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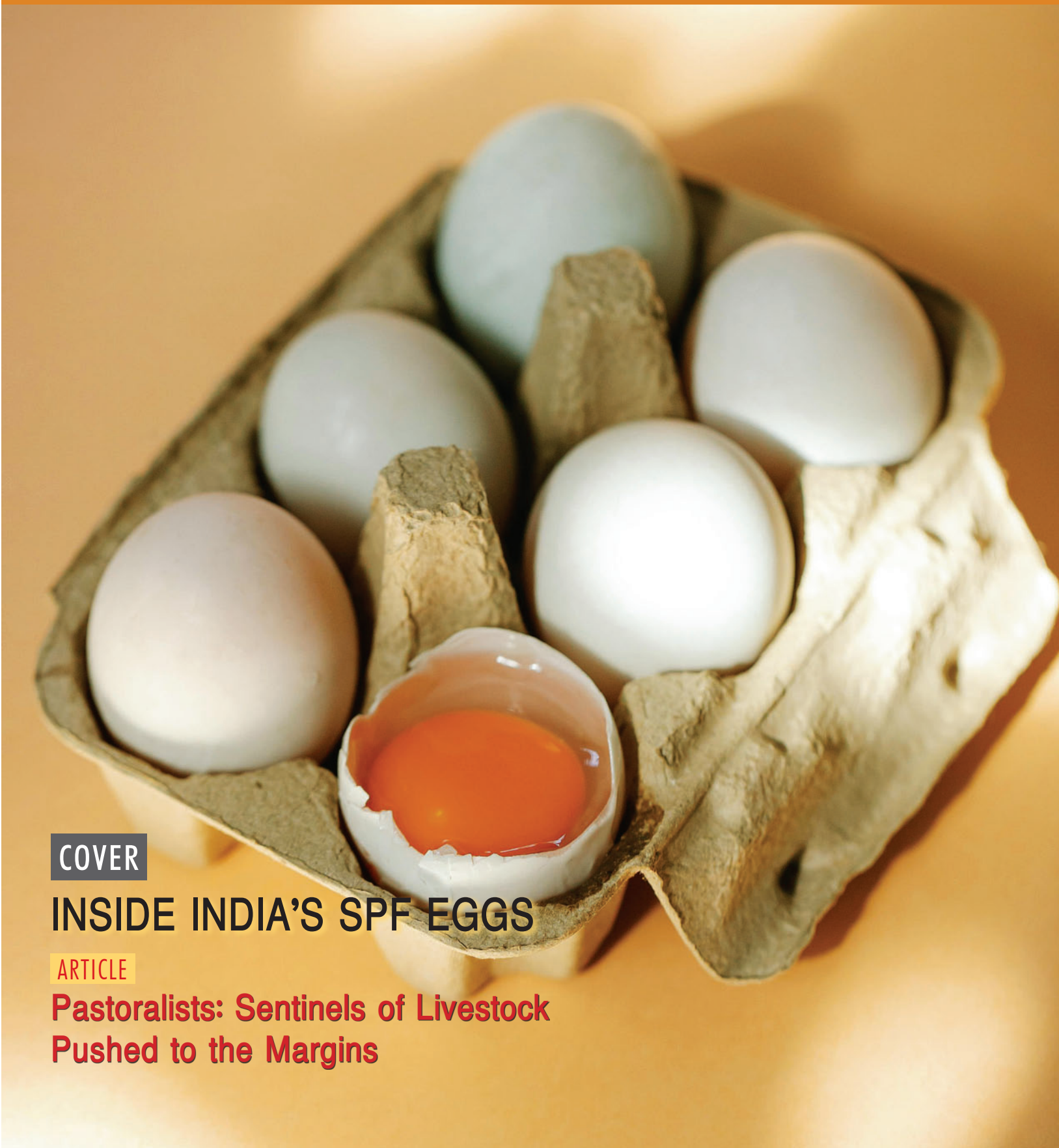
INDIAN POULTRY REVIEW

THE MAGAZINE OF INDIAN POULTRY INDUSTRY | MAY 2025



COVER

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ARTICLE

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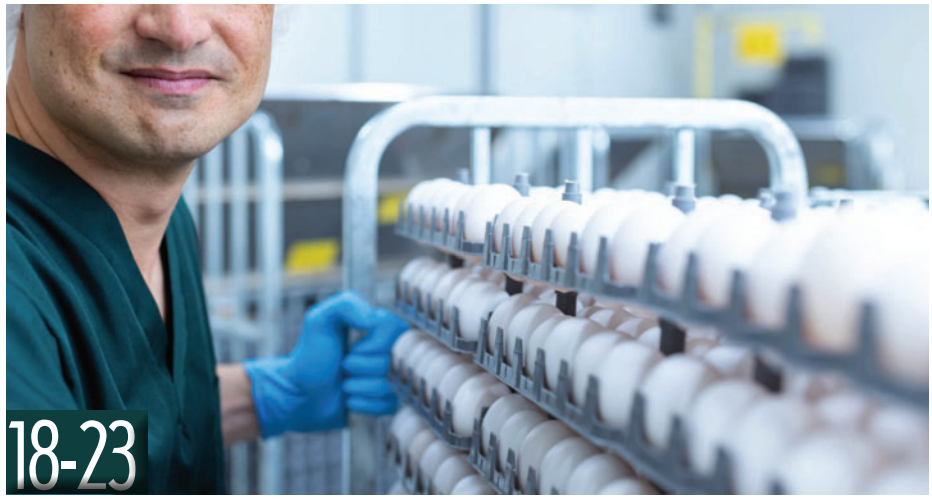

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The Edit

CRACKING OPEN OPPORTUNITIES

India, the third-largest egg producer globally, is poised to emerge as a major player in the export of eggs and egg products. With an annual output of over 142 billion eggs and increasing efficiencies in production, the country is well-positioned to cater to the growing international demand.

Beyond table eggs and processed products like egg powder and liquid eggs, India holds untapped potential in the export of Specific Pathogen-Free (SPF) eggs—crucial for vaccine manufacturing and biomedical research. Currently, India imports a significant quantity of SPF eggs. However, a handful of domestic producers have successfully established bio-secure facilities, paving the way for self-reliance and eventual export. With rising global demand from pharmaceutical and veterinary sectors, SPF eggs could become a high-value niche export for India, provided we scale up production under strict international biosafety norms.

India's advantages—cost-effective production, diverse agro-climatic conditions, and a growing surplus—align well with global protein needs, especially in the Middle East, Africa, and Southeast Asia. Egg products, particularly in processed form, find extensive use in the global bakery, confectionery, and foodservice industries. Moreover, the recent uptick in interest from Gulf and ASEAN markets signals a growing appetite for reliable, affordable, and high-quality supply.

However, the road to becoming an export powerhouse demands investment in cold chain infrastructure, stringent adherence to international food safety and biosafety standards, traceability systems, and export facilitation. Public-private collaboration, capacity-building for producers, and enabling policy frameworks will be key enablers.

With a strategic focus on both volume-based exports like egg powder and value-driven segments like SPF eggs, India's egg industry has the potential to deliver economic gains while supporting rural livelihoods and food security globally.

The shell is ready to crack. Are we prepared to lead from the front?

G. N. Ghosh
Managing Editor

Indian Research

Study to Optimise Transport Duration Without Compromising Welfare & Production Loss Under Indian Scenario

By
J.J Rokade*, M. Siddharth, M. Monika, M. Gopi, S. K. Bhanja, B. Ashim and A. Kumar
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**Corresponding author*

A total number of 120 marketable CAR1- Bro Vishal broiler chickens was divided into four groups in the 1st experiment and the birds were transported for different durations of 2h, 4h and 8h to identify the group showing significant signs of stress after transport. A control group was also kept without transport in the farm conditions to compare the effect of transport. The transportation was done in the early hours of the day and the vehicle was packed full of birds to create a field like condition. After transport, the birds were immediately checked for their welfare parameters and then they were slaughtered, and the blood and muscle samples were collected for lab analysis.

The study revealed transport affected welfare, carcass and serum biochemical parameters significantly ($P<0.05$). Welfare parameters such as runway time, gait score, tonic immobility and physical injuries were significantly ($P<0.001$) affected due to transport and the impact was higher in T4 group with 8h transport period. Body weight loss increased with increase in transport time with 8h transport showing highest body weight loss. There was no mortality observed in any of the treatment groups even in the longest transport time (8h).

Based on the results, it can be concluded that a transport period of more than 4h is not recommended as its causing significant ($P<0.05$) level of stress in the birds, leading to stress, production loss and compromising welfare of broilers.

Effect of Different Rearing System on Carcass Traits of Kadaknath Chicken

By
Saurabh1, G. Goyal2*, K.K.S. Baghel[1], A. K. Mishra[1], S.H. Khan[2] and R. Dhoulpuri[2]
[1]*College of Veterinary Science & .H., Rewa -College of Veterinary Science &* [2]*A.H. Jabalpur, NDVSU. Jabalpur. *Corresponding author*

Kadaknath, also known as Kalamashi. is an important native chicken breed of India famous for its black-coloured meat mainly reared by tribal people of Jhabua district of Madhya Pradesh. The present study was planned to investigate the effect of different rearing systems i.e. intensive, backyard and scavenging system on performance of Kadaknath breed and to calculate the cost economics of rearing of Kadaknath in the respective rearing systems. Day old 90 male chicks reared under electrical brooder up to 15 days of age were randomly distributed in equal number into intensive, backyard and scavenging rearing systems where they were kept for 98 days.

The body conformation traits of present study were significantly higher in intensive system followed by backyard and scavenging system in which following parameters include live weight (kg), bleed weight (kg), carcass weight (kg). Meat bone ratio was significantly higher in intensive system were, 1.525 ± 0.04, 1.522 ± 0.04, 1.09 ± 0.01 and 2.00 ± 0.01 respectively. The mean value of different cut off parts (g) like head, neck, giblet, wing, breast, drumstick, thigh and feet was found significantly higher in intensive system respectively.

The study concluded that Kadaknath reared in intensive system have shown higher shank and keel length, body weight, bleed weight, carcass weight, weight of different cut up parts and meat bone ratio in comparison to backyard and scavenging system. The dressing percentage was higher in intensive rearing system followed by scavenging and backyard rearing systems.

Evaluation of Metabolisable Energy and Crude Protein Energy Requirements in Rajasri Breeder Birds

By
K.Prashanth*, D. Krishna, V. Chinni Preetani, N. Kumari and S.V. Rama Rao
*P. V. Narsimha Rao Telangana Veterinary University, Rajendranagar, Hyderabad-500030. *Corresponding author*

An experiment was conducted to determine the metabolisable energy (ME) and protein requirements and their effect on production, reproduction, egg quality, serum biochemistry and immune parameters of the Rajasri breeder birds during 25 - 64 weeks of age. The experiment was a 3 x 3 factorial completely randomised design with three ME levels (2400, 2500 and 2600 kcal ME/kg diet) with CP(14%, 15% and 16%) levels.

The data of production parameters i.e. daily egg production, feed intake weight were recorded daily and expressed on four weeks interval. Reproductive (Fertility & Hatchability) egg quality parameters, immune response and serum biochemical parameters were studied at 10 weeks interval. Birds were fed ad lib during the study period (25 - 64 weeks). During the experiment egg production feed efficiency was not affected by the different levels of ME and CP.

However, feed intake, egg weight, body weight were affected by the level of ME supplemented. Reproduction, egg quality, serum biochemistry and immune parameters were not affected neither ME nor by CP levels used in the study. Based on results of the study, it was concluded that 2400 kcal ME / kg diet and 15% crude protein are sufficient for optimum egg production, egg weight, feed efficiency and reproductive parameters during 25 - 64 weeks age ofRajasri breeder birds.

Source: XXXVII Indian Poultry Science Association Conference, November 2022

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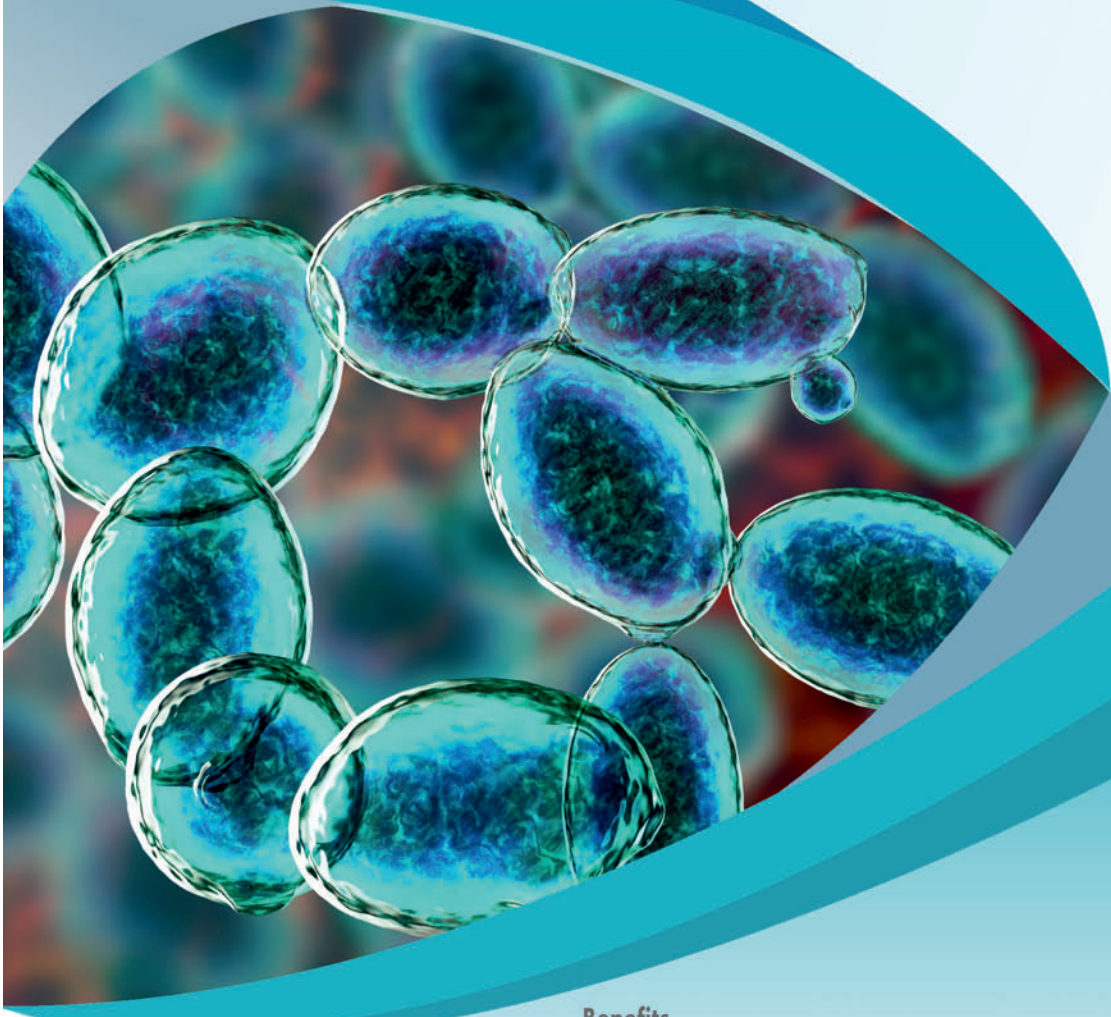

