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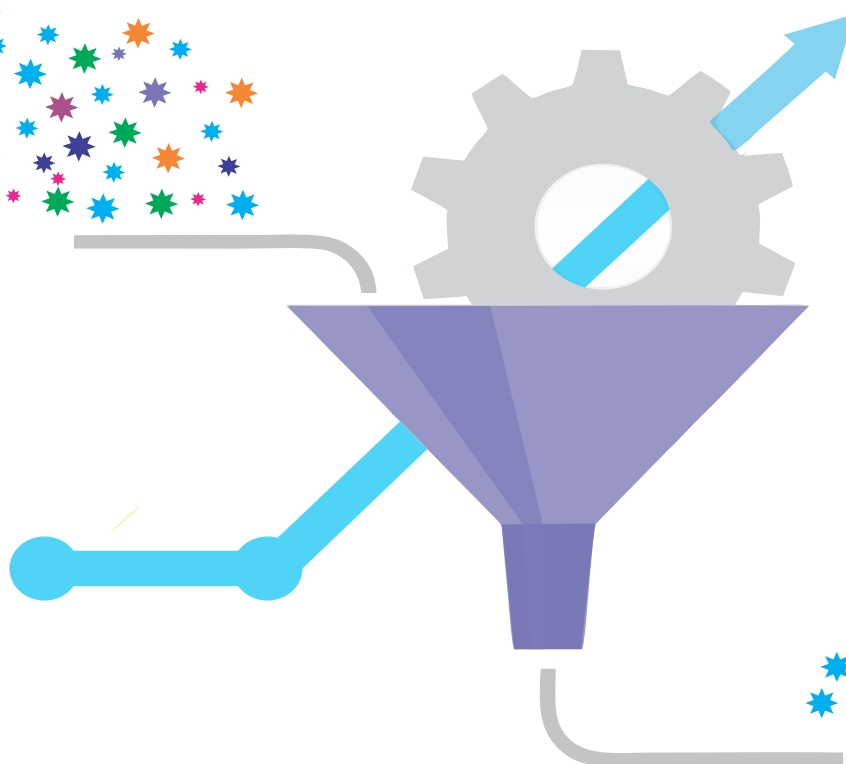
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From the Editor's Desk



Why Curbing of Heat Stress in Poultry Animals has Become a Necessity

In recent years, the poultry industry has been growing steadily. However, the increased humidity has affected the overall growth spectrum due to challenges faced by intensifying **heat stress in poultry animals**. Poultry animals often go through specific behavioural and physiological changes due to heat stress leading to clinical symptoms of low production and weakness.

Heat stress has led to a more **considerable compromise in the economy** as poultry animals tend to be affected gravely due to heat stress's adverse, ill effects. The low production of eggs, reduced nutrition in meat and eggs, lethargy and fatigue in poultry animals, and reduced reproductive health are some conditions that need to be adhered to.

The poultry industry has been expanding rapidly, and therefore the need for **effective animal management techniques** to curb heat stress must be emphasized intermittently. A healthy poultry management mechanism can increase the metabolism of animals, resulting in higher production and making nutrition content evident, thereby reducing economic losses on a larger scale.

The poultry industry can reach its optimum level only if a balance of ambient atmosphere and proper techniques for poultry management is attained. **Attaining sustainability through heat management and mitigation strategies can be a challenge, and therefore a broader approach shall be taken for a better future for poultry animals.**

OUR TEAM

Bhavana Gupta
Editor-in-Chief
editor@pixie.co.in

Siddhi Gupta
Co-Editor
siddhi@pixie.co.in

Priyanka Patlan
Co-Editor
editor.pcs@gmail.com
M: 999 170 5007

Prince
Graphic Designer
M: 9467147541

MANAGEMENT TEAM

Vishal Rai Gupta
Managing Director
vishal@pixie.co.in

Parth Rai Gupta
Director

HONORARY EDITORIAL BOARD MEMBERS

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Innovista Consulting, New Delhi

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Heat Stress in Poultry: Mitigation Approaches and Way Forward



Amitav Bhattacharya

Global population has grown from 1 billion in 1800 to 7.9 billion in 2020. Further, the projections are that it is likely to reach around 9.4 billion by the year 2050. The breakneck stride in global population has also made us to feel wary of food and nutritional security, especially quality protein security in future. Over the years, the trend to consume a protein rich low calorie diet is on the rise. Further, there has also been a marked increase in the consumption and production of meat and meat products. With the advent of time, the proportion of poultry meat in the overall global meat consumption has increased from 12% in 1961 to 35% in 2013. A baseline survey during 2014 by Sample Registration System portrays that 71% of Indians over the age of 15 are non-vegetarian. India has currently a population of around 1.33 billion which is expected to reach 1.65 billion by 2050 and by then, India may surpass China in terms of number of stomach to feed. It's not possible to sustain as a nation with ever increasing hunger. The solution lies in exploring options to find a resonance between production and consumption of eggs and poultry meat in India.

The wide range of acceptability of poultry products has led scientists to continuously strive to produce with the least possible input and maximum output. The present-day broiler and layer strains are a result of an exhaustive genetic selection achieved in the subtropical and temperate breeds of chicken through years for higher yield and productivity. Though, the production traits are inversely proportional to traits for health and well being, it's unfair economically to compromise with the production traits during the process of selection. Today, global warming and climate change contribute to an increase in the ambient temperature and the lack of sweat glands makes poultry birds vulnerable to heat stress. The exposure of poultry to heat stress changes the gene expression of cytokines, up regulates heat shock proteins and reduces the concentration of thyroid hormones. As heat stress persists, these cascades of cellular reactions result in oxidative stress, tissue damage and malfunction besides other adverse effects on production performance, meat and egg quality. In addition, heat stress causes damage to the gut microbiota, intestinal integrity, villus morphology as well as immunosuppression resulting in increased risk of necrotic enteritis outbreaks. Besides, the conventional methods of mitigating heat stress through environmental management, housing design, ventilation, sprinkling, shading, feeding management and nutritional interventions; in recent years, attempts have also been made to mitigate the adverse effect of heat stress by novel approaches in incubation (in-ovo feeding and thermal manipulation) and post-hatch period (dietary supplementation, ventilation strategies, housing management etc). The earlier intervention strategies have been inconsistent in poultry for managing heat stress. Thus, there is scope for exploring innovative approaches, including genetic marker-assisted selection of poultry breeds for increased heat tolerance, exploring the potential of native and improved/ coloured breeds of chicken commercially in tropical conditions for sustainability of poultry production to accomplish long term goals of food and nutritional security.



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Economic Recession - Recovery and Global Meat Market Dynamics

Welcome to Nutrinomics...

"Nutrinomics, is the merging of the nutrition and health economics disciplines to assess the impact of nutrition on animal health and disease and to illustrate the health and economic aspects of specific changes in the daily nutrition and nutrition recommendations through the lens of cost effectiveness".

Introduction

The world economy is experiencing an exceptionally strong but highly uneven recovery. Global growth is set to reach 5.6 % in 2021- its strongest post-recession pace in 80 years in part underpinned by steady but highly unequal vaccine access. Growth is concentrated in a few major economies, with most emerging market and developing economies (EMDEs) lagging: while about 90% of advanced economies are expected to regain their pre-pandemic per capita income levels by 2022, only about one-third of EMDEs are expected to do so. In low-income countries, the effects of the pandemic are reversing earlier gains in poverty reduction and compounding food insecurity and other long-standing challenges. The global outlook remains highly uncertain, with major risks around the path of the pandemic and the possibility of financial stress amid large debt loads.

By 2022, global output will remain about 2% below pre-pandemic projections.

By 2022, output in all regions is expected to remain below pre-pandemic projections, weighed down by the ongoing pandemic and its legacies, which include higher debt loads and damage to many of the drivers of potential output.

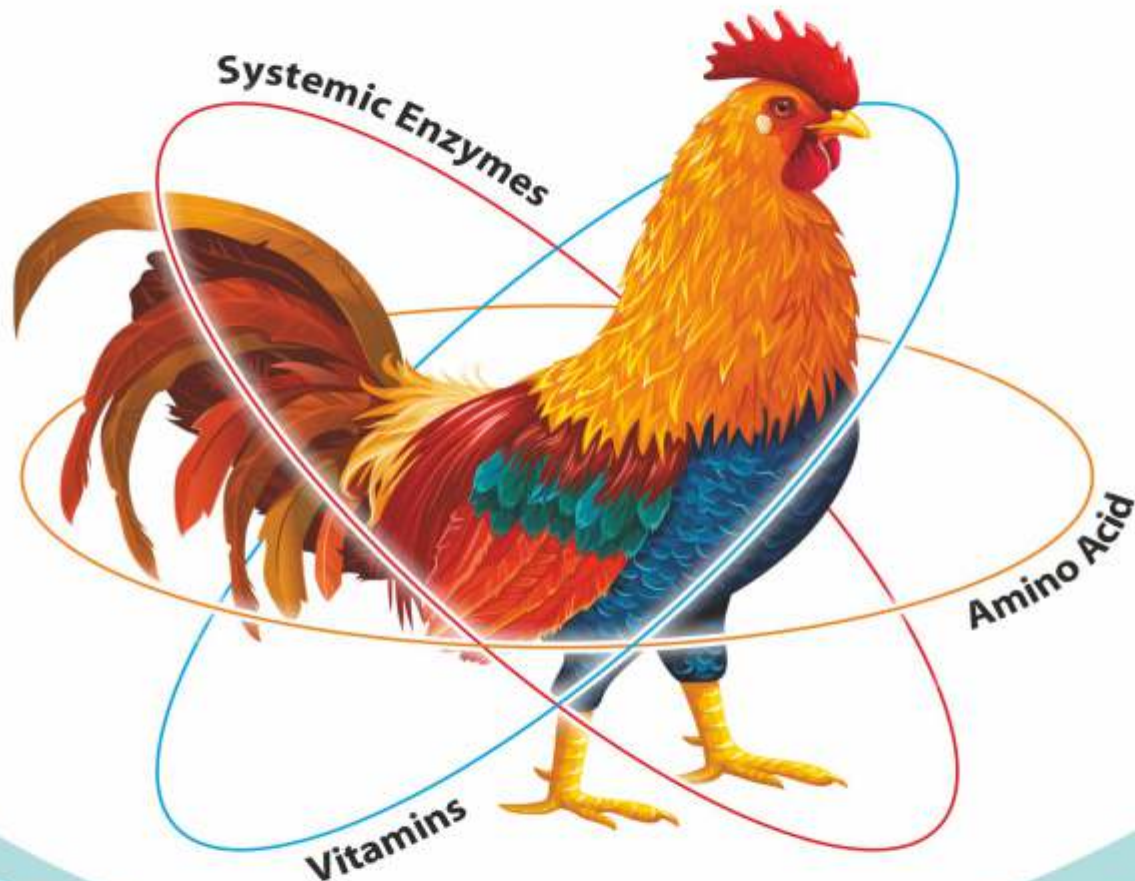
The recovery is expected to be strongest in East Asia and the Pacific, primarily due to strength in China. In South Asia, India's recovery is being hampered by the largest outbreak of any country since the beginning of the pandemic. In the Middle East, North Africa, Latin America and the Caribbean, the pace of growth in 2021 is expected to be less than the magnitude of the contraction in 2020, while the tepid recovery in Sub-Saharan Africa will make little progress.

In most regions, risks to the outlook are tilted to the downside. All regions remain vulnerable to renewed outbreaks of



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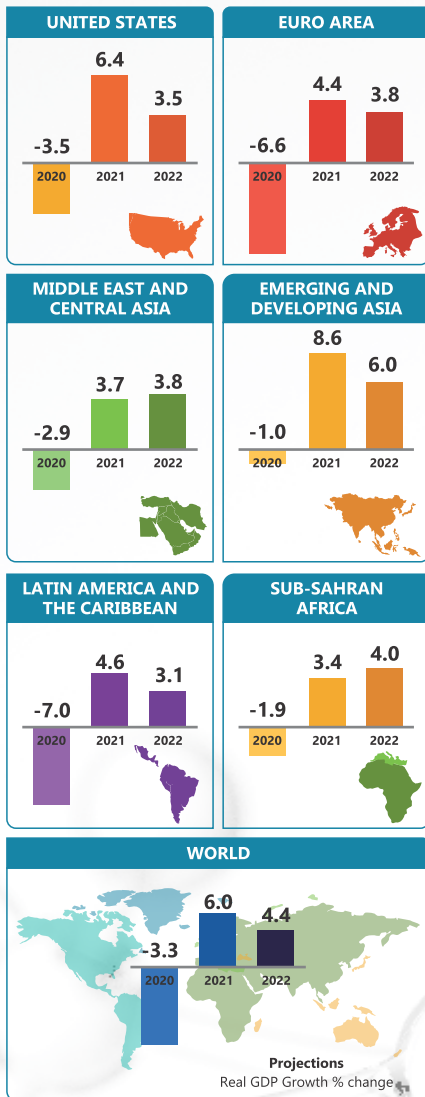


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GDP % Growth Projection by Region



COVID-19, which could feature variant strains of the virus; financial stress amplified by elevated debt levels; deeper-than-expected scarring from the pandemic; and rising social unrest, potentially triggered by rising food prices.

With 1.2 billion people and the world's third-largest economy in purchasing power parity terms, India's recent growth has been a significant achievement. Since independence in 1947, a landmark agricultural revolution has transformed the nation from chronic dependence on grain imports into an agricultural powerhouse that is now a net exporter of food.

Since the 2000s, India has made remarkable progress in reducing absolute poverty. Between 2011 and 2015, more than 90 million people were lifted out of extreme poverty.

The International Monetary Fund (IMF)

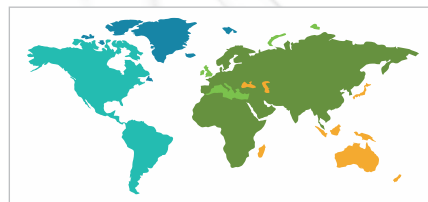
cut India's GDP forecast to 9.5% for the Financial Year (FY) 2022. This is considerably lower than the IMF's previous 12.5% growth estimate for India.

Growth prospects for India for FY22, however, remain higher than all other major economies. As per the IMF, India's GDP is expected to do better than China and the United States.

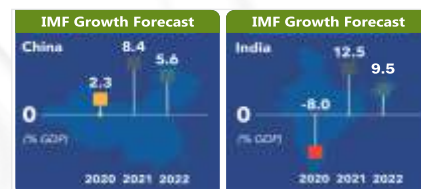
To build back better, it will be essential for India to stay focused on reducing inequality, even as it implements growth-oriented reforms to get the economy back on track. The World Bank is partnering with the government in this effort by helping strengthen policies, institutions, and investments to create a better future for the country and the people through green, resilient and inclusive development.

China is forecast to grow 8% in 2021 and 5.6% in 2022. It said that China's prospects for 2021 are marked down slightly due to stronger than anticipated scaling back of public investment. And in the long term, demographic challenges in China and other emerging markets make it more pressing to reverse a persistent decline in long term growth and build a more buoyant post-pandemic global economy.

The recovery is not assured until the pandemic is beaten back globally. Concerted, well-directed policy actions at the multilateral and national levels can make the difference in diminishing divergences & strengthening global prospects.



Economic Recession and Recovery of the two Powerhouses of Asian economy:-



What is the future of meat ? Well, it should continue to be produced and

consumed, just like it has been. Let's start from the start. Global population is expected to grow to 10 billion by 2050. 2.1 billion more mouths to feed from today. To meet the projected food, demand the answer can hardly be keeping twice as many poultry, 80% more ruminants, 50% more cattle and 40% more pigs, utilizing the same level of natural resources as we currently do. Also, just producing enough food will not be enough. Feeding the world population adequately would also mean producing safe food that ensures nutrition security.

While demand for livestock derived foods is expected to plateau in high income countries, it will grow rapidly in Africa & Asia mostly due to rising populations and rising incomes. As income rise, people will increasingly consume more resource intensive, animal-based foods.

World Meat Markets at a Glance and how will the economic recovery affect meats market?				
	2018	2019 estim.	2020 Nov	Change: 2020 over 2019
million tonnes (carcass weight equivalent)				
%				
WORLD BALANCE				
Production	342,2	339,0	337,3	-0,5
Bovine meat	71,6	72,8	71,9	-1,2
Poultry meat	127,3	133,6	137,1	2,6
Pig meat	120,9	109,8	105,3	-4,0
Ovine meat	15,7	16,0	16,0	0,2
Trade	33,8	36,2	37,6	3,9
Bovine meat	10,5	11,2	11,0	-1,7
Poultry meat	13,5	13,9	14,1	1,1
Pig meat	8,4	9,5	11,1	15,9
Ovine meat	1,0	1,0	1,0	-5,3
SUPPLY AND DEMAND INDICATORS				
Per caput food consumption:				
World (kg/year)	44,6	43,6	43,1	-1,3
Trade - share of prod. (%)	9,9	10,7	11,1	4,4
FAO MEAT PRICE INDEX (2014 - 2016 = 100)				
	2018	2019	2020 Jan-Oct	% Jan/Oct 2020 over Jan/Oct 2019
	95	100	96	-3,0

India will have 1.7 billion people by 2050, creating the most populated country in the world and with the most demand for food – an increase of a staggering 70%. Consumer spending will increase significantly, as more Indians move up the economic ladder.

If you are in India, you are seeing the meat consumption is on the rise, and not in a small way.

