the digestive tract (supply organs) and the immune system undergo much of their development. Problems during this period could have permanent negative effects on the function of these systems. Birds stressed during this period might have lifelong disability in digestion and the absorption of feed nutrients. Immuno suppression could also result from problems during this period leaving the bird more susceptible to disease and less responsive to vaccinations.

6 To 12 Weeks of Age

This period of rapid growth is when the pullet attains most of the adult structural components (muscles, bones and feathers). Poor growth during this period will prevent the pullet from attaining sufficient bone and muscle reserves needed to sustain a high level of egg production and maintain good shell quality. The skeleton is 95% developed by the end of the 13th week of life. At this time the growth plates of the long bones calcify and no further increases in bone size can occur. Any compensatory growth occurring after this period will not increase the size of the skeleton. The amount of mineral reserve available for egg shell formation is directly related to the hen's skeleton size. Reactive vaccinations, beak trimming, bird handling and other stressful management practices can delay development during this period of rapid growth.

12 to 18 weeks of Age

During this period the growth rate slows and the reproductive tract matures and prepares for egg production. Development of muscle continues and proliferation of fat cells occurs in this period. Excessive body weight gain during this period can result in pullets with an excessive amount of fat pad. Low body weights and stressful events during this time can delay the onset of egg production. Seven to ten days prior to the oviposition of the first egg the medullary bone within the cavities of long bones can be increased by feeding a pre-lay ration with increased levels of calcium.

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Target Body Weights at Critical Points of Development:

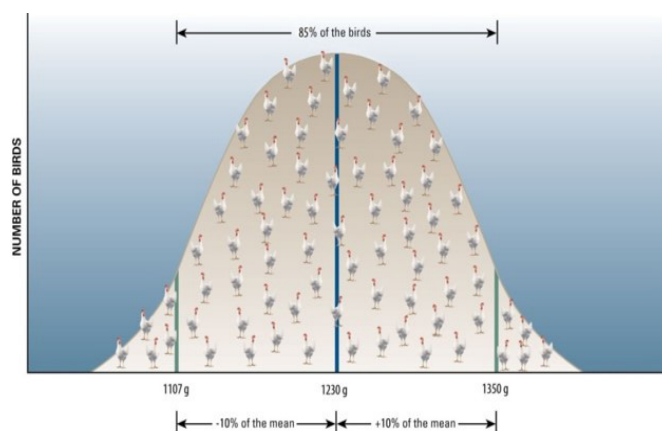
	W-36	W-80	Brown	Silver Brown	Sonia	Pink
6 WEEKS Development of immune and digestive systems	410– 430 g	410– 440 g	450– 470 g	470– 490 g	490– 500 g	480– 500 g
12 WEEKS Development of skeleton and muscle	950– 970 g	920– 990 g	1050– 1110 g	1060– 1120 g	1110– 1120 g	1110– 1130 g
17 WEEKS Development of the reproductive tract	1230– 1270 g	1170– 1250 g	1400– 1480 g	1500– 1580 g	1440– 1450 g	1440– 1480 g
40 WEEKS Evaluates adequacy of layer nutrition	1520– 1560 g	1590– 1710 g	1870– 1990 g	1960– 2080 g	1900– 1950 g	1870– 1950 g

Body Weight Uniformity:

Uniformity of body weights within a flock is as important as achieving the target average body weight. The proper goal during the growing period is 85% uniformity (85% of the individual bird weights are $\pm 10\%$ of the average). Poor pullet body weight uniformity complicates the proper feeding of the flock both in grow and lay and is the most important factor causing poor peak of production and substandard egg production. Another challenge resulting from poor uniformity is pullets coming into production at different times, with underweight hens producing small eggs.

Reasons for pullet poor uniformity include:

1. Enteric diseases such as coccidiosis, infectious bursal disease (Gumboro, IBD), spirochetosis, viral or bacterial enteritis, runting / stunting
2. Overcrowding leading to competition at feeders and drinkers
3. Inadequate nutrition because feed formulation does not match actual feed intake
4. Feed refusal due to poor quality, mycotoxins or abrupt changes in feed ingredients disrupting intestinal microflora
5. Feed management
 - a) Not enough feedings or stimulations
 - b) Slow movement of feeders leading to selective feeding
 - c) Not allowing the feeder to be emptied daily, leading to accumulation of fine feed
 - d) Improper feed particle size (see the "Feed Granulometry" technical update)
6. Stress from vaccination, excessive bird handling, heat stress
7. Poor beak trimming technique
8. Any restriction of water consumption will also reduce feed intake. Water must be freely available at all times. Causes of water intake problems include:
 - a) Overcrowding or equipment failure
 - b) Improper height of drinkers

Good Body Weight Uniformity Goal:

In flocks with poor uniformity it may be necessary to segregate the birds by weight and then feed separately. Birds on the floor can be separated into pens of different weight classes. When the birds cannot be separated, the flock should be fed according to the requirements of the lighter birds in the flock.

A weight monitoring program should begin when the flock is 1 week old. During the first 4 weeks when the birds are still small, bulk weigh random samples of 20 birds. After 4 weeks of age, individual bird body weights should be taken weekly from at least 100 birds. Continue weighing weekly until mature body size is reached at 32 weeks, then at least every 5 weeks during the remainder of the production period. For pullet flocks raised in cages, a selection of cages from all levels and positions within the house should be marked. All the birds in these cages should be weighed separately with the birds from the same cages weighed every week. Select cages at the beginning and end of feed lines, as well as from upper and lower levels.

Flocks raised on the floor can only be weighed randomly, but can be collected from several different locations. Platform scales can be used to continuously monitor growth, in addition to manual weighing.

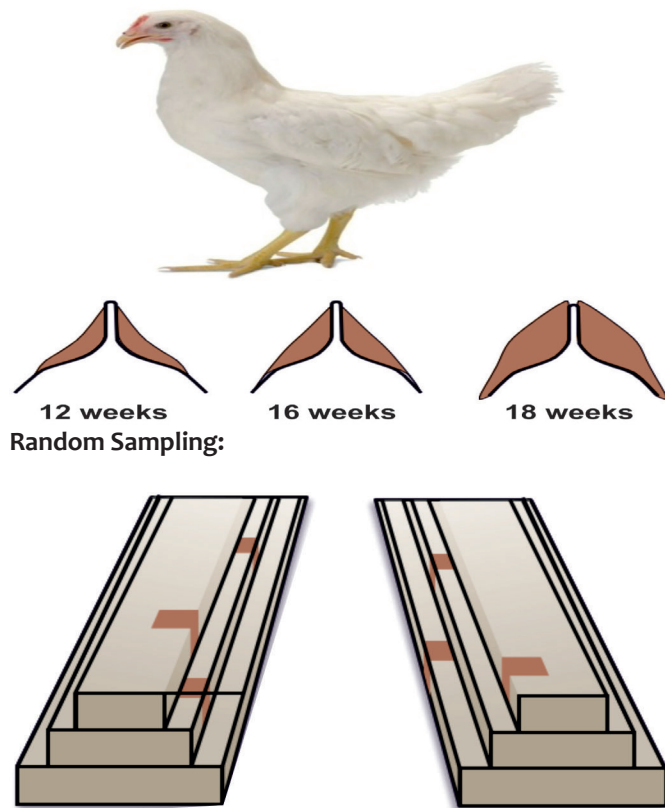
Weekly monitoring of body weights is preferable as the producer can identify growth problems quickly. It might be possible to associate the growth problem with a change of feed or a stressful management practice, allowing corrective action to be taken.