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Article

The Role of Nutrition in Reducing Heat Stress for Poultry Production

Dr. Pothanna
Technical Manager
Trouw Nutrition South Asia

Poultry farming, a critical component of global food production, faces significant challenges during the hot summer months. While heat stress can affect all livestock species, poultry are particularly vulnerable due to their unique physiological characteristics. Unlike mammals, poultry lack sweat glands and must rely on panting and evaporation to regulate their body temperature, making them less efficient at dissipating heat. Additionally, poultry have a higher metabolic rate, which results in greater internal heat production, further exacerbating the effects of high temperatures. As a result, poultry experience reduced feed intake, slower growth, decreased egg production, and an increased risk of mortality under heat stress conditions. In contrast, other species such as cattle and pigs possess more efficient thermoregulation mechanisms, like sweating, that allow them to better cope with heat. Given these challenges, poultry farmers must implement targeted summer management strategies, including nutritional adjustments, to help their birds cope with the stresses of elevated temperatures.

Heat stress in poultry can severely impact their health, performance, and overall well-being. Fortunately, proper nutritional management can mitigate its effects. Below are the key nutritional parameters that play a crucial role in managing heat stress in poultry.

Causes of Heat production

- Hot environment
- High feed intake
- High density feed
- High physical activity
- Overcrowding of birds in a limited space

Heat stress response to maintain normal body temperature

- Increased panting
- Spreading of wings
- Moves toward shades and cooler surfaces or at the place where airflow is more
- Blood-swollen wattles and comb
- Divert blood from internal organ to the skin which darken skin colour
- Birds try to move away from each other
- Less physical activity
- Eats less and drinks more water which will cause loose or watery droppings

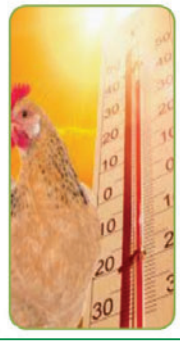
Impact on poultry production

Heat stress production losses depend on: maximum temperature, duration of high temperatures, rate of temperature change, and relative humidity of the air.

- ↑ Mortality
- ↓ Gut health
- ↓ Body weight
- ↓ Immunity
- ↓ Egg weight
- ↓ Albumin height
- ↓ Feed intake
- ↑ CFCR
- ↓ Meat quality
- ↓ Egg production
- ↓ Eggshell quality
- ↓ Hatchability

Impact on a molecular level

- Free radical generation, cell damage
- Intestinal barrier damage
- Electrolyte imbalance



1. Water Intake and Hydration
2. Protein Quality and Levels
3. Energy Density of Diet
4. Fat Content and Its Role
5. Electrolyte Supplementation
6. Antioxidants for Cellular Protection
7. Betaine for Thermoregulation
8. Fiber Content and Digestibility
9. Mineral Balance for Health Maintenance
10. Feeding Time and Frequency

Heat Stress and Protein Adjustments

During heat stress, it is essential to adjust protein levels in poultry diets to minimise metabolic heat production. High-protein diets, especially those derived from animal sources, can increase the heat load on poultry, exacerbating the effects of heat stress. Therefore, reducing animal protein intake during hot weather is crucial.

Plant-based proteins, such as soybean meal, are a better option during heat stress. They are easier to digest, produce less metabolic heat, and help poultry cope with high temperatures without additional stress. In addition, plant proteins are rich in essential amino acids, including arginine, which plays a key role in supporting overall metabolic functions.

The requirements for protein and amino acids remain largely consistent, regardless of environmental temperature. However,

it's important to avoid increasing the crude protein level in the diet, particularly from animal-based sources, as they tend to have higher heat increment values, meaning they produce more internal heat during digestion.

Vegetable proteins, such as soy, sesame, and sunflower, are preferred in the summer months, as they not only reduce the heat burden but also provide more arginine. Arginine absorption tends to be lower under heat stress, leading to an imbalance in plasma amino acids, which in turn increases amino acid catabolism and additional body heat. By using vegetable proteins, this issue can be mitigated, helping maintain better thermoregulation and reducing heat stress effects.

Energy Density in Heat Stress

Energy density plays a significant role in managing heat stress in poultry. During hot weather, poultry may reduce their feed intake due to the discomfort caused by high temperatures. In this scenario, ensuring a high energy density in the feed becomes crucial. A higher energy density allows the birds to get the required calories from smaller amounts of feed, helping to maintain their nutritional status without increasing the total feed intake.

Energy Sources: Carbohydrates and fats are the primary sources of energy in poultry diets. During heat stress, fat is a particularly efficient energy source as it provides more calories per unit weight than carbohydrates or proteins, making it an excellent option to maintain energy levels without requiring large quantities of feed. However, it's essential to balance fat inclusion carefully to avoid any negative effects on digestion and gut health.

To maximise energy utilisation, feed formulations may include higher proportions of fatty acids and carbohydrates that are easily digestible, such as corn and grains, which can provide readily available energy. Also, supplementing with energy-dense additives like fat sources (vegetable oils or animal fats) ensures that poultry can meet their energy needs during times of heat stress without overeating.

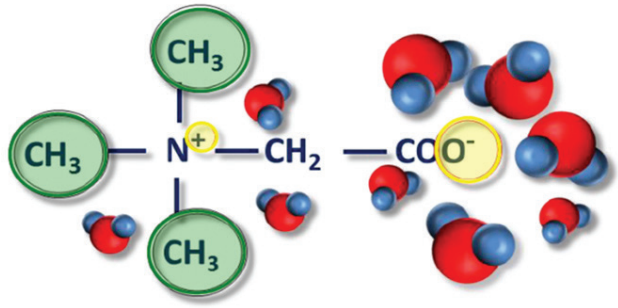
Feeding Strategies and Nutrient Balance During Heat Stress

Effective nutritional strategies during heat stress involve not only what is fed but also how and when it is fed. High-fibre diets are known to increase metabolic heat production and reduce nutrient digestibility, which can exacerbate heat stress in poultry. Therefore, lowering dietary fibre during summer can enhance nutrient absorption and reduce internal heat generation. At the same time, maintaining a proper balance of essential minerals—such as calcium, phosphorus, and magnesium—is critical to support bone health, muscle function, and electrolyte stability, all of which are compromised under thermal stress. Adjusting feeding times to cooler parts of the day, such as early mornings and late evenings, encourages better feed intake. Offering smaller, more frequent meals throughout the day further supports nutrient uptake and reduces the digestive burden, helping poultry manage heat stress more efficiently and maintain performance

Feed Additives

Vitamin C, or ascorbic acid, plays a pivotal role in supporting poultry health during heat stress. Its powerful antioxidant properties help neutralise free radicals, protecting cells and tissues from oxidative damage and promoting overall resilience. Vitamin C is essential for collagen synthesis, which supports the integrity of connective tissues, bones, and blood vessels—key factors in maintaining physiological stability under thermal stress. It also enhances immune function by boosting the activity of immune cells and cytokines, improving the bird's ability to fight infections during challenging conditions. Additionally, Vitamin C acts as a cofactor in converting inactive vitamin D to its biologically active form, 1,25-dihydroxyvitamin D, thereby supporting calcium-phosphorus

Chemical Structure of Betaine



balance, bone health, and immune function. This multifaceted role makes Vitamin C an indispensable nutrient in poultry diets during periods of elevated environmental temperature.

Betaine, a naturally occurring derivative of the amino acid glycine, was first identified in sugar beet juice and functions both as a methyl donor and a cellular osmoregulator. As a methyl donor, betaine contributes three methyl groups crucial for vital metabolic pathways such as DNA methylation, protein synthesis, and the regeneration of methionine and creatine

In poultry, the ability to convert choline into betaine is limited, making dietary supplementation essential. Betaine also supports liver health by preventing fat accumulation in hepatocytes. Importantly, as an osmoregulator, betaine helps cells maintain hydration and structural integrity under stress conditions like high temperatures. Unlike inorganic osmolytes, betaine protects cellular enzymes from osmotic inactivation and sustains nutrient uptake. This dual role makes betaine a valuable nutritional tool for mitigating the adverse effects of heat stress in poultry production systems.

Chromium is an essential trace mineral that plays a significant role in alleviating the effects of heat stress in poultry. Its primary function lies in enhancing insulin sensitivity by supporting the action of chromodulin, a peptide that strengthens insulin-receptor interactions. This facilitates efficient glucose uptake by cells, ensuring optimal energy utilisation during periods of elevated energy demand caused by heat stress. By promoting stable blood glucose levels and reducing metabolic strain, chromium helps maintain performance and energy balance. In addition, chromium contributes to immune resilience by lowering circulating cortisol levels—a stress hormone known to impair growth and immune function. This dual benefit of improved metabolism and stress modulation makes chromium a valuable component in summer feed strategies aimed at safeguarding poultry health and productivity

Conclusion

Farmers can adopt a comprehensive approach to mitigate summer heat stress in chickens by combining environmental controls, feed and water management, and stress-reducing treatments. Trouw Nutrition's Maxcare AHS(Anti-Heat Stress) is an important product to consider because it contains Betaine, Vitamin C, and Chromium, which are known for their anti-stress and antioxidant effects. These substances assist broilers and layers stay healthy and perform well in high temperatures. The Maxcare AHS dosing rate ranges from 0.5 kg to 1 kilogramme per tonne of feed. Implementing such solutions, combined with typical management approaches, can considerably lessen the impact of heat stress, leading to lower death rates, improved egg production, and faster growth rates in young pullets.

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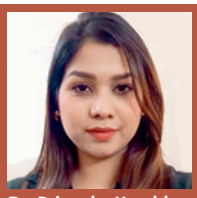
Finding the Future : Why Sustainable Feed is the Backbone of Poultry's Green Revolution

O. P. Singh
Managing Director

Dr. Priyanka Kamble
Sr. Marketing Manager

Huvepharma SEA (Pune) Pvt. Ltd

The poultry industry is at a crossroads. As the world demands more protein, it also demands more responsibility. Consumers are asking not just what they eat, but how it's produced. And while sustainability conversations often focus on farms and animal welfare, one of the most significant - and often overlooked - contributors to the industry's environmental footprint lies upstream: the feed mill.

The Carbon Reality Check

According to a comprehensive 2022 study on Spanish poultry production by Harrison T., a staggering 71% of total GHGe in the chicken meat value chain originates from feed alone.

Here's the breakdown:

GHGe by chain stage

- Breeder farms-17%
- Hatchery-5%
- Broiler farms-71%
- Slaughterhouse-7%

GHGe by source (origin)

- Feed -71%
- Feed combustion-8%
- Electricity-10%
- Water treatment-4%

That's not just a statistic—it's a wake-up call. It tells us that the most impactful change we can make starts before the chicks even hatch. Feed millers, you're no longer just part of the supply chain—you are now at the forefront of climate action.

For feed millers, this presents both a challenge and a tremendous opportunity. The sustainability of our entire industry hinges on how feed is formulated, sourced, and delivered. It's time to shift from traditional practices to climate-smart feed manufacturing. This is not just about reducing emissions — it's about future-proofing poultry production and leading the charge toward a greener, more responsible food system.

Why Sustainability in Feed Matters

The production of poultry feed, comprising grains, proteins, additives, and supplements, is energy-intensive and resource-hungry. From crop cultivation and fertiliser use to transportation and feed processing, every step emits greenhouse gases (GHG).

Feed alone can account for up to 60-70% of the total carbon footprint of poultry meat and egg production.

The Coming Shift: Feed Sustainability is Becoming a Competitive Advantage

Europe's sustainability regulations are tightening. Retailers and global food chains are setting stricter sustainability targets.

Investors are evaluating ESG (Environmental, Social, Governance) credentials. If you're a feed miller in 2025, the message is clear: sustainable operations are no longer optional—they're strategic.

Forward-looking feed manufacturers are already

- Running Life Cycle Assessments (LCAs) to identify and mitigate emissions
- Investing in automation and data intelligence for process optimisation
- Redesigning feed strategies aligned with Net Zero commitments
- Engaging in cross-sector collaborations to drive ecosystem-wide impact

The Wider Context – Other Drivers!

Sustainability isn't just a buzzword in the boardroom anymore -it's a business requirement woven deep into the supply chains of the world's biggest food brands. From Nestle and McDonald's to Burger King (RBI), Carrefour, and Ahold Delhaize, global giants are reshaping the poultry industry with bold climate commitments.