Meat consumption has been shifting towards poultry. In lower income developing countries this reflects the lower price of poultry as compared to other meats, while in high-income countries this indicates an increased preference for white meats which are more convenient to prepare and

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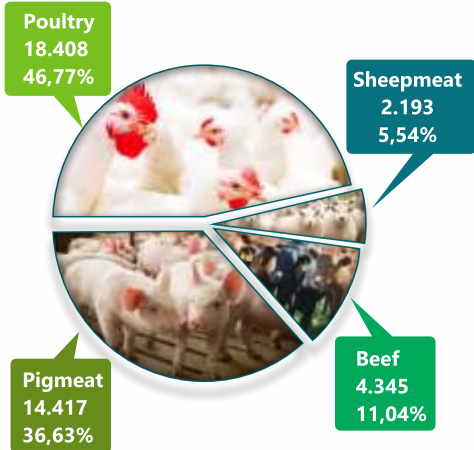
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perceived as a healthier food choice. Globally, poultry meat is expected to represent 47% of all the protein from meat sources in 2030, an increase of 2% points when compared to the base period. The global shares of other meat products are lower: beef (11%), pigmeat (36%), and sheep meat (6%).

The world production of meat of the main species will increase by 39,363 kt between 2021 and 2030

**World Meat Production Increase -
Δ in kt 2021-2030**



More than three-quarters of global agricultural land is used for livestock production today, which supplies one-fifth of the world's calories. Additionally, the domestication of livestock has altered the makeup of our ecological systems. Livestock production contributes to 14.5% GHG emissions globally. Livestock will continue to be raised in widely different ways around the world. By accounting for this diversity -in live-stock

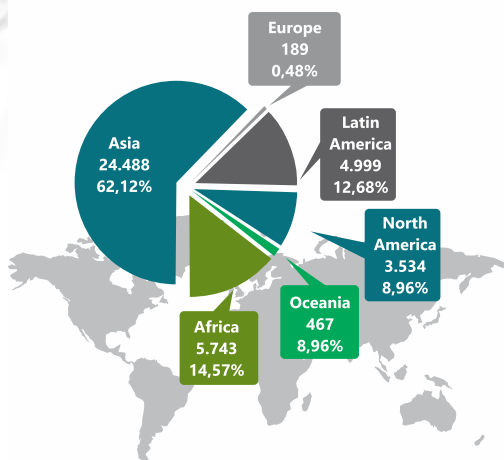
systems and businesses and their various development trajectories-the rising demand for meat, milk and eggs must be met sustainably.

Meat is big business and supports billions of livelihoods. Many view the aggressive push for alternative protein as an anti-meat agenda. Conventional protein production is fundamental to today's food system. A reduction in animal protein demand would reduce demand for feed crops like corn and soybean, altering the economics of production, putting producers under increasing pressure to diversify production.

Finally, this consumer preferences will evolve according to historical patterns. As a result, dietary preferences for lower meat consumption or

Asia will account for 62% of the increase in world meat consumption in the next decade

Increase of Consumption of Main Meats between 2021 and 2030 World Total of 39,419 kt



for alternative protein sources are assumed to expand slowly and to be adopted by a small part of population concentrated mainly in high income countries, and therefore hardly affect meat consumption over the next decade. Nevertheless, while the competition from substitutes will increase, consumer choice will continue to be influenced by the nutritional content in meat as compared to protein substitutes.



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*Improving food & health***Christophe Bostvironnois***DVM – Chr. Hansen, Hoersholm,
Denmark Roland Koedijk, PhD***Gaining a Better
Understanding of
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A recently released selflearning programme teaches professionals the different modes of action of probiotics. Marcelo Lang, global marketing excellence at Chr. Hansen, tells us more.

It's a difficult task to choose the right probiotic since probiotics have various modes of action which support the health of animals. According to Marcelo Lang, this was the reason for setting up a programme for professionals in the industry: "The aim of this programme is to educate professionals in the animal protein industry on the modes of action of probiotic bacteria."

Why is it important to understand the modes of action of probiotics?

There is a connection between the typically measured variables of economic importance in the production of animal agriculture and probiotic bacteria's major modes of action. At the same time, not all probiotics are the same. Strain matters! By gaining a better understanding of what probiotics do and how they affect performance in farm animals, veterinarians, nutritionists, and other professionals can make better decisions about which products will help the animals in their care.

Is there a lack of knowledge in the feed industry regarding the use of probiotics?

There's a lack of knowledge, but it's an uneven picture. Some professionals are quite familiar with the effects of probiotics and use them very effectively, while others still haven't caught up and are missing out. Thanks to new techniques, the science is advancing so quickly that even those professionals who are already familiar with and using probiotics will have a lot to gain from this programme.

What is your target group for the programme?

We developed the Modes of Action programme with food animal veterinarians and nutritionists in mind. Other professionals in the industry will also benefit from the program, but they may find some aspects a bit challenging. For example, the lessons on the effects of probiotics on the microbiome or the modulation of the innate and adaptive immune system may require some extra attention.

**Not all probiotics are the same.
Strains matters!**



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Stable:

Thermostable and suitable for Pelleting

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Typhimurium, Gallinarum, Choleraesuis, Derby, Dublin, Enteritidis, Pullorum

E. Coli

F4 (K88), F5 (K99), F6 (987P), F18, F41

Clostridium Perfringens

Type A, C, B, D, E

Staphylococcus Aureus



Can you tell us a bit more about the content of the programme?

There are four courses. The first one is a short introduction to the overall programme. The other three courses contain two to three lessons each, divided by specific types of interactions of probiotics with feed stuffs, with other microbes, and with the host. At the end of each lesson, there's a short quiz to help reinforce what has been learned.

What is the mode of action of probiotics?

Probiotic bacteria affect animal health and performance through interactions with feed stuffs, with other microbes, and with the host animal. In interactions with feed stuffs, we learn how these bacterial actions improve the digestion and availability of essential nutrients. In interactions with other microbes, we learn how probiotic bacteria successfully out compete and eliminate potentially pathogenic organisms from their micro environment and how those actions can lead to lasting positive changes in the intestinal microbiome. Finally, in interactions with the host, we learn about the myriad interactions of probiotic bacteria with the intestinal lining of their host. These interactions actively support the major barrier and immune functions of the intestinal tract.

Can you say more about these different modes of action?

When interacting with feedstuffs, some probiotics can convert sugars to organic acids that improve the intestinal environment and that serve as precursors to absorbable volatile fatty acids. Some probiotics produce an array of enzymes that drive the digestion of relatively hard-to-digest fibres and that improve the solubility of proteins.

When interacting with other microbes, probiotics are able to produce and secrete potent antimicrobial peptides that kill potentially pathogenic organisms, without causing any harm to other probiotic or commensal organisms.

Probiotic bacteria can competitively exclude the binding of potentially pathogenic organisms to intestinal microvilli, the site of nutrient absorption. Probiotic bacteria support the proper development of absorptive capacity in young, growing animals. They also actively support the barrier functions of the intestine tract, specifically the proper function of apical tight junctions. In

addition, probiotic bacteria interact with specialized cells of an animal's immune system to improve its capacity to respond to challenges.

What are the health benefits for animals when using probiotics?

Through their effects on feedstuffs, probiotics improve the digestion and availability of essential nutrients; these are nutrients that animals can use to maintain themselves, defend themselves, grow, and produce meat, milk, or eggs. Direct antagonism of potentially pathogenic organisms helps keep your animals healthy and thriving.

Gaining an understanding of the trillions of organisms that make up the intestinal microbiome is an essential element in making the most informed product choices for your animals.

Finally, through their direct effects on the host, probiotics reinforce the gut barrier functions, which stop pathogenic organisms from invading animal tissues and causing disease.

How do you know which probiotics to use in a certain situation?

Not all bacteria are equal in their ability to interact positively with feedstuffs, with other microbes and with the host: strain matters! Choosing the right probiotic depends on the specific situation or challenge facing each particular food animal production system. Understanding the modes of action of probiotic bacteria will enable you to make the most informed product choices for the animals in your care.

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- Protect dehydration & stress
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Garlic: A Potential Alternative to in Feed Antibiotics as Growth Promoter in Poultry Production

Sandeep Uniyal, Amit Sharma, Digvijay Singh and Udeybir Singh Chahal

Department of Animal Nutrition, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana

Introduction

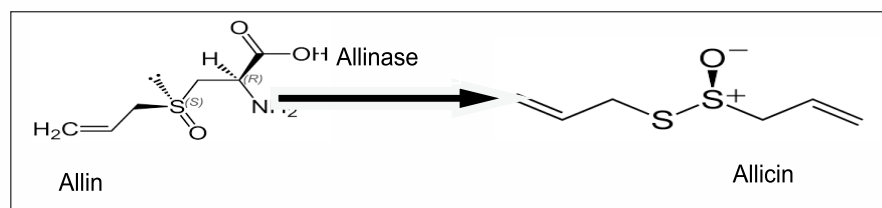
The discovery of antibiotics in the early 20th century followed by their economization due to large scale production during World War II for controlling human infections revolutionized food animal production, specifically poultry and swine, in the post war era. Concerns over environmental and public health risks associated with the emergence of antibiotic resistance in zoonotic bacterial pathogens due to therapeutic and/or non-therapeutic use of antibiotics have led to global interest in adopting more stringent use of antibiotics in food animal production. In 1986 Sweden banned the use of antibiotic growth promoters (AGPs) and this was followed by a series of events that led to an EU-wide ban that took effect on January 1, 2006. Recently, the Center for Veterinary Medicine, Food and Drug Administration (FDA) recommended judicious use of medically important antibiotics in feed based on key reports and studies describing the impacts of AGP on development and transfer of antibiotic resistance traits among intestinal microbiota and to the environment and humans (Kuehn, 2014). Withdrawing sub-therapeutic use of antibiotics in conventional as well as organic poultry production systems may help to mitigate the emergence of antibiotic resistance in pathogens. However, reduced growth rates in birds that are observed in the absence of AGPs will impact the efficiency of production and perhaps jeopardize food security. These merging issues for both conventional and organic swine production pushed the animal nutritionist to find the alternative approaches to improve feed efficiency in

the absence of AGP supplementation. One such alternative commonly known phytobiotics or Phtobiotics have been identified as effective alternatives to antibiotics. Phytobiotics are NGPs that have been growing in popularity as feed additives, due to their beneficial effect on gut health and immunity and growth performance. One such photochemical which have vast potential to replace synthetic antibiotics in feeding is garlic.

Garlic (*Allium sativum*) is an aromatic herbaceous annual spice grown in tropical and subtropical countries is one of the oldest authenticated and most important herbs commonly used as spice in human food preparation or as traditional therapeutic agent several common diseases such are cold, influenza, snake bites, skin infections, ulcer, diarrhoea and hypertension. It has been reported from various animal and human studies that garlic has antimicrobial, antifungal, immunomodulatory, hypolipidemic, anti-diabetic, anti-inflammatory and antioxidant properties.

Chemical Constituents of Garlic

Garlic is a good source of flavanoids and active sulfur containing compounds such as ajoenes (thiosulfinates (allicin), vinyldithiins, sulfides, diallyl trisulfide (DATS) and others that accounted 82% of the overall garlic sulfur content. Allicin the most biologically active sulfur-containing compound of garlic is responsible for its biological activity. Allicin is not present in raw garlic, but it produced by crushing or cutting the garlic cloves. Alliin, the main cysteine sulfoxide is transformed to allicin by allinase enzyme after cutting of the garlic and breaking down the parenchyma





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Antimicrobial activity of garlic

The antimicrobial activity of garlic is mainly due to active sulphur compound allicin which is effective against wide varieties of microorganism including antibiotic-resistant, Gram-positive and Gram-negative bacteria such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, *Salmonella*, *Klebsiella*, *Mycobacteria* which are potential risk factor for infection in poultry. The antimicrobial activity mainly due to disintegration of cell structures and inhibition of metabolic processes and enzymes containing thiol e.g., thioredoxin reductase, RNA polymerase, and alcohol dehydrogenase of the microbes

Antifungal Activity of garlic

Garlic extract containing alicin also have a broad spectrum antifungal against wide varieties of pathogenic fungi like *Candida*, *Torulopsis*, *Trichophyton*, *Cryptococcus*, *Aspergillus*, The garlic extract acted by disrupting the fungal cell wall and causing irreversible ultrastructural changes in the fungal cells, which lead to loss of structural integrity and inhibit the germination ability. These changes in the cytoplasmic content lead to nucleus and cell organelles damage that ultimately leads to cell death.

Antioxidant Activity of garlic

Poultry birds general remain under stress whether it is environmental stress, nutritional stress or production stress which leads to free radical induced oxidative damage in the body and results in lower production performance of the birds. Garlic has potent antioxidant activity and reduces oxidative adverse effects either by increasing the endogenous antioxidant synthesis or reducing the production of oxidizers such as oxygen-free radical species (ORS). Moreover, garlic extract was found to increase the activities of some antioxidant enzymes (e.g., superoxide dismutase (SOD)) and decrease glutathione peroxidase (GSH-Px) in the body. Usually, raw garlic had a stronger antioxidant activity than cooked garlic, and the antioxidant activity of fermented garlic, such as black garlic, was stronger than that of crude garlic

Immunomodulatory property

Garlic has a positive effect on functions of the immune system, and could offer a future alternative way in the control of chicken diseases. Garlic supplement in broilers augmented anti-body production against Newcastle disease virus (NDV). Garlic supplementation increases the size of the spleen, bursa fabricius and thymus of chickens which result in more lymphocyte proliferation and the increase in WBC counts. It has been reported garlic supplementation at 10 g/kg diet increased anti-NDV, anti-

SRBC and anti- *Brucella abortus* (BA) antibody productions in White Leghorn chicken. The stimulatory effect of garlic on humoral immune response maybe because of the improved immune cell functions that is cytokine production and or antigen presenting cells phagocytic capacity. Oxidative stress is a potential factor coupled with the immune response itself. Thus, the antioxidative properties of garlic might have resulted to the improved functioning of the immune cells by protecting them from oxidative stress.

Effect of supplementation of garlic powder on performance of chicken

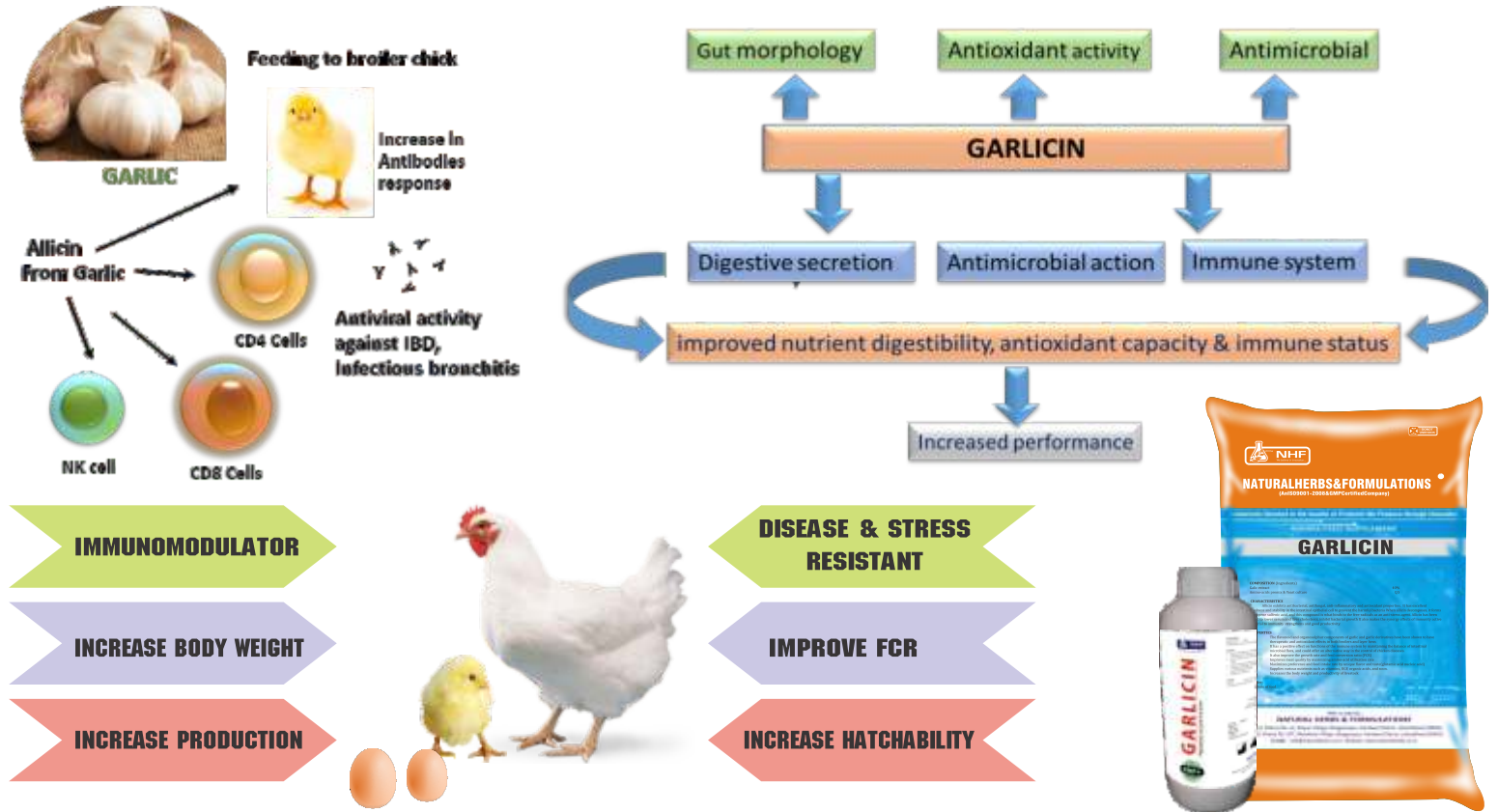
Breed/strain	Dose	Duration	Results	Reference
Broiler	0.3 %	6 weeks	16 % improves in FCR	Fadalla <i>et al.</i> , (2010)
Broiler	0.25 %	8 weeks	15 % and 8.8 % improves in FCR and body weight	Sangilimadan <i>et al.</i> , (2019)
Broiler	0.40 %	6 weeks	2.39% increase in final body weight	Isa <i>et al.</i> , (2012)
Broiler	1%	6 weeks	10.28% increase in final body weight	Mansoub (2011)
Broiler	3 %	6 weeks	60 % increase in final body weight	Eligib <i>et al.</i> , (2013)
Layer	2 %	12 weeks	improved yolk weight, yolk diameter, yolk color, and chick length, and lowered hen mortality	Asrat <i>et al.</i> , (2018)
Layer	1%	8 weeks	Improvement in egg production and lower egg yolk cholesterol content	Kolawole <i>et al.</i> (2019)
Layer	2 %	7 weeks	Reduction in broken eggs and higher albumen weight, height and diameter	Ayed <i>et al.</i> , (2018)

