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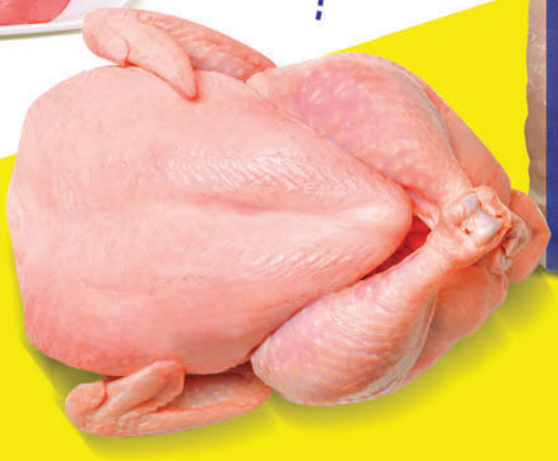

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The Edit

POULTRY FEED: THE NEED FOR SUSTAINABLE, NUTRITIOUS CHOICES

In an era marked by climate change and environmental awareness, the choices we make for poultry feed are critical. Poultry farming plays a vital role in global food security, but the sector's rapid expansion has brought challenges to resource sustainability. Amid rising concerns over environmental impacts, the need to prioritise sustainable yet nutritious feed options is essential. To feed a growing population, we must find ways to balance productivity, animal welfare, and ecological responsibility.

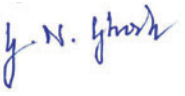
Conventional poultry feed ingredients like corn and soy have traditionally provided key nutrients but come with significant environmental costs. Large-scale monoculture farming contributes to soil degradation, deforestation, and high water usage. Additionally, as these grains are often diverted to livestock rather than human consumption, competition for resources has grown. This strain is compounded by global economic and environmental shifts, with farmers often bearing the brunt of volatile feed prices.

But the transition to sustainable feed for livestock isn't without challenges. Nutritionists must ensure that alternative ingredients meet poultry nutritional requirements without compromising growth or productivity. Furthermore, there are regulatory barriers, logistical issues, and the need for awareness among poultry farmers to encourage acceptance of these newer, non-conventional ingredients.

As the industry evolves, a collaborative approach is essential. Feed producers, researchers, and policymakers must work in tandem to establish standards, create incentives, and invest in research on sustainable ingredients. By embracing conscious choices in feed ingredients, we can contribute to a resilient and responsible poultry sector, one that meets consumer demands without compromising the planet's health.

This requires extensive research and development. Nutritional balance, digestibility, and consumer acceptability are crucial factors, as are regulatory frameworks that ensure safety and quality. For a truly sustainable future in poultry, all stakeholders—from feed producers to farmers and policymakers—must join efforts, investing in alternative raw materials that are environmentally friendly and nutritionally sound.

This shift towards sustainable feed is more than a trend; it is a necessity. By embracing alternative feed options, we can forge a path that supports both our environment and the health of poultry, ensuring that future generations inherit a world that remains as bountiful as it is balanced.



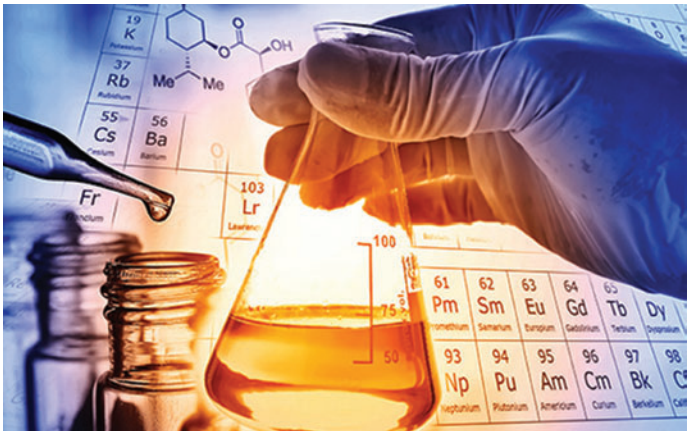
G. N. Ghosh
Managing Editor

Indian Research

Effect of Dietary Herbal Powder on Growth Performance, Serum Biochemistry, Immunity and Gut Health of Broiler Chicken

By
D. Sharina*, A. Biswas and C. Deo
ICAR-CARI, Izatnager, Bareilly

This study investigated the effects of herbal powder (HP) on growth performance, serum biochemistry, immunity, and caecal microbiology of broiler chicken. A total of 240 day-old unsexed CARIBRO-Vishal broiler chicks were randomly distributed into six dietary treatment groups marked as -Tl (Basal diet), T2 (Basal diet +5 g HP/kg diet) T3 (Basal diet + 10 g HP/kg diet), T4 (Basal diet + 15 g HP/kg diet), and T5 (Basal diet + 20 g HP/kg diet). T6 (Basal diet + 335 mg cloroteracylcline - CTC/kg diet) with five replicates having 8 birds in each and reared up to 42 days of age.



Birds were slaughtered at the end of feeding trial. The supplementation of 5g/kg herbal powder in feed significantly ($p < 0.05$) increased body weight of broiler chicks during overall experimental period (0-6 Wk) but no effect was seen on FCR and carcass characteristics of broiler chicken. Significant ($p < 0.05$) lower abdominal fat deposition was observed in all treatment groups in comparison to control and antibiotic groups. Serum cholesterol and triglycerides content of broiler chicken decreased in T2, T3 and T4 groups in comparison to control group. Serum AST and ALT was significantly ($p < 0.05$) lowerin all treatment groups.

The supplementation of 5 g to 15 g HP/kg diet resulted in lower Coliform counts with inverse trend in Lactobacillus count in caecum of broiler chicken. Immunity was higher in all treatment groups in comparison to antibiotic and control group.

In conclusion, the HP supplementation at 5 to 10 g/kg diet exerted immunomodulatory, anti-hyperlipidaemic, and antibacterial effects in broiler chicken without any adverse effects on the growth performance.

Effect of Spirulina Supplementation on Growth, Immunity, Gut's Bacterial Load and Histopathology of Broiler Chicken

By
A. Khadanga, K. Sethy*' S.M. Samantaray, P. Ray, M. Naik and S. Tripathy
Odisha University of Agriculture and Technology, Bhubaneswar-751 003, India

Spirulina platensis is a filamentous cyanobacteria algae containing high amount of protein, carbohydrate, several poly unsaturated fatty acids (PUFA), minerals and vitamins. Carbohydrate extracted from the Spirulina known as "spirulin" popularly acts as prebiotics. Spirulina may become a potential poultry feed additives in commercial purpose. To assess the effect of graded levels of Spirulina supplementation on body weight gain, immunity status, intestinal microbiota, and histology of vital organs, one hundred twenty Vencobb broiler birds of single hatch were randomly divided into 4 treatment groups.

Each group consists of 3 replicates with 10 birds each. The dietary treatments were: To: Basal diet; Ti: Basal diet + 0.5 % Spirulina powder: T:: Basal diet + 1.0 % Spirulina powder and T\: Basal diet + 1.5 % Spirulina powder. The experiment was carried out for 5th week in deep litter system and fed as per BIS, 2007. During the experimental feeding period, there was significant ($P<0.05$) increase in body weight gain in supplemented birds than control. Antibody titer measured against Ranikhet disease (ND) vaccine and cutaneous basophilic hypersensitive response against PHA-P was significantly ($P<0.05$) higher in Spirulina supplemented birds than control. E.Coli, Salmonella count was significantly ($P<0.05$) decreased and Lactobacillus count was increased in treated birds than control.

Histopathological examination of liver and kidney after stained by hematoxylin and eosin (H&E) showed no significant alteration in supplemented birds than control.

It may be concluded that Spirulina supplementation @ 0.5% in broiler chicken improved the body weight gain, immunity and intestinal lactobacillus count without any adverse effect on vital organs.

Source: XXXVII Indian Poultry Science Association Conference, November 2022

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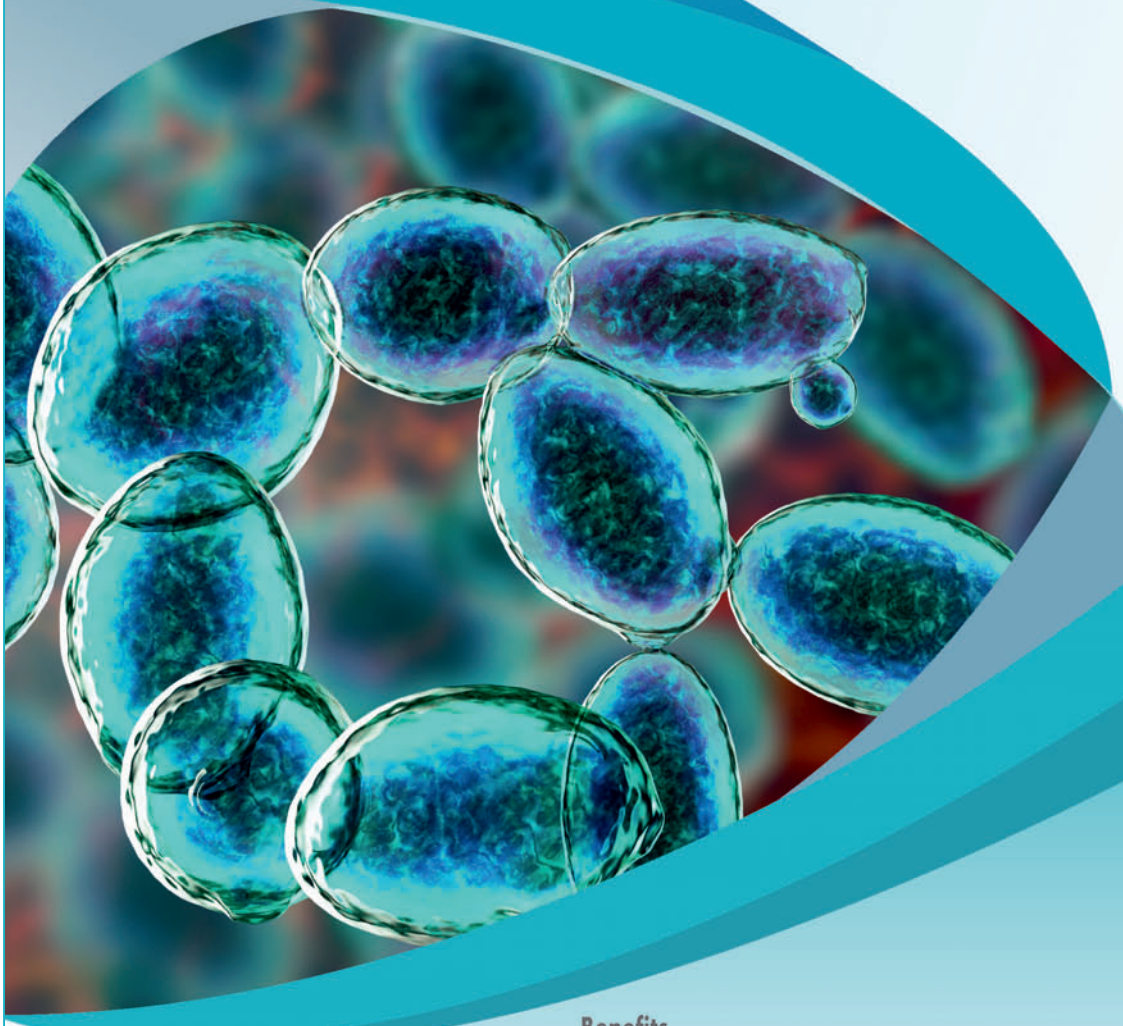

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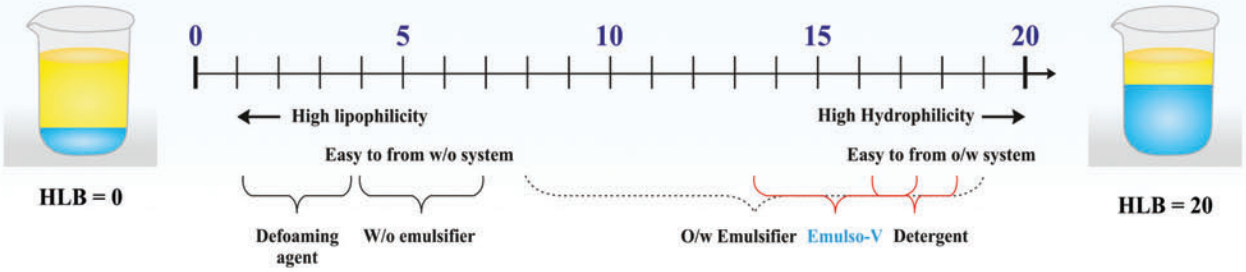

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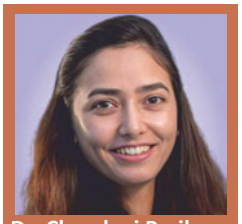
Article

Embracing the Changing Digital Landscape of India: Digital Solutions in Livestock and Animal Husbandry



Dr. Chandani Parihar
Strategic Marketing Director
Nutreco India

India's rise into the technical landscape has facilitated change for digital innovations and transformations across businesses over the past decade. Digital transformations and IoT (Internet of Things) enablers have all become a critical stepping stone for organisations in achieving long-term goals and providing solutions for long-standing challenges. Ushering in the phenomenon of startups and venture capitalists, many tech-based services have started surfacing that aim to provide more solution-based and customer-friendly environment.