Weigh birds prior to a scheduled change in feed formulation, such as from starter to grower feed. Scheduled changes in feed formulations should always be based on achieving target body weights and not the age of the flock. Under weight pullet flocks or flocks with poor uniformity should be retained on the more nutrient rich formulation. Flocks that will be receiving a harsh vaccination involving handling the birds for injection or during peak heat waves (acute heat stress) should be placed back on more concentrated feed formulations to compensate for loss of appetite.

Breast Muscle Development:

Pullets should be examined for breast muscle development as a good indicator of proper pullet development and a predictor of future layer productivity. Muscle contains glycogen, a rapidly available source of energy used for egg production. Pullets coming into egg production with insufficient muscle will not have sufficient energy available to sustain high egg production.

Proper Breast Muscle Development:



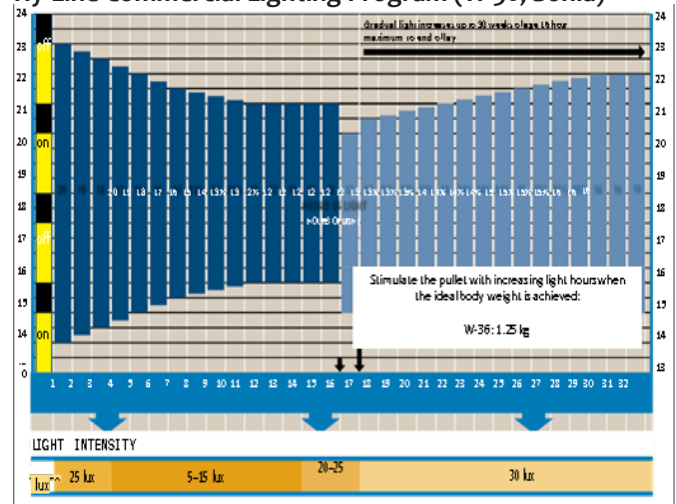
Lighting programs:

Step-down lighting programs modulate growth, determine age of sexual maturity and affect egg size and egg mass (within the genetic limits of the layer variety).

In a typical step-down lighting program, the hours of light are gradually decreased over the first 8–12 weeks. This provides the young growing flock additional hours of feeding time to promote growth. Age of sexual maturity and egg size is not affected if the step-down period is 12 weeks or less. When the step-down period is extended beyond 12 weeks, sexual maturity will be delayed and egg

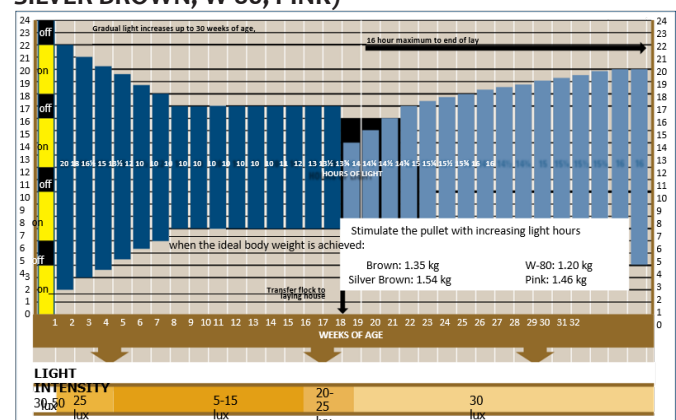
size increases. Step-down periods longer than 12 weeks are appropriate in commercial egg markets requiring large eggs or in breeder flocks requiring larger egg weights for hatching. On the contrary, fast step-down (< 8 weeks) can be used to stimulate rapid onset of lay and to reduce egg size, but this system needs to be applied only if pullet body size is on target.

Hy-Line Commercial Lighting Program (W-36, Sonia)



In open housing, the artificial lighting programs must complement the natural day length. After the initial step-down in lights over the first 12 weeks, the artificial lights are set to the longest natural daylength the flock will experience during the growing period. This will negate the influence that changes in natural daylength would have on pullet development and the age of first egg. A lighting program web tool is available at www.hyline.com that provides a customized lighting program for any location.

HY-LINE COMMERCIAL LIGHTING PROGRAM (BROWN, SILVER BROWN, W-80, PINK)



CONCLUSION

Careful attention to the principles of pullet management is fundamental for success and profits in laying flocks. Growing a pullet flock of the correct weight and body conformation will usually ensure success in the laying period. Problems such as low egg numbers and poor egg shell quality during lay can often be traced back to problems occurring in the growing period.

Evaluating Protease Enzymes



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Novus International.

Highlight Points

“It’s very important to optimise the commercial value from adding enzymes in feed. The more accurate the feed formulation the more consistent the response from the enzyme. Measuring values of enzyme in commercial units can be done in a controlled way. One principle to bear in mind that good enzymes always work.”

Enzymes increase nutrients available in feed ingredients. Since enzymes are substrate specific, the benefit of the enzyme in the diet is dependent on the mix of raw materials and the amount of substrate available.

Assessment of added value of enzymes isn’t simple. The most accurate method is to use in vivo techniques with animals consuming semi-purified diets. Using this method, the direct effect of an enzyme can be understood for each raw material. As this method is expensive and not available to do it for everybody, the matrix approach based on nutrients contribution values given by the supplier has been widely adopted to evaluate an enzyme.

Using a set of nutrient matrix values for an enzyme is a practical approach and providing unique matrix values to a given enzyme ensures it can be applied simply to any kind of diet, regardless of the raw materials or the amount of substrate. This approach has been easy to adopt in practical formulations but has consistently demonstrated enzymes failing to meet expectations. These failures have been due to the lack of or an excess of substrate and / or over-formulation.

When evaluating enzymes, a few concepts need to be made clear:

1. **Substrate:** The specific substance on which an enzyme act.
2. **Enzyme Effect:** Nutrients that a given enzyme will make available due to the direct enzymatic effect and the additional benefits accrued by the reduction of the substrate in the diet.
3. **Avoid over-formulation:** Enzymes need “nutritional space” to express and thus diets need to be near the deficiency point to make a good estimation of the enzyme’s potential.

Trials for evaluating enzymes:

The test of an enzyme requires being aggressive in the formulation and pushing the limits. Under-performing chickens will help provide a better evaluation of the enzymes and understand how accurate the formulation is.

Challenge Model: In this model, the diet with significant reduction of nutrients, that the enzyme will liberate and make available to the birds, needs to be formulated. Different enzymes can then be added on top.

Table 1: Challenge Model-Protease - 10% reduction of the CP & AA from the specifications.