Conclusion

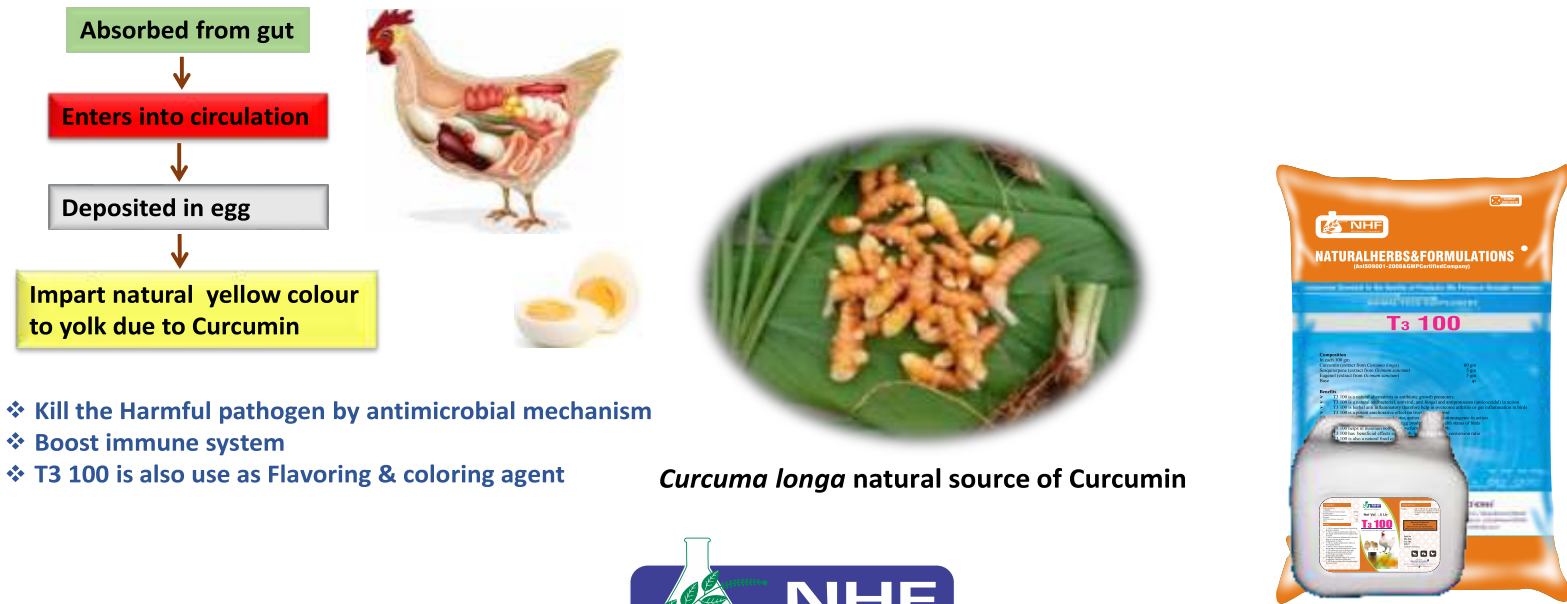
Herbal plants have considerable promise in health promoting effects in poultry, and because of these substances are considered as potential alternatives to antibiotics, garlic have confirmed improvement in performance of poultry by its antimicrobial, antioxidant and immunomodulatory properties. Therefore, garlic show promising potential for applications in organic and conventional poultry production.

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Summer Nutritional Management in Layers and Broilers



Dr V Rajendra Prasad
Poultry Consultant

Effects of heat stress in birds:

1. Heat stress have direct effect:

- on feed intake, growth rate, body weight in Broilers and Layers.
- and reproductive performance and egg production & egg quality in Layer birds.

2. Feed intake will reduce by 1 % for each one-degree centigrade rise in the temperature from 22C – 32C.

- and 5% for each one-degree centigrade rise in the temperature range of 32C–38C.

3. Water intake will increase by 7% for every degree rise in temperature above than 21C.

Nutritional changes

4. Dietary Energy - Fats/Oils

- Panting increases the need of maintenance energy to dissipate body heat during the high environmental temperature.
- The energy requirement for maintenance decreases by about 30kcal/day with increase in

environmental temperature above 21 °C.

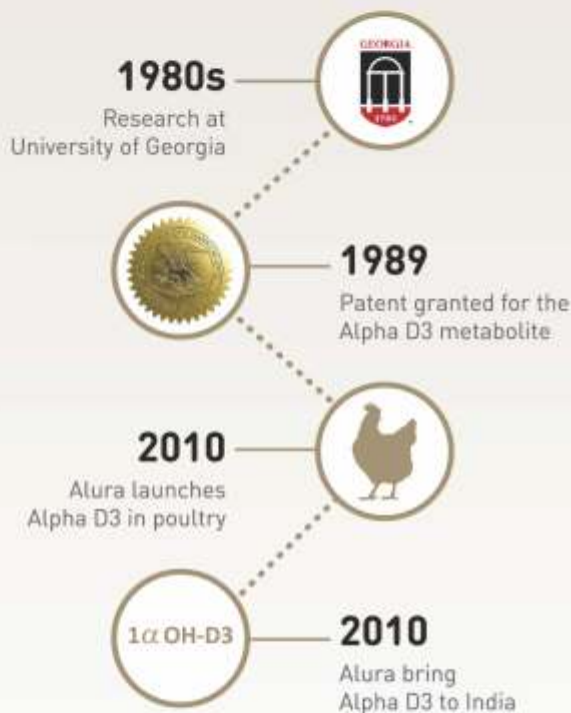
- Therefore, the concentration of energy should be increased by 10%, so the absolute energy requirement is not affected by heat stress.
- Increase in energy intake also increases the fat deposition in the carcass and mortality.
- Under such conditions, dietary supplementation of maximum 5% fats or oils helps to reduce heat production due to their higher energy value and lower heat increment compared to carbohydrates and proteins.

5. Dietary Protein - Amino acids

- Bird utilizes much more amino acids during heat stress.
- Supplementation of good quality protein rich raw materials with higher digestibility is required in summer.
- Ideal protein formulation with digestible amino acid levels suits perfectly for summer.
- For summer, the digestible amino



THE ORIGINAL ALPHA D3



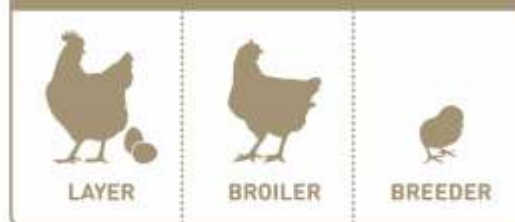
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- Prevents black bone syndrome
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- Synergetic and Complementary effects with Phytase
- Proven ROI in Broilers & Layers
- Thermostable for palletisation
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USAGE



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We are the only company to have extensively tested the efficacy of this metabolite through academic papers, clinical trials, and field tests. More than 40 published reviews in scientific journals proves Vitamin Alpha D3 produces more chicken protein, with a better quality at a lower cost.



acid levels need to be increased 3-5%.

- e) Cost of this addition can be minimized by including a Multi-Protease enzyme in the diets.
- f) Cost of Multi-Protease can be easily adjusted by considering 0.2% CP or 1% DAA matrix. Incorporation of good Multi-Protease enzyme is most ideal to reduce amino acid variability, protein wastage, litter ammonia and stress.
- g) It will balance all essential amino acids, optimize performance, and reduce cost of production.

6. Supplementation of vitamin A, E and C has received much research attention as an antioxidant in poultry during summer heat stress condition.

- a) As all these are effective in slowing down the lipid peroxidation process by eliminating the free radical forms during excessive heat in the membranes of cells and subcellular organs.

7. Vitamins and Minerals

- a) One of the major consequences of summer heat stress is increase in mineral excretion and lowering the levels of these key nutrient in circulating bloodstream and liver.
- b) All Vitamin and Mineral levels need to be increased by 10-20% during summer stress so that even if bird consumes less feed, these essential nutrient levels are maintained in birds.
- c) Storage of vitamins, enzymes, and probiotics in a cooler place of feed mill avoids the efficacy loss due to environmental extremities.

- d) Inclusion of Vitamin C and Vitamin E at a level of 100-200 ppm is recommended for stress relief and immunity.
- e) Similarly, minerals like Manganese (Mn), selenium (Se) and zinc (Zn) plays key role in improving immunity.
- f) Supplementation with Vitamin D3 is useful during summer stress to fulfil any deficit of calcium absorption and for better bone mineralization.

8. Choline chloride dosage may be increased during summer stress to ensure effective utilization of fat & nutrients, prevent fatty liver & partial methyl donor effects.

9. Dietary Electrolyte Balance (DEB)

The key elements involved in the maintenance of dietary electrolyte balance (DEB) in body fluids are sodium (Na), potassium (K) and chloride (Cl).

- a) The altered balance of these elements in body fluids during heat stress mainly suppresses growth of broilers and impairs eggshell quality of laying hens due to hyperventilation and results in respiratory alkalosis.
- b) Thus, the supplementation of their compounds such as ammonium chloride (NH₄Cl), sodium bicarbonate (NaHCO₃), sodium chloride (NaCl), potassium chloride

(KCl) and potassium sulphate (K₂SO₄) will fulfill the requirement of these elements and other electrolytes are well documented.

- c) Addition of electrolytes through water can also help in temporary basis.

10. Feeding methods

A good strategy is to withdraw the feed before six hours of an anticipated peak temperature to realize the full impact of this practice, because food remains in the intestine for up to six hours.

11. Research and practical experience have clearly demonstrated that adding certain additives

- a) Probiotics:
Restore & maintain the natural stability of gut microbiota
- b) Acidifiers
Maintain intestinal integrity:
Natural growth promoter
- c) Immunomodulators
Stimulate the immune system
- c) Enzymes:
Improve nutrient digestibility
- d) and combination as per individual farm experience can help reduce the impact of heat stress, improve feed intake & growth and in general enhance animal health.

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Dr. Gunjan Sharma¹,
Dr. Divyanshu Singh Tomar²

¹B.V.Sc. & A.H., M.V.Sc. (Animal Nutrition),
Dr. G.C. Negi College of Veterinary and
Animal Sciences, CSK Himachal Pradesh
Agriculture University, Palampur, H.P.

²B.V.Sc & A.H., M.V.Sc (Livestock Production
Management), ICAR- National Dairy
Research Institute, Karnal, Haryana
E-mail: dstomar26oct@gmail.com



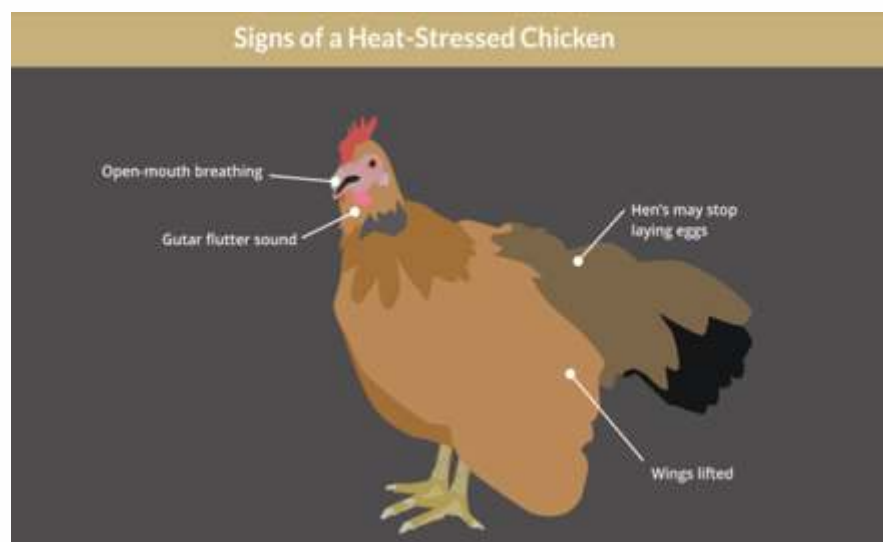
Strategies to Combat Heat Stress in Poultry

Poultry is currently one of the fastest expanding businesses of India's agricultural industry. This business faces a mishap due to rising global temperatures and the incontrovertible reality that current, high-yielding poultry breeds are more susceptible to heat stress. Heat stress sets in, when the ambient temperature rises above 80°F and becomes obvious above 85°F. Environmental temperature and humidity play a major role in heat stress. Thus it is important to measure both the temperature and humidity in the poultry shed.

Signs of heat stress

Poultry are particularly susceptible to hot and humid weather and are at risk of overheating. Poultry subject to high environmental temperatures exhibit many behavioural and physiological changes which allow them to re-gain heat balance with their ambient environment. As ambient temperature increases above comfort zone, chicken spend less time in feeding, more time in drinking and panting, as well as more time with their wings elevated, less time

moving or walking and more time in resting (Mack, et al., 2013). Birds pant to remove heat from their bodies, and are frequently seen extending their wings to allow heat to flow from less feathered body areas, such as under their wings, because they have a high normal body temperature and no sweat glands. This is a time-consuming exercise that needs more energy from the bird than merely sweating. Birds will eventually become exhausted due to heat exhaustion if they are not given relief from the heat.



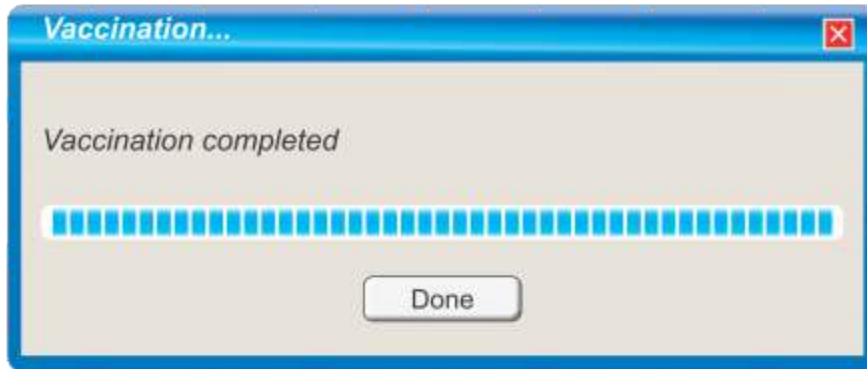


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Due to heat stress poultry exhibits various clinical signs such as panting, lethargy, reduced egg production, increased water intake, decreased feed intake, weakness, watery droppings etc.

Measures to mitigate heat stress in poultry

Providing Ventilation

Use of exhaust fans in poultry shed in most circumstances, air flow may be used to control heat in your flock. Airflow at the level of the birds is critical for eliminating bird heat. The first aim should be to increase ventilation to reduce heat from the birds. However, there are several instances where ventilation is restricted. If the air is calm and additional fans are not available, naturally ventilated barns are at risk of heat stress. Barns that are mechanically ventilated may also be at risk if they lack adequate ventilation and air mixing for the size and quantity of birds present.

Drinking water

During heat stress, the bird attempts to maintain its body temperature by increasing respiration, which results in the evaporation of metabolic water, which can significantly increase the water need. Heat stress will increase their water intake by 2 to 4 times than their normal intake. Birds should have access to cool water at all times. The amount of space available for watering should be doubled. To keep the water cool, the overhead tanks and pipe system should be appropriately covered. Providing fresh cool water in the middle of the day is particularly beneficial for internal body cooling (heat sinks) and lowering stress symptoms. To keep the water fresh and cool, flush the water pipes and waterers on a regular basis.

Feeding

It is very critical to feed the birds at the proper time of day to assist them cope with heat stress. A considerable rise in body temperature can be noted in the late afternoon, which might result in bird mortality in severe situations. If the birds were fed in the early or mid morning, this is not the hottest time of day, but it is the peak time of digestion. Withdrawing feed 8 hours before the expected peak temperature is a smart method for reducing the heat burden on the birds. In the morning, one-third of the daily feed



Use of exhaust fans in poultry shed

ration should be provided, followed by two-thirds in the late afternoon. Provision of calcium in the diet will also be fruitful as it will improve shell quality and prevent the birds from depleting bone calcium. Hence, this midnight snacking is a good tool to give hens extra feeding time in the cooler parts of the night.

Nutrient requirement

In the summer, increasing the nutritional density of the ration is a fairly straightforward strategy to assure optimal nutrient absorption despite lower feed consumption. To compensate for the lower consumption, the feed should be denser in nutrients, vitamins, and minerals. As the hot season advances, it may be essential to make some small adjustments in the feed formula once again in the middle of the summer. In addition, the following characteristics that affect heat stress management should be incorporated in the summer feed mix.

Using electrolyte

You can add electrolytes to your flock's drinking water for up to three days. Heat stress causes increased loss of several minerals including potassium, sodium, phosphorus, magnesium and zinc. When potassium chloride electrolytes are added to drinking water at a concentration of 0.6 percent, they

appear to improve water intake. Other potassium and sodium salts have been found to be less effective. You should start providing electrolytes prior to the heat stress period.