Many have pledged to cut greenhouse gas emissions (GHGe) by up to 50% by 2030, with full net-zero targets set for 2040 or 2050 under the Science Based Targets initiative (SBTi).

What's driving this urgency? For some, livestock emissions make up as much as 74% of their total GHGe footprint, with poultry playing a major role. These brands are also tightening standards around deforestation-free sourcing, animal welfare (like cage-free eggs and "star chicken"), and antimicrobial resistance (AMR) -all of which flow upstream to feed producers.

And let's not forget— these fast food chains, FMCG brands, and retail giants are among the world's largest buyers of poultry meat and eggs. So, aligning your feed production with their sustainability expectations isn't just an environmental obligation - it's a smart business strategy to stay relevant & competitive in an evolving, climate-conscious market.

This means that every ingredient, every additive, and every supplier decision matters more than ever. If your feed isn't future-ready, your place in the premium poultry supply chain may be at risk and your products might soon be off the menu at the world's biggest food tables.

Supplier Accountability and Carbon – Neutral Products

Feed manufacturers are encouraged to collaborate with suppliers who prioritise stainability:

- **Transparent Supply Chains:** Engaging with suppliers who provide transparent data on the environmental impact of their products ensures informed decision-making in feed formulation
- **Carbon-Neutral Additives:** Selecting feed additives and supplements from companies that offer carbon-neutral or low-emission products contributes to reducing the overall carbon footprint of poultry feed

Feed Additives

The Silent Carbon Carriers

Feed additives are essential for optimising animal health, performance, and nutrient utilisation. But did you know:

Many synthetic feed additives (like amino acids, enzymes, or vitamins) have higher per-kilogram CO_2 emissions than the main feed ingredients?

This is because their production often involves:

- High energy use in chemical synthesis or fermented in high-energy environments
- Use of non-renewable energy sources
- Global transportation and packaging emissions

A Smarter Choice: Additives that Cut, Not Contribute

Feed manufacturers often focus on macro-level formulation, but the sourcing of additives and supplements plays an equally critical role. Many additives, enzymes and premixes are produced with energy-intensive processes.

Now imagine this:

You're still delivering the same performance, health, and efficiency to the flock - but your additives contribute zero or near-zero emissions.

That's the power of sustainably manufactured feed additives. Therefore, partnering only with reputable, sustainability-focused suppliers- those who actively measure and minimise the carbon impact of their products-is essential.

Strategy for Feed Millers

From Compliance to Leadership

1. **Audit your feed**— Know your ingredient-wise carbon intensity
2. **Source smarter**— Prioritise regional, sustainable, and certified materials
3. **Scrutinise your additives and supplements**— Ask for carbon disclosures, LCAs, and sustainability reports
4. **Build partnerships**— Work with suppliers who align with your net-zero goals
5. **Label your progress**— Carbon transparent feed is coming fast. Be the first, not the last

The Next 5 Years: Call to Action

The Time to Lead is Now

The poultry sector is at an inflection point. Sustainability isn't a trend—it's the ticket to long-term resilience. Feed millers must lead this evolution, not follow it. By reformulating, measuring, and sourcing responsibly, the poultry feed industry can drive real change in reducing the sector's environmental footprint.

Together, let's feed the world responsibly. This is not just a sustainability goal, but a responsibility to future generations.

Sustainability is no longer about doing less harm. It's about doing more good.

The question is : Are you ready to feed the future, sustainably ?

Article

Recent Advances in Calcium and Phosphorus Nutrition for Broilers: An Indian Perspective

Dr. Vinod Koskewar
Premium Chick Feed Pvt Ltd

Dr. Sushant Labh
Kemin Industries South Asia Pvt Ltd

Introduction

Calcium (Ca) and phosphorus (P) are essential macro-minerals in broiler nutrition, playing a crucial role in skeletal development, metabolic functions, and overall growth performance. These minerals must be supplied in the right balance to maximise feed efficiency, ensure strong bone formation, and prevent metabolic disorders. In India, where poultry farming is a rapidly growing sector, optimising Ca and P nutrition is vital to improving bird health and farm profitability. The availability of mineral sources, variability in ingredient digestibility, and reliance on plant-based feeds necessitate precise supplementation strategies, including the use of phytase enzymes to enhance phosphorus bioavailability. This article explores the latest advances in Ca and P nutrition for broilers, highlighting their impact on growth, feed formulation, and sustainability in the Indian poultry industry.

Role of Calcium and Phosphorus in Broilers

- Bone Development and Strength: About 99% of calcium and 80% of phosphorus in a broiler's body are stored in the skeleton. These minerals are indispensable for forming strong, healthy bones that can support rapid growth and high meat yield
- Metabolic Functions: Calcium plays a role in nerve transmission, muscle contraction, and blood clotting. Phosphorus is vital for energy metabolism (ATP production), cellular function, and DNA/RNA synthesis (E. Humeret al., 2015)
- Enzymatic and Hormonal Interactions: Vitamin D3 regulates calcium and phosphorus absorption, while an imbalance of these minerals can hinder enzymatic processes critical to digestion and growth (Markus Rodehutscordet al., 2022)

Sources of Calcium and Phosphorus:

Common feed ingredients providing these minerals include:

- Calcium: Limestone, dicalcium phosphate (DCP), monocalcium phosphate (MCP), meat and bone meal (MBM), and fish meal
- Phosphorus: DCP, MCP, MBM, and plant-based sources (phytate phosphorus)

Calcium and Phosphorus Recommendations for Broilers

Based on life stages, broilers require varying levels of these minerals. Breeding companies come out with the standard levels of these and revise the specs from time to time. Of late, there has been a lower requirement of both these minerals, apart from the early stages. In the table below, Cobb and Ross standards for the same are illustrated. Nutritionists in India follow the levels based on their experience, which are these levels or slightly tweaked levels.

Table 1: Cobb Total Calcium and Available Phosphorus requirement comparison for year 2018 and 2022

Cobb Total Calcium Requirement (%)					
BREED	NUTRITION SPECS YEAR	D 0-8	D 9-18	D 19-28	D >29
COBB	2022	0.96	0.80	0.74	0.72
COBB	2018	0.90	0.84	0.76	0.76
DIFFERENCE		0.06	-0.04	-0.02	-0.04
DIFFERENCE %		6.7	-4.8	-2.6	-5.3
Cobb Available Phosphorus Requirement (%)					
BREED	NUTRITION SPECS YEAR	D 0-8	D 9-18	D 19-28	D >29
COBB	2022	0.54	0.40	0.37	0.36
COBB	2018	0.45	0.42	0.38	0.38
DIFFERENCE		0.09	-0.02	-0.01	-0.02
DIFFERENCE %		20.0	-4.8	-2.6	-5.3

Table 2: Ross Total Calcium and Available Phosphorus requirement comparison for years 2019 and 2022

Ross Total Calcium requirement (%)					
BREED	NUTRITION SPECS YEAR	D 0-10	D 11-24	D 25-39	D >40
ROSS	2022	0.95	0.75	0.65	0.60
ROSS	2019	0.96	0.87	0.78	0.75
DIFFERENCE		-0.01	-0.12	-0.13	-0.15
DIFFERENCE %		-1.0	-13.8	-16.7	-20.0
Ross Av P Requirement (%)					
BREED	NUTRITION SPECS YEAR	D 0-10	D 11-24	D 25-39	D >40
ROSS	2022	0.50	0.42	0.36	0.34
ROSS	2019	0.48	0.44	0.39	0.37
DIFFERENCE		0.02	-0.015	-0.03	-0.03
DIFFERENCE %		4.2	-3.4	-7.7	-8.1

(Values taken from Cobb broiler performance and nutrition supplement 2022, available on Cobbvantress website and Ross broiler specification 2019 and 2022, available on Aviagen website)

The Importance of Balance: Total Calcium(Ca) to Available Phosphorus(P) Ratio

The interplay between calcium and phosphorus is so strong that excess or deficiency in one mineral directly impacts the other's utilisation. The recommended dietary ratio of Ca to P typically ranges from 1.5:1 to 2:1 for broilers (Rafael F. Sens et al., 2021). An imbalance can cause the following issues:

- Excess Calcium: Reduces phosphorus absorption, lowers feed efficiency, and impairs the digestibility of other nutrients like fats and proteins (Markus Rodehutscordet al., 2022).
- Excess Phosphorus: This leads to poor bone mineralisation and hinders calcium retention (Laura Shiromi David et al., 2023).

Calcium, Phosphorus, and Vitamin D_3 Synergy

Vitamin D_3 is a key player in the absorption of both calcium and phosphorus. A deficiency in vitamin D_3 reduces calcium and phosphorus uptake, resulting in bone disorders like rickets and poor growth performance. The inverse relationship between vitamin D_3 levels and mineral requirements means that higher vitamin D_3 in the diet can allow for slightly reduced levels of calcium and phosphorus.

Dietary supplementation of 25-$(OH)_2$-D_3 has a positive impact on performance, tibia ash, and serum concentration of Ca, P. This supplementation can also spare some available P in the diet, even in diets containing phytase (with Ca, available P, and sodium matrix). In many cases, the P P-sparing effect of 25-$(OH)_2$-D_3 is without any apparent change in tibia morphology. At 250 mg/kg 1,25$(OH)_2$-D_3 can spare almost 0.1% available P, which is equivalent to 6kg Di-Calcium Phosphate (DCP) per ton of feed.

Vitamin D and its metabolites 25-(OH)-D_3 and 1,25-$(OH)_2$-D_3 have numerous functions in the avian system, though the maximum attention is given to Ca and P metabolism, bone health, and eggshell structures of broilers and layers. Plant sources of vitamin D cannot be relied upon to cater to the full needs of birds. Technically, 1,25-$(OH)_2$-D_3 supplementation to diet should be more effective than 25-(OH)-D_3 in alleviating negative effects associated with Ca and P imbalance and dietary vitamin D deficiency. In broilers 1,25-$(OH)_2$ -D_3 can help lower down/potentiate Av P. Weak chicks from the young hatch and management-challenged chicks can benefit more from this supplementation.

Phytate Phosphorus Neutralisation and Phytase Matrix Consideration

A large portion of phosphorus in plant-based feed ingredients (e.g., corn, soybean meal) is bound as phytate, which is poorly digestible by broilers. In Indian poultry diets based on vegetable ingredients, up to 70% of P is present as phytate-P, bound to the phytic acid molecule and unavailable for digestion and absorption. Regular levels of phytate in corn- and soybean meal (SBM)-based diets range from 2.5 to 4.0 g/kg and can cause a negative impact on growth performance and feed efficiency, as phytate can form complexes with protein, amino acids, and also other minerals (Rafael F. Sens et al., 2021).

Analysing the phytate levels in diets is very important while formulating. Rice polish, Deoiled Rice Bran(DORB), Cottonseed extract, Rapeseed meal, Wheat bran, and Sunflower meal have high phytates. Maize gluten meal, ground nut extract, and soymeal also have moderate levels of phytates. Generally, the phytate levels in broiler diets range around 0.18-0.30% and layer diets 0.30-0.50%. When formulating with alternate ingredients, the overall phytate level in the diet increases, and this impact on other essential nutrients and, ultimately, performance needs to be minimised by the addition of a good phytase at a higher dose.

Phytases are commonly used to hydrolyse phytate into free myo-inositol and 6 molecules of inorganic phosphate. Phytate degradation and elimination from the gastrointestinal tract with the use of phytase is correlated to significant improvements in P and Ca digestibility, ash content in tibia bone, weight gain (WG), and feed efficiency (J. I. M. Fernandes et al., 2019) and the extent to which phytate is eliminated from the tract can be intensified with greater levels of phytase.

The precise application of phytase matrix requires analysing values of the phytate content of feed raw materials actually in use. It's suggested to avoid applying the P matrix more than 90% of phytate levels in diets.

Phytase effects on the digestibility of amino acids and minerals other than P are inconsistent in the literature (Lagos et al. 2023). Expertise based on experience and a holistic approach with other enzyme matrices can help to take a call. The digestibility and requirements of antagonistic feed constituents, such as Ca, must be better elucidated to avoid excessive inclusion in the feed. The matrix value applied for any given dose of phytase is specific for the phytase source and is related to a combination of factors including differences in stability during the pelleting process and gastrointestinal tract, as well as differences in the efficiency of the phytase in degrading Inositol hexakisphosphate (InsP6) and each lower ester under the conditions of the gastrointestinal tract.

High Calcium Levels and its Hidden Cost

Excess dietary calcium binds with phytates, reducing phosphorus bioavailability and protein digestibility.

We have a problem with excess calcium. This excess calcium in the diet comes through

- Ingredient adulteration (soya and other ingredients adulterated with limestone powder(LSP)
- Water in Indian farms generally has a higher Total Dissolved Solids (TDS) and Ca between 100-200 mg/L
- Additives have LSP as a carrier
- Adulteration of some ingredients with soil
- LSP, being the cheapest ingredient at times, is used as filler in premix and full feed

Overloading broiler diets with calcium might seem like a good idea, but it can have undesirable effects in several ways. Some of the hidden costs of over calcium in diets are as follows.

- **Lower Feed Intake and Growth:** Too much calcium can depress feed consumption, slowing down growth rates
- **Compromised Gut Health:** During stressful months, acidifiers are often added to feed to control gut pathogens. However, excess calcium raises gut pH, undermining the acidifiers' effectiveness (Laura Shiromi David et al., 2023)
- **Reduced Fat Absorption:** Calcium interacts with dietary fats, forming indigestible "soaps" that hinder fat absorption
- **Impaired Protein Digestion:** Calcium binds to proteins in the lower gastrointestinal tract, leading to undigested residues in droppings
- **Mineral Imbalances:** High calcium levels disrupt the absorption of other critical minerals like phosphorus, magnesium, manganese, and zinc, forcing nutritionists to adjust premix levels. Excess Ca in the diet depresses P digestibility, +0.1% Ca levels decrease P digestibility by 4% (J. I. M. Fernandes et al., 2019)

Formulating Diets with Digestible Calcium and Digestible Phosphorus Specs

Currently, we formulate based on total calcium and available phosphorus and aim to formulate on digestible levels in the

coming years. Formulating broiler diets with optimal digestible calcium and phosphorus levels is theoretically essential for maximising performance and profitability. However, it requires overcoming challenges that are being faced globally as well as in the Indian subcontinent.