Livestock and animal husbandry sector has also not remained untouched from the changing tides. The digitalisation wave has penetrated across the species and value chain whether it is related to precision nutrition or better farm management. With the increasing penetration of digitalisation into animal production and the advancement of IoT technology, a new frontier has opened in which science and technology have combined to increase automation and bring more rapid real-time decision-making options. In this article, we look at three core areas where digital solutions have become an enabler for the industry.

Iot Solutions to Address the Challenges in Value Chain

Over the last few years, there has been a rise in tech-startups who have brought in innovative solutions especially for dairy and aqua value chains. They aim to simplify farm and feed management, bring in better efficiencies while ensuring quality throughout the value chain. Given the huge opportunity India presents with a growing animal protein consuming population, these solutions have also garnered the attention of investors.

Nutreco too has invested into two such companies via its investment arm, Nufrontiers. One such company is Stellapps, an IoT based startup, which aims to digitalise the entire dairy value chain. The organisation presents a unique integrated model that works at all intervention points from farms to processors that monitors the milk quality throughout to ensure that end consumers have a certified milk quality. At the same time, farmers are benefitted from a one-stop solution model wherein all their requirements from feed, health supplements to AI (Artificial Insemination) and extension services are provided. All of this is backed by cloud-based data monitoring and insight generation services that help to predict any existing diseases, other challenges and provide remedial action on immediate basis.

Another such IoT startup, that is successfully changing the lives of aqua farmers is Eruvaka Technologies. Their unique cloud-based aquaculture pond management solutions help to monitor ponds with intelligent control of aerators and feeders real-time, to reduce the production cost and risk of farmers while ensuring an increase in yield and improved FCR. Such remote monitoring technologies with right insights has helped farmers in Ecuador to become a leader in global shrimp farming.

Animal Nutrition Models and Services for Precision Nutrition

In today's uncertain environment, farmers are facing the difficult challenge of reconciling resources management, animal health & welfare, reduced ecological footprint, output quality with animal performance and sustainable income. When every decision impacts animal and business performance, one wants to build on more than intuition alone.

Trouw Nutrition also provides an integrated digital solution and service under its NutriOpt platform that provides right insights and supports decision-making with the belief that Knowledge Feeds Success. Tools like NutriOpt On-Site Adviser (NOA) and Mycomaster under the platform are aimed to bring lab to the sample for quick on-farm analysis of nutrients and mycotoxins respectively.

Another comprehensive solution to enable precision nutrition are the animal nutrition models. It has been demonstrated over the last 5 decades that integrated nutrition models based on a sound biological framework will continue to help producers, integrators, and animal nutrition companies to remain profitable in a sustainable way.

As our understanding of animal biology and nutritional metabolism continues to grow so too does the accuracy and applicability of models improve. Advancements in science now give us the ability to accurately predict growth at various stages and respective feed intake, as well as incorporate feed additives into mechanistic animal models. This has led to the role of models increasing beyond only providing nutrition solutions but also providing practical day-to-day management advice to improve efficiency and profitability.

Increasing Reach to Customers

Digital solutions also enable the businesses to reach directly to customers whether it is via utilisation of various social media platforms that provide a medium to directly connect with consumers or through app-based services that eliminate middlemen and increase the product reach.

New age digital platforms and solutions have opened several channels through which information is being communicated to stakeholders. Businesses are becoming more aware of the power of these platforms in communicating about their brand and developing brand stories. While one must be careful in choosing the platforms, the effectiveness cannot be doubted in today's age where everybody accesses information through mobile phones.

Conclusion

The impact of digital transformation on livestock and animal husbandry sector cannot be ignored and many more future innovations can be expected. The current challenge for the animal nutrition industry is where to wisely invest and how to extract value for customers and company with the advancement of resource-demanding technologies. Sensible assimilation of data and biology rather than blindly embracing a technology driven agenda could provide huge opportunities for innovation in the animal nutrition industry. Embracing the changing technology landscape in the industry does not mean accepting every digital solution offered but rather understanding what the commercial and technical risks are and then developing the appropriate mitigation strategies that can optimise both mechanistic and machine learning models to improve the welfare of people, planet and profit.

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Article

The Role of Calcium in Broiler Performance and Phosphorus Digestibility

Lode Nollet
Global Product Manager Enzymes
Huvepharma

In the past, there was little interest in the assessment of calcium (Ca) requirements in poultry diets. This was due to the availability of cheap limestone, which accounts for 80-85% of the total Ca in feed. However, driven by the numerous studies of the effect of Ca on phosphorus (P) digestibility and phytase efficacy, the impact of Ca on performance has gained increasing interest.

Research from recent years has indicated that oversupplying Ca can negatively affect animal performance:

- Limestone is a buffering substance and hinders sufficient acidification of the feed in the gizzard
- An excess of dietary limestone reduces feed intake
- Ca exerts a negative effect on the tight junctions, reducing gut integrity
- Excess Ca inhibits P digestibility of feeds

Inhibition of Phytase on Phytate Degradation Due to Ca

Dietary Ca forms complexes with phytate and these complexes canremain insoluble at a high pH (Fig. 1).

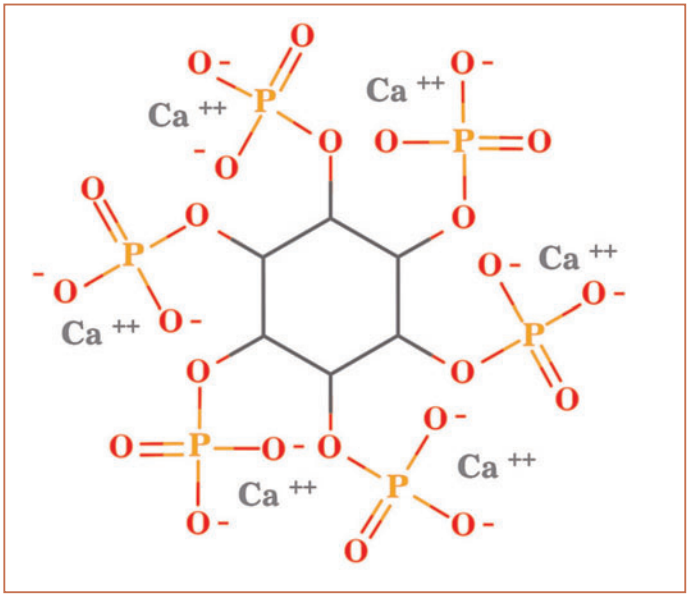

Fig. 1: Calcium chelates phytate, making it less accessible for phytase

These precipitated phytate-Ca complexes are not accessible for hydrolysis by a phytase and this reduces the amount of P released. Therefore, an excess of Ca will reduce the P digestibility. Moreover, the speed of the limestone solubilisation will dictate the concentration of Ca available to chelate with the phytate. Fine limestone is in general more soluble than coarse limestone, meaning it will bind faster to phytate. As a result, it has a stronger negative impact on P digestibility compared to a coarse limestone.

Ca and P Need to be In Balance

Lowering the Ca levels in feed would be advisable to improve P digestibility, besides the choice of a coarser limestone. However, absorbed P can only be retained in the bones when enough Ca is present at blood level to form hydroxyapatite (bone mineral).

Lowering the Ca level will improve the P digestibility, but due to the lack of Ca to retain the absorbed P, the P level in the bones can still be low. Deficiency of Ca can, therefore, cause poor bone quality, even when P digestibility is improved by lowering the Ca level. This indicates that an uncontrolled lowering of the Ca levels in the feed can also reduce the birds' motility and thereby performance.

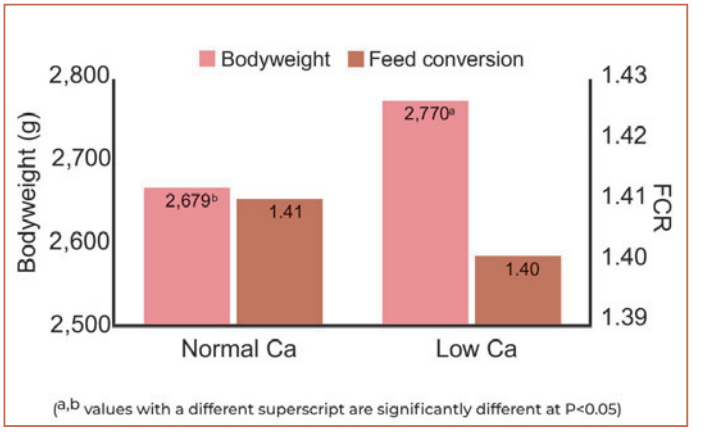

Fig. 2: Effect of lowering Ca levels on body weight and feed conversion at day 35

A Broiler Study

A practical example has been demonstrated in a recent 35-day broiler trial at the University of Warmia and Mazury, Poland. Feed was reformulated with 1,000 FTU/kg of a novel intrinsic heat stable phytase (OptiPhos Plus) only using its corresponding P matrix value, while an NSPase complex (Hostazym X) was added on top. Two different Ca treatments were imposed:

- Normal Ca level: formulated at: formulated at 8.5, 7.0 and 6.0g/kg in starter, grower and finisher diets respectively

- Low Ca level: formulated at 6.5, 5.0 and 4.0g/kg in starter, grower and finisher diets respectively. The overall technical performance was very good (EPEF >500) showing the impact of the enzymes on securing a high broiler performance

The following effect of Ca could be noted:

- The low Ca level gave a significantly higher end weight vs when feeding normal Ca levels. Feed conversion was not impacted despite the higher bird weight at low Ca levels (Fig. 2)
- Ca and P digestibility (at day 35) were highest at the low Ca inclusion level
- Bone ash analysis (at day 21) showed that tibia ash and Ca and P level in tibia ash were lower at the low Ca level. The impact was small, but significant (Table 1)

The fact that low Ca levels optimised technical performance and improved P digestibility, but reduced bone ash, demonstrates that too low Ca levels will lead to too low Ca levels at blood level, and, therefore, result in inefficient bone formation. This also indicates that there is a higher Ca requirement for optimal bone growth compared to what is required to optimise performance.

Table 1: Ca and P digestibility, tibia ash content, and Ca and P content in tibia ash at normal and low Ca levels

Treatment	Ileal digestibility (%)		Tibia Ash (% of DM)	Ca in Tibia DM (%)	P in Tibia DM (%)
	Ca	P			
Normal Ca	50.2[b]	54.5	48.4[a]	18.6[a]	10.1[a]
Low Ca	64.1[a]	60.6	46.8[b]	17.8[b]	9.8[b]

([a,b] values in a column with a different superscript are significantlt different at P<0.05)

Conclusion

- Reducing the Ca levels had a large positive impact, not only on animal performance, but also on Ca and P digestibility
- Reducing Ca levels impacts the bone formation, showing that the Ca requirements for bone formation are higher compared to the Ca requirement for optimal animal performance.