Using bicarbonate salts in water

For hens in the egg production industry, sodium bicarbonate in the feed or the usage of carbonated water is extremely beneficial. Panting and carbon dioxide emission can alter the acid-base balance in chicken, as well as the bicarbonate available for the development of egg shells. As a result, sodium bicarbonate can aid in the reduction of these alterations.

Supplementing vitamins

Supplementing broiler drinking water with vitamins (A, D, E, and B complex) can help reduce heat stress mortality. Vitamin C can successfully mitigate warm temperature reductions in laying hen egg production and eggshell quality, as well as sperm production in breeder males, in breeding poultry.

Other practices

- Delay poultry shed activities such as bird movement and litter conditioning.
- Reduce sun exposure in the poultry house or provide shade for pastured chickens.

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Summer Stress

“ Heat stress due to summer has several serious and economical effects on poultry. In broilers it can cause reduced growth rate, decreased feed intake and poor feed conversion. Laying birds experience a drop in egg production, poor egg weight and reduced eggshell quality. ”

Thermoregulation in poultry

The poultry rearing is well managed in temperature between 21-25°C which is called as thermo neutral zone; temperature above 35°C will cause heat stress to birds causing physiological changes. Chickens, unlike most other animals, do not possess sweat glands to aid in heat loss. Chicken removes excess body heat by following mechanisms.

Radiation- Heat will radiate from the bird's warmer body to a cooler surface, such as air, without the use of a medium (surface).

Conduction - Heat stressed birds will try to cool their bodies down by touching water pipes or digging into litter to come into contact with a cool floor.

loose or watery droppings and increased volume of urine causes wet litter condition. This makes the litter environment favorable for the sporulation of coccidian spores. Decreased blood flow to digestive tract causes immunosuppression, dysbacteriosis results into coccidiosis and necrotic enteritis

Hyperventilation or panting - Evaporation of one gram of water from lungs dissipates 540 calories of maintenance energy due to increased muscle activity, hence it is said that summer feed should have more energy.

Increased panting under heat stress conditions leads to increased carbon dioxide levels and higher blood pH (i.e., alkalosis). It also makes birds more prone

Boiled appearance of Breast due to heat stress (Picture 1)



Boiled appearance of Breast due to heat stress (Picture 2)



Convection- Moving air over birds is the most effective way to reduce heat stress. If the air is not moving quick enough, heat will begin to build up around the birds, which will increase heat stress.

Physiological & behavioral changes during heat stress

Under high temperature conditions, birds alter their behavior and physiological homeostasis seeking the thermoregulation, thereby decreasing body temperature. Following are the important changes which adversely affects the performance.

Reduced feed consumption

Water intake increases which leads to

to respiratory distress. Because of rapid panting (up to 10 times more than normal) and oxidative stress, degradation of cilia occurs which facilitates lodgment of Mycoplasma. As the heat stress elevates the multiplication of Mycoplasma it further causes respiratory distress, airsacculitis. Though Mycoplasma as own doesn't cause mortality it results into immunosuppression and occurrence of secondary infection. Some epidemiological studies also suggests that prevalence of viral diseases like IBD, VVND, etc. which causes immunosuppression. This also leads to occurrence of mycoplasmosis and





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further respiratory diseases. Increased loss of minerals like sodium, potassium, etc. through panting disturbs the electrolyte balance.

Hormonal changes during heat stress

High environmental temperatures alter the activity of the neuroendocrine system of poultry and elevate plasma Corticosterone concentrations. Increased Corticosterone concentrations i.e. epinephrine and norepinephrine causes increase in blood pressure, muscular tone and blood sugar levels. The combined effect results into increased maintenance energy which ultimately reduces the performance of the bird.

Boiled appearance of Breast due to heat stress (Picture 3)



Effect of heat stress on immune response

Increased environmental temperature causes immunosuppression by reducing growth of bursa, GALT and spleen, circulating antibodies, lymphocytes, phagocytic activity of macrophages, etc. Immunosuppression jeopardizes the birds into infection by opportunistic pathogens like mycoplasmosis, coccidiosis, necrotic enteritis, E.coli, ND, IBD, etc.

Clinical signs

Low feed intake Increased water intake Diarrhea or loose droppings Incidence of ascites increases Panting and rapid respiration Poor FCR and lower body weight Reduction in egg production, egg size, egg weight, and poor shell quality.

Post-mortem findings

Dehydrated carcass Cooked breast appearance Mucous exudates in mouth and nostrils Pale or cyanotic comb Par boiled appearance of breast Increased body temperature Fluid contents in intestine Rapid decomposition of carcass.

Heat stress management

To overcome the huge economic loss by heat stress, control should be based on following steps-

Management aspect

- Hang wet gunny bags on the sides.
- Evaporative cooling- Sprinklers are commonly used for evaporative cooling when temperatures are more than 40-41°C.

Boiled appearance of Breast due to heat stress (Picture 4)



- Stocking density - Reducing the bird density in summer will give more floor space per bird and allow more heat to escape from underneath their bodies and from the litter.
- Ventilation- Proper ventilation is crucial for heat stress management. A good ventilation system removes moisture, brings in an equal amount of fresh outside air, directs incoming air to all areas equally, keeps inside air moving to flush hot, humid air from between the birds, etc.

Nutritional aspect

Feeding practices

As there is decrease in daily feed intake increase the nutrition density, make the feed more concentrated. If there is enough floor space, extra feeders should be added. Encourage eating at cooler times of the day, i.e., early morning or in the evening. Remove feed 4 to 6 hours prior to an anticipated heat stress period. Birds should not be fed or disturbed during the hottest part of the day. Provide cold water for drinking especially during day times.

Energy- In order to provide higher energy levels fat inclusion should be more in feed which increases calorific value, palatability, feed intake by 5% and utilization of nutrients.

Proteins- The requirements for protein and amino acids are independent of environmental temperature. Oxidation of

protein also elevates the heat stress hence it is good to keep protein level low with balanced amino acids. Hence low protein levels (1-2% lower than usual) with higher critical amino acids i.e. lysine and methionine (5-10% higher than usual) is more helpful in managing heat stress.

Minerals & vitamins

The loss of activity of vitamins during storage at high temperature is prime concern during summer which makes it unavailable for bird. Heat stress also disturbs synthesis of vitamin C and absorption of vitamin A and E. Hence to avoid problems of vitamin deficiency due to above stated reasons 20-30% extra vitamins should be provided to the birds. Vitamin C-200-500 gm/ton of feed, Vitamin E- 50 gm/ton of feed should be provided.

Electrolytes

0.5-0.6% potassium and 0.5% sodium bicarbonate should be added to neutralize the respiratory alkalosis and its consequences.

Medication

Proper preventive measures to avoid respiratory and gut health problems should be taken during summer as these two systems are getting more involved. Antimycoplasmal agents (Pharmasin® - Tylosin, Vetmulin® - Tiamulin & Tilmovet® - Tilmicosin) should be provided with proper dose to prevent mycoplasmosis and secondary infection. Anticoccidial program should be well maintained during the summer. As a managerial practice farmer keeps birds off feed during hot period, this lowers the concentration of anticoccidial and infection may occur. To prevent coccidiosis proper anticoccidial programme with suitable molecule should be adapted.

As heat stress causes dysbacteriosis and increases chances of necrotic enteritis probiotics (B-Act® - B. licheniformis) and feed additives (Albac® - Bacitracin, Flavomycin® - Flavophospholipol, etc.) should be given to birds as a preventive measure.

To know more, please contact Huvepharma technical team



Huvepharma SEA (Pune) Pvt. Ltd.

42, 'Haridwar', Road 2 A/B, Kalyani Nagar, Pune 411006

Customer Care Contact: +91 20 2665 4193

Email: salesindia@huvepharma.com

Website: www.huvepharma.com

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Housing System of Poultry

Broadly, poultry housing systems are classified into three systems:

1. Free range or extensive system
2. Semi-intensive system
3. Intensive system

- Deep-litter system
- Slatted floor system
- Slat cum litter system
- Cage system

• **1.Free range system**

- This system is adopted only when

- Cost of housing is least.
- Feed requirements are less since birds can consume fairly good amount of feed from grass land.
- Fertility of soil can be maintained.

• **Disadvantages**

- The scientific management practices can not be adopted.
- Eggs are lost when laid inside the dense grasses unless special nests are provided.
- Losses due to predatory animals are more.



adequate land is available to ensure desired stocking density by avoiding overcrowding.

- We can rear about 250 adult birds per hectare. A range provides shelter, greens, feed, water and shade.
- Foraging is the major source of feeding for birds. Shelter is usually provided by temporary roofing supported by ordinary poles.
- The fields are generally used on rotational basis after harvesting of crops by moving of birds from one field to another depending on cropping programme.
- All categories of birds can be reared in this system.
- This system is most preferred for organic egg production

• **Advantages**

- Less capital investment

- Wild birds may bring diseases unless proper care is taken.

• **2.Semi-intensive system**

- The feeding and watering facilities are provided in the pen. As the name indicates birds are half-way reared in houses and half-way on ground or range, i.e. birds are confined to houses in night or as per need and they are also given access to runs.
- The houses are with solid floors while runs are fields only.
- The success of rearing depends on maintenance of condition of runs to reduce the contamination.
- Runs can also be used on turn basis.
- The stocking density rate on an average for adult birds is 750 per hectare.
- This system is usually adopted for duck rearing



Dr Mehak Jandyal



Dr Jeyapriya S

Dr Mehak Jandyal, Dr Jeyapriya S

Ph.D Scholar, department of livestock product technology, gadvasu, ludhiana

- **Advantages**
- More economical use of land compared to free range system
- Protection of birds from extreme climatic conditions
- Control over scientific operation is some extent possible
- **Disadvantages**
- High cost for fencing.
- Need for routine cleaning and removal of litter material from the pen.



- **3.Intensive system**
- Birds are totally confined to houses either on ground / floor or on wire-netting floor in cages or on slats.
- It is the most efficient, convenient and economical system for modern poultry production with huge numbers.
- **Advantages**
- Minimum land is required for farming.
- Farms can be located near market area.
- Day-to-day management is easier.
- The production performance is higher as more energy is saved due to restricted movements.
- Scientific management practices like breeding, feeding, medication, culling etc. can be applied easily and accurately.

- The sick birds can be detected, isolated and treated easily.
- **Disadvantages**
- Birds' welfare is affected. They cannot perform the natural behaviour like roosting, spreading wings, scratching the floor with legs etc.
- Since they are not exposed to outside sunlight and feed sources, all the nutrients should be provided in balanced manner to avoid nutritionally deficient diseases.
- Chances for spreading of diseases are more.



- **Deep litter system**
- In this system the birds are kept inside the house all the time.
- Arrangement for feed, water and nest are made inside the house. The birds are kept on suitable litter material of about 3" to 5" depth.
- The word litter is used for fresh litter material spread on the floor.
- Usually paddy husk, saw dust, ground nut hulls, chopped paddy straw or wood shavings are used as litter materials.
- This arrangement saves labour involved in frequent cleaning of faecal matter (droppings), however it needs periodical stirring.
- The litter is spread on the floor in layers of 2" height every fortnightly till the required is achieved.

- **Advantages**
- Vit B2 and Vit B12 are made available to birds from the litter material by the bacterial action.
- The welfare of birds is maintained to some extent
- The deep litter manure is a useful fertilizer.
- Lesser nuisance from flies when compared to cage system.
- **Disadvantages**
- Because of the direct contact

between bird and litter, bacterial and parasitic disease may be a problem.

- Respiratory problems may emerge due to dust from the litter.
- The cost of litter is an additional expenditure on production cost.
- Faults in ventilation can have more serious consequences than in the cage system
- **The built up litter**
- Deep litter or built up litter is accumulation and decomposition of litter material and excreta until it reaches a depth of 8" to 12", after an original start of 3" to 5" depth.
- Bacterial action decomposes litter and excreta into crumble form and heat is produced during decomposition which keeps litter dry and warm.
- If the amount of droppings exceeds the litter, fresh litter will be added to lower the amount of droppings.
- Periodical stirring of the litter should be carried out for an effective functioning of built-up litter.
- After one year, the litter is changed and the decomposed litter is used as good quality manure.
- The best built-up litter should be dry, friable and free from obnoxious odour.



- **Slatted (Slotted) Floor System**
- In a slatted floor, iron rods or wood reapers are used as floor, usually 2-3 feet above the ground level to facilitate fall of droppings through slats.
- Wooden reapers or iron rods of 2" diameter can be used on lengthwise of the house with interspaces of 1" between rods.
- **Advantages**
- Less floor space per bird is needed when compared to solid floor system.
- Bedding is eliminated

- Manure handling is avoided
- Increased sanitation
- Saving in labour
- Soil borne infection is controlled
- **Disadvantages**
- Higher initial cost than conventional solid floors
- Less flexibility in the use of the building
- Any spilled feed is lost through the slots
- More fly problem.



• Slat (Slot) Cum Litter System

- This system is commonly practiced for rearing birds for hatching eggs production, particularly meat-type breeders.
- Here, a part of the floor area is covered with slats.
- Usually, 60% of the floor area is covered with slats and rest with litter. Feeders and waterers are arranged in both slat and litter area.
- In case of breeder flock, nest boxes are usually kept on litter area.

• Advantages

- More eggs can be produced per unit of floor space than all solid floors.
- Fertility is better with the slat cum litter house than with the all-slat house.

• Disadvantages

- Housing investment is higher with the slat cum litter house than with the all-litter house.

Combination of slatted floor and deep litter

- 50% slat area and 40% litter area
- Slats on either side of house equidistant each side wall leaving central portion for litter floor
- The area is raised above the concrete floor by 0.5 metres or more to accommodate manure below the slatted area
- Waterers and feeders are placed on the slatted area
- Bird density upto 5-7 per square meter
- Expensive & complicated management

- The separation of birds from the manure beneath the slats commonly results in fly problems.

• Cage System

- This system involves rearing of poultry on raised wire netting floor in smaller compartments, called cages, either fitted with stands on floor of house or hanged from the roof.
- It has been proved very efficient for laying operations, right from day-old to till disposal.
- At present, 75% of commercial layers in the world are kept in cages.
- Feeders and waterers are attached to cages from outside except nipple waterers, for which pipeline is installed through or above cages.
- Auto-operated feeding trolleys and egg collection belts can also be used in this rearing system.
- The droppings are either collected in trays underneath cages or on belts or on the floor or deep pit under cages, depending on type of cages.

• Advantages

- Minimum floor space is needed
- More number of eggs per hen can be received
- Less feed wastage
- Better feed efficiency
- Protection from internal parasites and soil borne illnesses

- Sick and unproductive birds can be easily identified and eliminated.
- Clean eggs production
- Vices like egg eating, pecking is minimal.
- Broodiness is minimal
- No need of litter material
- Artificial Insemination (AI) can be adopted.
- **Disadvantages**
- High initial investment cost.
- Handling of manure may be problem. Generally, flies become a greater nuisance.
- The incidence of blood spots in egg is more
- Problem of cage layer fatigue. (It is a condition, in which laying birds in cages develop lameness. It may be due to Ca and P deficiency but the exact reason is not known)
- In case of broilers, incidence of breast blisters is more, especially when the broilers weight is more than 1.5 kg.



Cage system

Item	Hy-Line W-36, CV-22 or Sonia		Hy-Line Brown or Silver Brown	
Floor Space	All litter	10 birds/m ² /bird (1.1 ft ² /bird)	8 birds/m ² /bird (1.3 ft ² /bird)	
	All slat	12 birds/m ² /bird (0.9 ft ² /bird)	10 birds/m ² /bird (1.1 ft ² /bird)	
	Litter-slat combination	11 birds/m ² /bird (1.0 ft ² /bird)	9 birds/m ² /bird (1.2 ft ² /bird)	
Feeder access	Straight trough	8 cm/bird (3.0 in/bird)	9 cm/bird (3.5 in/bird)	
	Round pans	1 pan per 40 birds	1 pan per 30 birds	
Water access	Nipples or cups	1 per 10 birds	1 per 10 birds	
	Circular automatic water fountain, 46-cm (18-in) diameter	1 per 125 birds	1 per 125 birds	
Nest space	Colony nest, single tier, 1.1-1.4 m (3.5-4.5 ft) width	160 birds/nest (80 birds/side)	150 birds/nest (75 birds/side)	
	Individual nest	8 birds/nest	8 birds/nest	



Alleviating Heat Stress in Poultry With Betaine

By **Orffa Additives B.V.**,
Lien Vande Maele
(Central Technical Manager)



Heat stress in poultry

High environmental temperatures negatively influence productive performances in poultry such as broilers, layers and breeders. The optimum temperature for performance of poultry is likely to be 18- 24°C, depending on age and breed of the birds. If ambient temperature is higher, birds can experience difficulties in keeping their body temperature at normal physiological levels, this is defined as heat stress. During heat stress, body temperature, respiration rate and heart rate of the animals increase. Imbalances occur in the acid/ base metabolism, the distribution of ions throughout the body and the water retention. Moreover, reduced immune functions and increased oxidative stress level are observed. Eventually, severe heat stress will result in the death of the animals.

The level of heat stress in birds varies

depending on temperature, relative humidity, duration of exposure, diurnal variation, housing conditions and acute versus chronic prevalence of high temperatures. From the moment the heat energy produced is higher than the energy that can be excreted by the birds to the surroundings, symptoms of heat stress arise. One of the most obvious symptoms is decreased feed intake. Not only will the feed intake be lower in hot weather, but nutrient digestibility and conversion of the feed in meat/eggs will also be lower. This can be concluded from studies where animals in normal temperature environments are pair-fed the same amount of feed, but outperform their heat stressed counterparts. Impaired gut function and -integrity, inflammatory immune responses and oxidative stress explain this reduced performance. In addition to a decline in feed efficiency, the quality of end products (carcass quality and egg quality) differ significantly between heat stressed and control animals.