T1	T2	T3	T4	T5
Control	Neg Control	Protease A	Protease B	Protease C
Current Diet	Reduction of AA & CP by 10%	T2 + Protease A	T2 + Protease B	T2 + Protease C

Objectives of the trial:

1. “AA room” is created for enzymes to show their potential.
2. Each supplier has different recommendations of how proteases affect the feed. This trial allows simplifying the comparison.
3. Proteases can’t increase the AA digestibility 10% linearly. As a result, the AA ratio will be unbalanced and subsequently the performance of negative control as well as treatments will be lower than that of the control group.
4. The most aggressive protease will have the best performance compared to T2.
5. If any of the enzyme groups shows the same performance as the control group (T1), it signals some over formulation as no protease can increase 10% linearly on all the AA.

Response Model:

The model is a variation of the ‘Challenge model’ discussed in the previous section. In this model, two control diets will be used; the current diet (this group is optional if there aren’t enough treatments) and a diet group with anywhere between 5% to 10% lower AA specifications. The control 2 specifications will be used for the treatment groups. There will be a reformulation following the matrix value recommendation of each protease supplier.

Table 2: Response Model - Diet reformulation

T1	T2	T3	T4	T5
Control	Control 2	Protease A	Protease B	Protease C
Current Diet	Reduction of AA & CP by 5-10%	Reformulation of T2 + Protease A	Reformulation of T2 + Protease B	Reformulation of T2 + Protease C

Objectives of the trial:

1. Having T1 compared to T2 will assist in acknowledging any over-formulation or amino acid imbalance.
2. Having lower specifications in AA and CP creates enough space for the enzyme to express to potential.
3. This design allows each supplier to give their ideal recommendations.
4. If the enzyme recommendation is too aggressive, the enzyme group will clearly show lower performance than T2 as long as there is a gap of performance between T1 and T2.
5. If the enzyme recommendation is conservative and the enzyme can deliver additional benefits it will be reflected in greater performance than T2 as long as there is a gap of performance between T1 and T2.

Multiple Mycotoxins and the Indian Poultry Industry

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Highlight Points

Mycotoxins are the secondary metabolites of a variety of fungi like the Fusarium, Penicillium, etc. Multiple mycotoxins can generate additive or synergistic effect, interfere in nutrients digestion, absorption, assimilation and metabolism, cause damage to the Intestinal tract, disturb the normal microbiota of the intestine, all causing negative impact on the bird's performance.

Mycotoxins are the secondary metabolites of a variety of fungi like the Fusarium, Penicillium, Aspergillus etc. Fungi grows on the crops in the field and on grains in storage. The spectrum of mycotoxins produced depends on physical factors (moisture, relative humidity, temperature) and chemical factors (oxygen, carbon dioxide, and composition of the substrate). Moisture and temperature are the major factors influencing mould growth and mycotoxin production. Some fungi are capable of producing a variety of mycotoxins.

Some Fungi and the mycotoxins they produce:

Fungal species	Mycotoxin Produced
Aspergillus parasiticus	Aflatoxins B1, B2, G1, G2
A. flavus	Aflatoxins B1, B2
Fusarium Graminearum,	F. roseum, Deoxynivalenol, Zearalelone
F. moniliforme	Fumonisin B1
F. Sporotrichioides	T2-toxin, HT-2 toxin,
Penicillium verrucosum,	F. poae, F. tricutum, Ochratoxin A
Aspergillus Ochraceous,	A. paraciticus,
A. niger	Ochratoxin A

More than 400 different types of mycotoxins are produced by nearly 350 species of fungi, these can be found in the literature, and normally tests are performed for the following few - Aflatoxins, ochratoxins -A, DON, HT-2 or T-2-toxin, Fumonisin and Zearalenone.

Multiple mycotoxicosis or mycotoxinco-contamination with various types of simultaneously occurring mycotoxins is a major problem of the Indian Poultry Industry, that slowly and steadily alters the birds metabolism, suppresses the immune system, damages the liver, kidneys, intestines and changes the blood parameters, complicating the situation, making it difficult to diagnose, control and treat. Confusion prevails and Guess work fails, non-specific symptoms make it difficult to address the situation properly before much of the damage is done, then begins the blame game, and few Veterinarians and Marketing personnel

of Pharma Companies take advantage of the situation to promote their products vaccines fail to protect infections, antibiotics don't control the bacterial diseases, egg production reduces, body weights are depressed, farmer's loose heavily due to treatment cost and the reduced performance.

No single Toxin Binder, can totally prevent, control and treat this condition:

None of the toxin binder normally used in poultry feed will check / reverse or control Chemical toxicity of feeds.

Multiple mycotoxins can generate additive or synergistic effect, interfere in nutrients digestion, absorption, assimilation and metabolism, cause damage to the Intestinal tract, disturb the normal microbiota of the intestine, all causing negative impact on the bird's performance.

In a recent survey of the Mycotoxins Prevalence in India, it is reported that, 88 % of the samples were contaminated with more than one type of mycotoxin and 24 % had contamination with more than 4 types of mycotoxins. Different physical, chemical, and biological methods to prevent mycotoxicosis in poultry feeds have been reported but practical and costeffective methods for efficiently decontaminating multiple mycotoxins containing feedstuffs are currently not available.

T-2 toxin is the most potent toxin of the trichothecene family, inhibits the DNA, RNA synthesis, cause neural disturbances, cytotoxicity and disturbances in the skin, intestine, liver and kidneys, and severe immunosuppression. There are about 190 different types of T-2 toxins with the same basic chemical structure, but will need different detoxifying agents for their control, depending upon their concentration.

Potential mycotixin absorbent materials include activated carbon, aluminosilicates (clay, bentonite, montmorillonite, zeolite, phyllosilicates, etc.), complex indigestible carbohydrates (cellulose, polysaccharides) the cell walls of yeast and bacteria such as glucomannans (MoS&FoS), peptidoglycans, enzymatic degraders or digestors, and synthetic polymers such as cholestyramine and polyvinyl pyrrolidone and their derivatives.

Research on fungi and mycotoxins, various laboratories have tested more than 300 different materials e.g. organic binders, cellular components, aluminosilicates, activated carbon, etc. for their ability to bind mycotoxins.

The best strategy will be to use a combination of an anti fungal agent to control the growth of fungi, an absorber, an enzymatic degrader, a probiotic type of pH regulator and activated char coal as an adsorber to check the growth of fungi and production of mycotoxins, in combination with a product to protect the Intestines, liver, kidneys and to regulate the metabolic activity in the birds body, together all the above will ensure good health and performance.

Going for Growth; Improving Healthy Broiler Performance from week two onwards

Dr Ceinwen Evans, Global Technical Services Manager, Danisco Animal Nutrition.

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Highlight Points

1. Research has shown that achieving maximum degradation of phytate is also a key factor in the release of 'extra- phosphoric' nutrients (for example amino acids and energy).
2. Spore forming probiotics such as *Bacillus* spp are particularly favored for inclusion in animal feed because of their proven stability in feed production and through the digestive process.
3. Feed additive science will continue to offer producers new opportunities to develop larger, more healthy and uniform birds in less time and at a lower cost.

In the last issue, I discussed the part that first week nutrition had to play in contributing to the 65% improvement in broiler finishing weights since the 1960s. This article looks at how producers can maximize return on their feed investment and minimize challenges from week two up until the time that it takes to reach the ideal finishing weight required to supply the most popular poultry products.