Article

Strategies for Combating Mycoplasmosis in Poultry: A Focus on Prevention and Therapy



Dr. Amit V. Janbandhu
Product Manager (Nutrition)

Dr. Sanjay Singhal
Chief Operating Officer

Dr. Mayur M. Purankar
Product Manager (Therapeutics)

Stallen South Asia Pvt. Ltd

Introduction

The poultry industry plays a crucial role in alleviating poverty by providing vast opportunities to millions of people across the country. According to the Government of India, the country ranks 3rd in the world for egg production and 5th for chicken meat production. The Indian poultry market was valued at INR 1,905.3 billion in 2022, with a growth rate of 6.77% for eggs (DADF) and 7%-8% for chicken meat (industry estimates). The annual per capita consumption is 101 eggs (DADF) and approximately 4.8-5 kg of chicken meat (based on the industry's estimated placement of 500 crore day-old chicks).

However, there remains a significant gap in the consumption of poultry meat and eggs, primarily due to various challenges faced by the Indian poultry industry. One of the major challenges is the economic losses caused by infectious diseases. Among these, diseases caused by Mycoplasma species are particularly concerning (Marois et al., 2001). The primary pathogenic species are Mycoplasma gallisepticum (M. gallisepticum) and Mycoplasma synoviae (M. synoviae) (Umar et al., 2017). These Mycoplasma infections lead to substantial losses in the poultry industry by reducing egg production, stunting growth, and increasing condemnation rates at slaughterhouses. It has been reported that flocks affected by Mycoplasmosis may experience a 10-20% reduction in egg production (Bradbury and Morrow, 2008).

Stallen South Asia Pvt. Ltd. offers a wide range of products to control and prevent Mycoplasmosis which causes Chronic Respiratory Disease (CRD) and CCRD related conditions in poultry. The products include Forlutin 10% (Tiamulin Hydrogen Fumarate 10%), Doxatin (Tiamulin Hydrogen Fumarate 3.3%, Doxycycline HCl 2%)and Stylosin 100 (Tylosin Tartarate 10%) for prevention through feed additives and Forlutin 80% (Tiamulin Hydrogen Fumarate 80%) for treatment purpose through drinking water.

Mycoplasma in Poultry

Mycoplasmas are free-living, self-replicating bacteria characterised by having the smallest genome among bacteria, with a low guanine-cytosine (G+C) content ranging from 23% to 40% (Nicholas and Ayling, 2003). Unlike most bacteria, Mycoplasmas lack a cell wall, and their cell membranes are incorporated with sterols, which distinguishes them from other organisms. The absence of peptidoglycan makes them naturally resistant to antibiotics such as the beta-lactum antibiotics that target cell wall synthesis. Based on 16S rRNA analysis, Mycoplasma belongs to the phylum Firmicutes, class Mollicutes, and family Mycoplasmataceae (Ley, 2003; Ley, 2008). Among the 22 known species of Mycoplasma in birds, the four most common pathogenic species are Mycoplasma gallisepticum (M. gallisepticum), Mycoplasma synoviae (M. synoviae), Mycoplasma meleagridis (M. meleagridis), and Mycoplasma iowae (M. iowae). Of these, M. gallisepticum and M. synoviae are of particular importance due to their high prevalence in various types of poultry, with M. gallisepticum being considered the most pathogenic (*Umar et al., 2017*).

Sialoglycoprotein receptors in the respiratory epithelium are crucial for the attachment of Mycoplasma to epithelial cells, which is necessary for the initiation of the disease. This attachment process is mediated through cyto-adherence and is essential for Mycoplasma to evade the host's innate defence mechanisms. Due to the absence of many metabolic pathways in Mycoplasma, these bacteria require close interaction with host cells for survival (*Simecka et al.,1992*).

Pathogenesis

Mycoplasma-Induced Cell Injury

Mycoplasma species can cause direct cell injury, although the exact mechanisms remain unclear. Mycoplasmosis leads to cell injury by depriving the host cells of essential nutrients, producing toxic substances, and altering host cell metabolites. Mycoplasma produces enzymes such as phospholipases, proteases, and nucleases, which damage host cell membranes and increase the risk of genetic alterations, potentially leading to autoimmune diseases (*Bhandari and Asnani, 1989; Umar et al., 2017*).

Role of Hydrogen Peroxide in Oxidative Damage

A critical factor in Mycoplasma-induced cell injury is the production of hydrogen peroxide, which significantly damages cell membranes and facilitates Mycoplasma adherence. The hydrogen peroxide released by Mycoplasma induces oxidative stress in host cells and can cause haemolysis. Catalase, an enzyme in host cells, converts hydrogen peroxide into nascent oxygen (O_2^-), further contributing to oxidative damage. To combat this, host cells produce antioxidant enzymes like glutathione (GSH) and superoxide dismutase (SOD), which help mitigate the oxidative stress caused by Mycoplasma (Razin et al., 1998).

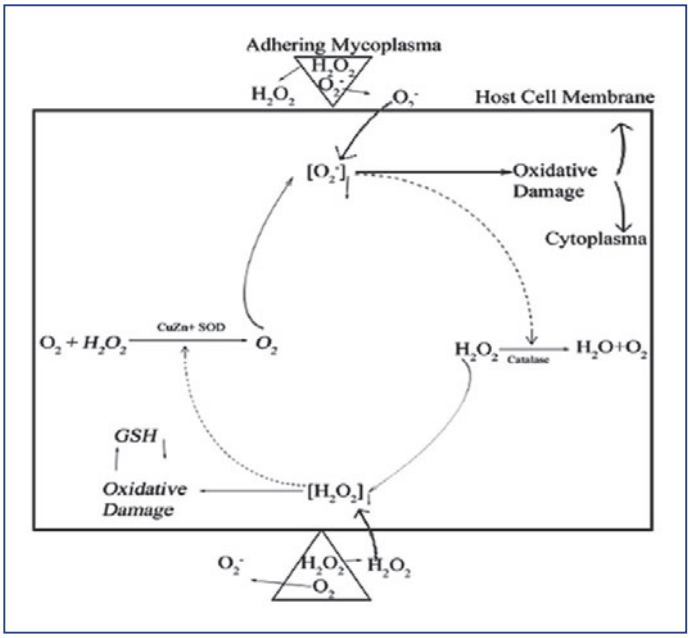

Figure 1. Sequence of events for oxidative damage in host cell caused by Mycoplasma (Razin, 2006).

Transmission

Mycoplasma is transmitted both vertically through eggs and horizontally through close contact, airborne droplets, and contaminated dust particles (Papazisi et al., 2002; Umar et al., 2017). The risk of transmission increases with the density of poultry populations in an area, often due to rapid expansion. This increased risk is one of the key reasons why maintaining Mycoplasma-free flocks is challenging (*Lysnyansky et al., 2005*).

Mycoplasmagallisepticum

M. gallisepticum is the causative agent of Chronic Respiratory Disease (CRD) in chickens, with an incubation period of 16-21 days. The major clinical signs of CRD include gasping, respiratory rales, coughing, nasal discharge, and rhinitis. In some cases, M. gallisepticum can also lead to arthritis, salpingitis, conjunctivitis, and fatal encephalopathy. In egg-laying birds, the infection can cause a significant decrease in egg production and increased embryo mortality (*Mukhtar et al., 2012*).

Mycoplasmasynoviae

M. synoviae is a significant pathogen in poultry worldwide, primarily due to the economic losses it causes, such as reduced egg production, growth retardation, and the condemnation of poultry meat at slaughterhouses. It typically causes infectious synovitis (a respiratory infection) in chickens, which can also result in subclinical infections. Currently, M. synoviae more commonly causes air sacculitis than infectious synovitis in chickens and turkeys. Air sacculitis can also occur because of co-infection with M. gallisepticum and E. coli. When the infection becomes systemic, it leads to inflammation of the synovial membranes of joints and tendon sheaths, resulting in synovitis, tenovaginitis, and bursitis (*Kleven, 2008*).

Tiamulin Hydrogen Fumarate

Chemical Composition

Tiamulin hydrogen fumarate (14-deoxy-14 [(2-diethylaminoethyl)-mercapto-acetoxy] mutilin hydrogen fumarate), known commercially as Forlutin10%, Forlutin 80% (Stallen South Asia. Pvt. Ltd), is a semisynthetic derivative of the diterpene antibiotic pleuromutilin. It is widely used in the treatment of airsacculitis, a condition primarily caused by Mycoplasma species. Animals infected with Mycoplasma spp. are more susceptible to various viral infections such as infectious bronchitis and Newcastle disease, as well as bacterial pathogens like Escherichia coli (causing coli septicemia). This susceptibility can lead to reduced growth rates, impaired feed conversion efficiency, and increased morbidity and mortality. Tiamulin is available as a crystalline powder, typically white to yellowish in colour. It is commercially produced in several formulations: as a soluble powder with 45% tiamulin hydrogen fumarate in a lactose carrier, a 12.5% solution for inclusion in drinking water, and as a medicated feed premix available in strengths of 2%, 10%, and 80%. These formulations are widely available in most countries around the world.

Mechanism of Action of Tiamulin

Tiamulin exerts its antibacterial effects by binding to the rRNA within the peptidyl transferase slot on the ribosome. This binding interferes with the correct positioning of the CCA ends of tRNA, which is crucial for peptide transferase activity and subsequent protein production (*Poulsen et al., 2001*).

Microbial Resistance

Tiamulin has shown remarkable stability in terms of resistance development in Mycoplasma species. According to Valks and Burch (2002), Mycoplasma gallisepticum has exhibited almost no resistance development to tiamulin over the past 25 years. These findings are consistent with earlier research by Drews et al. (1975) which also indicated that tiamulin is generally a low inducer of resistance in Mycoplasma. Further studies by revealed that tiamulin targets the 50S subunit of the bacterial ribosome, particularly interacting at the peptidyl transferase centre. They concluded that a mutation in the L3 protein of the ribosome, which points into the peptidyl transferase cleft, can lead to tiamulin resistance by altering the drug-binding site. Tiamulin has been shown to be compatible with tetracyclines in broilers. However, it is incompatible with nitrovin, a former growth promoter used in pigs and poultry. (*Noa et al., 2000*).

Tylosin Tartrate

Mechanism of action of Tylosin

Tylosin tartrate (TT) is a macrolide antibiotic used in veterinary medicine and is extracted from the soil microbiome called Streptomyces fradiae. It is a bacteriostatic antibiotic that binds to the 50S subunit of the bacterial ribosome and inhibits bacterial protein synthesis. Stylosin-100 (Tylosin Phosphate 10%) is known to be strongly effective against Gram-positive and mycoplasma bacteria.

Use of Tylosin

Tylosin tartrate is effective in the treatment or prevention of chronic respiratory disease (CRD or CCRD) in poultry. It is particularly useful after vaccinations or during other stress conditions to prevent respiratory infections.

Conclusion

Stallen South Asia Pvt. Ltd. provides effective solutions for preventing and treatment of Mycoplasmosis in poultry caused, Chronic Respiratory Disease (CRD), and CCRD related conditions. Forlutin 10%, Doxatinand Stylosin-100 are feed additives that help prevent infections offers additional preventive support. For treatment, Forlutin 80% is administered through drinking water to manage active infections. This comprehensive product range supports overall poultry health and productivity.