For the industry, the detrimental effects of high environmental temperature on poultry lead to considerable economic losses. As the frequency of high-temperature days is expected to increase with climate change and global warming, mitigating the negative impact of heat stress on poultry production will be an important mission.



The functions of betaine

Betaine plays an important role in alleviating heat stress in poultry and has multiple functions which are beneficial to animals experiencing heat stress.

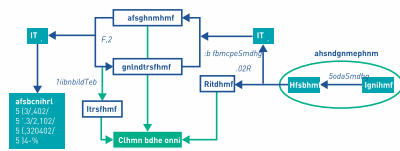


Figure 1: The transmethylation cycle

First of all, betaine functions as a methyl donor in the liver. Endogenously synthesized from choline, betaine donates its methyl-group to regenerate methionine, the central methyl donor in the transmethylation cycle, as shown in Figure 1. When next to the endogenously produced betaine, additional betaine is supplemented to the feed, this can spare the other methyl donors in the transmethylation cycle (choline and methionine) and positively influences the methylation process, improving synthesis of compounds like carnitine and creatine. Thus betaine plays a role in protein and lipid metabolism in the liver. Good functioning of this protein and lipid metabolism is highly important, especially when animals experience (heat) stress and feed intake is impaired.

Next to its role as a methyl donor, betaine is considered to be an extremely effective osmoprotectant for cells. When heat stress causes water and ionic imbalances, betaine helps cells throughout the body to minimize water loss, to maintain cellular volume and to preserve cellular metabolism.

Functioning as an excellent osmolyte, betaine can be surrounded by a hydration shell of multiple water molecules. In situations of cellular dehydration, cells are exposed to osmotic and ionic stress. As a solution, betaine can be accumulated in the cells to maintain the water absorption and cell turgor. Intracellular betaine preserves the osmotic equilibrium and contributes to sustained metabolic processes inside the cell.

Betaine as an osmolyte not only helps the cell in minimizing water loss, it provides stabilizing effects on cellular structures (e.g. protein and DNA-structure). Betaine is universally known

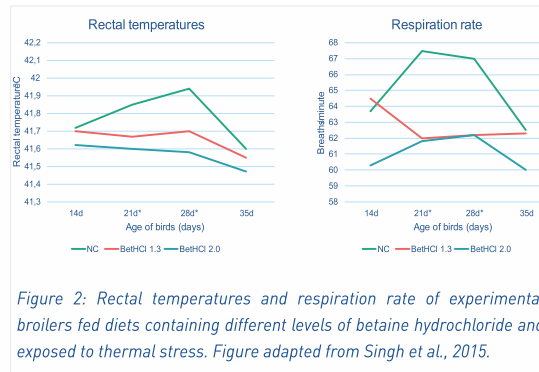


Figure 2: Rectal temperatures and respiration rate of experimental broilers fed diets containing different levels of betaine hydrochloride and exposed to thermal stress. Figure adapted from Singh et al., 2015.

for its unusually strong stabilizing effects on the three-dimensional folding structure of proteins and protects proteins from denaturation and deactivation. The protection of these macromolecules against denaturation, for example caused by high temperatures, allows the cell to maintain its metabolic activities and to continue proliferation. Therefore, to preserve optimal function of several tissues and organs during heat stress, a sufficient availability of betaine is crucial.

Reducing heat stress

High environmental temperature causing heat stress in poultry leads to stressful behavioral responses. Providing birds with enough betaine by supplementing the feed with betaine hydrochloride or betaine anhydrous, can reduce symptoms like panting and even prevent the increase of body temperature. In the study of Singh et al. (2015), broilers were kept at temperatures varying between 28 and 35°C. Betaine hydrochloride significantly decreased rectal temperature and respiration rate on days 21 and 28, both at a dosage of 1.3kg/ton and at 2kg/ton (see Figure 2). The improved capacity of the birds to control their body temperature can be explained by the increased water retention when betaine is supplied, which might increase peripheral blood flow and evaporation, reducing heat stress. Alleviating heat stress symptoms is not only beneficial for animal welfare, it leads to better performance and decreased mortality.

Improving digestion, absorption and nutrient utilization

One of the tissues where betaine establishes its beneficial effects during heat stress is the gut tissue. Dietary betaine increases the betaine concentration in the intestinal

epithelium, stimulating the protection of the intestinal cells against osmotic disturbances. The osmoprotective effects of intracellular betaine preserve the important functions of the intestinal cells such as enzyme production and nutrient absorption. Because betaine also stimulates intestinal cells to continue proliferation, a better conservation of the

mucosal structure of the gut (crypts and villi) can be observed.

It is well known that the process of nutrient digestion and absorption depends on an intact gut epithelium and that this gut integrity is impaired during heat stress. The supplementation of betaine reduces the negative effects of heat stress on the gut and improves the digestibility of nutrients. When feed intake is reduced, an optimal utilization of the nutrients that are consumed is extremely important to keep up performance.

Results on production

Plenty of studies describe the positive results of betaine supplementation on the performance of poultry (broilers, laying hens, quails and turkeys). A lot of these studies were done in environments with high temperatures, indicating the assistance of betaine in alleviating heat stress. In broilers, increased weight gain, enhanced feed intake, improved feed conversion, a higher breast muscle yield and reduced abdominal fat weight are observed. In layers and breeders, betaine counteracts performance losses induced by heat stress. Egg production increases up to 23.6% and there's also an improvement of egg quality. Moreover, a reduction of fatty liver problems and for breeders beneficial effects on reproduction, e.g. increased viability and motility of spermatozoa and improved hatchability, are resulting benefits.

Conclusion

The multiple functions of betaine can improve poultry tolerance to heat stress. Dietary application of betaine hydrochloride or betaine anhydrous, in dosages from 0.5 to 2 kg/ton, is an efficient tool as part of a strategy to counter the negative effects of heat stress in poultry production.

Automation In Poultry Housing



Dr. R. Shirisha

Assistant Professor, Department of Poultry Science, College of Veterinary Science, Mamnoon, Warangal

Highlights Points:

Automation is the technique or system of operating or controlling a process by highly automatic means and reducing human intervention to a minimum or using any machine that performs repetitive tasks with some degree of automation.

Automation is used in many different industrial situations to relieve human physical and/or mental effort while improving efficiency of production. Equally important, automation can work in situations that may be hazardous to humans.

Many tasks in the poultry industry were traditionally labour intensive and involved repetitive actions by people, for example checking birds for health and welfare, feeding birds, collecting eggs and removing manure.

While automation has enabled some of these tasks to be performed more easily to a certain degree, other tasks have been automated completely, reducing the need for close supervision by humans.

Introduction:

Historically, the chicken industry began in New England, USA but quickly moved to the west coast and south of USA, mainly due to the warm weather. The first cage installations in early 1950's as the demand of eggs grew and this need for higher stocking density made early producers think of ways to accommodate more number of birds in the same area. Thus came the first modern battery which was called

Pyramid type batteries or California cage simply because they were first introduced in California. Thus California became the hotbed of American poultry industry and the first multitier cages were produced, allowing to double or triple the number of birds in same house.

Uses of Automation

Provide proper housing for the birds, Transport, handle and pack eggs, Water the birds, Manage environment inside the poultry house, Feed the birds





,Remove poultry manure from the house

Modern Housing And The Beginning of Automation

Up until 1950 layer birds were housed on floors instead of cages, just like broilers. Commercial farming was a new concept and most of the farms were backyard farms with a few hundred birds. Even on commercial farms the birds used to be reared on the floor which caused various problems like coccidiosis. But farmers quickly discover that they could house layer hens in wire mesh cages suspended over a pit to collect droppings. This was well and truly the first step the layer industry took towards automation.

For Metabolism: Water is involved in every aspect of poultry metabolism. It plays important roles in regulating body

temperature, digesting food, and eliminating body wastes. At normal temperatures, poultry consume at least twice as much water as feed. When heat stress occurs, water consumption will double or quadruple.

The Essential Nutrient: Water is often taken for granted, and yet it is probably the most essential nutrient. Water far the single greatest constituent of the body represents about 70% of total body weight. Access to water is very important, and a lack of water for several hours will probably cause a decline in egg production. Hens are more sensitive to a lack of water than a lack of feed.

Amount of Water Needed: Water and food consumption rates are interdependent, so reduced water intake

can also lead to reduced food intake. There are other factors that affect water intake, with temperature being the most obvious one. Water intake is also affected by the type of drinkers used. The rule of thumb for water intake is that water intake is usually 1.5 to 2 times feed intake.

For Digestion: Water in the crop softens the feed so that digestion can occur.

For Egg Production: An egg consists of approximately 75% water and without access to a regular, clean supply of water, a hen will be physically unable to produce eggs. Thus one of the early automations invented for the egg industry was the simple Nipple drinker.

- The main purpose of the drinking systems is the supply of clean, fresh and adequate drinking water to your birds. advantages of an automated drinking system, below listed are the main features:
- Better hygiene ,Better control of water temperature , Minimum of water spillage; The drinking system is easy to clean and flush by means of incorporated manual or optionally automatic flushing system. Easy access for birds to the drinking water. Optimal dosing of medication or other additives to the drinking water. Better control of litter quality (dry) . Lower humidity and less ammonia in the poultry house

Automation – Feeding Systems:

An important part of raising chickens is





feeding - feeding makes up the major cost of production and good nutrition is reflected in the bird's performance and its products. when it comes to egg farming the feeding is even more critical in the Pullet stage than it is during the laying stage

Egg Handling Systems :

Hen health and egg quality are the top two priorities on egg farms all day, every day. Egg farmers follow guidelines to ensure the hens are provided with nutritious feed, clean water, proper lighting and fresh air.

- Light, housing, diet and health are very important to the production process in order to provide high-quality eggs, and therefore, very important to the egg farmer.
- Preserving safety and quality throughout the gathering, inspecting, packaging and handling process is immensely critical and thus so is the need for automation.
- To understand the importance of automation in egg handling let us take a quick look into the process chain of Egg Collection which includes the following phases:

Laying: Hens lay eggs in a controlled environment and are fed a high-quality, nutritionally balanced diet of feed made up mostly of corn, soybean meal, vitamins and minerals to produce quality eggs.

Collecting: Some eggs are still gathered by hand, but in most production facilities, automated gathering belts do the job.

Washing: Although the hen supplies the bloom, a natural coating to protect the porous shell, in nature, the coating dries and is lost. The bloom is also lost through

the egg washing process when the eggs are washed and sanitized.

Candling: The step in the grading during which the farmer (egg grader) looks inside the egg, without breaking it, to determine the quality.

Grading: Farmers classify their eggs by the size, interior and exterior quality at the time it is packed.

Sorting & Packing: Eggs are sorted according to size and should be placed large-end up in their cartons

Climate in poultry houses

The climate in poultry houses influences the well being and health of humans as well as the birds. Respiratory, digestive and behavioural disorders are more likely to occur in houses in which the climatic conditions are not up to standard. The efficiency with which feed is utilised is related to the health status of the flock. Animals that are not healthy cannot be expected to perform optimally. The younger the animals are or the higher their production level, the more sensitive they become to the climatic conditions in the house. Climate can be defined as the sum of environmental factors which influence the functioning of man and animal.

The following Climatic factors must be measured at animal level:

- Temperature
- Airspeed and air movement
- Relative humidity
- Light
- Air-composition

Measuring and assessing temperature

Measuring the temperature is the most common way of assessing the climate in a house. Such a measurement can give a lot of useful information and is not

expensive or hard to do. There are several ways of measuring the temperature:

1. Minimum/maximum thermometer (in every house or section of a house)
2. Temperature sensor (computerized climate control)
3. Thermometers (alcohol, electronic)
4. Infrared thermometers – electronic thermometers

Some other factors which affect the climate of the poultry house

- **Humidity** is controlled by the intense heating or cooling of house air in response to the temperature outside the house. When outside temperatures are low, relative humidity in the house is low, which often results in dry dust circulating in the air within the house. If the relative humidity is too high, this may result in wet litter. The ideal relative humidity for poultry is 60-80%.
- **Air Composition:** The most important components of air are nitrogen (N₂, approximately 79%) and oxygen (O₂, 20.3%). In addition to these main components there are several other gasses such as carbon dioxide (CO₂), and water (H₂O). Birds inhale O₂ and exhale CO₂ and H₂O. In a poultry house some of the other harmful gases are Ammonia (NH₃), Hydrogen sulphide (H₂S), Carbon monoxide (CO), Sulphur dioxide (SO₂). This is why it is important to ventilate the poultry house properly.
- **Dust** is harmful to poultry and has a negative influence on the house climate. The functioning of equipment may also be seriously hampered by dust, including heating, lighting, and ventilation, and dust has also been shown to carry microorganisms. Proper maintenance of poultry houses and regular cleaning creates more comfortable conditions for birds and better working conditions for humans.

Advance Automation In The Poultry Industry

Automation can range from semi-automatic to fully automatic. An example

of a semi-automatic system is the collection of eggs via a conveyor belt system. Although the system may automatically count the number of eggs passing a specific point, the machine does not make decisions about how it should operate.

For example, the back-up of eggs is not detected. Should a problem occur with the egg collection or transfer process, the human operator must take control. Fully automatic capability involves autonomy of decision-making. Returning to the cruise control.

The machine is programmed to respond to the increased egg weight by moving the egg collection belt forward a short distance to reduce the risk that additional eggs don't roll into the pile and cause a problem. At least one automated egg collection system includes sensors under the egg collection belt to monitor egg weight at specific locations.

These are often at critical points such as in front of nest boxes. The information is provided to the machine's computer control system, which has been programmed to estimate the number of eggs at the location based on weight. As the number of eggs increases so does the risk that extra eggs added to the pile may crack or break eggs, thus reducing product quality or quantity.

Some of the most advanced automation systems may incorporate some form of

artificial intelligence, aided by modern computers. One or more sensors provide information to the system's computer which processes the information, using it to make decisions.

Computerised bird performance monitoring system

Best friend of today's multi-tasking farmer

All the information required like:

- a) FCR
 - b) Mortality
 - c) In House Temperature
 - d) Humidity
 - e) Body Weight Of Live Stock
 - f) Egg Counting ...and much more is just one click away.
- Reports & alarm available as text message on your mobile phone.
 - Gives you virtual control over your farm, no matter where you are.
 - Back in India we recently developed a software program called 'Intelligent Egg Flow Control', which is a system that can scan the egg conveyer or the egg collection belt for potential blockages due to excess eggs coming on at the same time and also avoid starvation of the egg conveyer due to lack of eggs. An important benefit of such a system would be that the machine would make sure that egg flow is consistent on every egg collection belt, when the conveyor

belt transports the eggs to the packing area. Thus, the risk that a blockage of eggs could occur on the conveyor belt (with subsequent loss of eggs and labour time for cleaning up the mess) could be greatly reduced.

- A second system that has been implemented is 'Accu-feed System' which uses QTDS technology to accurately measure and discharge required grams of feed per bird in front of every cage box. And apart from discharging the required amount of feed it is also programmable to identify no. of birds per box and discharge feed accordingly.
- Millions of birds (layers and broilers) are maintained in various housing systems, so a reliable, automatic method to improve surveillance of large numbers of the birds is very relevant. Automation may be the answer, but the challenge is to determine the best way for this to be done.
- Traditional industry monitoring technologies
- Through integration of the production and health and welfare measures, farm managers would be able to continuously monitor and micro-manage their birds for optimal health, welfare and performance.



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Jesse Stoops
Product Manager
jesse.stoops@nutrex.eu



Dr. Amit Kumar Patra
M.V.Sc(Animal Nutrition)
Technical Sales Manager-SOUTH ASIA
amit.patra@nutrex.eu



Geert Van de Mierop
Managing Director
geert.vandemierop@nutrex.eu



K. Van de Mierop

Introduction

Arabinoxylans (AX), a non-starch polysaccharide (NSP) and poorly digestible plant cell wall component, is by far the most important anti-nutritional factor in raw materials such as wheat and corn. Due to its abundance, location in the plant material and molecular structure, AX reduces feed digestibility considerably.

Firstly, water-soluble AX will increase the viscosity of the digesta in the lumen, making digestion and absorption of nutrients extremely difficult. Also, unfavorable hindgut fermentation is stimulated.

Secondly, water-insoluble AX is mainly responsible for the entrapment of nutrients making them unavailable for digestion and absorption.

Nutraxe Xyla HS is a highly effective endo-xylanase product with unique characteristics that allows the product to stay active when high temperatures and severe pelleting conditions are used. Nutrase Xyla HS is able to efficiently reduce the anti-nutritional effects of both water-soluble and water-insoluble AX.

The aim of this trial is to investigate the effect of Nutrase Xyla HS to a corn-based diet with reduced energy matrix values on broiler performance.