A broiler's digestive capability is generally mature by its second week at which stage the bird can no longer rely on the contribution of the yolk which provides around 30% of the nutrients required for growth and maintenance in the first few days after hatch.

The ratio of protein, lipid and carbohydrate in the diet and the digestibility of these nutrients will have a major impact on skeletal development and the body composition from this point onwards.

As the bird ages, protein content is typically reduced and the energy component increased. These dietary changes, combined with other factors such as production stress, can also cause gut health challenges which can impact not only growth but live ability.

Skeletal development:

Despite improvements in genetics and production practices, 2 - 6% of broilers a year are still lost due to skeletal issues. A 5,000% increase in weight from around 36 - 40g at hatch to over 2,000g 5 - 6 weeks later requires a correspondingly

rapid development of the skeleton and musculature, for example a four-fold increase in tibia and femur length over six weeks. Selection for rapid growth of breast muscle has also resulted in change of body conformation, moving the centre of body gravity forward which not only causes increases in the energy required simply to move around but also puts extra strain on the bird's immature skeletal structure.

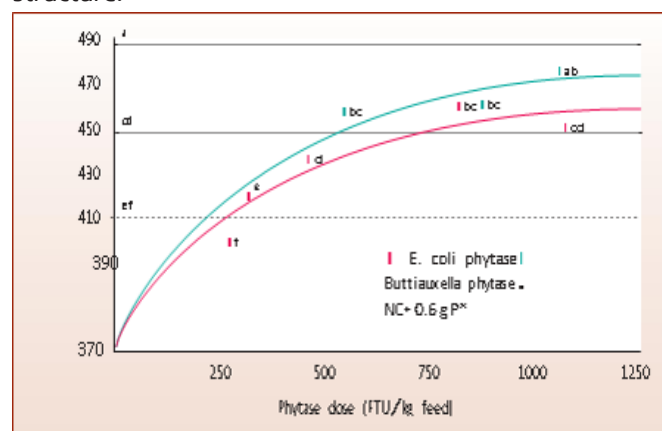


Fig. 1. Improvements in bone mineralisation delivered by higher doses of both best in class *E. coli* phytase and novel *Buttiauxella* phytase, 5-20 day trial with Ross 308 male broilers, PC reduced by 0.15% av.P (Schothorst Feed Research, 2014).

Rapid bone formation happens proportionally from days 4 - 18 for all poultry and likewise mineralization, which takes from 4 -11 days post-hatch.

There is also virtually no carry over effect of starter nutrition on bone composition because the fast growth of the bones means that all bones formed during the starter period have been replaced completely by the end of the finisher period. As bone grows, there is an increased accumulation of calcium and phosphorus; therefore bone mineral ash should increase with age. However, the cortical bone of a modern broiler chick is less mineralized than 'non-selected' birds and even as an embryo, its bones are more porous. The tibia, particularly the epiphysis end, is particularly impacted by dietary deficiencies in the growing phase.

We know that calcium and phosphorus make up more than half of a bird's mineral requirement. Research has also shown that insufficient calcium and also inadequate calcium: available phosphorus ratios are the most likely causes of bone mineralization issues such as tibia dyschondroplasia.



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This is a cartilage anomaly which is the most frequent cause of lameness in broiler chickens and accounts for 60% of the skeletal disease in chickens. 30% more birds are impacted by another disease associated with rapid growth, angular bone disorder. This can cripple young birds meaning that they cannot reach feed or water and lead to increased culls.

These diseases not only cause economic losses because of flock mortality but also producer profitability is at threat from increased carcass condemnation and downgrading at slaughter. In addition, porosity of the bones can lead to some breakage issues when the birds are processed, resulting not only in immediate food safety hazards from fragments of bone stuck in the meat but quality issues such as black bone syndrome. This occurs when bone marrow expands after being frozen, is forced out through porous bones and stains the meat 'black' around the bone when it is cooked. While it is not in itself harmful, the impact that it has on brand reputation of broiler producers and retailers alike certainly is.

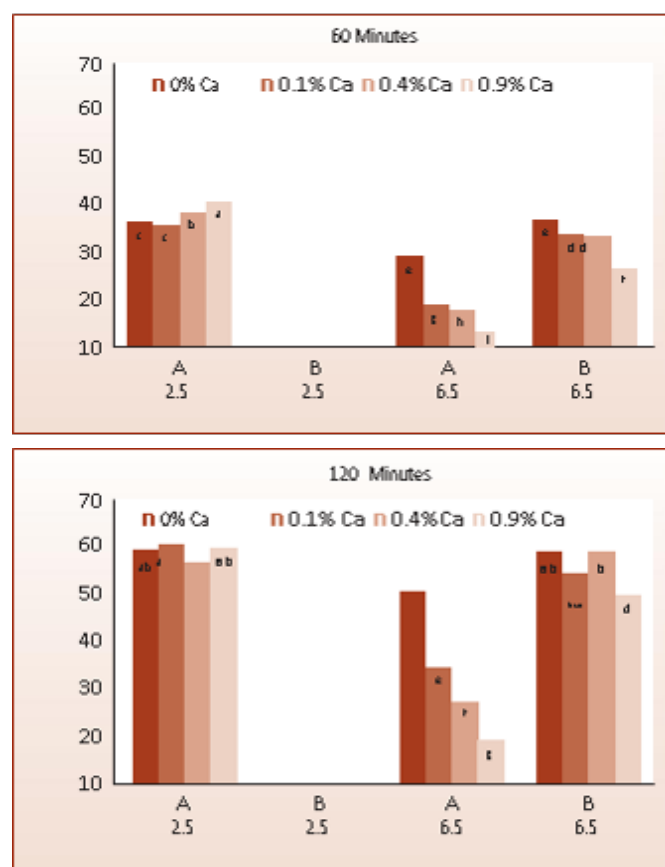


Fig. 2. In vitro trials show activity of some phytases is reduced by high calcium at pH 6.5 but not pH 2.5. Higher doses (>1000 FTU/kg feed) of all phytases have been shown to offset these effects as long as there is sufficient phytate in the diet (Tamin, Angel and Christman, 2004).

The most recent research shows that by far the biggest threat to achieving healthy broiler growth performance is a high level of phytase, the form in which phosphorus is naturally stored in feed raw materials at a range of 2.5 - 4.0g / kg in typical poultry rations. Phytase should, in theory, be a

valuable source of phosphorus, but this phosphorus 'pool' remains largely unobtainable to the bird because their own enzymes cannot degrade phytate effectively. Even average levels of phytate have been shown to reduce feed intake and growth performance by impacting the availability of essential minerals and amino acids and wasting vital energy.

The strategic use of phytase, which in simple terms has been shown to break down phytate and make more minerals and amino acids available to the bird, can have a significant, positive impact on broiler performance, as well as contributing substantially to feed costs savings. Many different factors impact phytase efficacy not least of which is the phytase source. There are a number of phytase products on the market and they do not all have the same activity levels at the different pH levels found in a broiler's gut.