Variability in Ingredient Digestibility

Ingredients such as dicalcium phosphate (DCP), monocalcium phosphate (MCP), and limestone often vary in their mineral content and digestibility due to differences in processing, source, and quality. For example:

- The phosphorus digestibility in DCP may range from 85–90%, depending on the source
- Limestone solubility varies with particle size and purity, impacting calcium digestibility
- A significant portion of phosphorus in plant-based ingredients (e.g., corn and soybean meal) is bound as phytate, making it indigestible without phytase supplementation. Variability in phytate content complicates accurate formulation

Lack of Accurate Digestibility Data (published and real-time): Many feed ingredients lack standardised published data on digestible calcium and phosphorus levels. Nutritionists often will have to rely on generalised values or outdated information, leading to inaccuracies in formulations. For the same ingredient, there is a huge variation in published digestible calcium and phosphorus levels.

Limestone Solubility and its Implications

Limestone is one of the most common sources of calcium in broiler diets, widely valued for its availability and cost-effectiveness. However, the solubility of limestone can significantly impact its nutritional efficiency and the overall health and performance of broilers.

Solubility and Particle Size: Limestone solubility is influenced by its particle size. Fine particles dissolve more rapidly in the gut, releasing calcium faster, while larger particles dissolve slowly, providing a sustained calcium supply. Solubility at times depends on the source/ore of limestone also. In India, the use of fine limestone is more but coarse ground limestone needs to be preferred more.

Fine Limestone: Highly soluble, suitable for early calcium needs.

Coarse Limestone: Less soluble, ideal for sustaining calcium levels over time.

Role of Acid Binding Capacity: Fine-ground limestone has a high acid-binding capacity, meaning it can neutralise stomach acidity. This property can sometimes interfere with the gut's natural digestion process, particularly for other nutrients like protein and phosphorus.

Key Takeaways

- Calcium and phosphorus are foundational to broiler health, especially for skeletal growth and metabolic processes. Adjusting calcium and phosphorus levels based on life stage and environmental factors ensures optimal bird performance. Maintaining the correct Ca:P ratio is crucial to avoiding nutrient imbalances and maximizing performance
- Indian diets are typically rich in calcium. While it might seem beneficial to add extra calcium to broiler diets, doing so can have several negative consequences
- Supplementation of Vitamin D and its metabolites 25-(OH)-D_3 and 1,25-$(OH)_2$-D_3 have numerous functions in avian systems, though the maximum attention is given to Ca and P metabolism, bone health, and eggshell structures of broilers and layers

- Supplementation of a good phytase can overcome challenges associated with phytate phosphorus in plant-based diets. The precise application of phytase matrix requires analysing values of the phytate content of feed raw materials actually in use
- Solubility and particle size of limestone can significantly impact its nutritional efficiency and the overall health and performance of broilers
- Global data on digestible phosphorus and calcium is not standardised. There is a need to generate data for Indian ingredients
- Lameness in broilers and layers should be thoroughly investigated and then action needs to be taken. Supplementing more calcium doesn't work in 99% of cases of lameness.
- By paying close attention to these critical minerals, poultry nutritionists can unlock the full potential of broiler diets, boosting growth, feed efficiency, and profitability

Conclusion

Optimising calcium and phosphorus nutrition is key to improving broiler performance, skeletal integrity, and feed utilisation. As Indian poultry producers and nutritionists transition towards more efficient feeding strategies, it is crucial to adopt precise mineral balancing, utilise digestible Ca and P values, and incorporate phytase enzymes to enhance phosphorus absorption. Over-supplementation of calcium can lead to hidden costs, including impaired nutrient digestibility and poor gut health. Furthermore, understanding the solubility and particle size of calcium sources like limestone can significantly improve mineral utilisation. With continuous research and innovation, the Indian poultry sector can refine its approach to these important mineral nutrition, leading to better productivity, economic efficiency, and environmental sustainability.

(References are available upon request)

COVER

INSIDE INDIA'S SPF EGGS

Dr. Reena Kushwaha, Dr. Pankaj Kumar Shukla, Dr. Amitav Bhattacharyya
Department of Poultry Science, College of Veterinary Science & Animal Husbandry (DUVASU), Mathura, present a robust overview of Regulatory Dynamics, Market Insights and Strategic Outlook for Export and Import of Specific Pathogen-Free (SPF) Eggs in India

Introduction: SPF Eggs – A Gold Standard in Global Biosafety

Specific Pathogen-Free (SPF) eggs are fundamental to the pharmaceutical, diagnostic, and research industries. Derived from flocks that are consistently monitored and proven to be free of designated pathogens, these eggs ensure the integrity of biomedical products, especially vaccines. India, with its expanding biotechnology and vaccine sector, is witnessing growing demand for SPF eggs, both domestically and for export. The global SPF egg market, valued at USD 349 million in 2023, is projected to grow at a CAGR of 7.02%, reaching USD 561.15 million by 2030. This article delves into the scientific, regulatory and economic facets of SPF egg production, import and export in India, offering insights for stakeholders across industries.

What Makes an Egg SPF?

SPF eggs are certified to be free from specific avian pathogens. They are crucial for vaccine manufacturing to avoid contamination and ensure safety.

SPF Eggs Market Segmentation by Production Types

1. **Barn Eggs:** Produced in climate-controlled barns where hens have the freedom to move and access nest boxes, these eggs represent the largest market share (55-70%) due to their balance of welfare standards and cost-effectiveness.
2. **Free-Range Eggs:** Hens have continuous daytime access to outdoor ranges, promoting natural behaviors like foraging. This segment appeals to welfare-conscious consumers and holds a significant market share (20-35%).
3. **Organic Eggs:** These combine free-range standards with organic feed and stricter regulations on antibiotics and sustainability practices. This niche market segment (5-15%) caters to consumers prioritising multiple aspects of welfare and environmental sustainability.

Understanding SPF Egg Production: Scientific and Operational Aspects

Definition and Criteria

SPF (Specific Pathogen-Free) eggs are laid by hens that are housed in strictly isolated and monitored environments to prevent exposure to contaminants. These hens are fed sterilised, pathogen-free feed, which is often gamma-irradiated to eliminate microbial contamination, and provided with acidified water (pH<4) to inhibit bacterial growth. They are raised under continuous veterinary surveillance to ensure optimal health and disease prevention. Additionally, autogenous vaccines, tailored to flock-specific pathogens, are used to enhance immunity, while selective breeding for disease resistance further strengthens their health through genetic selection. This rigorous approach ensures the production of high-quality SPF eggs free from harmful pathogens.

Key Pathogens for SPF Certification

- Salmonella enterica (including S. pullorum and S. gallinarum)
- Avian Influenza Virus
- Newcastle Disease Virus
- Mycoplasma gallisepticum, M. synoviae
- Avian leucosis virus and Egg drop syndrome virus

Facilities and Management

SPF (Specific Pathogen-Free) eggs are produced under stringent biosecurity measures, including tiered containment zones consisting of outer buffer zones, shower-in entry areas, and inner sterile zones to prevent contamination. The facilities employ advanced climate and air filtration systems, such as HEPA filters, UV-light sterilisation, and positive air pressure, alongside climate-controlled environments to minimise stress and pathogen exposure in the hens. Routine diagnostics, including serological and molecular testing (PCR, ELISA, virus isolation, and culture), are conducted to ensure early pathogen detection. Sentinel birds are strategically placed to monitor for potential disease outbreaks, providing an additional layer of surveillance. Strict disinfection protocols are enforced using agents like peracetic acid, hydrogen peroxide vapour, and fumigation chambers to maintain a sterile environment. These comprehensive measures ensure the highest standards of hygiene and pathogen control in SPF egg production.

Biosecurity and Health Programs

To maintain the highest biosecurity standards, all personnel undergo rigorous screening and must adhere to strict protocols, including the use of bio-secure clothing such as disposable coveralls, gloves, and hairnets before entering sensitive areas. The facilities implement comprehensive rodent and pest control programs to eliminate potential vectors of disease. A zero-tolerance policy is enforced for any biosecurity breaches—even minor violations trigger immediate full re-testing of the flock and a review of procedures to prevent future lapses. These measures ensure the integrity of the SPF environment and minimise the risk of pathogen introduction.

Regulatory Mechanisms: Navigating International Trade of SPF Eggs

Domestic Regulations

In India, the production and use of Specific Pathogen-Free (SPF) eggs are regulated by multiple authorities to ensure quality and safety. The Central Drugs Standard Control Organization (CDSCO), under the Drugs and Cosmetics Act, 1940, oversees SPF eggs, mandating strict compliance with Good Manufacturing Practices (GMP) for vaccine and pharmaceutical production. The Indian Council of Agricultural Research (ICAR) establishes and enforces standards for SPF poultry farms, certifying eggs for research and vaccine development. Additionally, the Department of Animal Husbandry & Dairying (DAHD) monitors animal health and biosecurity measures to maintain disease-free conditions in SPF facilities. Together, these regulatory bodies ensure that SPF eggs meet the highest standards for scientific and medical applications.

India's Export Regulations

1. **Pre-Export Requirements:** To export SPF (Specific Pathogen-Free) eggs from India, exporters must adhere to specific regulatory requirements. First, they must obtain an Importer-Exporter Code (IEC) from the Directorate General of Foreign Trade (DGFT) under the Ministry of Commerce and Industry, followed by mandatory registration with the Agricultural and Processed Food Products Export Development Authority (APEDA). Additionally, exporters must secure a veterinary health certificate issued by the Department of Animal Husbandry, Dairying, and Fisheries (DAHD&F), verifying that the SPF eggs meet the health and biosecurity standards set by the World Organisation for Animal Health (OIE). These measures ensure that exported SPF eggs comply with international trade regulations and maintain high-quality assurance for global markets.

2. **Compliance with International Standards:** The export of SPF (Specific Pathogen-Free) eggs requires strict compliance with international standards, including guidelines from the World Organization for Animal Health (WOAH) as well as country-specific import regulations such as EU Directive 2002/99/EC (European Union), USDA (United States), and PMDA (Japan). Exporters must provide health certificates issued by ICAR-recognised laboratories, confirming the eggs' pathogen-free status. Additionally, comprehensive documentation detailing biosecurity protocols and pathogen testing results must be submitted to demonstrate adherence to sanitary and phytosanitary (SPS) measures. These stringent requirements ensure that SPF eggs meet global quality and safety standards, facilitating smooth international trade.

3. **Logistics and Packaging:** To ensure the quality and viability of SPF eggs during transit, they must be packed in sterile, shock-proof containers equipped with temperature monitoring devices to track environmental conditions in real-time. The eggs must be transported under strictly controlled conditions, maintaining a temperature range of 12–15°C and relative humidity below 70% throughout the supply chain. These measures prevent thermal stress, moisture damage, and microbial contamination, preserving the eggs' integrity until they reach their destination.

4. **Customs Clearance:** For international shipments of SPF eggs, exporters must submit essential documentation including a detailed export declaration, commercial invoice specifying the quantity and value of the consignment, and an official phytosanitary certificate verifying compliance with plant and animal health regulations of the importing country. These documents are mandatory for customs clearance and demonstrate adherence to international trade laws, ensuring smooth cross-border movement while meeting the biosecurity and regulatory requirements of both exporting and importing nations.

India's Import Requirements

Imported SPF eggs must fulfill:

1. Pre-Import Approvals: Before importing SPF eggs into India, importers must secure necessary pre-import approvals to ensure compliance with national biosecurity and food safety standards. This includes obtaining a Sanitary Import Permit (SIP) from the Department of Animal Husbandry, Dairying & Fisheries (DAHD&F) and the Central Drugs Standard Control Organization (CDSCO), which verifies that the shipment meets India's animal health and pharmaceutical requirements. Additionally, importers must adhere to regulations set by the Food Safety and Standards Authority of India (FSSAI) to guarantee the eggs' safety for research, vaccine production, or other approved uses.

2. **Health and Safety Checks:** Upon arrival in India, SPF egg shipments undergo rigorous health and safety checks to ensure compliance with national biosecurity protocols. The Animal Quarantine and Certification Services (AQCS) conducts mandatory inspections to verify documentation and assess the physical condition of the consignment. Additionally, samples are subjected to pathogen testing—including advanced diagnostics like RT-PCR for avian influenza—at authorised laboratories such as ICAR-National Institute of High Security Animal Diseases (NIHSAD).

3. **Documentation:** For the import of SPF eggs into India, complete and accurate documentation is mandatory to ensure regulatory compliance and traceability. The importer must submit the original health certificate issued by the exporting country's official veterinary authority, validating the eggs' pathogen-free status. Additionally, proof of compliance with OIE standards and detailed traceability records—such as farm-to-port transportation logs—must be provided to verify the integrity of the supply chain. Importers are also required to maintain batch-specific traceability records for at least six years, enabling authorities to track the eggs' origin, handling, and distribution in case of any biosecurity concerns.

International Standards

The import and export of SPF eggs must adhere to globally recognised international standards to ensure biosecurity, food safety, and quality assurance. Compliance with the WOAH (World Organization for Animal Health) Terrestrial Code (Chapters 6.7 & 10.4) is mandatory, as these guidelines outline stringent requirements for pathogen-free poultry production

and trade. Additionally, the Codex Alimentarius Commission's CAC/RCP 58-2005 provides hygiene standards for primary production of eggs, ensuring safe handling and processing. For comprehensive food safety management, ISO 22000 certification is recommended, as it integrates hazard analysis and critical control points (HACCP) to mitigate risks across the supply chain.