(References on request)

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FUTURE OF FEED FORMULATION

Poultry feed industry plays a crucial role in shaping global poultry production. It is a significant contributor to food security and economic growth. Several trends and innovations in poultry feed formulations are set to shape the feed industry for the future landscape, driving greater efficiency, sustainability and welfare. **IPR** researches several sources to explore cutting-edge developments in poultry feed

Feed formulation is both a science and an art, requiring knowlwdge of feed and poultry and some patience and innovation. Typical poultry feed formulations indicate the amounts of each ingriedient that should be included in the diet, and then provide the concentration of nutrients (composition) in the diet. The nutrient composition of the diet will indicate the adequacy of the diet for the particular class of poultry for which it is prepared. It is common to show the energy value in metabolisable energy (kcal or MJ ME/kg feed) and protein content of the diet but comprehensive information on concentrations of mineral elements and digestable amino acids are also provided. Digestible amino acids often include not just the first limiting amino acid, methionine, but also most of the ten essential amino acids. A number of databases are available to provide information on the digestible amino acid contents of various poultry feed ingredients.

The process of quantifying the amounts of feed ingredients that need to be combined to form a single uniform mixture (diet) for poultry that supplies all of their nutrient requirements is ideal feed formulation. Since feed accounts for 65-70% of the total live production costs for most types of poultry throughout the world, a simple mistake in diet formulation can be extremely expensive for a poultry producer. Feed formulation requires a thorough understanding of the:

A. Nutrient requirements of the class of poultry (e.g. egg layers, meat chicken or breeders)
B. Feed ingredient in terms of nutrient composition and constraints in terms of nutrition and processing
C. Cost and availability of the ingredients

Most large-scale poultry farms have their own nutritionists and feed mills, whereas small operations usually depend on consultant nutritionists and commercial feed mills for their feeds. It is, therefore, essential that formulations are accurate because once feeds are formulated and manufactured, it is often too late to remedy any mistakes or inaccuracies without incurring significant expenses.

Feed formulation, often referred to as least cost formulation, is the process of matching the nutrient requirements of a class of animals with the nutrient contents of the available ingredients (raw materials) in an economic manner. As mentioned earlier, this requires an in-depth understanding of the requirements of the animal, nutrient contents including digestibility values, and prices of the ingredients.

With this knowledge, a mathematical formula is used to derive the amounts of each ingredient that need to be included in the diet. When using only a few ingredients, the formulae are simple. However, when there are numerous ingredients available in different amounts and at different costs, more complex formulae are required. There are numerous feed formulation software packages readily available today that have functions beyond the simple matching of nutrient requirements with nutrient contents of available ingredients.

Although some feed mills produce test diets for evaluation in the laboratory or in feeding trials to confirm the adequacy of the diet, the most important preparation for an accurate and economic formulation is to test the chemical composition of the ingredients available for use. Most feed mills today have their own quality control (QC) laboratories.

Feed formulation requires in-depth knowledge of animal nutrition, particularly the nutrient requirements and the nutrient composition of the ingredients. It also requires nutritionists to know whether using certain proportions of some ingredients will impact on issues such as feed flow through the mill, pellet quality of the diet, response of the diet to feed additives, or gut health of the bird. In some parts of the world, considerations such as the colour, smell and particle size of the feed are viewed as important by the feed buyer, despite that these factors may have little influence on the nutritional quality of the feed. Ultimately, feed formulation is about economics; for some operations, it probably means the best feed conversion efficiency of the animal, whereas for others it perhaps means the least cost per unit of product output.

With growing consumer awareness and concerns about environmental impact, the poultry feed industry is currently under pressure to adopt more sustainable practices. This includes sourcing feed ingredients responsibly, promoting biodiversity and reducing the ecological footpint. Companies are increasingly exploring alternative protein sources, such as insects, algae and single-cell organisms, to replace traditional feed components like soy and fishmeal. Sustainable sourcing practices will not only appease eco-conscious consumers but also enhance the long-term viability of the poultry industry.

According to Fact.MR's analysis, global poultry feed market enjoyed a valuation of US$123.5 billion in 2023 and is forecasted to surge to US$228.1 billion by the end of 2033. This jump is because, over the course of the next ten years, worldwide sales of poultry feed are projected to rise at a CAGR of 6.3%.

Advancements in technology, particularly in the field of data analytics and artificial intelligence, are revolutionising the way poultry feed are formulated. Precision nutrition aims to tailor feed formulations to the specific needs of individal flocks or even individual birds, optimising growth rates, feed efficiency and overall health. By analysing vast datasets on bird genetics, behaviour and nutritional requirements, farmers can expect reduced feed wastage and improved flock performance.

As antibiotic usage faces increasing scrutiny due to concerns over antimicrobial resistance, the industry is turning towards nutritional additives and alternative health management strategies. Probiotics, prebiotics, essential oils and organic acids are gaining prominence as natural alternatives to promote gut health and disease resistance in birds. Furthermore, ongoing research into immunomodulatory feed additives is expected to enhance the birds' overall immune response, minimising the need for antibiotics.

Automation and smart farming is set to transform the poultry sector, including feed production and distribution. Smart feeding systems equipped with sensors and IoT (Internet of Things) technology can monitor feed levels, consumption patterns and bird behaviour in real-time. This data driven approach will enable farmers to optimise feed delivery, prevent overfeeding, and adjust rations according to changing environmental conditions or flock requirements. Additionally, automated feed mills will streamline production processes, ensuring consistent feed quality.

While consumers are demanding more transparency regarding the origin and composition of the products they consume, the poultry feed industry is expected to enhance traceability systems, enabling consumers to access information about the feed ingredients used, the farming practices employed, and the overall environmental impact. This transparency will build trust and reinforrce the industry's commitment to sustainability and ethical practices. The future of the poultry feed industry is promising, driven by a commitment to sustainability, technological advancements and animal welfare. Embracing alternative and sustainable ingredients, precision nutrition and smart farming practices will empower farmers to meet the growing demand for poultry products while minimising their environmental impact. As the industry adapts to new challenges posed by climate change and consumer expectations, collaboration and innovation will be key to ensuring a thriving and responsible poultry feed sector.

Farmers are continuously adapting innovative feed formulation methods to reduce poultry feed cost. Innovative feed formulation enables the use of less common ingredients that can bring about substantial cost savings, but overuse can also cause new headaches. A formula for pigs or poultry is composed of two parts that can be revised to realise potential savings in feed cost. Most nutritionists attempt to achieve savings by altering nutrient composition, but substantial savings can be realised in adjusting ingredients.

1. ENERGY

Let us begin by examining the ingredients used in a typical formula. Cereals and lipids (oils and fats) invariably provide the majority energy, and their contribution to total formulation cost is usually the highest. Common cereals like maize and wheat are often considered indispensible, but this is far from true as under certain conditions alternatives can be used, resulting in significant

cost reduction. To this end, ingredients such as tapioca, sorghum, triticale, rice, rye and oats are often priced favourably enough to be used in sufficient amounts to replace all or part of the more common energy sources. These less common cereals are not without their problems and, as such, care must be taken when used in excessive amounts. Of course, cereal byproducts, and other energy-rich feedstuffs, are also useful in replacing common cereals, and examples include wheat byproducts, distiller's grains, full-fat soybeans, tapioca and even citrus pulp.

2. PROTEIN

Ingredients that supply protein make the second most expensive contribution to feed cost. Here, the situation is more difficult as alternative ingredients are less readily available, but not impossible to find. Experience has demonstrated that the best way to address this issue is by the use of crystalline (synthetic) amino acids. This is not an easy path to follow, however, as there is a limit beyond which performance drops drastically. The most common suggestion is to set an upper limit of synthetic lysine (pigs) or methionine (poultry). As these amino acids are, respectively, the first limiting amino acid, other synthetic amino acids will almost always be used at levels below this threshold. In some formulae, some buffering should be considered to counteract the acidic environment created by a high inclusion level of certain amino acids.

3. MINERALS

Next is phosphorus, the third most expensive contribution to overall feed cost. In this case, the use of phytase is recommended when prices of inorganic phosphorus salts are too high. In some cases, phytase should be used even in double doses to further reduce cost and inclusion of inorganic phosphorus. Most likely, the cost of calcium and sodium sources is always quite low, and, as such, these ingredients do not merit much attention for our purposes. Nevertheless, some commercial products (such as premixes and concentrates) are fortified with elevated concentrations of calcium carbonate and salt as a way of reducing their cost.

4. PREMIXES

Then, we come to the vitamin and trace mineral premixes. Here there is tremendous variation in quality and prices in the market. First, there are products that are cheap enough but in return they do not provide enough nutrients for adequate animal performance. In most cases, however, premixes are over-fortified with vitamins and trace minerals resulting in wasting of nutrients. Reducing the inclusion level of a premix is quite often an easy solution, but this should not be done without consulting a qualified nutritionist.

5. ADDITIVES

Finally, we must examine all additives that are so often added in most diets without much consideration to their real effectiveness and return on investment. It is not uncommon for many formulae to contain up to ten additives that provide only marginal (if any) benefit. Such additives should be examined very thoroughly based on published scientific evidence.

In a real case scenario, when a client asked for a review of his formulae, it was found that the nutrient specifications were well set for his farm and genetics; and hence moved to ingredients being used. In a wheat-maize nutrition programme, a third cereal is introduced in the feeds (sorghum); the level of synthetic amino acids were increased and some of the protein sources used removed; phytase, was doubled in dose and almost eliminated phosphate salts; the inclusion of the vitamin premix was reduced (but not that of the trace minerals); and finally one of the three additives used was removed (not needed any longer as the problem for which it had been added was already resolved).

After five months of observation, bird performance was not affected, carcass quality was maintained and animal health remained constant. In round numbers feed cost was reduced by 5 euros per metric tonne, resulting in 50,000 euros per year savings.

While current methods for feed formulation are based on minimising costs, not maximising profits, complex models of bird growth and reproduction as functions of genetic, feed and other environmental variables are being developed, but their adaptation has been slow. The development of profit maximising models will evolve to centre on the production functions of broilers and layers.

The production functions are the relationship between the value of products (mainly meat and eggs) and the cost of feed. The production function is the tool used to maximise profits subject to all the various inputs, not just feed or nutrition. The production function is subject to the law of diminishing returns. The most profitable output levels are those where the marginal value (price) of the meat or eggs is just equal to the marginal cost of the inputs including feed, housing, processing and all other costs. Anything that affects the production function, bird genetics, feed quality, housing and environment, will be considered to maximise profits for the poultry farm.

The profit maximising models of the poultry farms will improve as various technical improvements are made: metaboliseable energy to describe ingredients will evolve to net energy systems that consider that the heat production (and, therefore, energetic efficiency) of broilers is different depending on the ingredients used to formulate the feed and the environmental temperatures under which they are reared. Amino acid needs will include a method to find the birds' needs for the non-essential amino acids. "Digestible" amino acid assays will differentiate between digestion and absorption to best balance various sources. The carbohydrate fractions of feed ingredients will be determined to optimise the use of exogenous enzymes. The value of meat and egg co-products will reduce overall costs (e.g. organic fertiliser for crop enhancement). Future profit maximising production models will be ever-evolving processeses where field conditions and results are continually being utilised to re-calibrate the technical models so that the management team can use them with cost and return projections to decide on the best choices of inputs and outputs.

The mechanics or process of feed formulation has changed very little since the 1950s. The nutritionist collects and combines three sets of data: the nutrient composition of the ingredients available, the minimum and maximum acceptable nutrient levels in the feed, and the prices of the ingredients. Computers are then used to find the least-cost combination of ingredients meeting the nutrient specifications. Oviedo-Rondon (2014) presented a very insightful list of reasons why this process is inefficient, outdated and still used. Modeling of the technical and economic aspects of poultry meat and egg production should lead to more comprehensive processes for feed formulation and increased or maximised profits, but it has not been widely adopted.

Modeling poultry growth and performance in order to maximise profits, while optimising the environmental impact of chicken meat and egg production, would seem to be prudent. The word "optimising" was used regarding poultry's environmental impact because co-products, manure and offal are important sources of soil enriching compounds, not just contaminants to be disposed off. Poultry production must be regarded as a part of the agricultural ecosystem, providing organic materials for grazing livestock etc. Such models should be helpful and perhaps even necessary for companies to remain competitive as world populations increase and resources are spent.