The first E.coli phytase, launched back in 2003, offered a 20% improvement in bio- efficacy and associated feed cost savings compared to traditional fungal phytase. However, the latest *Buttiauxella*-based phytase is even more cost effective because it offers much higher activity earlier in the gastrointestinal tract. It has an optimal pH which better matches that in the proven trichlorus and gizzard of a broiler, where the pH can be as low as 2.5 and feed has a residency time of 40-60 minutes.

The activity of the *Buttiauxella* phytase at pH 4.0 is almost double the activity at pH 5.5, the level at which all commercial phytases have their activity standardized and much higher than other phytases. Research has shown that this offers a high and fast rate of phytic acid degradation compared to E. coli phytases at 500 FTU / kg feed.

The other factor that has been shown to impact phytate degradation is the dose of phytase used. This should be determined through proper application of evidence-based matrices that vary according to factors such as the age of the bird (older birds tend to utilize phytate phosphorus much more readily), levels of phytate and available nutrients in the diet and health status.

While the level of phytate degradation is always higher with the latest advanced phytases such as *Buttiauxella*, trials have shown that higher doses, for example 1,000 FTU / kg will improve performance for both best-in-class E. coli and the *Buttiauxella* phytase, both in terms of bone mineralization (Fig. 1) and feed conversion ratios.

There was also a much less pronounced effect from high calcium levels when a *Buttiauxella* phytase was used because its ability to rapidly degrade IP6 in the acid stomach results in more consistent phytate hydrolysis (Fig. 2).

The Impact of Phytase:

Research has shown that achieving maximum degradation of phytate is also a key factor in the release of 'extra-phosphoric' nutrients (for example amino acids and energy).

Shan & Davis (1994), Cabahug et al (1999) Sands et al (2004) and Woyengo et al (2012) have shown that high dietary phytate-phosphorus levels reduce feed intake and growth performance in broilers.

Ten broiler studies using *Buttiauxella* phytase clearly supported the correlation between the level of dietary phytate and amino acid digestibility response.

Plumstead et al (2013) also showed that the improvement in amino acid digestibility from the same *Buttiauxella* phytase was dependent both on the dose of phytase and the phytate level of the diet.

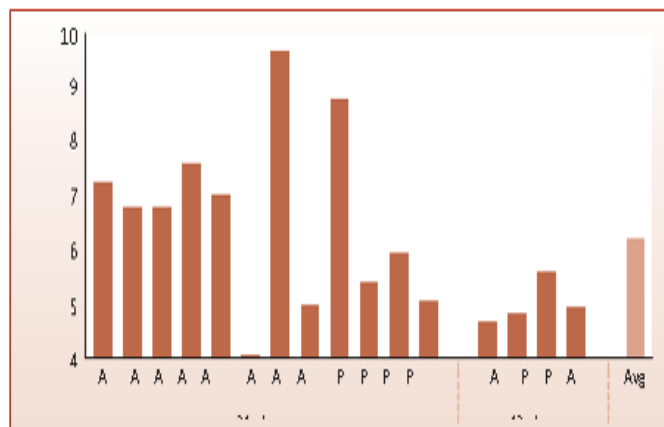


Fig. 3. Improvement in bodyweight gain response (%) at 1,000 vs. 500 FTU/kg across nine broiler trials, with *Buttiauxella* phytase (A) and/or a best-in-class *E. coli* phytase with an average phytate-P level in feed (0.26%) (Danisco unpublished, 2014).

In addition, trials have shown that using both a best-in-class *E. coli* and bacterial phytase at doses higher than 500 FTU/kg showed improvements in diets with sufficient phytate (Fig. 3).

Very recent research has shown that losses in amino acids and energy are caused by sodium imbalance, reduced amylase activity and increases in mucin secretion.

The importance of sodium recovery, digestibility and absorption for the effective absorption and conversion of nutrients – in particular glucose – along four areas of the small intestine was established in these studies, which were conducted on broilers aged 7-21 days. It was concluded that adding a *Buttiauxella* phytase enhanced the absorption of sodium – and therefore also protein and glucose – from the gut, with positive effects on growth performance.

Reduced AGP use:

As the bird grows and the gut microbiota matures and caecal flora develop, it is important to ensure that its gut microbiota is balanced to support strong growth performance.

The viscosity of the gut contents plays an important role in the development of the microbial population, especially in the small intestine. Undigested nutrients flowing to the hind gut can not only impact performance but also directly contribute to good bacteria in the gut microbiota being outnumbered by bad, which in turn impacts the dynamic balance of the mucus layer, epithelial cells and immune cells.

Bacterial overgrowth – known as dysbacteriosis, which tends to impact the bird between 20 and 30 days of age – may lead to coccidiosis and necrotic enteritis (NE) which in turn result in mal absorption of feed, diarrhea and damage to the intestine, ultimately leading to diseased birds, poor growth performance (and therefore a lack of uniformity in the flock) and increased mortality.

When you are producing millions of birds a week, it can seem very hard to ensure that non-beneficial bacteria do not get the upper hand. Clostridia can form spores and survive in litter for long periods, even in some disinfectants, to infect chickens whose immune systems are compromised by a gut imbalance at a later date.

Risk of Necrotic Enteritis:

The risk of necrotic enteritis (NE), due to the Gram-positive bacterium *Clostridium perfringens*, has increased in recent years because of the voluntary or legally required withdrawal of the use of certain in-feed antibiotic growth promoters (AGPs) with anti-clostridial activity.

The microbial imbalances that have been proven to cause clostridial blooms and outbreaks of NE are also not easily detected so it pays to have an ‘insurance’ policy in place, especially as poor gut health through poor coccidiosis control and enteritis has been calculated to cost up to 6.8p / bird.

To understand if AGPs can be replaced in this capacity, it is important to understand their mode of action and those of the possible ‘alternatives’.

Like AGPs, feed enzymes such as xylanase, amylase and protease have been shown to help prevent microbial overgrowth in the small intestine.

Unlike AGPs whose mode of action is anti-microbial, these feed enzymes support healthy bird performance by improving fibre, starch and protein digestibility which, in turn, reduces the amount of available substrate for non-beneficial bacteria. Like feed enzymes, probiotics – ‘live microbial feed supplements which beneficially affect the host animal by improving its intestinal microbial balance’ – support healthy performance.

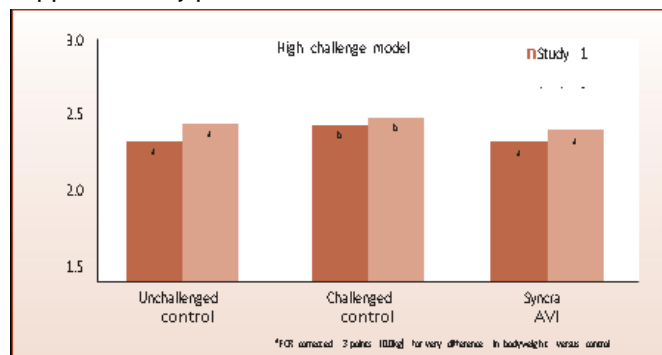


Fig. 4. Meta-analysis of two studies with NE challenge model, showing that a combination of multi-enzymes (xylanase, amylase and protease) and *Bacillus* spp three strain probiotic maintained feed conversion ratio similar to unchallenged control under necrotic enteritis challenge (Mathis et al., 2013).

maintain a beneficial – as in diverse and stable – microbial population in the gut of the bird. This makes the gut environment less conducive to colonization by micro-organisms that may have a negative impact on animal performance.