Trade Flow & Market Dynamics: Global and Indian Perspectives

Global Demand Drivers:

The global demand for Specific Pathogen-Free (SPF) eggs is primarily driven by their critical role in pharmaceutical and biomedical applications. A key demand driver is their irreplaceable use in vaccine production, particularly for viruses like influenza, measles, mumps, and rabies, where SPF eggs serve as a sterile growth medium. Leading Indian vaccine manufacturers including Serum Institute of India, Bharat Biotech, and Hester Biosciences—heavily depend on imported SPF eggs due to limited domestic production capacity, despite India's growing biotech sector.

Beyond pharmaceuticals, SPF eggs are essential in advanced research, particularly in virology, embryology, and immunology studies, where their sterile, contamination-free nature ensures reliable experimental results. The increasing focus on vaccine development, pandemic preparedness, and biomedical research further amplifies global demand, making SPF eggs a strategic commodity in both public health and scientific innovation. Countries with strong biotech and vaccine industries remain the largest consumers, while producers strive to meet stringent quality standards to support this high-value market.

Distribution Channels:

- Supermarkets and General Grocers: The primary sales channel, accounting for 65-75% of SPF egg sales, offering convenience for consumers purchasing their regular groceries
- Specialty/Natural Food Stores: Growing in popularity, these stores focus on organic, ethically sourced products, representing 10-15% of the market
- Food Service: Encompassing restaurants, hotels, and catering services, this channel is driven by the rise of 'conscious dining' trends, holding 8-15% of the market share
- Direct-to-Consumer (DTC): This smaller but dynamic segment 3-8% includes sales through farm shops, online platforms, and local farmers' markets, offering higher profit margins and greater brand control

Major Exporting Nations

- United States: Charles River Labs, VALO BioMedia, Hy-Line SPF
- France: Couvoir Francois, INRA facilities
- UK and Hungary: Research-grade SPF producers
- Japan: Nisseiken Co.

India's Import History and Bottlenecks

India imported 2.5 million SPF eggs in 2021, underscoring its heavy reliance on foreign suppliers to meet the demands of its booming vaccine and biopharma sectors. The COVID-19 pandemic exposed critical vulnerabilities in this supply chain, as global disruptions led to shortages, delayed vaccine production, and inflated costs.

Key Bottlenecks:

- Freight & Logistics: High air cargo costs and limited cold-chain infrastructure increase expenses
- Sanitary Import Permit (SIP) Delays: Prolonged approvals from DAHD&F and CDSCO slow down critical imports
- Customs Clearance Hurdles: Inconsistent inspections and documentation checks cause shipment delays

Key Indian Players

- Indovax Ltd. (Haryana): First domestic SPF producer (100,000-layer capacity)
- Venkateshwara Hatcheries: Expanding SPF output
- Govt. Research Bodies: Collaborating with ICAR & DBT
- Domestic SPF eggs: 30-50% cheaper but limited supply.

Global SPF Eggs Market Share by Region (2023)

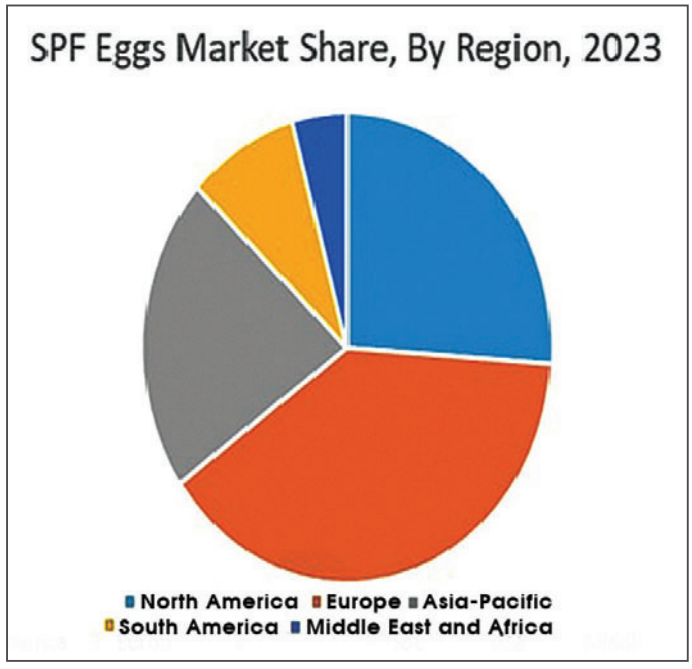


Chart: SPF Eggs Market Share by Region, 2023
Source: Virtue Market Research, April 2024

1. North America (40-45%)

- U.S. dominates (~90% of regional share) due to major pharmaceutical and vaccine companies (e.g., Merck, Zoetis).
- Canada contributes with biotech research demand.

2. Europe (25-30%)

- Germany, UK, and France lead in vaccine production (e.g., GSK, Sanofi).
- Strict regulations (EU GMP standards) drive SPF egg adoption.

3. Asia-Pacific (15-20%)

- China is the fastest-growing market (expanding vaccine & biotech sectors).
- India & Japan increasing investments in local SPF egg production.

4. South America (5-8%)

- Brazil is the largest consumer (Butantan Institute, Fiocruz drive demand).
- Argentina and Mexico emerging as secondary markets

5. Middle East & Africa (3-5%)

- Saudi Arabia, UAE, South Africa investing in local vaccine production (e.g., SPF eggs for flu vaccines)
- Still reliant on imports but growing.

6. Economic Significance and Investment Potential

- Vaccine Industry Backbone: Essential for flu, rabies, and measles vaccines (Serum Institute, Bharat Biotech consume ~70% of imports)
- Export Potential: Rising demand from Africa/SE Asia for

vaccine production, with 20-30% cost competitiveness over Western suppliers
- High-Margin Niche: SPF eggs command 4-5x higher value than commercial eggs, with stable pricing

Investment Hotspots:

1. Infrastructure: Hatcheries with ISO 22000-certified biosecure facilities
2. Tech Integration: Blockchain traceability and AI-driven pathogen surveillance systems
3. R&D: Breeding programs for disease-resistant SPF flocks (ICAR-NIHSAD collabs)

Government Incentives: PLI schemes for biotech, 100% FDI in animal husbandry, and proposed SPF Export Promotion Cell under APEDA enhance viability.

With global health security prioritisation post-COVID, India's SPF sector is primed for 15-20% annual growth, offering investors a unique convergence of agri-tech, biopharma, and export-led returns.

Innovations Driving Growth

Block chain Traceability

End-to-end supply chain transparency with real-time tracking of production conditions, health records, and logistics. Builds trust with global buyers by providing immutable, auditable data for compliance with international standards (OIE, USDA, EU).

Functional Enhancements

Nutrient-enriched SPF eggs (Vitamin D, E and Selenium) for specialised research and diagnostics, omega-3 fortified SPF eggs catering to niche biomedical and nutraceutical applications and immunoglobulin-enhanced eggs for advanced biotech and antibody production, reducing reliance on mammalian cell cultures.

Automation and AI Surveillance

AI-powered cameras and IoT sensors monitor flock health, detecting early signs of stress or disease. Predictive analytics identify potential biosecurity breaches before they escalate, ensuring uninterrupted pathogen-free production.

SWOT Analysis: Indian SPF Egg Sector

India's SPF egg industry possesses notable strengths, including a skilled workforce of trained veterinary professionals and robust domestic demand driven by the country's thriving vaccine manufacturing sector.

However, it faces critical weaknesses such as inadequate infrastructure and high production costs, which hinder scalability. The sector presents promising opportunities, particularly in expanding exports to emerging markets in Africa and Southeast Asia, supported by government initiatives aimed at boosting biotech and pharmaceutical trade.

Nevertheless, significant threats persist, including the risk of disease outbreaks disrupting production, regulatory bottlenecks causing delays, and volatile international freight logistics impacting supply chains. Addressing these challenges while leveraging its advantages will be crucial for India to strengthen its position in the global SPF egg market.

Future Outlook: Strategic Roadmap for Atmanirbhar Bharat in SPF Production

India's SPF egg industry is poised to become a global leader, leveraging rising international demand through cutting-edge biosecurity measures and digitalised supply chains. A collaborative approach involving APEDA, ICAR, and private sector players will be the key in transforming India into a trusted SPF production hub. To accelerate growth, the government must introduce policy incentives, including subsidies, insurance schemes, and export benefits, while simplifying regulations through a Single Window Licensing System for faster approvals (SIP, BIS, DGFT). Strengthening R&D investments in high-yield breed development and advanced diagnostics will enhance productivity and quality.

Additionally, establishing a dedicated SPF Export Promotion Wing under APEDA can drive market expansion. The vision "Make in India – From Poultry to Pharma" underscores the sector's potential to bridge agriculture and biotechnology, ensuring self-reliance and global competitiveness in vaccine production and research.

Conclusion: India's Global Role in the SPF Future

India's biotechnology revolution cannot depend on foreign SPF eggs. With the right blend of regulation, investment, innovation, and entrepreneurship, India can establish itself as a global SPF egg exporter, strengthen its pharma-vaccine ecosystem, and protect its sovereignty in health infrastructure. As new diseases emerge, SPF eggs will remain the cornerstone of diagnostic and preventive medicine.

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Article

Pastoralists: Sentinels of Livestock Pushed to the Margins

SHRIDHAR speaks

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

It certainly was the most delicious paneer I had ever had; it had a unique melt in the mouth pungency, much smoother than the fancy fermented imported cheese. The host, with genuine pride, informed us that he had procured this cheese specially for our dinner from the Bakarwals of Jammu and Kashmir. Since he was a reputed and well connected citizen of the state, now a union territory, he would have got it for a song. But believe me, in Delhi's upmarket stores, it costs a fortune; thanks to the power of branding and marketing. Perhaps, or quite likely, the Bakarwals, happily tending the bakris (goats) from which they derive their identity, as also the heavenly cheese, are blissfully unaware how precious their produce is, and how niche a market it commands.

Bakarwals have their kin, not by blood or society, but the lifestyle, all across the country; in fact, in many other parts of the world too. We come across them frequently on the highways; they are quite a familiar sight herding their cattle, sheep, goat, camels, buffaloes etc., yet we do not bat an eyelid at the wonderment of their lives. Rather we curse them for slowing down the traffic and at times abuse the system that allows them on roads serving no other cause except to slow down the pace of our economic growth. Are we all not guilty of apathy, a sin worse than the sin of indifference?

What to stare in the face, the global Sustainable Development Goals (SDGs) do not even cast a glance at them. The United Nations' Food and Agriculture Organisation (FAO) does no more than lip service to their plight, despite recognising their immense contribution to food and nutritional security. At home neither the Ministry of Fisheries, Animal Husbandry and Dairying nor the Ministry of Environment, Forest and Climate Change, nor the NITI Aayog have any information, data or scheme, or even recognition of them. The National Agenda on Doubling Farmers' Income does not expend even one word, nor does the fourteen volume report of the Committee on the subject running into more than a couple of thousand pages spare a thought for them.

And yet these are the human civilisation's original livestock farmers, holding on to their lifestyles amidst the onslaught of modernity, providing the purest of the genuinely organic livestock products to consumers till this very day. They are the pastoralists, raising livestock in the harshest of environmental conditions and producing milk, cheese, meat etc. of the highest quality at the cheapest rates. While misleadingly claimed and labelled organic livestock products fetch a princely sum, the purest of organic livestock commodities produced by these pastoralists either don't find appropriate buyers or it is the traders who capitalise upon the product quality to obtain the financial gains the label organic fetches.

Defying the norms of statistical probability, the population of pastoralists in the world, according to various studies, is estimated to be between 120 to 500 million, a sizable number even if we assume the lower end of the range. Their population in India is assessed to be between 14 to 35 million. Since there are no officially validated figures, either global or national, one has little choice but to base the appreciation of the issues on the basis of data thrown by studies and anecdotal evidence. Pastoralism is not recognised as a sector or even a sub-sector of the agriculture economy in India or in any other country for that matter. No official definition of such a category exists. Officials are aware of its existence, only at a personal level though, so no wonder they do not give it any official recognition as a distinct system of livestock management and economy.

The Cambridge Dictionary defines Pastoralist as a farmer who breeds and takes care of animals, and Pastoralism as a form of animal husbandry where domesticated animals known as livestock are released onto large vegetated outdoor lands (pastures) for grazing, historically by nomadic people who moved around with their herds. Pastoralism is hardcore animal husbandry; a living pattern of tending herds of animals in natural environments in forests and wastelands, thus creating a complex but symbiotic relationship amongst nature, animals and humans. In a nutshell, Pastoralism is the use of extensive grazing on common pasturelands for livestock production, and hence one of the earliest and key production systems in the world's waste/public/dry lands. Despite its rich history, its practitioners have remained poor and marginalised.

Pastoralists are a collective of several hundred million livestock keepers distributed all over the world. They are characterised by unique and challenging livelihoods whose hallmark is continuing mobility and closeness to nature, even though the environment in which they live may be hostile. They are the main, if not the only, producers of livestock products, primarily food, in the harshest of

environments: drylands, mountains and cold areas. They also singularly sustain vibrant and culturally unique communities, and blend livelihood with culture; they, generally, don't compromise their distinct lifestyles for better commercial gains. However, if they were to, their products being genuinely and purely organic could give them financial returns of several multiples more. Alas! The governments, all across the globe, have failed them, resulting in high level of poverty amongst them.