MATERIALS AND METHODS

LOCATION
AgriVet, India

BREED	GENDER
Cobb 400T/430Y	100% ♂

PARAMETERS DIGESTA D42
Intestinal viscosity (jejunum and ileum)

TRIAL DESIGN	
Total no. of animals	198
No. of treatments	3
No. of repeats	6
No. of animals	11

DESCRIPTION OF DIETARY TREATMENTS		
TREATMENT	DESCRIPTION	DOSAGE
Positive control (PC)	Corn-soy-based broiler diet. The diet was formulated according to the nutrition specification of Cobb 430Y without enzyme supplementation.	-
Negative control (NC)	The positive control diet was reformulated to contain approximately 100kcal/kg, 0.14% and 0.12% less apparent metabolizable energy (AME), phosphorus (P) and Calcium (Ca), supplemented with 500 FTU/kg Nutrase P	-
NC + Nutrase Xyla HS	Negative control diet supplemented with 100 g/T of feed Nutrase xyla HS.	100 g/T feed



INDIAN HERBS ROBUST AND COMPLETE RANGE OF PRODUCTS FOR POTENTIATING ANTIOXIDANT DEFENSE, STRESS TOLERANCE AND IMMUNOCOMPETENCE IN BIRDS

HeatBeat

Power-packed with natural heat stable vit. C, organic chromium complex and mint

Replenishing & Revitalizing Formula

ELECTRO-C

Water soluble concentrate power-packed with electrolytes, natural vitamin C & energy

HERBAL C

Natural heat stable vitamin C and universal anti-oxidant

With Triple Advantage

OSMO C

Natural, heat stable vitamin C with betaine and Phyto-antioxidants



Heat stability

Naturally conjugated phytoconstituents remains highly heat stable at pelletization (upto 130°C)



Universal antioxidant

Antioxidant activity in both lipid and is aqueous phase and is higher than synthetic coated vitamin C



Adaptogen

Helps attaining adaptive homeostasis



Outstanding bioavailability

Provides self replicating, sustained bio-activity and gets fully absorbed in biological system

Heat and oxidative stress

Cellular oxidation

Free radical generation

Cell death and mortality

Immuno-suppression

Increase respiration, alkalosis and compensatory HCO₃ loss

Extreme heat stress adversely affects production, performance and farm profitability

Modern high performing poultry birds face difficulties in coping with heat and other stressors resulting into thermo-intolerance, reduced feed intake, poor growth, FCR, poor shell quality, reduced egg production, hatchability, increased morbidity and mortality. There is a need to strengthen antioxidant defense of birds by supplementing potential antioxidant.

INDIAN HERBS SPECIALITIES Pvt. Ltd.

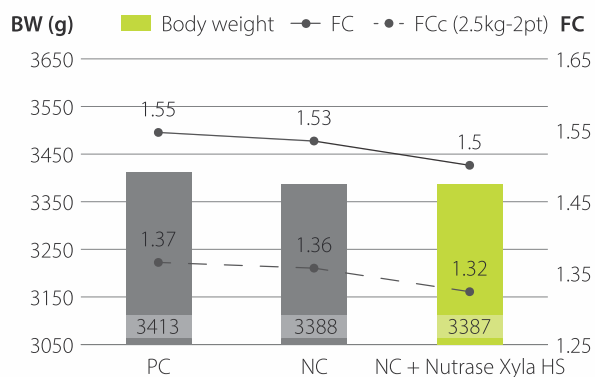
C-215, 2nd Floor, Elante Offices, Plot No. 178-178A, Industrial & Business Park Phase - 1, CHANDIGARH (U.T.) - 160002, Ph. No. 0172 - 5011470, 4181014, +91 9023247217
E-mail : ihspl@indianherbs.org, Website: www.indianherbs.org



	STARTER D0-14		GROWER D15-28		FINISHER D29-42	
	PC	NC	PC	NC	PC	NC
Composition (%)						
Corn	54.13	56.66	56.85	59.52	58.38	62.29
Soybean meal	30.15	29.66	24.96	22.88	22.54	22.04
Full fat soybean	6.00	3.66	8.00	8.00	8.00	8.00
Meat-bone meal	2.50	2.50	2.50	2.50	2.50	2.50
Rape seed meal	-	2.50	-	2.45	-	-
Rice bran	2.0	2.0	2.5	2.0	2.5	2.0
Soybean oil	1.52	-	1.88	-	3.09	0.82
Nutrase P	-	500FTU/kg	-	500FTU/kg	-	500FTU/kg
Nutrients (%) and energy level						
Crude protein	23.0	23.0	21.0	21.0	20.0	20.0
Calcium	0.90	0.78	0.84	0.72	0.76	0.64
Available P	0.48	0.34	0.45	0.31	0.40	0.26
Energy (kcal/kg)	2900	2800	3000	2900	3100	3000

RESULTS

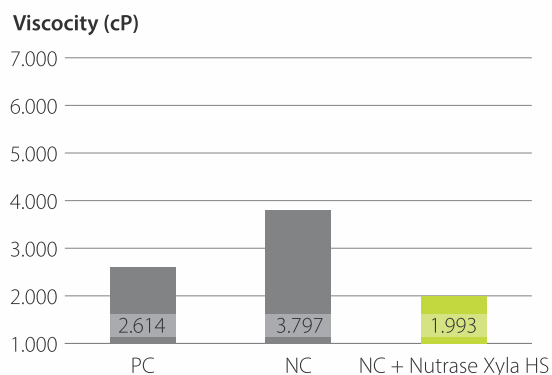
PERFORMANCE DAY 1-42



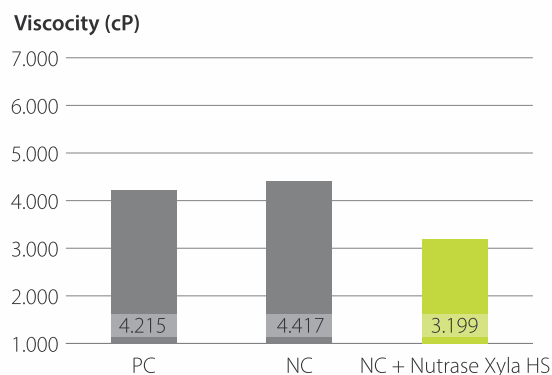
The supplementation of Nutrase Xyla HS to the diet resulted in a positive effect on feed conversion. Specifically, a 5-point improvement in corrected feed conversion (FCc) was observed with the use of Nutrase Xyla HS compared to the positive control group, and a 4 point improvement compared to the negative control group. In this trial, no significant differences were observed in terms of the final body weight.

Finally, although the diet did not contain any high viscosity ingredients, supplementation of Nutrase Xyla HS to diet resulted in a clearly reduced intestinal viscosity compared to both control diets, thereby also improving digestion and litter quality.

JEJUNUM



ILEUM



CONCLUSION

The supplementation of Nutrase Xyla HS improved intestinal viscosity and feed conversion of broilers fed diets with reduced energy levels. Based on these trial results, Nutrase Xyla HS can be supplemented to a corn-based diet with matrix values of 100 kcal AME without detrimental effect on broiler performance.



SAI KRISHNA POULTRY EQUIPMENTS



Deluxe Drinker
(Standard & Large)



Chick Feeder



Chick Drinker



Deluxe
Jumbo Drinker



Feeder



Jumbo Drinker



Gas Brooder



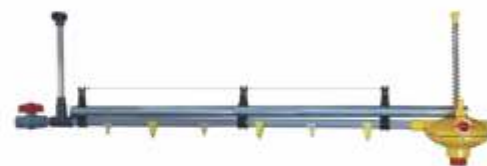
Parent Feeder
Male & Female



Egg Tray



Chick Feed Tray



Nipple Drinking System

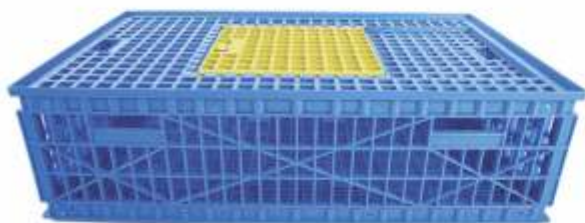
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Bird Transportation Crate



Chick Transportation Crate

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Water Quality Without Worries.

Gerwen Lammers, Ph.D.

Daisy Roijackers, M.Sc.

Marc Spackler, M.Sc.

Carly Vuldere, B.Sc.

Intracare B.V.

Voltaweg 4, 5466 AZ,

The Netherlands

www.intracare.nl

Abstract

Water is an essential nutrient for poultry and a good water quality is essential for good performance of the flock. However, the water quality in farms is often neglected, leading to the formation of biofilm in the pipelines. This biofilm not only contains pathogenic micro-organisms that can transmit rapidly over the entire farm by the watering system. It also reduces the effectivity of water additives like antibiotics and vaccines, and retains and releases residues of these additives for a prolonged period of time. Therefore cleaning (removing biofilm) and disinfection (destroying micro-organisms) should be a top priority. Chlorine derivatives and acid based products only disinfect the water system, but do not break down and remove the biofilm. Intra Hydrocare has this dual property and has proven to be very effective in assuring a long term high water quality. When the incoming water is of good quality and the water

The importance of good water quality

A bird can survive for weeks without feed but only a few days without water. Water is an essential nutrient for many functions within the body, such as carrying feed through the digestive tract and transporting nutrients (vitamins, minerals, amino acids) throughout the body. Additionally, water is required for enzymatic and chemical reactions in the body, regulation of body temperature, lubrication of joints and organs, and excretion of waste products from the body (Jéquier & Constant, 2010). Research has demonstrated that good water quality is essential for flock performance (do Amaral, 2004). Restricting the water consumption of broilers by 10% significantly correlates to a lower feed consumption and a lower weight gain. Furthermore, it has a negative influence on the intestinal weight and villi height of the animals (Viola et al., 2009).

Even though the importance of high water quality in the agricultural sector has been proven, the drinking water quality of farm animals is often neglected. On many farms the drinking water is contaminated with pathogenic bacteria, which can attach to the inner surface of the drinking line and start the formation of a biofilm (LeJeune et al.,

2001). Such biofilm restrains the water flow, causes corrosion and leakages, and contaminates the water with detaching bacteria and other organic material. Additionally, biofilm can reduce the effectiveness of water-added antibiotics and vaccines. Our own studies demonstrate that contaminated water lines can absorb up to 25% of added antibiotics, and research of the Dutch Animal Health Service indicated that antibiotic residues are released from these lines for even 20 weeks after administration (Vijhe & Fabri, 2014)

In the agricultural sector many animals have access to the same water source. This is especially a large problem for the poultry sector, where thousands of animals are housed together. This facilitates a rapid transmission of bacterial diseases caused by *Mycroplasma gallisepticum*, *Escherichia coli*, *Salmonella* spp., *Campylobacter* spp., and *Pasteurella multocida*, viral diseases such as Newcastle disease, infectious bronchitis, infectious bursal disease virus, egg drop syndrome, Marek's disease, and avian influenza, and protozoan diseases by the drinking water system (Australian National Water Biosecurity Manual, 2009 and Do Amaral, 2004).



Disinfection without cleaning is not sufficient

To guarantee a high and consistent water quality, both cleaning and disinfecting are important. However, many commonly used products on water lines only have disinfecting properties (Gomes et al., 2016). Chlorine derivatives (chlorine, chlorine dioxide and salt electrolysis into chlorine and sodium) only disinfect, and acid based products (like acidifiers or peracetic acid) are only able to maintain a constant microbiological status. If a biofilm is present, those agents reacts with the surface and kill or reduce the amount of pathogens on the biofilm, but do not breakdown or remove the biofilm itself. If the water is e.g. chlorinated, micro-organisms will remain inside the biofilm, and pollute the entire water system the moment the chlorine derivative is removed from the water. In addition, the use of chlorine derivatives requires gradually increasing dosage in order to keep the same degree of disinfection.

A more efficient and long term solution is a product that disinfects and cleans the drinking water system simultaneously. Intra Hydrocare is a water-based solution of 590 g/l hydrogen peroxide and activated silver. It has proven efficacy by European biocidal product regulations (BPR) in PT02 (disinfectants), PT03 (veterinary), PT04 (food & feed) and PT05 (drinking water) applications. These registrations also implicate that the product is safe for animals, equipment, and environment. Furthermore Intra Hydrocare has no negative effect on the taste of the water. This is beneficial, because an abnormal water taste can relate to a lower water intake, which is the case when chlorine derivatives or acid products are used. This was confirmed by a recent study in two houses with 52.000 broilers at a multinational integrator in New Zealand. One house was treated with chlorine dioxide and one house with the Intra Hydrocare. The broilers from the house treated with chlorine dioxide were drinking 78 ml/broiler less in the first week and 382 ml less measured at 41 days compared to the broilers from the house treated with Intra Hydrocare. The additional water intake resulted in an improved feed conversion rate (FCR) of 1.5 points and an 77 gram weight gain.

The costs of sanitizing water systems

The water consumption of broilers and layers is 1.8 times higher than their feed consumption, and this increases even further when then outside temperature increases. For a house with 20,000 broilers, the average cost of feed is around € 25,000 (NZ\$ 40,000). Cleaning the drinking system and guaranteeing clean water for the whole round will cost only € 25-50 (NZ\$40-80), which is 0.1-0.2% of the total feed costs. The low costs and the previously described importance of high water quality should make cleaning and disinfecting water systems a top priority.

Intra Hydrocare in practise: dosing 1 day a week

The water quality can be measured by sending samples to a laboratory for microbiological analysis, or by using the Intra Clean Quick scan kit. The last contains a device that measures the ATP content originating from living organisms, which is expressed in relative light units (RLU, table 1).

Table 1. Water quality values in Relative Light Units (RLUs) and their definition.

RLU value	Definition
<70	Suitable for human consumption
<300	Suitable for animal consumption
300 - 500	Monitoring advised
500 - 1000	Action required
>1000	Immediate action required

As can be seen in table 1, RLU values below 300 are suitable for animal consumption. In practise, this is often not the case. A database containing information on the RLU values measured at the nipple of thousands of measuring points in poultry farms in 2015 and 2016, gives an overview of the average water quality. The results (Figure 1) show that

33% was suitable for animal consumption, 23% required monitoring or action and 44% required immediate action because the water was of such poor quality that animal health and performance were affected.

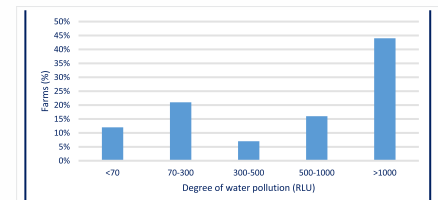


Figure 1. Water quality measured at the nipple in Relative Light Units (RLUs).

The effectiveness of Intra Hydrocare is shown in a case study on a research breeder farm which was categorized to the >1,000 RLU group. With an RLU value of 2,019 before treatment, this farm had a severely polluted water system. The results of dosing Intra Hydrocare at the maintenance level (1 day a week) over a 7 month period are shown in Figure 2. After cleaning and rinsing the RLU values dropped to the level suitable for animal consumption. With the exception of the 4th month, when probiotics and a vaccine were formerly administered, all RLU values are even suitable for human consumption.

Where chlorine derivatives and acid based products have to be dosed continuously, Intra Hydrocare is able to keep a system with good quality incoming drinking water clean with a maintenance dose of 1 day a week after one initial cleaning session. Besides the savings on sanitising product and labour, it also provides freedom for the poultry farmer to dose dietary feeding supplements on the remaining 6 days.

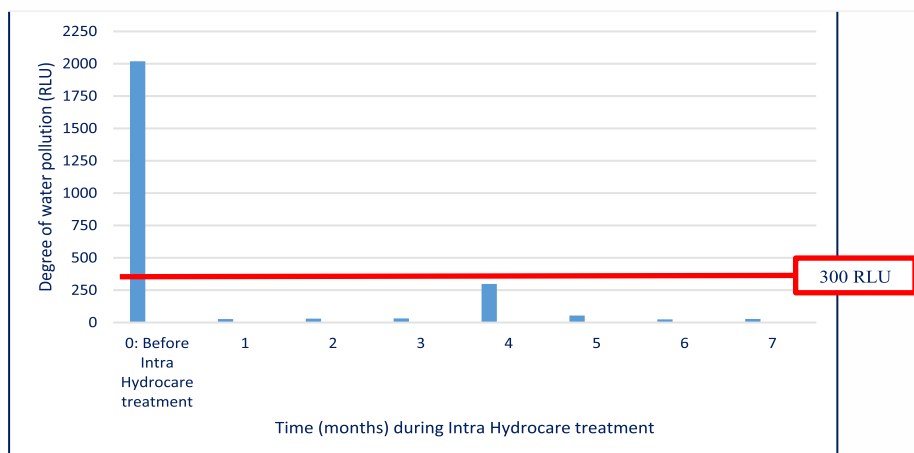


Figure 2. Degree of water pollution in RLU on a poultry farm over a 7 month timeframe before and during treatment with Intra Hydrocare.



Dr. Sharad Durge,

M.V.Sc., M.B.A., Ph.D.

Animal Nutritionist – PAN India

Sapience Agribusiness Consulting LLP

Vitamin D Metabolites for Better Poultry Production and Safe Environment

The better growth and production in poultry require a ration balanced with macronutrients and micronutrient. There are many nutrients required for the growth and development of chickens in which minerals and vitamins are of apex value. Deficiency of minerals and vitamins in feed and its unavailability in the body results into various diseases. Deficiency or unavailability of active form of vitamin D (1-25-dihydroxy cholecalciferol) causes diseases like rickets, stunted growth, osteomalacia, tibial dyschondroplasia (TD), slipped tendon in broilers and growers, and lameness, poor quality egg, broken egg, double yolk, meat spot egg production problem in layer.

Metabolites of vitamin D (Alpha calcidiol) are readily converted into active form of vitamin D (1-25-dihydroxy-cholecalciferol) and active form of vitamin D acts like a hormone. The absorption of calcium and phosphorus in the intestine, reabsorption in the kidney and mineralization and demineralization of the bones (calcium and phosphorus deposition and mobilization in bones) in coordination with parathyroid hormone (PTH) are some of the major functions of the vitamin D hormone (Atencio et al., 2009). For proper functioning of the muscle and nervous system coordination maintaining calcium homeostasis in the body is most essential function of vitamin D hormone (De Luca, 2008). In uterus of laying hens this hormone stimulates the production of calcium binding protein (CaBP) which is indispensable in calcium absorption for shell formation (Corradino et al., 1968).