Spore forming probiotics such as *Bacillus* spp. are particularly favored for inclusion in animal feed because of their proven stability in feed production and through the digestive process.

They complement the mode of action of enzymes by making the gut environment less conducive to colonisation by micro-organisms that may have a negative impact on performance, for example *Salmonella*, *E. coli*, *Campylobacter* and *Clostridium*.

Combining a three strain *Bacillus* spp. with commonly used enzymes such as xylanase, amylase and protease was shown to deliver net benefits of 14% in relative cost per kg live weight gain in a necrotic enteritis (NE) challenge model in a series of US trials (Fig. 4). A three-to-one return on investment was also shown through significantly improved digestion and gut health support in the low challenged birds in these trials.

Another study countered the common argument that feed additives are more costly than AGPs, showing a 2.5% higher gross profit when phytase was added to the enzyme and probiotic combination.

Research has shown that individual birds within a group have different microbial communities compared to each other, indicating that animals of the same age and breed have unique microbial populations.

The same study demonstrated that the diversity of the intestinal microbiota increases with age, especially within the caeca. So whether you are using probiotics on their own or with enzymes, it is important that your probiotic supplier has completed a large number of gut sample screenings in your region over a decent period of time.

They should also work with you to develop tailored gut health solutions that will help resolve complex-by-complex variability or livability challenges.

Natural betaine supplementation has also been shown to have positive effects on broiler gut structure. Its gut integrity benefits can help protect the animal against dehydrating conditions associated with situations such as coccidiosis or the proliferation of other undesirable micro-organisms in the gut, which can contribute to poor performance.

Research on coccidia-challenged broilers at the PARC Institute, USA in 2013 showed that coccidial lesion scores at 21 days were reduced when natural betaine was supplemented to diets containing varying levels of the coccidiostat salinomycin. It also helps maintain optimum villi height and crypt depth, which may support the bird's ability to absorb nutrients.

What's next?

Feed additive science will continue to offer producers new opportunities to develop larger, more healthy and uniform birds in less time and at a lower cost. It is important in such a competitive market that any solutions offered are proven to work in comparable production conditions and with birds of a similar age.

SELECTION OF ORGANIC TRACE MINERALS

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Highlight Points

Trace minerals play an important role in the body. Though required only in small quantities as compared to other nutrients, their deficiency may cause poor health and impaired performance. A trace mineral efficiency in the diet can reduce production efficiencies by 20 - 30%. As a result, trace element supplementation in animal diets has long been used to ensure rapid development, enhanced reproductive health and improved immune response (Overton and Yasui, 2014).

Over the years trace elements have been supplemented in animal feeds as inorganic salts such as sulphates and chlorides. However, the bioavailability of trace elements from these inorganic sources is relatively lower than that of minerals from feed and fodder sources (Spears, 2003). Recent studies in mineral research indicate that absorption and utilization of trace elements is higher if they are supplemented in an organic form.

Organic Trace Minerals:

The classification of Organic trace minerals as done by the Association of American Feed Control Officials (AAFCO, 1998) is tabulated below. According to AAFCO organic minerals are metal ions chemically linked to an organic molecule such as an amino acid which forms a chemical structure with unique characteristics bringing about stability and high mineral bioavailability.

CLASSIFICATION OF ORGANIC TRACE MINERALS (AAFCO, 1998)

Class	Definition
Metal polysaccharides	Metal polysaccharide complexes are formed by complexing of a soluble salt with a polysaccharide solution, e.g., Zn or Mn-polysaccharide complex.
Metal Proteinates	The product resulting from the chelation of a soluble salt with amino acids and /or partially hydrolysed protein. e.g., Cu, Co and Mn proteinates.
Metal amino acid Complex	The product resulting from complexing a soluble metal salt with an amino acid (s), e.g., Zn-Amino acid complex, K- Amino acid complex, and Cu- Amino acid complex.
Metal (Specific Amino Acid) Complex	The product resulting from complexing a soluble metal salt with a specific amino acid. Minimum metal content must be declared. When used as commercial feed ingredient, it must be declared as specific metal, specific amino acid complex: e.g., Cu-lysine, Zn-lysine, Mn- methionine.
Metal amino acid Chelates	Metal amino acid chelates are available for Zn, Cu, Fe, Mn and Co in addition to the macro-minerals like Ca and Mg. The product resulting from the reaction of a metal ion from a soluble metal salt with a mole ratio of one to three (preferably two) moles of amino acids to form coordinate covalent bonds. The average weight of the hydrolysed amino acids must be approximately 150 and the resulting molecular weight of the chelate must not exceed 800 Da.

Factors Affecting the Absorption and Bioavailability of Organic Trace Minerals Size:

- Molecular size is a major factor in determining the bioavailability of organic trace mineral.
- The molecular size of organic trace minerals depends on the nature of the ligand and the molecular ratio of ligand to the metal.
- The variations in the molecular size of an organic trace mineral affects its bioavailability and consequently its ability to influence animal performance.

Solubility:

- Solubility of an organic trace mineral is a key determinant of bioavailability.
- Organic trace minerals that have low solubility in the intestine are not absorbed efficiently.
- The solubility of an organic trace mineral generally decreases as the size of the ligand increases from a single amino acid to a dipeptide, tripeptide and so on. If the size of the ligand exceeds a tetra or pentapeptide, the ligand is almost insoluble in the intestine.

Specificity:

- Metal specific amino acid complexes result from complexing a soluble metal salt with a specific amino acid. They combine a specific single amino acid with a single metal ion to form a specific chemical entity. The end product is a new molecule containing one ion of the metal and one molecule of the specific amino acid.

- An organic trace mineral containing only a small and specific ligand such as a single amino acid is likely to be absorbed intact, leading to a better bioavailability.
- Studies evaluating the effect of amino acids and some “derivatives” on copper absorption showed that, in general, the Copper complexes of monomeric (one) amino acids are better absorbed than dimeric (two) or trimeric (three) or polymeric (four or more) amino acids (Kirchgeßner and Grassmann, 1967, 1969).

Stability:

- The effectiveness of organic trace minerals is attributed to the association of the metal with the ligand. It is therefore imperative for the metal-ligand complex to remain stable in the digestive tract.
- The pH in the digestive tract varies between 2 and 7. This means, that when ingested by an animal, an organic trace mineral faces the challenge of an acidic to a neutral environment.
- This change in pH levels influences the stability of the organic plex as a reduction in pH leads to an increase in dissociation of the mineral and the ligand.

Organic trace minerals have a higher bioavailability resulting in better animal performance, health, production and immune response. Critical factors such as size, solubility, specificity and stability of an organic trace mineral ensure optimum absorption and bioavailability. If such factors are not taken into consideration, a deficiency in trace minerals may result in sub optimal performance affecting growth, egg production, milk production and more.