Pastoralist systems in India vary from being eternally mobile to what is called transhumant: a seasonal movement of livestock between fixed summer and winter pastures. Animals maintained in mobile systems include camels, cattle, ducks, donkeys, goats, pigs, sheep and yaks; and in some limited areas of the northern Himalayan regions of Himachal Pradesh, Jammu and Kashmir and Uttarakhand, buffaloes too. Let the romantic urbanite know that, contrary to the image created by the Bollywood, singing while dancing and prancing around the trees is an unaffordable luxury when one is looking for a new shelter each day, not only for himself and family but for the horde of livestock which will provide food to those very urban citizens who do not even recognise their existence.

Pastoralists have been deeply affected by marginalisation on account of poor understanding of their livelihood system and non-recognition of their immense contribution to agricultural economy and nutritional security. There have been attempts, perhaps well-intentioned too, to make their lives sedentary. At another level are the deliberate hurdles to their mobility which is a *sine qua non* for their livelihoods and the very existence. Such response may be due to our inability to provide basic services such as education and health to these communities, not to mention the veterinary services which are the mainstay of their profession. What the governance systems, in the onslaught of economic development, are pushing for is the disruption of pastoral mobility. We do not realise that such an approach has the potential to trigger food insecurity as the pastoral systems are characterised by strong resilience, better productivity, and above all a much superior quality of the products.

The future of pastoralism depends on ecological and environmental conservation, sustainable utilisation of common lands, improvement of livestock productivity, and most importantly the redressal of the ever growing conflicts over depleting resources. The key is an integration of pastoralism with agriculture, animal husbandry and the rest of the economy

Pastoralism is a complex activity, hinging on a fine balance between human population, animal population and natural resources. It continues to provide a valid livelihood for millions of people and has the potential to continue to do so. But the future of pastoralism depends on ecological and environmental conservation, sustainable utilisation of common lands, improvement of livestock productivity, and most importantly the redressal of the ever growing conflicts over depleting resources. The key is an integration of pastoralism with agriculture, animal husbandry and the rest of the economy. We must acknowledge the critical significance of pastoralists and their extensive livestock tending in our rural economy and contribution to the food basket; food which is genuinely organic and of an enviably high quality.

Do remember these lines from George Bernard Shaw's play The Devil's Disciple, "The worst sin towards our fellow creatures is not to hate them, but to be indifferent to them: that's the essence of inhumanity." Our indifference has pushed our pastoralist brethren to the edges of society. Let them not be the lost tribe.

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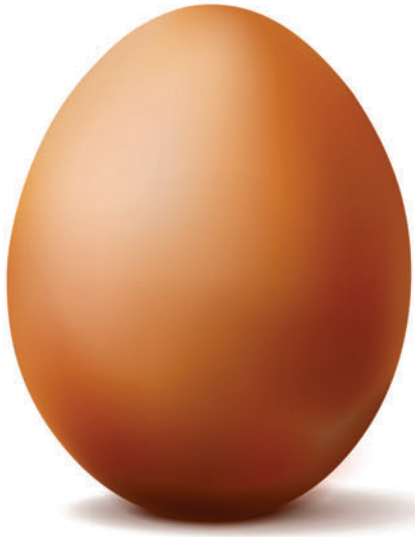

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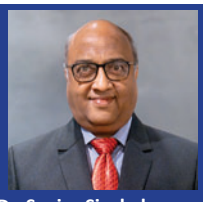
Article

Stallen Unveils World Class Halquinol Manufacturing Facility

Dr. Amit V. Janbandhu
Product Manager
Dr. Sanjay Singhal
Chief Operating Officer
Stallen South Asia Pvt. Ltd

Halquinol is one of the most beneficial antimicrobial compounds that are administrated to poultry and pigs. It is widely used internationally to promote better growth rates in animals and birds. It also demonstrates higher feed conversion efficiency. Halquinol, also known as Chlorhydroxyquinoline, is a potent non-antibiotic compound recognised for its remarkable antibacterial, antifungal, and antiprotozoal properties.

Properties

It consists of a blend of three chlorinated oxines: 5,7-dichloro-8-hydroxyquinoline (5,7-DCL; 57-74% w/w), 5-monochloro-8-hydroxyquinoline (5-CL; 23-40 % w/w), and 7-monochloro-8-hydroxyquinoline (7-CL; 0-4 % w/w).

The molecular weights of the three constituent molecules of Halquinol are: 5,7-dichloro-8-hydroxy quinoline: 214.1; 5-chloro-8-hydroxy quinoline and 7-chloro-8-hydroxy quinoline: 179.6.

Appearance

Cream to pale green, fine powder

Mode of Action

Its mechanism of action involves broad-spectrum antimicrobial activity, achieved by inhibiting respiratory enzymes within the cytoplasmic membrane of target organisms. It actively depresses the metabolism of the gastro-intestinal (GI) tract of animals and birds, which enhances the transit time of feed in the intestine. This augments the absorption procedure of nutrients and the overall digestion system. Another Halquinol use is to prevent and treat scours in swine, which are caused by E.coli and Salmonella spp. It controls diarrhoea and wet droppings.

Despite being primarily, a gut acting compound that is not absorbed by the gastrointestinal tract, Halquinol exhibits triple-action as an antidiarrheal product, targeting bacteria, fungi, and protozoa. In the context of poultry production, Halquinol is frequently used as a feed additive, particularly in developing countries (Basit et al., 2020; Habib et al., 2019). Notably, there is no evidence from microbiological

studies suggesting the development of resistance to Halquinol.

Stallen Inaugurates New Halquinol Production Unit at Vatva, Gujarat

To maintain its commitment to quality, affordability, and timely delivery, Stallen has commenced the production of Halquinol, a non-antibiotic growth promoter classified under hydroxy-quinolines. This compound comprises 5-chloro-8-hydroxyquinoline, 5,7-Dichloro-8-hydroxyquinoline, and 7-Chloro-8-hydroxyquinoline, with the product Halquinol 98% manufactured in accordance with BP 80 (British Pharmacopeia 1980) specifications. Stallen offers Halquinol 98% as a chemical API for use in veterinary formulations and feed additives, alongside the commonly available 60% and 12% variants.

With adherence to BP specifications and increased monthly production capacity, Stallen is well-equipped to meet global demand, holding valid Halquinol registrations in over 15 countries. The company's strategic vision includes gradually introducing a range of APIs from its Vatva facility to reduce reliance on imports from China in the animal health sector. The Vatva plant has a production capacity of 100 tons of Halquinol per month. The final API undergoes HPLC testing to ensure potency, purity, and concentration, meeting high-quality standards. This plant supplies Halquinol to more than 15 countries, including India.

Global Reach and Market Presence

Over the 25 years, Stallen has expanded its footprint and capacities. Today, Stallen's export operations span more than 50 countries across 6 continents serving as a testament to our product quality and service. In an attempt to be completely self-sufficient, Stallen has backward integrated and controled the end-to-end supply chain. As a result, they currently operate 5 different manufacturing locations in addition to the 2 supply plants of FATRO:

1) **Feed Additive Manufacturing Unit- Palghar, Maharashtra, India**
   Produces a wide range of feed additives and supplements including antibacterials, mycoplasma treatments, dewormers, anthelmintics, growth promoters, toxin binders, anticoccidials, water sanitizers, fly control products, and disinfectants. Available as tablets, boluses, powders, and oral liquids.
2) **Feed Additives Manufacturing Unit – Sajjanpada, Maharashtra**
   Focuses on specialised and customised feed supplements for domestic and export markets for different animal species.
3) **Feed Additives and Cattle Feed Premix Manufacturing Unit – Alexandria, Canada**
   Manufactures high-quality feed additives and cattle premixes for the North American market, adapting formulations to meet local nutritional and regulatory needs.
4) **Therapeutics /Formulation Unit – Palghar, Maharashtra, India**
   A pharmaceutical unit producing therapeutics and beta-lactam formulations. Equipped for making effervescent tablets, oral/topical liquids, powders, boluses, and ointments.
5) **Halquinol API Manufacturing Unit – Vatva, Gujarat**
   Dedicated to Halquinol API production, used for its antimicrobial and growth-promoting properties in animal health.

The Halquinol API Manufacturing Unit at Vatva, Gujarat, the fifth addition plays a crucial role in supporting the supply chain of Stallen South Asia's other four manufacturing units. It supplies Halquinol to the factories in Palghar, Sajjanpada, and Alexandria for making feed additives, premixes, and animal health products. It is also used by the Therapeutics Unit at Palghar for pharmaceutical formulations. In-house production ensures consistent quality, cost control, steady supply, and faster production.

Quality and Certifications

All of Stallen's plants are certified and regularly audited by ISO, GMP, GMP+, HACCP, ISO 14001, HALAL and FDA, along with approvals from international regulatory bodies, to ensure safe and high-quality products.

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Article

Role of Dietary Trace Mineral and Coenzyme Q10 (Antistress factor) in Heat-stressed Poultry

Dr. Md. Emdadul Haque, Dr. Venket M Shelke & Dr. Partha Das
Kemin Industries South Asia Pvt Ltd

Introduction

Heat stress is a significant challenge in the poultry industry, particularly in warm, tropical, and sub-tropical regions. It reduces the performance of birds and directly impacts their economic returns. Birds are heat stressed when their net heat loss is less than their net heat production, making it challenging to balance these two factors[1]. Heat stress affects birds of all types and age groups leading to physiological consequences such as increased body core temperature, reduced voluntary feed intake, depressed immunity, altered electrolyte balance, impaired endocrine and reproductive functions, decreased energy availability, altered digestibility and metabolism of nutrients, disruption in intestinal epithelium structure and function, altered normal and protective microbiota, and increased circulatory cortisol anzd corticosterone levels[2]. To reduce heat stress production, birds resort to strategies like feed intake which results in reduced growth rate, poor meat quality, decreased egg production, and reduced feed utilisation efficiency[3]. Nutritional management is a widely followed method to mitigate the negative impact of heat stress and reduce production losses. Meeting mineral requirements during heat stress is crucial for poultry efficiency, with trace minerals and coenzymes playing a critical role in reducing the negative effects of heat stress.

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

Zinc (Zn)

Zinc supplementation significantly enhances growth and FCR(Feed Conversion Ratio) in heat-stressed poultry[4]. It increases weight gain, and feed efficiency in broilers[4] and improves feed conversion, and egg production in layers raised under high temperatures [5].

Zinc, a key component of the carbonic anhydrase enzyme, improves eggshell weight and reduces shell defects[6]. It is crucial for maintaining an efficient immune system during heat stress, as it increases antibody titer Immunoglobulin G & Immunoglobulin M (IgG & IgM) and cell-mediated immunity [7].

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 heat stress [8].

Copper (Cu)

Copper (Cu) is a crucial trace mineral in birds, essential for antioxidant activity and immunity[9]. Birds require 5-8 ppm of copper in their diet[10]. Heat stress can decrease copper intake due to reduced feed intake and increased excretion, leading to marginal copper deficiency. This impairs the immune system, reducing T lymphocyte synthesis, antibody production, and phagocytic index[11]. Cu supplementation during heat stress can help birds cope with the stress efficiently and maintain the eggshell and shell membrane quality in layer [12].

Selenium (Se)

Selenium has a vital function in poultry's antioxidant defense system during heat stress. Organic selenium is more bioavailable than inorganic forms in chicken[13]. It boosts weight gain and feed efficiency in heat-stressed birds while improving feed conversion, egg output, egg quality, haugh units, and eggshell quality in layers raised at high temperatures[14]. It protects the mucosa of the small intestine and pancreas from oxidative damage during heat stress, enhances vitamin E absorption, and protects cell membrane fats from oxidative damage[15,16]. 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 heat stress [17].

Chromium (Cr)

Chromium (Cr) is a mineral involved in the metabolism of carbohydrates, proteins, lipids, and nucleic acids through insulin action[18]. Chromium supplementation enhances insulin, glucose, and cholesterol levels in heat-stressed birds by restoring the Cr reservoir and utilising glucose extensively[19]. It reduces oxidative stress, lipid peroxidation, and hepatic nuclear protein, and heat shock protein expression in heat-stressed layers[20]. Organic chromium has more bioavailability and lower toxicity than inorganic forms[21]. Chromium supplementation in birds reduces stress by increasing orexin and glucose transporter (GLUTs) levels and reducing nuclear factor kappa B(NF-κB) and heat shock protein (HSPs) levels, promoting a more thermoneutral physiology [22].

Manganese (Mn)

Manganese (Mn) aids in carbohydrate and lipid metabolism by increasing insulin synthesis from the pancreas[23]. In heat-stress conditions, Mn supplementation can alleviate its negative effects on broilers, particularly in chronic heat-stressed broilers,

by reducing abdominal fat deposition by decreasing lipoprotein lipase (LPL) activity[24]. Supplementation of Mn can protect the embryo of birds from maternal heat stress by enhancing epigenetic-activated antioxidant and anti-apoptotic activities [25]. It acts as a cofactor for many of the enzymes required for eggshell synthesis and helps maintain eggshell quality during heat stress conditions [26].

Iodine (I)

The thyroid gland hormones in birds significantly regulate metabolic and thermogenic functions[27]. Heat stress can decrease thyroid hormone concentrations in the circulatory, potentially due to a decrease in feed intake[28]. Heat-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 [29]. Thyroid gland function is influenced by the amount of iodine in the diet and iodine deficiency at this stage may prove harmful to poultry [30]. Iodine deficiency can cause metabolic disorders and reduced laying rates [31]. The recommended iodine content for layers' diet should be 0.48 mg/kg of feed [32].

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[33]. 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[34]. It significantly supports enzymes in the tricarboxylic acid cycle (TCA), enabling the removal of harmful metabolites via catalases and peroxidases with iron[35]. Heat stress reduces Fe levels in serum and tissue, leading to immune and antioxidant system malfunction, causing health issues in birds[36,37]. Birds under heat stress should consume a normal dietary iron concentration; otherwise, the immuno-antioxidant systemcollapse will negatively impact animal health [37].