Vitamin D steroid hormones help in repairing and maintenance of skin health and intestinal microbiota bio balance as well. The level of vitamin D bioavailability is linked to its impact on the gastrointestinal microbiota in

gastrointestinal bacterial genera (Luthold et al, 2017, Garg et al, 2018). Vitamin D hormone plays an important role in the barrier function and homeostasis of intestinal microbiota, and also alleviates the disease progression through anti-inflammatory immune responses. Vitamin D alters the population of intestinal commensals such as Faecalibacterium, Clostridium, and Ruminococcaceae who are the principal producers of short-chain fatty acids and Akkermansia and Bifidobacterium also produce lactate and butyrate (Venegas et al, 2019). Acetate and lactate produced by Bifidobacterium and Bacteroidetes can be consumed by butyrate-producing microbes such as Faecalibacterium and Roseburia (Rios-Covián et al, 2016) used as stimulant of intestinal villus growth (Kien et al, 2007). Butyrate is one of the preferred energy sources over glucose and glutamine by epithelial cells and may account for 70% of the total energy consumption of the enterocytes (Schepach et al, 1994). Hence, butyrate helps rapid cell proliferation in the small and large intestine to maintain intestinal barrier and cell integrity (Guilloteau et al, 2010; Peng et al, 2009). Further the vitamin D hormone also plays a very important role in gene transcription process associated with vitamin D receptors (VDR) in the nucleus.

Birds may receive vitamin D from vitamin D premixes, endogenous production (ultraviolet radiation) and animal by-products (Atencio et al., 2009). But, to produce active form of vitamin D (1-25-dihydroxycholecalciferol) it has to undergo two hydroxylation processes. First 25-hydroxylation in livers (25-hydroxylase, non-regulated enzyme) to transform into 25-hydroxy-cholecalciferol (25-OH-D3) and second 1-hydroxylation in kidney (1 α -hydroxylase, highly regulated enzyme) to



transform into 1-25-dihydroxy-cholecalciferol (1,25-OH₂-D₃) the active form. Liver is a most efficient organ for conversion of vitamin D into 25-hydroxycholecalciferol (25-OH-D₃) but as 1 α -hydroxylase is highly regulated hormone in kidney the conversion of 25-hydroxycholecalciferol (25-OH-D₃) into 1-25-dihydroxycholecalciferol the active form is not an efficient process (efficiency 20%). Further, with increasing age the efficiency of kidney to regulate production of 1 α -hydroxylase enzyme decreased which will directly impact on production of 1-25-dihydroxy-cholecalciferol, the active form of vitamin. Metabolites of vitamin D (1 α -OH D₃) which has been hydroxylated at α -carbon and no further activation in kidney is needed to produce active form of vitamin 1-25-dihydroxy-cholecalciferol. It bypasses kidney hence biological availability into active form is 95%; which is higher than traditional vitamin D (Kappeli et al., 2011). It is scientifically proven that Alpha D₃ has similar biological activity on weight basis to 1-25-dihydroxy-cholecalciferol to stimulation of intestinal calcium transport and bone calcium (Holick and Semmler, 2018).

Metabolites as reservoir for 1,25 (OH)₂D₃

The absorption of metabolites (83.6%) is much higher than traditional vitamin D (66.5%) in the birds. It is ten times more effective than traditional vitamin D hence efficient in the prevention of various skeletal disorders (Bikle, 2021). Vitamin D metabolites are transported in blood by vitamin D binding protein (DBP) (85-88%) and albumin (12-15%). DBP has high affinity for the metabolites of vitamin D which are readily converted into 1,25 (OH)₂D₃ whenever necessary hence serves as a reservoir for the active form of vitamin D in blood.

Following are some of the factors influencing vitamin D hormonal requirement in wherein use of metabolites of vitamin D can solve the problem

Age of bird

Young chicks produce low amount of hydroxylase enzymes required for conversion of vitamin D into its active form up to 14 days of age. However, the growth is rapid at young stage. Unavailability of active form of vitamin D hampers the growth performance in

chicken. Chicks from parents fed deficient levels of vitamin D exhibit lameness and stunted growth irrespective of the vitamin D concentration in their diet (Warren and Livingston, 2021). Whereas, in older birds the activity of the critical enzyme in the kidney declines with age, and so supplementation of vitamin D metabolites is necessary to maintain the production and improve eggshell quality in aged layer diet.

Breed and sex of bird

A high incidence of tibial dyschondroplasia (TD) and poor egg shell quality is observed in different breeds attributed to poor utilization of traditional vitamin D. Supply of metabolites of vitamin D reduce the incidence of TD and improved egg shell quality (Edwards et al., 2002; Han et al., 2017; Warren and Livingston, 2021)

Ultraviolet light availability

Absence of ultraviolet/fluorescent light increase incidence of tibial dyschondroplasia (TD) in birds fed adequate levels of Ca and vitamin D. Requirement of vitamin D for optimum growth and leg health is increased in diets containing the recommended levels of Ca and iP in absence of ultraviolet fluorescent light. It means even though vitamin D is adequate its conversion efficiency is low in absence of ultraviolet light/fluorescent light. Conversion efficiency of metabolites is much higher (Alpha calcidiol 95%) without requirement of ultraviolet/fluorescent light.

Vitamin C

Vitamin C plays a role in the conversion of vitamin D to 1,25-(OH)₂D₃ active form by mediating via 1 alpha-hydroxylase as activator (Cantatore et al., 1991). Vitamin C contributes in stress relieving hence known as antistress vitamin. During thermal stress, majority of vitamin C is utilized to relieve stress by scavenging oxidative radicals. Low availability of vitamin C, less conversion efficiency of vitamin D lower availability of 1,25-(OH)₂D₃. Even if a higher concentration of vitamin D is recommended its bioavailability is doubtful during the summer months.

Calcium and Phosphorus in the diet

Metabolites of vitamin D use in the diets can lower the ratio of Ca to inorganic P (iP) and improves the utilization of

phytate P (Khan et al., 2010). Vitamin D metabolites is known to increase the activity of intestinal phytase in chicken to improve phosphorus absorption and utilization. Diet supplemented with Alpha D₃ improve utilization of phytin P at lower dietary concentrations of Ca and P.

Fat percent

Fat is included as source of energy in the diet because specific dynamic heat production is lower and metabolic water produced on oxidation is more than carbohydrate. High level of dietary fats decreases Ca retention and bone calcification. The formation of Ca and Mg soaps makes these minerals unavailable for and not absorbed through the gut which leads to deficiencies of these minerals. Availability of active form of vitamin D found to make more availability of Ca even at higher level of fat in the diet.

Aflatoxin

Research studies reported plant aflatoxin in the diet interfere with the utilization of vitamin D and increase its demand (Costanzo et al., 2015). Fusarium toxin changes basic steroid structure of vitamin D and reducing availability for further conversion. However, metabolites are in active form and readily absorb into blood. Regular dose of metabolites is sufficient for optimum performance of the bird.

Egg shell formation

Chicken eats during the day however formation of egg shell takes place in the night. Calcium is directly provided by the ionic blood calcium, to supply daily 2 g of shell calcium, of which 40 percent is derived from bone mineralization because of desynchronization between the period of feed intake during daytime and shell formation during the night. This daily resorption of bone is facilitated in hens by the presence of a calcium reservoir, the medullary bone (about 12% of total bone calcium) and role of active form of vitamin D in bone mineralization and Ca and P homeostasis is well known. Continuous supply of metabolites in the diet is necessary for better egg production.

Metabolites of vitamin D utilised lower level of Ca and P in the diet and also improve phytate P utilisation. Lower level of Ca and P reduce the cost of feed and reduce excretion of these minerals into environment to control pollution.



IMPORTANCE OF PACKAGING IN MARKETING OF SHELL EGGS

Dr Mahendra Deshpande - General Manager , Hartmann India Ltd.

The egg comes with its own natural packaging, thanks to the magical attribute of nature. However, in the commercial industry, during transportation, an egg can suffer a lot of damage. Hence it is imperative to use the best handling methods when it comes to such a sensitive product as an egg to avoid shell damage. Many producers make sure that the eggs are protected in layers of packaging and are handled under specialized conditions. But why is it so necessary after all?

Functions of packaging

In a general situation where people might neglect the packaging, it is one of the most important components which ensures that the eggs reach the customers in a single piece. The science behind it is essential to plan a packaging system that would make the storage, transportation, and sale of the product is perfect. Here is a list of things that good packaging can protect the egg from:

- Organisms like bacteria and viruses that might harm the quality of egg.
- Predators.
- Loss of moisture which is essential to maintain the egg quality.
- Tainting of the shell.
- Harsh temperatures can cause damage.
- Complete or partial damage to the eggst caused by various reasons.

Eggs are breathable; the proper handling of eggs might help to control the moisture loss to a certain extent but good packaging would help to prevent it completely by letting the egg breathe too. The material used for packaging is made of such a material that would allow the oxygen to enter without damaging the quality. In this way, the temperature inside the egg would also remain suitable by avoiding any kind of humidity that can enter the shell.

The material quality is very important – while a good packaging material can be reused, it is obligatory to check for the cleanliness and odour factors to avoid issues such as tainting, etc.

In addition to having a clean and odourless environment for the eggs, it is also important that inside the packaging, they can also withstand the shocks caused due to transportation or storage.

In the end, the design of the package is also something that is essential. It is important because the customer would like to recognize the product right from its outer covering. Every informed customer would like to know the contents of the products they are buying to access the quality. This builds customer trust.

Thus, it is important that to provide the best quality of eggs to the customers, a lot of focus must be laid on its packaging. But besides, there are also some extra considerations that you can take a look into:

- Quality Check
- Storage Facilities
- Transportation Type
- The Total Distance to be Covered
- Climatic conditions
- Total time required
- Cost of the overall proces



Egg Packages:

It is also important to take a look at the various kinds of packaging that are possible when we are delivering eggs to our customers. The egg packaging is quite varied when it comes to the design and the kind of material that is used.



Option 1: Basket:

Eggs are packed with clean and odourless packaging that is made from rice husks, wheat chaff, or chopped straw in a firm walled basket or a crate which decreased the risk of any damage. It is however a quite ancient method of packaging eggs.

It is also possible to pack the eggs in a simple basket without any cushioning materials such as straw, etc. But in this case, the damage can occur more easily. This kind of packaging is ideal if the distance is short.

Option 2: Egg Trays:

The very common kind of packaging is a filler tray or more commonly called as Egg trays. These trays are then placed together in a box or a case. This kind of packaging can be seen quite easily in any general situation as it is widely used by egg farmers, traders, and retailers in India. These filler trays are made from recycled paper pulp which is designed for the eggs to fit in comfortably.

They are designed in a way so that they can be stacked on each other while evading any kind of pressure. Another great advantage of these trays is that it gets easy to count the eggs in each box as the quantity for each type of tray is fixed. For example, a standard tray would have 30 eggs and if a box holds 10 trays, the total quantity of the eggs would be 300.

The cases to hold these trays are made out of cardboard and so special attention must be given when stacking them as they can damage the packaging due to excessive overload. Filler trays can also be made out of plastic. There are certain advantages for it too mainly that they are reusable and washable. The filler trays can also be covered with plastic covering as a final package.

Option 3: Size-specific Packaging:

The size of the egg packaging can also be modified for retail sales. Each package can be varied and could hold up to anywhere from 4 to 12, 18, or 30 eggs. These packages can be made from paperboard or molded paper pulp. Even plastic can be used to make such packaging. Just like the trays, it is also possible to pack eggs in small packaging and then cover them with plastic film for more protection.

The smaller egg packs can also be made out of polystyrene and there are many pros to it. It is a superb material as it protects the eggs from odour and moisture besides providing them with great cushioning.

While the use of smaller cases is dependent on availability and cost considerations, these small cases are an excellent choice for retailers and customers. They are very easy to handle and give the opportunity for the customers to inspect the eggs too.

Labelling

When we talk about packaging, we cannot simply neglect labelling as it provides all the important information about the contents of the products to the wholesaler, retailer, and even customers. They are not just a paper on the box but contain valuable information for buyers concerning the size of the eggs, the size of the eggs, the weight and quality as well as the grade description (-AA, A, or B.) These labels might also provide information about the producer of eggs, how to store them, and

their expiration date. An appropriate piece of information on the box can help the customers to build a foundation of trust and persuade them to purchase the product without touching, seeing, or even smelling.

Labels can either be printed directly on the cartons or can be attached to the cartons. A thing that is to be taken into consideration is the cost of labeling. This depends on the kind of method one chooses like stencils or stamps.



Costs of packaging

When calculating the costs of packaging, here are the following expenses that must be considered:

- Packaging Materials
- Labelling
- Labour cost
- Additional working capital
- Changing existing facilities (if applicable)
- Packaging machinery (if applicable)



HARTMANN PACKAGING EGGCELLENT PACKAGING

The objective of our company is to “Think Performance – Raise the Bar.”

How are we the market leaders in effective packaging?

Effective Protection and Saleability

An excellent protection facilitates OTIF deliveries while attractive POS branding and messaging mean fast-moving sales.

Sustainable Materials

Hartmann’s FSC[®], a certified molded fiber packaging is made from recycled paper. Thus the packaging itself can be recycled and reused. The material is also biodegradable for safe and easy disposal after use.

Smooth and Efficient Egg Packing

A thoroughly designed shape that makes egg handling easier means that the whole process of delivering the eggs gets pretty efficient with efficient stacking and low storage requirement.

Consumer Preference

Aware consumers these days prefer environment-friendly packaging that is FSC[®] certified and carbon neutral. The packaging at Hartmann also helps to keep the content dry by absorbing any external humidity.

Link with the customer

Egg cartons represent the link between producers and consumers. The cartons would protect the product from damage during transport and handling, ensuring intact and clean shells. Cartons that are thoughtfully designed works magic for both local and branded products. The inner lids display the nutritional chart while the outer lid carries the FSSAI grade and shield, in addition to other environmentally friendly and welfare logos. It also carries Farm identification, day of packaging, and use-by date.

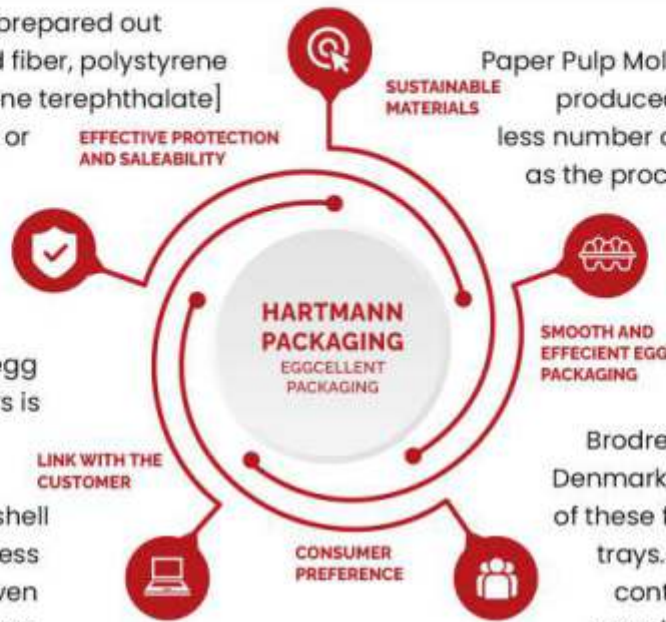
The Cartons may be prepared out of Paper pulp molded fiber, polystyrene foam, PET [polyethylene terephthalate] transparent polymer, or PLA [Polylactic acid] potentially biodegradable material.

The acceptability of egg cartons by consumers is traditionally based on the ability to inspect products for shell integrity and cleanliness at the point of sale. Even transparent PET cartons, which show at least 30% of the shell surface, are opened to confirmed acceptability. The tab or thermally sealed cartons would probably be rejected by Indian consumers. This reality presumes an effective molded closure that allows cartons to be opened at the point of sale to inspect the contents followed by secure closure before transferring it to the shopping cart.

Practical aspects relating to the design of cartons include compatibility with packers and stampers, sizing of the cells, the thickness of partitions to protect eggs from Medium to Jumbo grades, and sufficient rigidity to withstand transportation in cardboard boxes, metal baskets, or racks.

The significant emerging issue in selecting cartons relates to consumer perceptions of sustainability. Cartons that are manufactured either completely or partially from recycled materials are favored by environmentally conscious buyers and consumers.

Paper Pulp Molded fiber cartons are more environmentally friendly than polystyrene foam or PET. Generally, Indian consumers do not understand the triangle recycle codes and often are unaware of the environmental fate of their



cartons. Paper Pulp Molded fiber cartons are produced by a comparatively less number of companies in India as the process involved requires sophisticated equipment, technology & a large scale of production. Hartmann India Ltd, a subsidiary of Brodrene-Hartmann A/S of Denmark, markets a full range of these fiber cartons and Egg trays. Fiber cartons usually contain a high content of recycled materials and are

regarded by consumers as being "environment-friendly". Hartmann has adopted a STEP approach to manufacturing. The acronym is derived from *"Sustainability Tools for the Entire Production Chain"*

The company engineers have analyzed each stage of the production process and have optimized energy utilization.

Molded fiber cartons and trays can be recycled at the waste receiving center. The protective capability of molded cartons depends on the quality of the material used for their fabrication. Soft pulp products, used primarily for low-cost generic eggs, may contribute to breakage through rough handling especially when exposed to water or stored in an environment with high humidity for prolonged periods. In contrast, rigid molded cartons provide protection equivalent to PET cartons. Pulp cartons, on the other hand, offer limited opportunities for printing beyond brand identification and the statutory nutritional information on the underside of the lid. Cartons that allow partial visualization of eggs apparently have a small area for adding labels or possible modifications.