As Oviedo-Rondon (2014) pointed out, various models have been developed but failed to gain widespread acceptance. The models are, for the most part, very good attempts to advance from least-cost models of feed formulation to maximum-profit models. Models all suffer from similar problems that limit their usefulness as they centre around: (1) how they model nutrient "requirements" when there really are none, only profit-maximising nutrient levels ; (2) their methods of approaching economic profit

maximising; and (3) their reliance on inappropriate technical properties of feed and the environment.

We will first deal with the changing paradigms necessary to move from least-cost to maximum profit models. The basic economic techniques of decision making for feed formulators to make a move from least cost to maximum profit models will be explained. Then we will describe several areas where the biology and feed formulation need to be re-evaluated to reduce the error in models to improve the outcomes of economic modeling for meat and egg production. The environmental costs of production shuld be included in these models to maximise the sustainability of poultry production.

The main biological areas that need to be addressed are as follows.

(1) The use of metabolisable energy (ME) in modeling broiler and layer performance is inadequae. ME overestimates the amount of energy that birds get from feed ingredients. ME measures the difference between the amount of energy ingested and the amount of energy excreted over a given period of time. But the origins of the energy contained in the excreta are difficult to determine (feed, turnover cells from the gut, microbial). It is also a measurement that accounts for nutrients totally burned or oxidised, as opposed to utilised. The objective of animal production is to not oxidise as many nutrients as possible but to deposit them in the carcass or egg. There should be a shift from ME to net energy (NE).

(2) NE measures the energy that is utilised for maintenance and production, such as tissue deposition and reproduction. But NE is not the sole characteristic of feed ingredients; rather it is the reflection of the interaction that occurs when the bird consumes certain feed. It is determined by the amount of heat produced during metabolic processes, which, in turn, is affected by feed constituents and the environment in which they are reared. Fortunately, today's poultry production environments are largely controlled, although the growth of free-range production means NE research will need to examine the environmental influence of production on heat increment. NE is an important next step for feed, i.e., gross energy, when ME is obtained.

(3) Digestible amino acid measurements as currently implemented have two major methodologies for measuring digestibility in chicks and older stocks differ considerably (Khalil et al., 2023). Thus a) digestibility as a function of age needs to be researched and added to future models, and b) digestibility measurements need to take into account the level of amino acids in the assay diets. Measurements taken in digestibility assays should be reconciled with the typical feeding levels to have appropriate values for feed formulation.

(4) The non-essential amino acids are ignored in most feed formulation models. It is important to lower the protein level in diets in order to achieve some welfare objectives., such as reduced excreta moisture and gas emissions (sulfur dioxide and ammonium, for instance). There is now strong evidence suggesting that some of the so-called non-essential or dispensable amino acids, such as glycine and serine, have become essential (Hillier et al., 2019). Therefore, these amino acids need to be represented mathematically to properly balance diets.

(5) The carbohydrate fractions of most ingredients need to be known to best determine the effects of vaious digestive enzymes and interactions with other nutrients. This is essential for future feed formulation because non-starch polysaccharides (NSP) make up the bulk of fibre, which is currently represented by the highly inaccurate crude fibre. The structures and functions of these NSP and other carbohydrates, such as resistant starch as well as various oligosaccharides, must be explored in order to determine their nutritional roles with or without glycanases.

(6) The batch-to-batch variation in ingredient composition needs to be known so that the costs of supplying nutrients to different proportions of batches, or flocks can be understood. How to be sure that more than half the birds are getting enough of each nutrient or if that is cost effective?

The reasons Oviedo-Rondon (2014) gave for the slow adaptation of modeling in feed formulation included a lack of education and understanding of profit maximising approaches by nutritionists. Being responsible for the major input in poultry meat and egg production, feed, it might be assumed that nutritionists necessarily have some understanding of economics. They set the minimum and maximum levels of all nutrients, determining to a large extent, the profitability of the company (or at least the contribution of live production). In reality, poultry nutritionists rarely have a good (or any) background in production economics. They

are much more likely to have studied and researched veterinary science and molecular biology than economics. The move to profit maximising strategies must include the nutritionist sharing responsibilities with other specialists. In the future, with maximum profit formulation models, nutritionists will be one member of a business team, jointly responsible for nutrient levels, feeding programs, environmental conditions, products produced, etc. The teams will likely include specialists in production economics, business management, marketing, environmental engineering, veterinary medicine and animal welfare.

Maximum profit models require a different thought process, or paradigm. The necessary shift is from trying to find the lowest level of nutrients that result in maximum performance (genetic potential), to understanding and describing the responses to different nutrients. From a statistical perspective, it is from regarding nutrient levels as continuous variables instead of class variables. From an econometric perspective, the needed change is from regarding responses to nutrients as non-linear, diminishing marginal returns problems instead of spline models with breakpoints.

The present information age is a time when details about the environment of poultry production facilities are observed and recorded and available to be related to performance outcomes. There are enormous amounts of data on things like temperature, humidity and photoperiod just waiting to be related to growth rates, feed intake and processing yields. Large amounts of analytical data on feed ingredient composition are being collected and are available to be related to bird performance under different environmental conditions. Some data is there, it just needs proper analyses and presentation to help maximise overall technical and economic efficiencies of poultry production. Profit maximising formulation should become an iterative process where the results of each production cycle are compared to model projections and the model projections are adjusted to better fit the latest observed data ad thus better predict future performance. The use of current prices in profit maximising models will be replaced with each company's best prediction of costs and returns based on current prices and yearly cyclical prices and any other relevant or expected influences. So the era of big data has arrived, and it is imperative to start putting in place a strategy to take advantage of the large volume of data becoming available so that profit-maximising models will be effectively used to achieve sustainable production in the future.

Because feed is the most expensive input in poultry meat and egg production, feed formulation is central to determining the profitability of each producer. When formulation is conducted in a least-cost manner, there are inherent conflicts since different managers are rewarded for different objectives. The nutritionist wants least cost, cheap, feed. The broiler grow-out manager wants to maximise feed utilisation efficiency. There is an inherent conflict because cheap, low energy feed leads to poor feed utilisation efficiency. The objective of feed formulators should not be to produce low total amino acid feeds, but to formulate feeds with total amino acid levels that result in maximum profits subject to total amino acid costs versus resulting returns from bird performance (growth rate, feed utilisation efficiency and meat or egg yields, and livability or disease risk).

The approach of Lemme et al. (2019) of demonstrating the effects of total amino acid level on various outputs is spot on if not particularly helpful. They show body weight responses to dietary total amino acid level as a spline line graph, and analyse all the data as if the treatments were discrete variables and not continuous. To be helpful to the producers, it is the regression relationships that need to be known with appropriate confidence levels around the lines, not pooled standards errors. This is especially true in this case since the response to dietary total amino acid level appears to be a second order curve. With regressions and using their previous performance data, producers can calibrate projections for their enterprises and future projections.

In the future, feed formulation will be a part of management tools that resolve the conflicts between various aspects of poultry production. There are other areas where nutritionists will interact with other managers to maximise returns to the farm. The choice of ingredients will include their effects on pellet mill energy expenditures to make good pellets that result in optimum feed utilisation for the grow-out manager. Nutritional effects on egg size will help breeder managers produce chicks of optimum sizes to maximise broiler growth rate and feed utilsation efficiency. The quantitative relationships (regressions) between all the various inputs and outputs need to be known for the overall profitability of producers to be maximised subject to environmental costs and welfare concerns to move from linear least-cost models to non-linear profit maximising models.

Surely molecular genetics and bioinformatics will greatly impact feed utilisation and immune function in birds and productivity of plants. Will photosynthesis be harnessed one day to produce carbohydrates, fats and total amino acids in vitro from CO_2 and ammonia? Will the outputs of the system be tailored to contain uniform mixtures of energy and total amino acids in the precise proportions that different classes and ages of poultry need? Will plant based substitutes become more acceptable to consumers?

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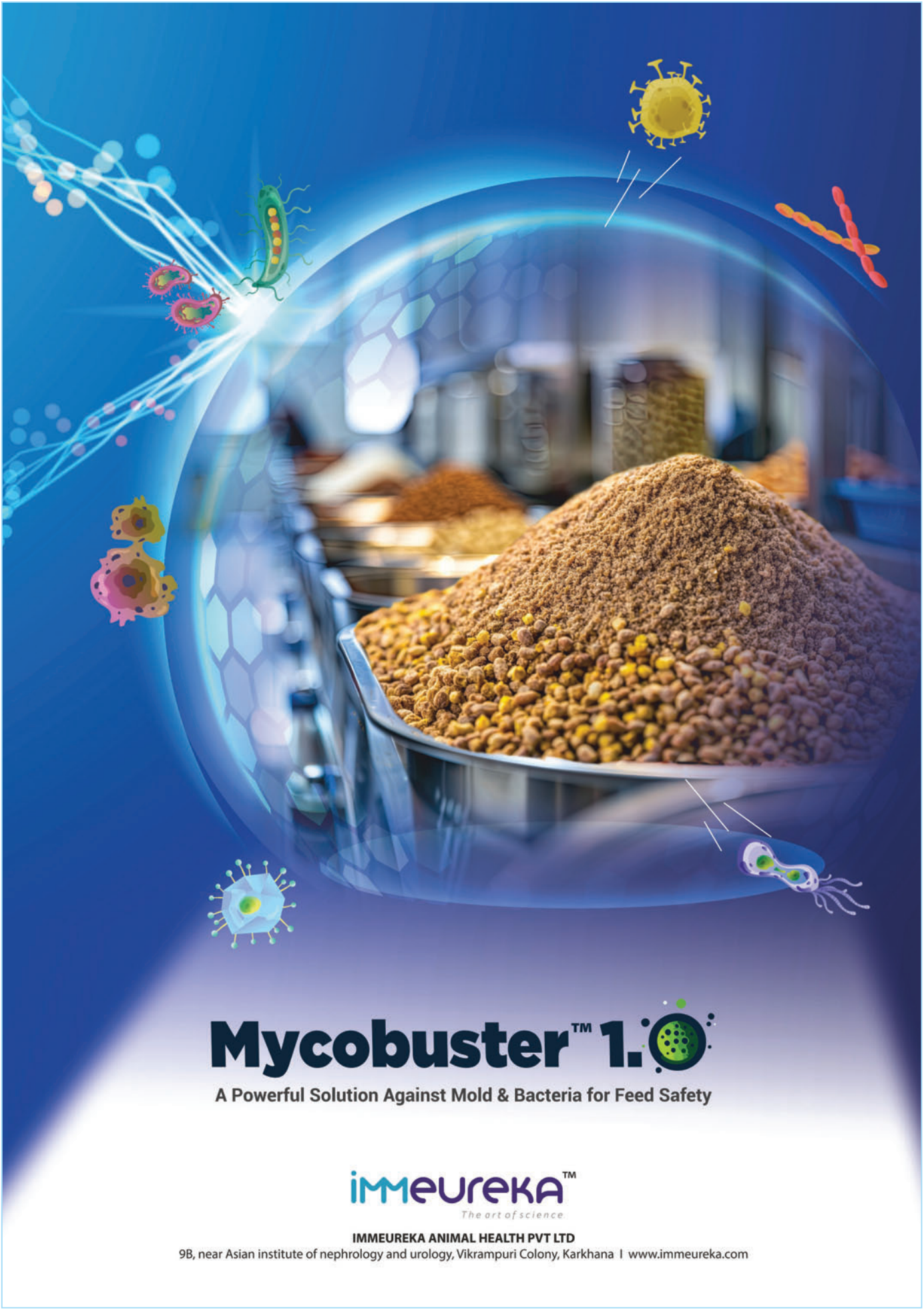
(References on request)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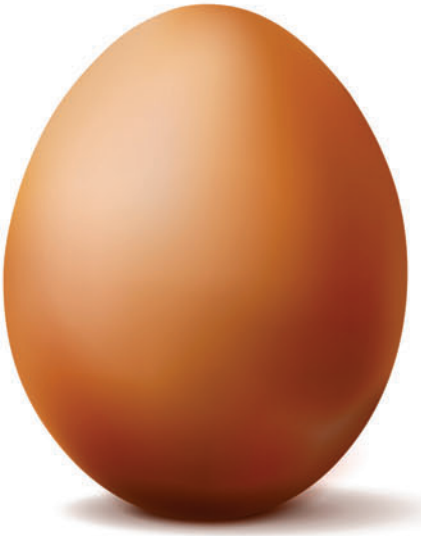

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Article

Role of Dietary Trace Mineral and Coenzyme Q10 (Antistress Factor) in Oxidative-stressed Poultry

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Optimising performance in poultry production requires constant vigilance against a silent threat: oxidative stress. This condition arises when the body's natural antioxidant defenses struggle to neutralise free radicals, unstable molecules formed during normal cellular processes, and environmental exposures. Excess free radicals wreak havoc by damaging cells, tissues, and organs, ultimately impacting overall bird health and performance.