Coenzyme Q10 (CoQ10)

Coenzyme Q10 (CoQ10), also known as ubiquinone, is a lipophilic antioxidant found in the mitochondria of all body cells[38]. It has various homologs based on an isoprenoid moiety, with CoQ10 being prominent in humans and birds[39]. It serves as an electron carrier in the mitochondrial respiratory chain and a lipid-soluble antioxidant [40]. It is an important bioactive compound that can strongly remove free radicals from cells [41]. The body synthesises it, but excessive free radical scavenging during heat stress depletes it [41]. 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 grower and finisher stage in heat stress conditions [41]
- CoQ10 lowered the levels of glucose, cholesterol, triglycerides, and corticosterone in the blood, which is a key biomarker for heat stress. This could be because CoQ10 reduces the oxidative effects of heat stress [42]
- T3, T4, and their balance control animal body temperature and metabolic activity. Heat-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 heat stress [41]
- Heat 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 [42]
- 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 [42]
- 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 [43]
- 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 [44]
- Coenzyme Q10 plays a crucial role in the regeneration of antioxidants like superoxide dismutase and vitamin E[45]. As a result, these antioxidants improve sperm quality and prevent lipid peroxidation in the sperm plasma membranes of male broiler breeders [46]

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Conclusion

Heat stress poses a significant threat to the poultry industry due to rising global temperatures. Despite various strategies, the industry largely uses only a few. Heat stress is caused by factors like high environmental temperature, humidity, radiant heat, and airspeed, causing physiological, neuroendocrine, and behavioral changes. No single approach can fully mitigate its effects. A holistic approach is needed to mitigate heat stress's negative effects. Trace minerals and CoQ10 can effectively alleviate some adverse effects. Supplementation of these minerals and coenzyme combinations is crucial for birds to fully recover and perform efficiently during heat stress. Combining CoQ10 and trace minerals can offer benefits to poultry in hot regions, reducing the negative impacts of high ambient temperatures.

(References are available on request)

Article

Silent Messengers: The Role of Wild Birds in Spreading HPAI H5 in Asia

Dr. Rajesh Reddy
Product Manager
Glamac International Pvt. Ltd.

In the last decade, highly pathogenic avian influenza (HPAI) has moved from being a seasonal threat to a year-round challenge for both the poultry industry and wildlife conservation in Asia. Countries like China, Vietnam, India, Indonesia, South Korea, and Japan have all faced repeated outbreaks, often originating without clear human intervention. A recent study by Martelli et al. (2025), though based in Europe, offers crucial insights for Asian governments, veterinarians, and epidemiologists by identifying the wild bird species most closely associated with HPAI H5 transmission and emphasising the role of eco-epidemiological modelling.

Why this Matters for Asia

Asia sits along major migratory bird flyways — the East Asian-Australasian Flyway (EAAF) and the Central Asian Flyway (CAF) — connecting breeding grounds in Siberia with wintering sites in Southeast Asia, the Indian subcontinent, and Australia. Wetlands, rice paddies, and aquaculture ponds are common stopovers for these birds — and unfortunately, also home to millions of free-ranging or low-biosecurity poultry farms.

This ecological overlap increases the risk of spillover events. However, much of the surveillance in Asia has historically focused on poultry-side monitoring, often neglecting the wild bird interface. The European study offers a model for shifting that focus — identifying bridge species that frequent both wetlands and farms, thereby playing a critical role in virus transmission.

Key Lessons from Europe with Relevance to Asia

Martelli et al. modelled 40 wild bird species near poultry farms in northern Italy and found that species like cattle egrets, little egrets, herons, pheasants, and moorhens had the strongest association with HPAI outbreaks. These are birds often found in Asia too — especially in India, China, and Southeast Asia — foraging in wetlands and agricultural lands side by side with ducks, chickens, and buffalos.

Interestingly, ducks and gulls, while still relevant, were not the strongest predictors of outbreaks in this study. The focus shifted to birds that traverse both wild and domestic zones — echoing patterns seen in Bangladesh's Haor wetlands, Vietnam's Mekong Delta, and China's Poyang Lake region, where free-grazing ducks intermingle with wild migratory birds during seasonal flooding.

Surveillance Must Evolve in Asia

Current surveillance programs in Asia often centre around Anseriformes (ducks and geese), but this study suggests expanding the net to include Ardeidae (herons and egrets), Galliformes (pheasants), and even corvids and passerines that live near human habitation. Many of these species are:

- Abundant across rural Asia
- Resident year-round, not just seasonal visitors
- Active in human-modified landscapes like rice paddies, garbage dumps, or fish farms

Moreover, the study uses species distribution models combined with outbreak data to build predictive risk maps — a technique that can be localised in Asian countries using eBird data, satellite imagery, and outbreak records.

Strengthening Asia's Defences

Here's what Asia can learn and do:

1. Broaden wild bird surveillance: Include species not traditionally considered reservoirs, like cattle egrets and pheasants
2. Integrate eco-epidemiology: Use mapping and modelling tools to predict where outbreaks might occur, based on bird movement and land use
3. Reevaluate farm siting and biosecurity: Farms near wetlands or open water bodies need stricter controls
4. Invest in cross-border coordination: Migratory birds don't recognise national borders. India, China, and Southeast Asian countries must coordinate surveillance and response

A One Health Wake-Up Call

Wild birds are more than innocent bystanders in the HPAI story. They are sentinels, transporters, and possibly even victims. Asia, with its dense human and animal populations, is a hotspot for zoonotic diseases. By bridging the knowledge gap at the wild-domestic interface, Asian nations can strengthen early warning systems, reduce poultry mortality, and protect public health.

Conclusion

The study by Martelli et al. underscores a pressing need— Asia must widen its surveillance lens. Rather than just watching the skies for ducks and geese, we must look around — at the egrets in our rice fields, the magpies in our mango orchards, and the pheasants in our forests. They may hold the keys to anticipating and preventing the next HPAI outbreak.

(References available on request)

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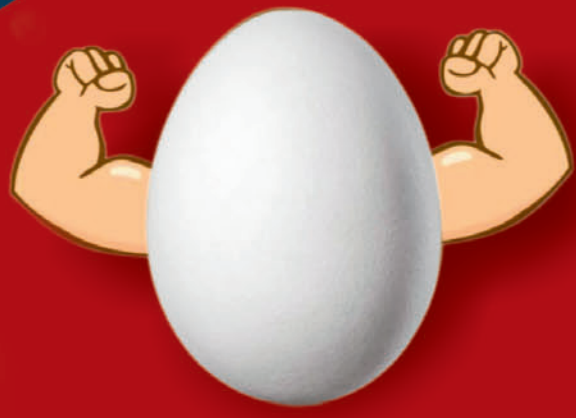

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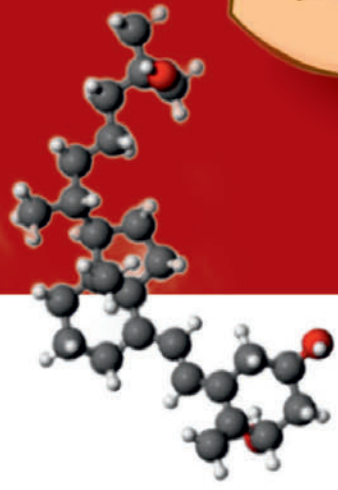

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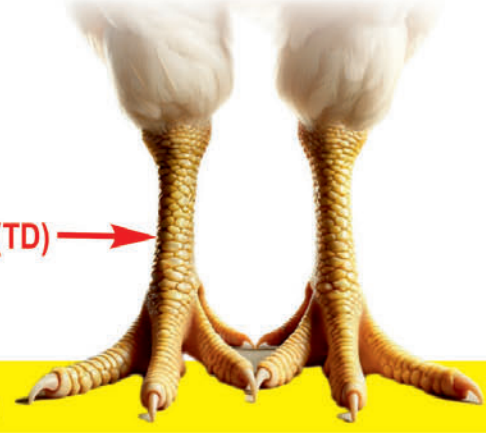

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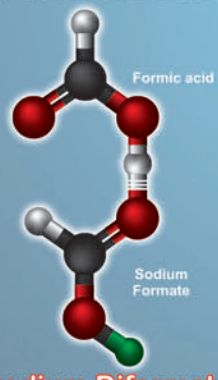

Sodium Diformate

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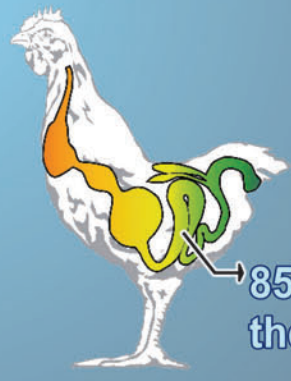
- Boosts performance



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Istanbul Hosts a Stellar Edition of VIV Select Türkiye 2025

The 11th edition of VIV Select Türkiye, was held from 24th to 26th April at the Istanbul Expo Centre. The expo was a resounding success, reaffirming its status as the leading international trade fair for poultry technologies in the region. VIV Select Türkiye 2025 attracted over 15,000 industry professionals from around the world—including poultry breeders, feed millers, equipment manufacturers, and pharmaceutical companies.

The exhibition hosted more than 250 exhibitors across three halls, highlighting the latest innovations in poultry breeding, meat processing, feed production, veterinary tools, and poultry farm equipment. Notably, there was strong participation from South Asian delegates, including feed millers, poultry breeders, and pharmaceutical companies.

Zeus Biotech at VIV Asia 2025

Zeus Biotech marked a strong presence at VIV Asia 2025 in Bangkok, reinforcing its global footprint across more than 22 countries. The event served as a valuable platform to reconnect with international customers and longstanding business associates. VIV Asia provided the perfect setting to showcase innovations, strengthen relationships, and explore new beginnings.

INTERNATIONAL

US Broiler Feed Conversion 21 Points Lower By 2050

Genetic selection will continue to drive improvement in growth rate, meat yield and feed conversion as nutritionists utilise precision nutrition to focus on income over feed cost.

The average feed conversion in U.S. broilers has been reduced to less than 1.75 pounds of feed per pound of broiler today and it is projected to be close to 1.5 by 2050, reported Michael Kidd, Ph.D., Department Head and Professor, Centre of Excellence for Poultry Science, University of Arkansas.

In a presentation delivered in 2024 titled, "Global Poultry Nutrition Challenges," Kidd used historical improvement trends in broiler performance along with research results and technological advances to highlight challenges and opportunities for the future of poultry nutrition.

Broiler performance metrics have increased dramatically in the last few decades. For example, breast meat yield in 2024 is double what it was in 2001. Kidd said that the improvements will continue. He said that producers should be able to grow a 4.2-pound bird fast food cut up size birds in 26 days or less in 2050.

Kidd said that he expects poultry nutritionists to focus more on precision nutrition and that U.S. integrators now have a unique opportunity to focus on amino acids. He said that there has never been a better time for the U.S. poultry industry to work with the soybean crush facilities on efficiency because there are so many new plants, and they all conduct near infrared (NIR) spectroscopy on soybeans and the resulting meal. Nutritionists should work with their soybean meal supplier to obtain the data on individual loads of soybean meal to adjust ration formulations. "There is a $20 per ton opportunity if the NIR value for each load is shared with the feed mill," Kidd said. This should provide sufficient incentive for soybean crush facilities to share this data.

Much of the research on vitamin and mineral needs of poultry is old and was conducted on birds that grew slower. Kidd said that we need more research on vitamin and mineral needs since sources are changing and requirements of the birds have potentially changed. He said that modelling is great, but that you need some data to start with.

Kidd said he thinks use non-linear equations for least cost formulation of rations offer a big opportunity for the poultry industry. He stressed that producers need to look at income over feed cost for the poultry products that they produce and not focus on minimising feed conversion.

IPR Espresso

Centre Mandates Poultry Farms Registration, Urges Enhanced Surveillance

Amid rising bird flu cases in the country, the Union Government has made registration of poultry farms mandatory and urged the need for increasing surveillance to curb avian influenza.

A high-level meeting in New Delhi, chaired by Alka Upadhyaya, Secretary at the Department of Animal Husbandry and Dairying (DAHD) under the Ministry of Fisheries, Animal Husbandry and Dairying set up a three-pronged strategy with stricter biosecurity, surveillance and mandatory registration of poultry farms.

The strategy "encompasses stricter biosecurity measures wherein poultry farms must enhance hygiene practices, control farm access and follow stringent biosecurity protocols to minimise the risk of infection, strengthened surveillance and mandatory registration of poultry farms to enhance disease tracking and control", stated the ministry.

"All poultry farms must register with state animal husbandry departments within a month. The government has urged poultry industry stakeholders to ensure 100 per cent compliance with this directive," it added. "Protecting our poultry sector is critical for food security and rural livelihoods. Strict biosecurity, scientific surveillance, and responsible industry practices are essential in our fight against bird flu," Upadhyaya said. In addition, she stated the need for developing a predictive modelling system for early warning and environmental surveillance which would enable proactive disease detection and response, minimising the risk of outbreaks and protecting the poultry industry.

Avian Influenza is a highly infectious viral disease affecting birds, with occasional transmission to mammals. Since its first detection in India in 2006, outbreaks have been reported annually across multiple states. Notably, Highly Pathogenic Avian Influenza (HPAI) has, since January, affected eight states - Maharashtra, Chhattisgarh, Jharkhand, Andhra Pradesh, Madhya Pradesh, Telangana, Karnataka, Bihar. Currently, six active outbreak zones remain in Jharkhand, Telangana, and Chhattisgarh in the country. Besides poultry, the animal and bird species affected include tiger, leopard, vulture, crow, hawk egret, pet cat, demoiselle crane, painted stork, crow, jungle cat.

Meanwhile, DAHD has permitted the use of the H9N2 (Low Pathogenic Avian Influenza) vaccine, developed by ICAR-NIHSAD, Bhopal, which is now available commercially.