Standardization of Botanical Powders starts at the Grassroots

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The organic revolution in the food industry has taken the world in its stride. The consumer awareness of the health benefits of natural products shall keep this revolution going. There has been tremendous growth in the global organic animal food industry. The global organic poultry market alone is expected to make \$7.67 billion in 2021. Although there have been several discussions to meet the desired market demand, there is little talk around the quality and consistency of natural products. With this in mind, we have designed this series of articles, which sheds light on the importance of standardization in botanical powders. In the last two issues, we have discussed with evidence what standardized botanical powders (SBPs) are and how an SBP comes into being.



The medicinal property of a plant is determined by the natural phytoactive chemicals they possess. Phytochemicals, such as alkaloids, terpenes, phenolic compounds and flavonoids are encapsulated by a specialized membrane known as tonoplast. A tonoplast is a semipermeable membrane surrounding a vacuole in a plant cell. Once the SBP is fed to the animal, the tonoplast disintegrates in the gut of the animals, releasing the phytochemicals. These phytoconstituents have been reported to exhibit various biological effects for instance adaptogenic, hypoglycaemic, antioxidant, immunomodulatory, anti-inflammatory, anti-cancer and gut enhancing properties. However, the biosynthesis of phytochemicals is significantly affected by several factors such as environmental stress conditions like seasonal changes, geographical location, plant maturity, soil type, farming practices, genetic make-up and post-harvest processing to mention a few.

In India, manufacturers can purchase crude botanicals from local Bazaar, where 52% of their stock comes from temperate and tropical forests, 25% from wild-grown regions, and 20% from farms or plantations. Scientifically, harvesting botanicals from wild sources not only damages the biodiversity of the region but also there is no accountability to the variation in their phytochemical constituents,

which poses an issue when botanical compounds need to be standardized. Therefore, it is important to ensure that plants selected for their medicinal uses contain relatively fewer variations in phytochemical constituents. Standardization is essential to maintain consistency in the biological outcome when consumed by animals. Hence to overcome these issues the standardization process begins at the farm where the medicinal plants are cultivated under supervision and can be harvested at the optimum time of growth for the best utility of the phytochemicals.

Contracted supervised farming:

One of the strategies to procure superior quality raw botanicals with the least variability in their phytoconstituents is through contracted supervised farming. This helps monitoring of the raw product for its authenticity, safety and least variability in the desired phytochemical; ensuring organic methodology is used in the plant cultivation process; harvesting at the specific age of maturity, when the phytochemicals are at their peak; to the farming community this generates a steady source of income; this generates gainful employment in rural communities; they receive support and guidance throughout the cultivation process; they receive input after analysis of the soil and water samples for pH, conductivity, organic carbon, phosphorus, potash and residual pesticides. Since the plants are grown organically, pesticide use is avoided, which in turn helps the environment. However, to ensure that the crops receive sufficient nutrients the manure used as fertilizer is also assessed, for physical and chemical properties such as colour / odour, moisture percentage, pH, conductivity, organic carbon, N-P-K, CN ratio, micronutrients like Fe, Mn, Zn, etc. A technical team supervises the land for soil water logging, major weed infestation and irrigation and assists the farmers to solve any issues in the field. In general, it is a win-win situation for both the contracting herbal company and the farmer.



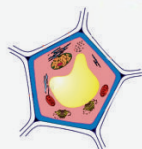
Figure 1: Farmers receive support and guidance from land preparation until the time of harvest



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Assessment of authenticity:

The herb samples collected from the farm should be evaluated extensively for their genuineness at the physical, microscopic, and molecular levels (Figure 1). The authenticity of the herbs is already established at the seed level during collection. Ultimately, all these assessments are necessary for the standardization process of the SBPs and to provide consistency in each batch to give the desired biological effect.

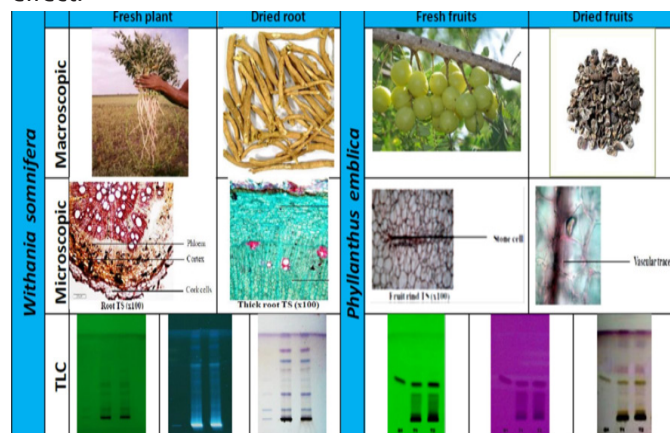


Figure 2: Herbal authentication

Assuring safety:

To ensure the SBPs are safe, the herbs are collected from a pristine area where there is no heavy presence of contaminants. Also, the safety is ensured with the harvested raw herbs through testing for pesticides, heavy metals and mycotoxins / aflatoxin. The samples can be tested for pesticide residues with Gas Chromatography – Electron Capture Detector (GC-ECD) and Gas Chromatography-Tandem Mass Spectrometry (GC-MS / MS) as shown in Figure 3. Heavy metals such as Cadmium, Arsenic, Lead and Mercury are evaluated with an inductively coupled plasma mass spectrophotometer (ICP-MS) as shown in Figure 4. Heavy metal, pesticides and mycotoxins occurrences in herbs, if not maintained below safe levels can lead to life-threatening toxicity in animals. Aflatoxin and mycotoxins are detected using high-performance liquid chromatography with fluorescence detection (HPLC-FLD) as shown in Figure 5.