Why Focus on Oxidative Stress Now?

Erratic weather patterns, characterised by sudden downpours, fluctuating temperature, and humidity, pose a significant threat. These conditions create a perfect storm for oxidative stress in poultry due to several factors:

a) Rapid Environmental Changes: Sudden temperature swings and heavy rain disrupt birds' physiological homeostasis, increasing free radical production
b) Immune System Activation: Erratic weather patterns can trigger an inflammatory response, generating free radicals as signaling molecules
c) Oxidative Shock Response: High temperatures activate a cellular defense mechanism called the oxidative shock response, generating free radicals
d) Disrupted Cellular Function: Excessive oxidative stress disrupts normal cellular function, leading to leakage of cellular components that form free radicals
e) Wet Litter Conditions: Heavy rains and gastrointestinal insults leading to abnormal droppings, create damp litter, promoting not only coccidiosis oocyst sporulation but also bacterial and mold growth, and exacerbating oxidative stress

Combating Oxidative Stress: The Approach

Commercial poultry producers can employ a multi-faceted approach to mitigate the risk of oxidative stress in their flocks:

1. Reducing Free Radical Production:

A- Diet Management:

- Balanced Nutrition: Provide diets with essential vitamins (vitamin E, B vitamins) and minerals (selenium, manganese, zinc)
- Optimum Energy Levels: During oxidative stress periods, consider diets with lower energy densities

B- Environmental Control:

- Temperature Regulation: Implement proper ventilation and cooling systems
- Litter Management: Maintain dry litter conditions to minimise stress and prevent bacterial and mold growth. Usage of ammonia binders is also recommended during severe winter conditions

2. Enhancing Antioxidant Defenses:

A- Dietary Supplementation:

- Antioxidant Additives: Incorporate feed additives rich in antioxidants like vitamin E, organic selenium, or plant extracts
- Breeding Programs: Genetic Selection: Implement selective breeding programs for improved thermotolerance and stronger antioxidant defense systems

Role of Trace Mineral and Coenzyme Q10 in Mitigation of Oxidative Stress

Zinc (Zn)

Zinc, a key component of the carbonic anhydrase enzyme, improves eggshell weight and reduces shell defects. It is crucial for maintaining an efficient immune system during oxidative stress, as it increases antibody titer, Immunoglobulin G & Immunoglobulin M (IgG & IgM), and cell-mediated immunity.

Zinc aids in quenching free radicals by participating in antioxidant enzyme systems like superoxide dismutase (SOD) and metallothionein. It also releases enzymes like catalase (CAT), glutathione peroxidase (GPx), vitamin A, and vitamin C, which raises their levels in the serum and makes it easier for the body to deal with oxidative stress.

Copper (Cu)

Copper (Cu) is a crucial trace mineral in birds, essential for antioxidant activity and immunity. Birds require 5-8 ppm of copper in their diet. Oxidative stress can decrease copper intake due to reduced feed intake, leading to marginal copper deficiency. This impairs the immune system, reducing T lymphocyte synthesis, antibody production, and phagocytic index. Cu supplementation during oxidative stress can help birds cope with the stress efficiently and maintain the eggshell and shell membrane quality in layer.

Selenium (Se)

Selenium has a vital function in poultry's antioxidant defense system during oxidative stress. Organic selenium is more bioavailable than inorganic forms in chicken. It boosts weight gain and feed efficiency in oxidative-stressed birds while improving feed conversion, egg output, egg quality, haugh units, and eggshell quality in layers raised at high temperatures. It protects the mucosa of the small intestine and pancreas from oxidative damage during oxidative stress, enhances vitamin E absorption, and protects cell membrane fats from oxidative damage. It also aids immune systems by increasing antibody titer (IgG and IgM), interleukin production (Tumour Necrosis Factor-alpha (TNF-α), Interferon-gamma (INF-γ) and interleukin-2(IL 2)), and phagocytic functions of macrophages, thereby reducing the negative effects of oxidative stress.

Chromium (Cr)

Chromium (Cr) is a mineral involved in the metabolism of

carbohydrates, proteins, lipids, and nucleic acids through insulin action. Chromium supplementation enhances insulin, glucose, and cholesterol levels in oxidative-stressed birds by restoring the Cr reservoir and utilising glucose extensively. It reduces oxidative stress, lipid peroxidation, hepatic nuclear protein, and oxidative shock protein expression in oxidative-stressed layers. Organic chromium has more bioavailability and lower toxicity than inorganic forms. Chromium supplementation in birds reduces stress by increasing orexin and glucose transporter (GLUTs) levels and reducing nuclear factor kappa B(NF-κB) and oxidative shock protein (HSPs) levels, promoting a more thermoneutral physiology.

Manganese (Mn)

Manganese (Mn) aids in carbohydrate and lipid metabolism by increasing insulin synthesis from the pancreas. In oxidative-stress conditions, Mn supplementation can alleviate its negative effects on broilers, particularly in chronic oxidative-stressed broilers, by reducing abdominal fat deposition by decreasing lipoprotein lipase (LPL) activity. Supplementation of Mn can protect the embryo of birds from maternal oxidative stress by enhancing epigenetic-activated antioxidant and anti-apoptotic activities. It acts as a cofactor for many of the enzymes required for eggshell synthesis and helps maintain eggshell quality during oxidative stress conditions.

Iodine (I)

The thyroid gland hormones in birds significantly regulate metabolic and thermogenic functions. Oxidative stress can decrease thyroid hormone concentrations in the circulatory, potentially due to a decrease in feed intake. Oxidative-stressed layers have lower serum Triiodothyronine (T3), Thyroxine (T4,) and Thyroid stimulating hormone (TSH) concentrations, as well as an increase in Adrenocorticotropic hormone (ACTH) concentrations, and there is a direct correlation between plasma T3 concentration and egg productivity. The amount of iodine influences thyroid gland function in the diet and Iodine deficiency at this stage may prove harmful to poultry. Iodine deficiency can cause metabolic disorders and reduced laying rates. The recommended iodine content for layers' diet should be 0.48 mg/kg of feed.

Iron (Fe)

Iron (Fe) is an essential mineral that is regularly supplemented in poultry feed. It is a vital component in various enzymes and proteins that regulate cell development, oxygen transport, and health. It is involved in biochemical reactions like the antioxidant system, by being part of enzymes like catalase, and various oxidation-reduction reactions, and is essential for the immune response. It significantly supports enzymes in the tricarboxylic acid cycle (TCA), enabling the removal of harmful metabolites via catalases and peroxidases with iron. Oxidative stress reduces Fe levels in serum and tissue, leading to immune and antioxidant system malfunction, causing health issues in birds. Birds under oxidative stress should consume a normal dietary iron concentration; otherwise, the immuno-antioxidant system collapse will negatively impact animal health.

Coenzyme Q10 (CoQ10)

Coenzyme Q10 (CoQ10), also known as ubiquinone, is a lipophilic antioxidant found in the mitochondria of all body cells. It has various homologs based on an isoprenoid moiety, with CoQ10 being prominent in humans and birds. It serves as an electron carrier in the mitochondrial respiratory chain and a lipid-soluble antioxidant. It is an important bioactive compound that can strongly remove free radicals from cells. The body synthesises it, but excessive free radical scavenging during oxidative stress depletes it. CoQ10 can be used as a nutritional supplement for various beneficial effects, including:

- CoQ10 significantly enhanced the performance (body weight gain, feed intake, and F:G ratio) of broilers, particularly the grower and finisher stage in oxidative stress conditions
- CoQ10 lowered the levels of glucose, cholesterol, triglycerides, and corticosterone in the blood, which is a key biomarker for oxidative stress. This could be because CoQ10 reduces the oxidative effects of oxidative stress
- T3, T4, and their balance control animal body temperature and metabolic activity. Oxidative-stressed birds consistently have decreased T3 and T4 concentrations. CoQ10 enhanced T4 concentrations in blood serum, demonstrating its capacity to reduce the deleterious effects of oxidative stress
- Oxidative stress in broiler chickens increases the H/L ratio index, affecting the number of lymphocytes and heterophiles. CoQ10 supplementation can decrease the H/L ratio, potentially reducing its harmful effects
- Broiler chicken's susceptibility to ascites (pulmonary hypertension syndrome)) is reduced by CoQ10 supplementation, which improves hepatic mitochondrial function, respiratory chain-related enzyme activities, and mitochondrial antioxidative activity
- Dietary CoQ10 significantly increased hepatic CoQ10 levels in laying hens, and it acts as an HMGR (hydroxymethyl-glutamyl-CoA reductase) inhibitor in the livers, suppressing cholesterol synthesis, which in turn results in a reduction in egg yolk cholesterol
- Dietary CoQ10 supplementation may increase tissue concentrations, which may restore mitochondrial functions and regulate Pdss2 (decaprenyl-diphosphate synthase subunit 2), BMP15 (bone morphogenetic protein 15), and GDF9 (growth differentiation factor 9) mRNA transcripts, improving oocyte quality and broiler breeders' incubated eggs' hatchability
- Coenzyme Q10 plays a crucial role in the regeneration of antioxidants like superoxide dismutase and vitamin E. As a result, these antioxidants improve sperm quality and prevent lipid peroxidation in the sperm plasma membranes of male broiler breeders

Kemtrace Supreme

Kemtrace Supreme is a highly bioavailable complete organic mineral mix of Metal Propionates ensuring optimal mineral nutrition to broiler, layer, and breeder birds and reducing oxidative stress to enhance absorption.

- IOMPS- State-of-the-art Manufacturing: Kemin's Metal Propionates are manufactured in the new Integrated Organic Mineral Production System; With more stable minerals and better mineral complex formation
- A fully organic formulation: Zn, Mn, Cu, Co, Cr in Metal Propionates form; Iron as Iron Ascorbate; Selenium as Se Yeast; Iodine as EDDI
- Optimised mineral concentration: All the minerals are optimised to fulfill the nutrient requirement; Higher Zn, Mn, and Cr concentrations to fit the needs of Broiler, Layer, and Breeders
- Boosted with antistress factors: Coenzyme Q 10 (Antistress factor) is added to reduce oxidative stress; higher Chromium concentration to reduce stress, boost immunity, and increase meat yield

Conclusion

Oxidative stress poses a significant threat to the poultry industry. This multifactorial condition arises from factors such as fluctuating temperatures, humidity, nutrient imbalances, and metabolic stress. Combating oxidative stress in poultry requires a comprehensive approach. While no single strategy can fully mitigate its effects, trace minerals and Coenzyme Q10 play a crucial role in reducing oxidative damage and promoting overall bird health. This is particularly important in South Asia, where open housing systems and challenging environmental conditions exacerbate the risk of oxidative stress. By supplementing with these essential nutrients, poultry can better withstand oxidative stress and maintain optimal performance. *(References are available upon request.)*

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Indian Agriculture:
Harvesting Success Yet Challenges Galore

SHRIDHAR speaks

Tarun Shridhar
Director General, Indian Chamber of Food and Agriculture; and former Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India

Will India be the next food superpower of the world? Economist, a magazine otherwise not too kind towards us, thinks so. An article on Indian agriculture in the July edition of the magazine is impressively titled "The world's next food superpower". It rightly articulates that portents do strongly indicate that a near stagnant annual growth rate notwithstanding we are destined to be the global superpower in the food and agriculture sectors. At the same time, there is a bonafide apprehension too that politics and populism may pull us back.