A national study will evaluate theeffectiveness of LPAI vaccination. The meeting also extensively discussed the possibility of allowing the use of a vaccine against Highly Pathogenic Avian Influenza (HPAI) in India.

The meeting recommended conducting detailed science-based assessments to determine the feasibility of HPAI vaccination in India. Research efforts have also been initiated to develop an indigenous HPAI vaccine following global best practices.

Assam Poultry Farmers Urge Government Support to Get Rid of Contract Farming

Most poultry farmers in the Bongaigaon district have been forced to enter into contracts with private companies to rear broiler chicks because of the lack of government assistance.

NATIONAL

According to the district Animal Husbandry and Veterinary Department, around 200 broiler chicken farms are functional in the district at present, and most of them are under contract farming mode. Under this mode of farming, poultry companies – which are mostly from other states – provide broiler chicks, feed, vaccines, and technical advice to the poultry farmers with whom they sign contracts for raising the chicks and then delivering them to the company concerned as full-grown chickens.

On the other hand, the contract poultry farmers have to set up the required infrastructure, buy feed at the rate of Rs 40 per kg from the companies, provide labour, buy medicines when required, take the liability if any chick dies due to factors other than epidemic diseases, and raise the birds as per the technical guidance provided by the companies to whom the birds are sold back at a fixed rate at the approximate age of 40 to 42 days.

In return, the company pays a minimum rate of Rs 8 per kg up to a maximum rate of Rs 11 per kg to the contract farmer concerned against a broiler chicken with a weight of around 2.8 kg. This pittance includes all the costs of production borne by the contract farmer against a broiler chicken.

It is alleged that the contract poultry farmers have no scope to bargain regarding the sale price of their chickens. They cannot approach the authorities concerned if an agreement is breached by the company because the contract papers are written in English, which is almost unintelligible to the majority of poultry farmers. Moreover, it is alleged that the companies do not share copies of the relevant agreements with the farmers.

Consequently, farmers who rear broiler chicks on a contract basis for private companies earn much less than those who sell their broiler chickens independently in the open market. Independent farmers earn 40 to 88 per cent more profit than contract farmers, a poultry trader said.

"Unless these poultry farmers are brought under the cooperative system, it will be difficult for them to continue the poultry trade independently," said Bongaigaon District Animal husbandry and Veterinary officer Dr. Shahidul Islam.

According to some poultry farmers, they need bank loans with a minimal interest rate, inputs such as quality feed, free vaccines, broiler chicks at a reasonable price, as well as technical guidance from the veterinary department for rearing the chicks and selling full-grown chickens in the market.

It is reported that the private companies are running their poultry trade through contract farming in the district without taking any formal consent from the veterinary department. It is also alleged that these companies do not allow contract farmers to consult the local veterinary department over farm-related issues. "Only the collective effort of government agencies can free us from exploitation by the private companies," a local broiler farmer said.

Technical Seminar Series for Vengem LPAI Vaccines

Ventri Biologicals organised a series of technical seminars on Vengem, its vaccine for LPAI (H9N2) across the country.

At the sessions in Yamunanagar and Panchkula, Harjit Padda, DGM, Sales and Marketing introduced the speakers and set the tone for the meeting. Dr. Namdeo Bulbule, AGM, spoke on the critical role of Vengem in boosting flock immunity and significantly reducing the economic impact of Low Pathogenic Avian Influenza (LPAI) – a persistent threat to poultry health and farm profitability. Raju Tanna, AGM, delivered the vote of thanks.

Seminars were also held at Anand (Gujarat) and Bishnupur (West Bengal).

At Anand, the event commenced with an inspiring address by Deepak Khosla, GM, who highlighted Vengem's transformative role in reshaping poultry health through effective immunisation. Dr.Prakash Reddy, DGM, provided a strategic overview of disease control and emphasised Vengem's vital role in strengthening flock immunity against Low Pathogenic Avian Influenza (LPAI). Dr H. G. Murade delivered the closing remarks and Ram Ghate, AGM proposed the vote of thanks.

The seminar at Bishnupur began with a welcome address by Chita Ranjan Sahoo, AGM. Dr. Shashikant Shiwarkar delivered an in-depth technical presentation, showcasing Vengem's proven efficacy in preventing economic losses caused by LPAI and offering a comprehensive disease control roadmap for modern poultry operations. His session stressed the importance of proactive vaccination in safeguarding both flock health and industry profitability. Kaustav Chattopadhyay delivered the vote of thanks.

The momentum of the Vengem vaccine launch campaign continued with resounding success in Coimbatore. The seminar began with an insightful address by Deepak Khosla, GM, who highlighted Vengem's potential to transform poultry disease management and improve farm productivity. Dr. Prakash Reddy, DGM, spotlighted Vengem' s efficacy in preventing economic losses caused by Low Pathogenic Avian Influenza (LPAI).

Dr.N. Baburaj, DGM, provided valuable updates on the broader Ventri Biologicals' vaccine portfolio. Mr. Chinnaraj, AGM, delivered the vote of thanks.

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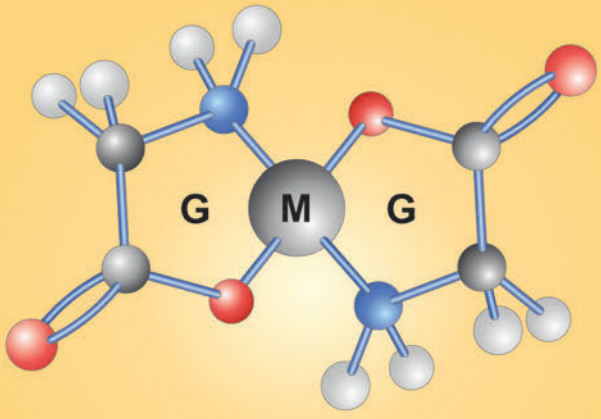

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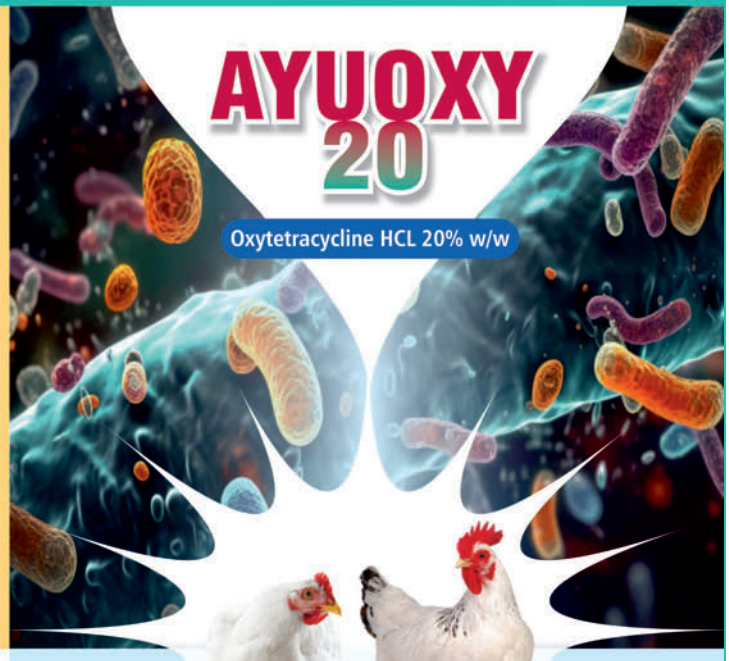

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Vets in Poultry Organises 2nd National Symposium

Vets In Poultry (VIP), India's foremost network of poultry veterinary professionals, hosted its 2nd National Symposium on 7th May 2025 at the Hyatt Regency, Chandigarh. Centred around the theme "The Poultry Summit: Innovate, Integrate & Thrive," the event welcomed approximately 600 participants, including veterinarians, industry stalwarts, researchers, entrepreneurs, and policymakers, for a day of robust dialogue, knowledge sharing, and collaborative exploration of the sector's future.

The symposium was graced by eminent dignitaries including Chief Guest, Shri Nitin Gadkari, Hon'ble Union Minister, Ministry of Road Transport & Highways, Government of India; Special Guest, Shri Mahipal Dhanda, Hon'ble Cabinet Minister, Government of Haryana, Ministry of Higher Education, Archives, Parliamentary Affairs, School Education and; Guest of Honour, Smt. Alka Upadhaya, IAS, Secretary, Department of Animal Husbandry and Dairying (DAHD), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

The event commenced with the unveiling of the symposium souvenir, followed by a warm welcome by Dr. Vishal Rawat, Head – North, VIP. Dr. Santosh Ire, Secretary, VIP, shared the journey of the organisation — from its humble beginnings as a WhatsApp group of 50 veterinarians in 2014




to its evolution into a national platform. Dr. Ajay Deshpande, President, VIP, then addressed the gathering, setting the stage for a powerful lineup of sessions.

The Keynote Address was delivered by Mr. Balram Singh Yadav, Managing Director, Godrej Agrovet.

Prof. (Dr.) A. S. Ranade, Technical Advisor, VIP, concluded the inaugural session with remarks on the importance of scientific collaboration in advancing the industry.

The symposium featured compelling sessions from leading voices in the field:

- **Unlocking Poultry Potential through Genetics**
  Dr. G. L. Jain, Geneticist & Principal Advisor, VH Group
- **Navigating Disease Challenges: A Deep Dive**
  Dr. K. Jayaraman, Senior Poultry Advisor & Consultant, Coimbatore
- **Tech for Health: Revolutionising Poultry Business**
  Mr. Suresh Rayudu Chitturi, Chairman, International Egg Commission & MD, Srinivasa Farms
- **Empowering the Poultry Sector: Vision 2047**
  Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD
- **Mitigating Climate Change: A Comprehensive Approach**
  Prof. (Dr.) N. K. Mahajan, Former Head, Department of Veterinary Public Health & Epidemiology, LUVAS, Hisar




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INFAH National Seminar 2025 Shines Spotlight on Public-Private Partnerships to Boost Animal Health

The Indian Federation of Animal Health Companies (INFAH) hosted its National Seminar 2025 on 20th March in New Delhi, under the theme "Strengthening Animal Health and its Economics through Public-Private Partnership for Viksit Bharat."

Over 100 delegates, including policymakers, scientists, and industry leaders, convened to explore collaborative strategies for enhancing veterinary health.

In the inaugural session, Dr. Anup Kalra, Joint Secretary, INFAH emphasised INFAH's role in bridging government, academia, and industry for Viksit Bharat. Dr. Shirish Nigam, President, INFAH, stressed the need for industry introspection and policy advocacy, presenting key regulatory demands to the government.

Keynote Addresses

- Chief Guest, Prof. (Dr.) S.P. Singh Baghel, Hon'ble Minister of State, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India underscored livestock farming's central role in economic development and called PPPs the most effective model for rural transformation

- Delivering the Thematic Address, Smt. Alka Upadhaya IAS, Secretary, Department of Animal Husbandry & Dairying, Govt. of India promoted the One Health approach and highlighted India's vaccine self-reliance, AMR, and the need for mastitis control programs
- Dr. Abhijit Mitra, Animal Husbandry Commissioner, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India recognised INFAH's contributions to antimicrobial data and called for unified efforts in veterinary medicine
- Mr. Abhay Mahajan, KVK, DRI, Chitrakoot, emphasised holistic rural development through ethnoveterinary practices, traditional knowledge, and youth empowerment
- Dr. Raghavendra Bhatta, DDG (Animal Science), ICAR, emphasised the livestock sector's contribution to the economy and India's goal to be PPR and rabies-free by 2030. He urged a mindset shift from "PPP" to "Partnership for Prosperity" and aligning with global animal health standards
- Dr. Gauri Shankar, Deputy Drugs Controller, CDSCO, emphasised digital regulatory processes and mutual accountability
- Dr. Hirofumi Kugita, Representative for Asia-Pacific, World Organisation for Animal Health (WOAH), promoted international collaboration and alignment with global veterinary standards

A series of technical sessions followed covering PPP in Animal Health and Nutrition; Regulatory Framework for Animal Health Drugs & Biologicals; Imports & Exports of Veterinary Products; Ayurveda & its Role in Animal Health; Navigating the Intellectual Property & Trade Regime.

A detailed report compiling seminar insights and recommendations will be submitted to the Hon'ble Minister and DAHD to inform future policy and foster public-private innovation in animal health.

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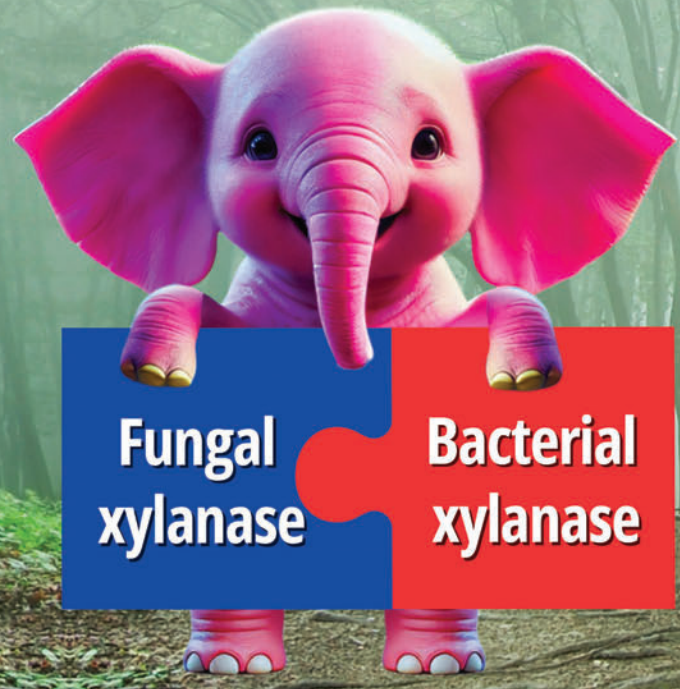

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