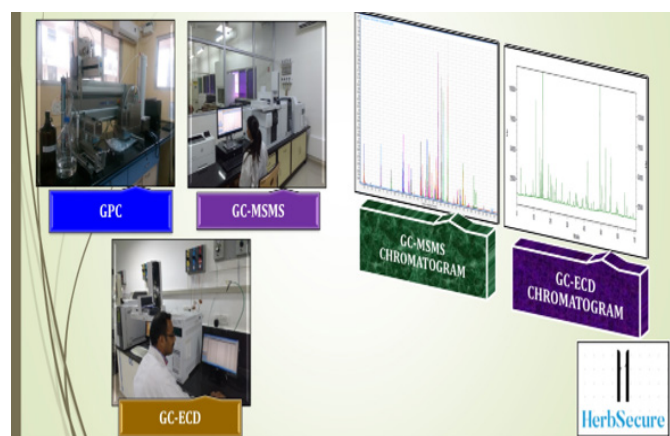


Figure 3: Pesticide Residues in the raw material are evaluated by GC-MSMS/GC-ECD

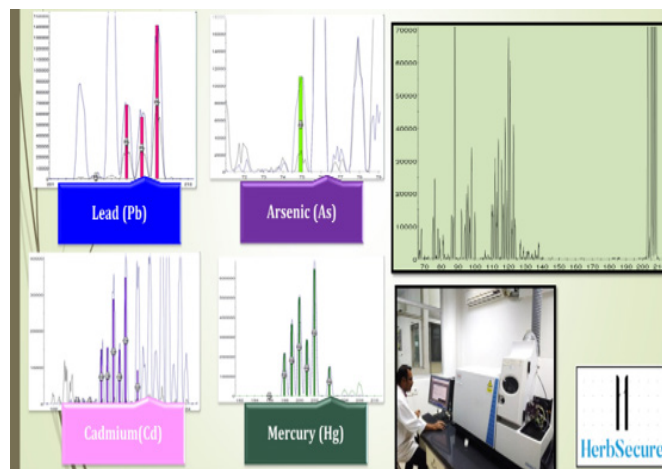


Figure 4: Heavy metals in the raw material are detected by ICP-MS

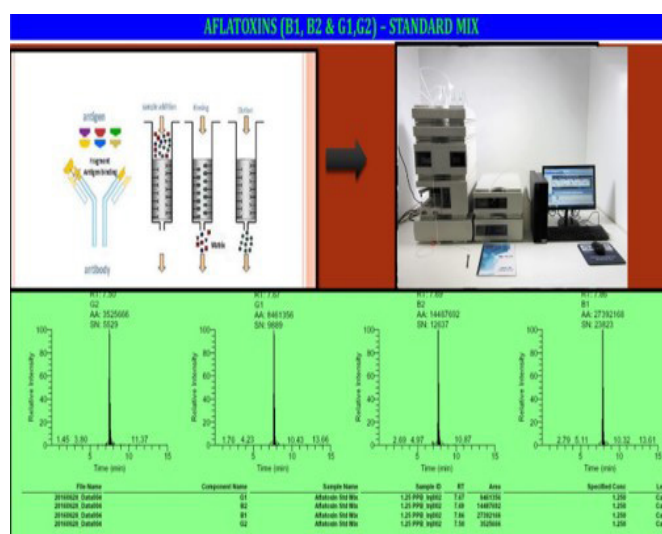


Figure 5: Aflatoxins in the raw material can be detected through HPLC-FLD

Traceability of the raw material to its origin:

The whole process of cultivation to harvest should be well documented, just as travel information in a passport Figure 6. Supervised farming helps maintain scientific recording that gives details at each stage of growth, if at all there are any untoward variations noticed in the performance of the product, it can be traced back and re-evaluated with scientific data. Post-harvest the product should be well labelled too (Figure 7). So that finished goods can be traced to which farm they originated from. The whole raw material procurement process becomes more science-based which helps in the standardization of SBPs and is eco-friendly, by maintaining the biodiversity of the forests, avoiding pesticides, and ensuring customers a safe end product free of synthetic constituents.




Authentication certificate (Passport Data)			
			
1)	Genus	:	<i>Ocimum tenuiflorum</i> L.
2)	Species	:	<i>tenuiflorum</i>
3)	Author	:	Linnaeus
4)	Family	:	Lamiaceae
5)	Synonym	:	<i>Ocimum sanctum</i> L.
6)	Common name (as prevailing in the area collected)	:	Sacred basil(E), Tulasi (K), (T), (H)
7)	Plants part(s) collected	:	Leaf/aerial part
8)	Describe the habitat include associated species, soils, rainfall, pollinators, predators	:	Agriculture land, red soil, 1000 - 1200mm rainfall. Associated species: <i>Eclipta prostrata</i> , <i>Alternanthera triandra</i> , <i>Blumea laceru</i> etc. butter flies, dragon flies, honey bees, rats, frogs etc.
9)	Describe the plant you sampled as you see it today (flower color, fruit color, growth form, DBH, height, bark color and texture, slash, latex, other)	:	Cultivated in order to get young twigs which are used to make garlands; which are used in temples during pooja. Aromatic Herb, about 45 -80cm tall, leaves simple, opposie, petiole 0.5-1.0 cm long, ovate, margin serrate, apex obtuse, pubescent with septate and glandular trichomes; herbaceous, varies in colour from purple to green, flowers in terminal branched racemes. Flowers 1-3 together in verticels. calyx bilipped, upper larger, greenish, corolla pinkish to white, bilabiate, stamens 4, didynamous, ovary 4 lobed, style long, fruit contains 4 nutlets brownish
10)	Quantity collected	:	1kg
11)	Material collected (tick appropriate box)	:	<input checked="" type="checkbox"/> Single place <input type="checkbox"/> Multiple places
12)	Place(s) of collection	:	
	Place	District	State
i)	Ambadihalli	Ramnagara	Karnataka
13)	GPS data	:	
	Latitude	Longitude	Altitude
i)	12° 72'56.10"N	77 ° 33'43.80"E	756m
14)	Time of Collection	:	
		Date	Time
		04/1/2020	8.00am
15)	Approximate age of the plant (at the time of collection)	:	8 months
16)	Collected from (tick appropriate box)	:	<input checked="" type="checkbox"/> Cultivated land <input type="checkbox"/> Wild
17)	Mode of drying (please tick the appropriate)	:	<input checked="" type="checkbox"/> Sun dry <input type="checkbox"/> Shade dry <input type="checkbox"/> Any other
18)	Batch No/voucher (Herbarium)	:	1031
19)	Traditional Use	:	Beads made from stem wood is used to make garland, leaf oil is a perfume, leaf juice is used to cure cough, herb is considered sacred and grown in front of House.
20)	Collector's name	:	Dr. P. Santhan Ph.D (Bot) – In house Taxonomist
21)	Determined by Date Sign	:	Dr. P. Santhan Ph.D (Bot) – In house Taxonomist 30/01/2020 

Figure 6: Passport data of *Ocimum*, authenticated by a botanist

The current article emphasizes the importance of procurement of high-quality raw material by focusing on its authenticity, safety, and documentation to keep good consistency in the concentration of the phytoconstituents. Finally, these would result in high-quality SBPs. In our next issue, we shall elaborate on the “Check, Assessment, and Revalidation of SBPs.”

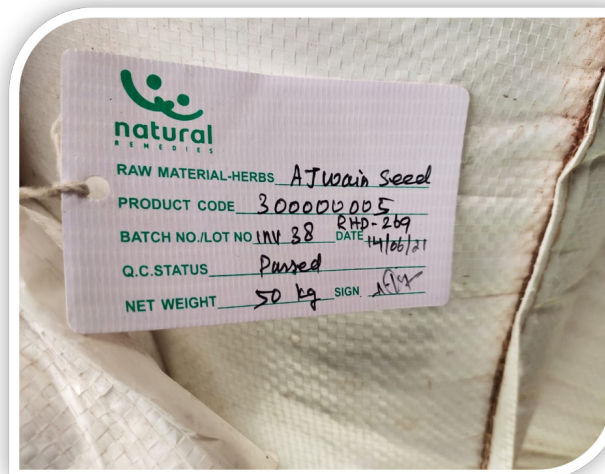


Figure 7: Post-harvest the raw material is labelled so that its origin can be traced back

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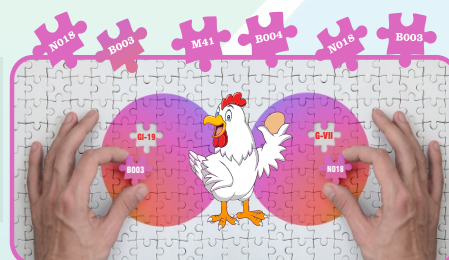
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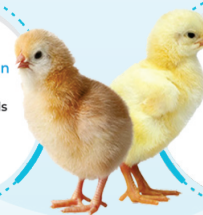
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