The journey so far has indeed been impressive despite several lost opportunities. Not too long ago we were derided as an agriculture "Basket Case", characterised by perpetual shortages and chronic distress in the agriculture sector. During the 1950 and 60s, our food and agriculture sector was defined as "ship to mouth", a pejorative for our dependence upon imports and foreign aid; in fact crying for mercy in order to feed our population. Who in our generation can forget PL (Public Law)-480?: wheat imported under this law from the USA was described as "fit enough only for the pigs to eat"; ironically it also used to be in short supply. But now we have reason to thump our chests having emerged as a net exporter of almost all food commodities. "Basket Case" is now recognised as the "Breadbasket" of the world.

The sector may still be plagued with imperfections plentiful, the growth rate may still be pointing towards stagnation, access to finance continues to be an issue, markets are yet to mature, technology and other inputs may even now be out of reach of the small farmer; yet it may not be a hyperbole to say that the Indian agriculture is flourishing in the face of multiple challenges. Amidst the difficult working environment and conditions, our farmers have been giving us record harvests, each bettering the previous one. Leave aside the phenomenon of famine, today's generation won't even know what food shortage means. During the global food scare that followed Russia's invasion of Ukraine, India came to the rescue of the global community emerging as the major exporter of rice and wheat; after all, we are the world's second biggest producer of both. In one of the many such examples, we have sent more than 60 million tonnes of wheat to Afghanistan during the past two years.

Still we need to guard against lapsing into complacency and recognise that serious inefficiencies persist. According to an estimation by a Singapore based Agri-business entity, our land under cultivation is one third more than China but in comparison we harvest only a third as much produce by value. Agriculture employs almost half of our workforce, 260 million, but contributes only about 18% to the GDP and 12% of exports. By contrast, business services such as call centres and IT companies employ less than 1% of workers but produce 7% of GDP and almost a quarter of exports. Therefore, radical rethink in policy and perspective is imperative.

"Our farms are starved of capital and knowledge on modern methods and practices," wrote Prof. Ramesh Chand in the 2017 NITI Ayog Policy Paper titled Doubling Farmers' Income. A confusing paradox considering the substantial financial outlays, both direct and indirect, in the central and state budgets. The predicament perhaps lies in our fixation with treating agriculture as a mere production oriented activity with the sole objective of providing affordable food, and not viewing it as a vibrant enterprise which could lend dynamism to the economy. What prevents us from recognising our farmer as an entrepreneur, innovator, a progressive business owner, and above all a bold risk taker.

Why should the farmer be starved of finance? Theoretically, a plethora of financial incentives and capital investments have been provided to the farm sector: from high tariffs to protect domestic produce from cheap imports to subsidies on a variety of inputs such as seed, fertiliser, pesticides, energy, water etc. In fact, the rate of subsidy on water and electricity has reached the maximum of 100% in certain states. These financial stimuli are further enhanced through loans which carry either no or a concessional rate of interest; low cost or fully subsidised insurance; and price support for major commodities. Populist measures such as periodic loan waivers add on to this seemingly huge financial basket. And finally, the income enjoys exemption from tax. Yet, the growth of the sector has been consistently low, hovering around 3% over the years, and when we discuss the sector, the most commonly used phrases are "farm distress" and "crisis". Within the sector, it is dairy, fish farming and poultry which have been regularly, for more than a decade now, registering an annual growth between 6 to 10% whereas none of the financial incentives listed above are available to these activities. If the growth only of crop husbandry is computed, it would be under 3%. We have narrowly confined our understanding of agriculture to only mean growing crops on the soil and targeted financial inputs accordingly.

Logical though it sounds, it would be an erroneous inference that there is no correlation between infusion of finance and growth?

We would serve the sector well by clearly differentiating between public investment in agriculture and subsidies. At present the bulk of public spending in agriculture is biased towards providing cheap inputs to the farmers. The sector is tightly controlled; from inputs to extension to marketing. Cheap subsidised inputs compromise on quality, and also on basic principles of return on investment by artificially keeping the cost low. This reduces the incentive to perform better, as recovery of cost of inputs has been eased. Dairy, poultry and fish farmers need to work harder to recover the cost and then generate surplus to stay afloat. Innovation also gets pushed to the margins as incentive has already gone missing. Agriculture extension system has been in a state of disrepair for quite some time now, and private talent does not venture into this territory as we prefer subsidised services, even if they are of dubious quality. The mandi, controlled by the Market Committees, is a monopsony of a different and ugly kind, though the raison d'etre of this mandi was precisely to free the farmer from monopsony. There is an utter lack of transparency in their functioning, cartels control them, traders pool for price fixing, payments are unreasonably delayed pushing the farmers again to money lenders. Unfortunately, the steps to ease these controls and provide a greater degree of freedom to the farmer over his profession have met with opposition from some quarters. This could also be on account of our traditional suspicion of private sector investment in agriculture. We may affirm our commitment to agriculture and farmers through heavy budgetary allocations, but the real growth in terms of productivity, value and realisation of the goal of doubling farmers' income would be a reality if private investment in the sector too flows with as much enthusiasm and ease as in the manufacturing and services sectors.

Another stark irony is that while we are treating private investment in agriculture with suspicion, the public institutions, despite the pronouncement, view the agriculture sector and the farmer with the same, if not higher, degree of suspicion. No financial institution shows any willingness to finance beyond the subsidised government schemes; agriculture is still considered a high risk financing activity and farmers a high risk category of borrowers. As a result, insurance too remains out of bounds; in fact no insurance company responds favourably to insuring a fish farming activity. Beyond the comfort of the Kisan Credit Card (KCC) there is hardly any substantial institutional credit available to the farmer. So the dependence upon the informal channels remains high. In fact, NABARD acknowledges that more than 30% rural households still take credit from non-institutional sources. Distribution of this credit is also uneven and skewed amongst states, and heavily prejudiced against small and marginal farmers; the landless tillers remain outside its purview. Availability of financial resources does not automatically mean an access to those resources; and this access continues to be a challenge even though availability ceases to be a major issue. Given the large proportion of resource constrained small and marginal farmers in India, timely availability of adequate credit is fundamental for the success of farming activities.

The sector may still be plagued with imperfections plentiful, the growth rate may still be pointing towards stagnation, access to finance continues to be an issue, markets are yet to mature, technology and other inputs may even now be out of reach of the small farmer; yet it may not be a hyperbole to say that the Indian agriculture is flourishing in the face of multiple challenges

Income support, yes. Subsidies to offset high cost of farming, yes. But let these not be confused with investment. There is no dearth of finance, but dearth of good finance. Invest as much in infrastructure, R&D, digitalisation; basically in what generates greater monetary value to the farmer. This should be in no conflict with the government's welfare and income support to the farmer. Let the investment be evaluated on the threshold of financial return. Treat agriculture as business and encourage financial returns on business principles. It is definitely encouraging that on the lines of ease of doing business we have started talking about ease of doing agriculture. Let the focus be shifted from production to farmer, not merely in the idiom of welfare, but prosperity. Our policy direction should be to make agriculture a profession of choice and not compulsion. And this would not be possible in a regime dominated by subsidies and loan waivers, rather it requires creation of a positive and strong enabling ecosystem.

CLFMA Hosts AGM and National Symposium

The 57th Annual General Meeting and 65th National Symposium of CLFMA of India took place on 21st and 22nd September in Goa, drawing around 400 participants from diverse fields, including feed manufacturing, dairy and aqua farming, veterinary science, nutrition, government, academia, and industry. Distinguished guests included Rajiv Ranjan Singh, Hon'ble Minister of Fisheries, Animal Husbandry, and Dairying, and Dr. Abhijit Mitra, Animal Husbandry Commissioner.

The symposium's convener, Divya Kumar Gulati, opened with remarks on the event's focus on transformative discussions, especially addressing high soya meal and corn prices due to the government's MSP and ethanol mandates. He called for a united approach to address these challenges.

CLFMA Chairman Suresh Deora highlighted the association's role in linking farmers, industry, and government and urged support for stabilising prices of essential feed ingredients.

Tarun Shridhar, Former Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, provided a thematic address on sustainable policies that balance environmental concerns with the growth of the livestock sector. He highlighted issues like antimicrobial resistance, greenhouse gas emissions, and the need to treat the livestock industry as a vital food sector.

In his keynote, Godrej Agrovet's Managing Director, Balram Singh Yadav, noted the sector's growth due to government initiatives and startups. He discussed increasing demand for animal-based nutrition, the influence of digital technology, and the importance of innovation in embryo transfer and sustainable practices to align with shifting consumer preferences.

Lifetime Achievement Awards were presented to Dr. O.P. Chaudhary, Former Joint Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India and Dr. Deepashree Desai, Head and In-Charge Professor at the Department of Poultry Science at Bombay Veterinary College.

The second day began with the announcement of the newly elected leadership team for 2024-26 under Divaya Kumar Gulati, Managing Director, Nurture Technology.

The day also featured three panel discussion sessions - Managing Input Costs and Exploring Alternatives, Leveraging Emerging Technologies for Efficient Livestock Management & Retailing & Securing Sustainable Livestock: Challenges and Opportunities.

The symposium highlighted key topics like the effects of climate change on agricultural output and farmer income, emphasising the need for sustainable, climate-smart agriculture. The event concluded with a call for stronger collaboration among government bodies, stakeholders, and regulators to foster a supportive environment for the livestock sector's growth.

CLFMA's New Leadership Team 2024–2026		
Chairman	Divya Kumar Gulati	Nurture Aqua Technology Pvt. Ltd.
Deputy Chairman	Sumit Sureka	Shivshakti Agro (India) Pvt. Ltd.
Deputy Chairman	Naveen Pasuparthy	Nanda Feeds Pvt. Ltd.
Deputy Chairman	Abhay Parnekar	Godrej Tyson Foods Ltd.
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Immediate Past Chairman	Suresh Deora	S.A. Pharmachem Pvt. Ltd.
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Other Members of the Managing Committee 2024-2026	
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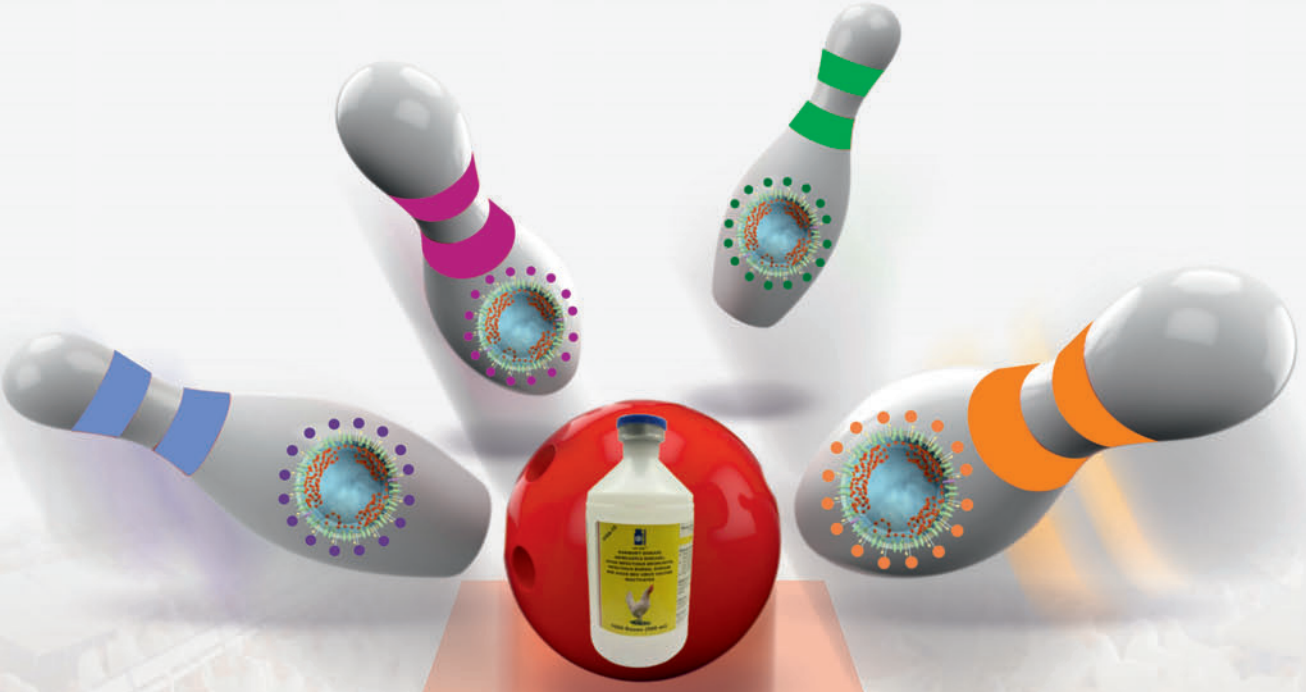

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IPEMA Conducts Its AGM

The Annual General Meeting (AGM) of the Indian Poultry Equipment Manufacturers Association (IPEMA) was organised on 30th September at Hyderabad. Presided over by Uday Singh Bayas, President of IPEMA, the meeting provided a comprehensive overview of the association's activities and achievements over the past year.

Members discussed sector challenges such as fluctuating market demands and supply chain constraints, alongside potential expansion opportunities in Asia-Pacific and Africa. A proposal to enhance lead and attendee data management for expos was approved, with a solution expected to be finalised post-Poultry India Expo 2024.

IPEMA reaffirmed its support for national and international events through branding and video promotions. Members reached a consensus on the successful completion of technical seminars in Nasik, Guwahati, Ajmer, Patna, and Lucknow, along with IPEMA's participation in the MAP Russia Poultry Expo 2024 and the Nepal-India Expo 2024. This collective support highlights the significant benefits of these initiatives in enhancing industry visibility and fostering growth for IPEMA members.

Vijaya Kranti unveiled the memento for the 16th Edition of Poultry India Expo 2024.

Preparations for the Knowledge Day event, scheduled for 26th November were also reviewed, with the event aimed at promoting innovation within the industry.

Key updates on the Poultry India Expo 2024, scheduled for November 27th-29th, highlighted its anticipated global reach, expecting over 400 exhibitors and 40,000 visitors. Marketing efforts are underway with substantial international and national media coverage.

The meeting concluded with a vote of thanks from Uday Singh Bayas.

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MAFSU-Nagpur Veterinary College Hosts IPSACON 2024

The 39th Annual Conference & National Symposium of the Indian Poultry Science Association (IPSA), themed "Shaping the Indian Poultry Sector for Sustainable Growth," was organised from 16th to 18th at MAFSU-Nagpur Veterinary College. This significant event brought together professionals, industry leaders, and students to discuss advancements and challenges in poultry science. The sessions covered a range of topics, including Poultry Nutrition, Management, Health, Vaccines, Artificial Intelligence, Welfare, Processing, Economics, and Entrepreneurship.

The conference offered a variety of activities, especially for students, such as poultry judging, egg recipe competitions, a National Poultry Quiz, campus placements, and post-conference visits to poultry facilities. Attendees had the chance to interact with industry through dedicated stalls and a farmer-industry dialogue on the final day, addressing pressing issues faced by poultry farmers.

The organising committee included Dr. Niteen Patil, Vice-Chancellor of MAFSU, Nagpur, and other MAFSU officials Dr. S. V. Upadhye (DI & Dean of Veterinary Science), Dr. N. V. Kurkure (Director of Research), and Dr. A. U. Bhikane (Director of Extension Education). The conference was hosted by Dr. A. P. Somkuwar, Associate Dean of Nagpur Veterinary College, along with Dr. M. M. Kadam, Professor & Head of Poultry Science, as the Organising Secretary, Dr. Suresh Jadhav and Dr. Darshan Bhaisare, Assistant Professor as Co-Organising Secretaries, Dr. Ajit Ranade, Former Associate Dean of Mumbai Veterinary College and current President of IPSA.

The conference was inaugurated on 16th October with Bahadur Ali, Managing Director & Founder of IB Group, as the Chief Guest, and Dr. G. L. Jain, Principal Advisor of Venky's Group, as the Guest of Honour. Both emphasised the importance of industry-academia collaboration, with Mr. Ali announcing a demonstration shed on campus to support collaborative research. Dr. Jain discussed emerging challenges in poultry breeding and urged young scientists to gain hands-on experience.

The event offered various engaging competitions, including e-poster presentations, oral presentations for faculty, a poultry quiz, and photography and art contests. Campus interviews for M.VSc, and Ph.D. students, a poultry judging competition, and an egg cookery contest for hotel management students were

also held. Additionally, a farmer-industry interaction saw the participation of 65 farmers and state veterinary officials, providing a platform to discuss industry challenges.

On 17th and 18th October keynote speakers like Dr. G.L. Jain and Dr. P. K. Shukla presented on recent advancements. Awards were distributed to recognise outstanding achievements in poultry science, including the IPSA Dr. D. Choudhury Award for Best Doctoral Dissertation, IPSA A.P. Chapter Award for Best M.V.Sc. Dissertation, IPSA Lifetime Achievement Award and IPSA Fellowship Award.

The conference also welcomed special invitee Thulasimathi Murugesan, a TANUVAS student and badminton silver medalist at the 2024 Paris Olympics and Paralympics, who inspired attendees to pursue sports alongside academics.

The valedictory function on 18th October had Dr. Umesh Sharma, President, Veterinary Council of India (VCI) as Chief Guest. Dr. Sharma announced a new VCI curriculum introducing a separate Department of Poultry Science, which will be implemented starting in the 2025-26 academic year. Dr. Sandeep Ingle,Vice President VCI was the Guest of Honour. The event concluded with a strong emphasis on fostering sustainable growth within India's poultry sector.

Srinivasa Hy-Line Technical Seminar 2024

The Srinivasa Hy-Line Technical Seminar 2024 was organised in Hyderabad from 16th to 18th October. The seminar titled, "Maximizing Profitability & Performance of Egg Farming", brought together Indian poultry industry leaders, the global Hy-Line International team, industry experts, and top consultants to discuss pioneering insights aimed at enhancing the productivity and profitability of the Hy-Line W-80 in India.

The speakers from Hy-Line International included:

- Jonathan Cade, President, Hy-Line International
- Dr. Daniel Alberto Valbuena Hernandez, Global Technical Manager, Hy-Line International
- Dr. PetekSettar, Applied Geneticist, Hy-Line International
- Mr. Vitor Arantes, Global Technical Service Manager, Hy-Line International
- Mr. Thomas Dixon, Global Product Manager, Hy-Line International
- Dr. Ravindran Marimuthu, Technical Manager, Hy-Line India

These industry leaders provided valuable insights into the latest developments in egg production and Hy-Line genetics, sharing record-setting benchmarks and performance standards shaping the industry's future.

Additionally, presentations from leading companies such as Vaksindo Animal Health Pvt. Ltd, dsm-firmenich Animal Nutrition & Health, Kemin Animal Nutrition & Health Asia Pacific, Cargill Animal Nutrition & Health, EW Nutrition, Nova-Tech Engineering, and Ashok Mandava, Managing Partner of Vijayanagar Egg Farm, significantly enriched the discussions. Sessions were moderated by Dr. Chandrasekaran, Dr. S.V. Rama Rao, and Dr. Jayaraman, facilitating insightful discussions that engaged all participants.

The seminar concluded with a strong commitment to reshaping the future of egg farming in India, setting new industry standards, and fostering progress in poultry farming.

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Insightful Technical Seminar by Optima

On 15th October, Optima Life Sciences organised a technical seminar in Pune titled, "Understanding Causes of Lameness Incidences in Poultry and Strategies to Minimise It". Over 125 participants attended the seminar that provided valuable insights into poultry health.

Dr. Nivedita Pande's presentation focused on using analytical epidemiology to identify lameness in poultry. She shared findings from a clinical controlled trial aimed at establishing guidelines to reduce lameness in commercial broilers. Key diagnostic indicators, such as elevated heterophil-to-lymphocyte ratios, high serum phosphorus, and low zinc and boron levels, were linked to lameness. Body weight, femoral length, and bone curvature were also identified as contributing factors. Dr. Pande discussed the potential for future research to predict subclinical lameness, facilitating early intervention.

Renowned nutritionist, Dr. U.C. Patel, addressed the metabolic causes of lameness, emphasising the importance of calcium, phosphorus, and phytase balance. He cautioned against simply increasing calcium and phosphorus without considering other factors and stressed the need for analysing mineral sources for bioavailability.

Dr. C.V. Chandrasekaran, Vice President, Optima Life Sciences, highlighted the role of improving calcium and phosphorus digestibility in reducing the risk of lameness. and introduced Ozyme P Advance, a new potentiated phytase and boron blend. This product boasts unique features, including 10% higher activity than conventional phytase enzymes (measured in FTUs), protection against denaturation, and enhanced stability for a longer shelf life. The seminar was co-ordinated by Sakshi Kulkarni, Director and study facilitated by Vinay Kulkarni, Executive Chairman, Optima Life Sciences. It closed on an optimistic note, paving the way for future advancements in poultry management.

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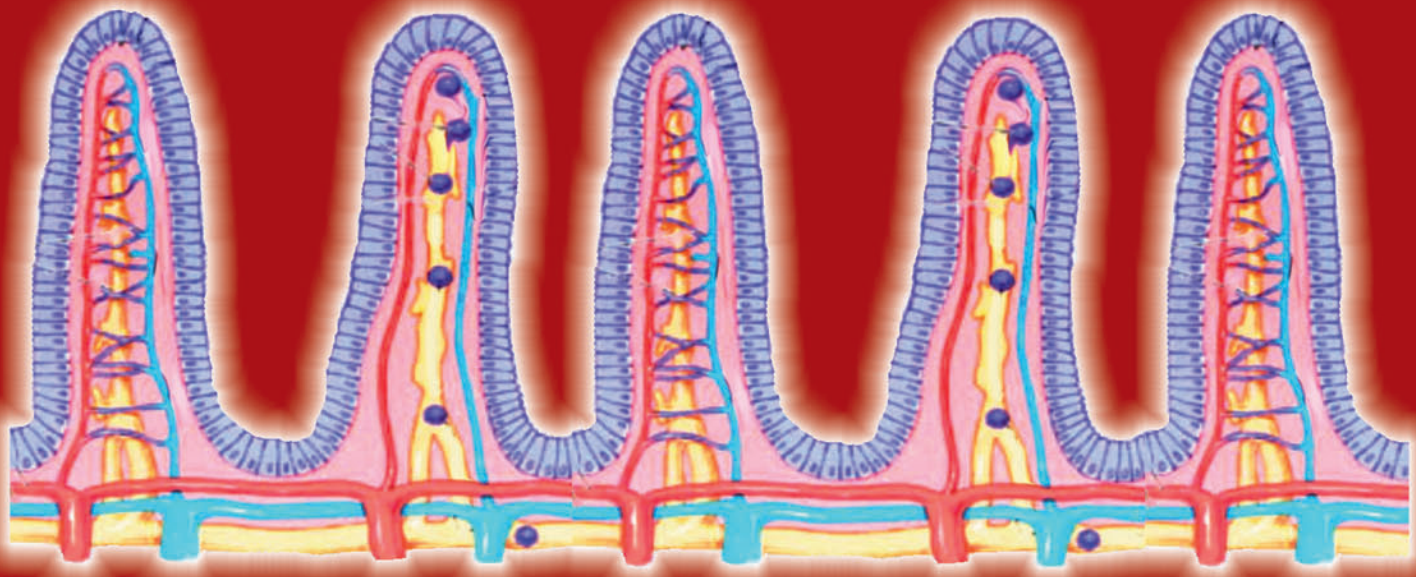

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