The Bottom Line

Cartons are quite important to the egg industry as they facilitate the mass marketing of a fragile food product. Understandably, the design and outer appeal which projects the image of a product relates directly to costs for material and artwork. Ironically, many consumers purchasing organic eggs favor molded fiber cartons based on their perceptions of sustainability and biodegradability.

It is needless to say that future advances will include higher levels of sustainability and design changes that can improve the shelf life besides making the product look more attractive. Both the industry and carton manufacturers must become more aggressive in their informational programs which focus on increasing awareness about the importance of the environment and sustainability to their



The opportunity:
More and more consumers are choosing environmentally friendly packaging.

customers. The egg industry will have to respond to the rising demands of the major chains, retail stores, and consumers for such environmentally friendly packaging.



April 2022

1. Anuga Food Tec

Dates: 26 -29 April, 2022
Venue: Cologne Trade Fair Center
City: Cologne
Country: Germany
Website: www.anugafoodtec.com

May 2022

1. Fieravicola

Dates: May 04 - 06, 2022
Venue: Cesena Fiera
City: Rimini
Country: Italy
Email: info@fieravicola.com
Website: www.fieravicola.com

2. IFFA / IFFA-DELICAT 2022

Dates: May 14 - 19, 2022
Venue: Exhibition Centre Frankfurt Ludwig
City: Frankfurt
Country: Germany
Email: ingmar.stork@messefrankfurt.com
Website: www.iffa.messefrankfurt.com

3. VIV Europe

Dates: May 31 - June 2, 2022
Venue: Jaarbeurs Exhibition Centre
City: Utrecht
Country: The Netherlands
Website: www.viveurope.nl

August 2022

1. ILDEX Vietnam 2022

Dates: August 3-5, 2022
Venue: SECC, HCM
City: Ho Chi Minh City
Country: Vietnam
Email: panadda@vnusiapacific.com
Website: www.ildexvietnam.com

2. Livestock Asia

Dates: 10 – 12 AUGUST 2022
Venue: MITC Complex
City: Melaka
Country: Malaysia
Email: livestockmalaysia@informa.com
Website: www.livestockmalaysia.com

3. Livestock Philippines 2022

Dates: August 23 - 25, 2022
Venue: World Trade Center
City: Pasay city
Country: Phillippines
Email: rita.lau@informa.com
Website: www.livestockphilippines.com

September 2022

1. Victam Asia 2022

Dates: 7 - 9 September 2022
Venue: IMPACT Exhibition Center
City: Bangkok
Country: Thailand
Website: www.victamasiasia.com

October 2022

1. Sommet-elevage, France

Dates: 4 - 7 October 2022
Venue: Grande Halle Showgrounds
City: Clermont- Ferrand
Country: France
Website: www.sommet-elevage.fr

2. VIETSTOCK 2022

Dates: 12 - 14 October 2022
Venue: Saigon Exhibition & Convention Center (SECC)
City: Ho Chi Minh City
Country: Vietnam
Website: www.vietstock.org/en-us

November 2022

1. EuroTier

Dates: 15 - 18 November 2022
Venue: Deutsche Messe AG
City: Hannover
Country: Germany
Website: www.eurotier.com/de

December 2022

1. EuroTier

Dates: 02 - 04 December 2022
Venue: Myanmar Expo Hall
City: Yangon
Country: Myanmar
Website: www.agrilivestock.net



ORGANIC CHICKEN BY COUNTRY CHICKEN CO



RAISED BY NATURE

The world is shifting toward organic products and the benefits they can offer. **Country Chicken Co, a Hyderabad-based company, has raised high bars as they have become the first brand to exclusively sell high-quality and quality standard organic chicken.**

Country Chicken Co came forward with a simple mission to bring healthy, wholesome, and **flavorful chicken and nutrient-rich eggs** to consumers through their organic chickens. Their main objective revolves around providing consumers with a better and healthier alternative than regular chicken, which will help them connect their roots once again.

Country Chicken Co's Journey started in **2009** when Hemambar Reddy, Founder of the company, and G SaikeshGoud, Founder, and CEO of the company, ventured into the idea of providing the best free-range, antibiotic, hormone-free, organic country chickens for delivering the best quality chicken to consumers and collectively supporting local farmers.

After 12 years of business, Country Chicken Co has been dedicated to delivering the highest quality Country Chicken meat for a better and healthier future. **Their first online delivery platform started in October 2021.**

Hemambar Reddy, having over 25 years of experience in the meat industry, came forward with the idea of CCC. G



RAISED BY NATURE

Saikesh Goud, a BTech&MTech graduate from IIT BHU (Varanasi), has over eight years of business experience in fourteen different states of India. His diverse professional background has led the startup journey as well. Mohd Sami Uddin, Co-founder, and COO of the company, have exhibited experience and management expertise in helping the company reach its peak.

It recently became the first meat company to showcase its brand and products at **Expo 2020 Dubai** through opportunities given by the Federation of Indian Chambers of Commerce and Industry and India and Telangana's government. Earlier this year, Country Chicken Co also opened its first offline outlet at Pragati Nagar in Kukatpally. Their plans include opening 4 more outlets in Hyderabad and will further expand Tier-2 and Tier 3 Cities of Telangana and Andhra Pradesh.

Their "NatuKodi" (organic chicken) includes various kinds of chicken, including country chicken like Kadaknath, which originated in Indonesia, Classic Andhra originated in Andhra Pradesh, Tender Telangana originated in Telangana, and Mysore queen originated in Mysore. The prices range as per chicken breed, quality, and weight.

The main distinction between local chickens and Country Chicken Co's organic chickens is primarily influenced by the quality of feed and rich meal for poultry. A richer quality of meat is made possible by their feed, which typically contains essential vitamins and vegetarian goodness such as tomatoes, aloe vera, sunflower powder, and more.

Country Chicken Co has led down solid foundations such as free grazing for chickens, no force-feeding, no anti-biotics, and steroid for healthy and chemical-free chickens. The orders can be placed through pre-booking and general booking through their website, WhatsApp, and Swiggy for a feasible experience for consumers.

Apart from quality and reach, they have also contributed largely to the employment of farmers committed to bringing good, high-quality country chicken meat to enhance consumers' taste buds. The commitment of Country Chicken Co toward sustainable and organic chicken is noteworthy and an inspiration for the poultry industry.



An Overview Of Cargill's CSR



Cargill has set an example for its generous contribution towards maintaining sustainability and impacting a positive community for people through its CSR. **They have thrived towards adding value for farmers and the agricultural community to a more significant extent, thus incorporating various schemes under CSR.**

In 2020, Cargill devised a Hatching Hope India program for farmers' groups in Mayurbhanj, Odisha. Cargill partnered with Heifer India for executing the program for better connectivity between masses and to enhance the life of poultry farmers.

The main focus and objective of this program were to enhance farmers' income and provide awareness of the benefits of poultry through increased production, promotion, and consumption.

The program's focal point has mainly been to improve farmers' income to close the income gaps and increase producers' community for a better supply in the poultry industry. They also realized that contributing to environmental sustainability by increasing producers' capacity can benefit the environment and economy.

Their initiative also included spreading awareness of improved production techniques and poultry nutrition through mass-market channels so that poultry farmers can take significant advantage of technology.

The organized efforts of backyard poultry benefitted over 30,000 women farmers and 300,000 households together. Throughout the poultry sector, such initiatives have significantly impacted farmers and their livelihood.



Evonik and Nutrition Technologies work together to secure future food supply through insect protein proteins

Evonik and Nutrition Technologies, a Singapore-based manufacturer of insect-derived products, have agreed to jointly conduct a research and development project on the amino acid requirements of Black Soldier Flies (BSF) in Southeast Asia. Insects have great potential as a sustainable protein source to feed animals, with lower greenhouse gas emissions, land use, and water requirements than traditional livestock feed ingredients. The project aims to optimize BSF diets to maximize sustainability outcomes in livestock production while continuing to provide safe and healthy meat.

“The demand for nutritious animal protein is growing sharply in Asia”, says Shreedhar Patel, head of the Regional Platform Asia South in the Animal Nutrition business line of Evonik. “With Nutrition Technologies, we are applying our extensive animal nutrition expertise to explore the most efficient ways to incorporate alternative sources of protein into the food value chain. This should help bolstering food security and availability while minimizing use of arable land and freshwater”.

With the globally recognized knowledge of feed additives that Evonik brings to the project, and the expertise in Black Soldier Fly production from the Nutrition Technologies team, the agreement will accelerate the ability for both parties to deliver optimal BSF protein profiles to enrich animal diets. The research will take place across two locations: Nutrition Technologies' flagship manufacturing facility in Johor, Malaysia, and Evonik's state-of-the-art laboratories in Singapore.

“Evonik and Nutrition Technologies, a Singapore-based manufacturer of insect-derived products, have agreed to jointly conduct a research and development project on the amino acid requirements of Black Soldier Flies in Southeast Asia.”



Press Release of Web Meeting of Maharashtra Co-operative Development Corporation, Pune along with CLFMA

On 9th March, 2022 Maharashtra Co-operative Development Corporation, Pune along with CLFMA Organized Web Meeting from 3:30 pm to 5:30 pm.



CLFMA Chairman Mr. Neeraj Kumar Srivastava delivered the Welcome address and introduced CLFMA to the participants. He thanked all the participants, industry colleagues, CLFMA Members, all eminent speakers, etc for

joining the Web Meeting. Some of the Eminent Speakers were Viz. Shri. Milind Aakre, Managing Director, MCDC who gave an introduction of Maharashtra Cooperative Development Corporation.



The Second eminent speaker, was Shri. Shrushri Siddhi Satpute, Regional Head Rest of Maharashtra and Goa of Receivables Exchange of India Ltd. (RXIL), Pune, who spoke

on "Information of receivable discounting". The third and last eminent speaker was Shri. Ravi Kantimahanti, Director, Agri 10 X, who delivered presentation on the topic "Digital Platform".



Forum was opened for the Q & A Session, questions asked by the participants were satisfactorily answered by the Speakers. The Web Meeting ended with the summarization and vote of thanks by CLFMA

Executive Director, Ms. Chandrika Venkatesh.

The Web Meeting in association with MCDC was appreciated by the participants. Almost 38 participants attended the Webinar. MCDC has shown interest to associate with CLFMA officially to connect CLFMA Feed Manufacturers with the FPOs' who are Maize growers.



We Maharashtra Cooperative Development Corporation, Pune Would like to invite the CLFMA Feed Miller Members for a web Meeting

Agenda of the Meeting

- Welcome and Introduction Shri Neeraj Kumar Srivastava
03:30 PM to 4:00 PM
- Introduction of MCDC Shri Milind Aakre
04:00 PM to 4:30 PM
- Information of Receivable Discounting Shrushri Siddhi Satpute
04:30 PM to 04:45 PM
- Information of Digital Platform Shri Ravi Kantimahanti
04:45 PM to 05:00 PM
- Question Answer Time
05:00 PM to 05:20 PM
- Vote of Thanks Smt Chandrika Venkatesh
05:20 PM to 05:30 PM

Link of Meeting
Meeting With CLFMA (Feed) Members
Wednesday, March 9 · 3:30 - 5:30pm
Google Meet [joining info](#)

Video call link <https://meet.google.com/jxgoitm-adh>





National Conference on Poultry & Poultry Products “Creating an Economically Viable and Sustainable Poultry Industry” 21st March, 2022



Dr. Sanjeev Balyan,
Hon'ble Minister of State of
Fisheries, Animal Husbandry
& Dairying Government of India

Under the aegis of CII and supported by Huvepharma SEA, the 'National conference on poultry & poultry products-creating an economically viable and sustainable poultry industry' was held in New Delhi on 21st March, 2022.

The conference could not have come at a better time for the embattled industry. It has been besieged with seemingly never-ending crises-COVID, bird flu, escalating feed ingredients and logistics cost, so on and so forth. The conference, the first in person, sit down one since COVID hit, served as a platform for the industry to come together, and collectively make representations to the government, policy makers to help alleviate problems faced by the industry.

In attendance were Dr. Sanjeev Kumar Balyan, Hon'ble Minister of State of Fisheries, Animal Husbandry and Dairying Government of India, Mr. Atul Chaturvedi, Secretary Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Dr. O. P. Chaudhary Joint Secretary (NLM) Department of Animal

Husbandry & Dairying, Government of India, industry titans and stakeholders of the industry.

A major and recurring theme in the proceedings was the size of the world population, which is projected to get to 10bn by 2050. More importantly, India will become the MOST populous nation in the world. Feeding this population is going to be a challenge considering the limitations in resources. Food production will have to be doubled, but it will have to be grown in the same amount of land, with lesser amount of water and probably with more expensive inputs. There were more questions than answers questions to which this conference has paved the way for finding answers.

The industry was in agreement that the 'consumer' will emerge as a key consideration and newest stakeholder in the industry. Why? COVID has changed the manner in which consumers shop. Gone is the preference of making a visit to the wet market. It is replaced with clicking 'buy' on the phone, laptop, only after having checked all the label claims. Stores like Nandu's are a manifestation



Mr. O. P. Singh, Managing Director, Huvepharma



Mr. O. P. Singh, Managing Director, Huvepharma



Hon'ble Guests



Audience



Speaker's of the Day



Speaker's of the Day



Speaker's of the Day



Audience

of what the consumers want-hygiene, traceability of meat, processing, storage conditions- the full experience.

Today, chicken is the most common meat served in Indian homes. With improving purchasing power, more disposable income, better awareness associated with benefits of animal protein consumption- its going to hold this position undisputed. So, what do we need to do today to ensure that we satisfy the burgeoning demand of tomorrow?

The panellists emphasised and re-emphasised about the nature of conducting poultry production- it has to be sustainable. Available resources cannot be utilised indiscriminately, with disregard to the ecosystem. Poultry production should be regenerative. And for it to be such requires a large-scale collective effort centred on small-scale farmer success and system level collective impact.

Dr. Sanjeev Kumar Balyan, Hon'ble Minister of State of Fisheries, Animal Husbandry and Dairying Government of India, in his address mentioned that only if there is a farmer, there will be poultry. Integration of small and marginal farmers with poultry production is an area that needs attention. There is definitely a case here for better hand holding and integration of marginal, small & medium farmers with poultry production houses.

The need to guarantee feed safety was highlighted by several speakers. We are ultimately, what we eat...so if what we eat is not safe food, it makes its way up the food chain, creating a considerable risk to human health. It would serve the industry well to embrace the 'food safety culture'-a top down heightened consciousness towards feed safety.

This redirected the focus to food processing. Currently, in India, about 5% of poultry meat is sold in processed form, of which only about 1% undergoes processing into value-added products (ready-to-eat/ ready-to-cook). The poultry processing industry in India is expected to expand at a CAGR of ~ 12% between 2018 and 2023. For this statistic to become a reality, food processing needs to be pushed and encourage for better promotion of chicken protein. Presentations were made by stakeholders

showcasing the various capabilities currently available and those under development for the India market.

There is growing pollution from poultry waste. Poultry operations generate a lot of waste throughout various stages of production. The waste needs to be treated, processed and disposed off or repurposed to limit littering and pollution. Poultry waste management solutions were presented and discussed.

Disease management in poultry was also discussed aggressively. Especially because Avian influenza and other diseases continue to wreak havoc with the industry, eroding its value.

There has been a lot of evolution and innovation in enhancing poultry production efficiencies. One of the sessions deliberated on technology adaptations and innovations leading to increased quality of feeds in terms of nutrition, technology towards environmental control farms, hatchery technologies, automation in processing, innovations in packaging and integration of safety and hygiene that are the essential requirements to produce healthy and nutritious poultry products. The way forward is automation - to limit the degree of human involvement and thus, error, leading to better output. The world is looking to India to claim its rightful place on the world stage as a leading producer of poultry and value added products. As a low hanging fruit, Indian chicken meat should be promoted to targeted countries where meat is imported on a large scale. The panel discussed the deterrents in import of Indian poultry output. Perception, lack of image building and networking, sluggish lobbying were identified as some of the culprits. The answer to which was that the industry should put up a united front. This was reiterated by Mr. Bahadur Ali, Founder and Managing Director IB Group. He said there is strength in numbers, better influencing and bargaining power too.

Mr. Ali expressed his concern about the volatility in pricing of corn and soya, which is depending the cost of production.

Mr. Ram Reddy, Managing Director Sneha Farms requested for FTAs with targeted countries which will act as a

stimulus for exportability of hatching eggs, table eggs, value added chicken meat and egg powder.

A key announcement that was made by Dr. Sanjeev Kumar Balyan Hon'ble Minister of State of Fisheries, Animal Husbandry and Dairying Government of India, was to reactivate the Poultry Advisory Committee. This committee would serve as the conduit between the ministry and industry and function as an effective tool to compile efforts being made by both sides for the betterment of the industry.

Mr. Atul Chaturvedi Secretary Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying and Dr. O. P. Chaudhary Joint Secretary (NLM) Department of Animal Husbandry & Dairying, Government of India, both shared how various government schemes have fared and what new ones have been launched.

The conference presented an opportunity to look beyond problems-tap into opportunities that would shape the future of the poultry industry. As it turned out, there are limitless possibilities and untapped potential. One thing is for certain-the stage is set for explosive growth of the industry in the decades to come.

The principal sponsor of the conference was Huvepharma SEA. Huvepharma is a Bulgaria based multinational specialising in veterinary healthcare with an experience of over 50 years. They are the world's first carbon neutral approach company, revolutionizing the way poultry industry does business. To know more about Huvepharma please visit www.huvepharma.com.



Huvepharma SEA (Pune) Pvt. Ltd.

42, 'Haridwar', Road 2 A/B,

Kalyani Nagar, Pune 411006

Customer Care Contact: +912026654193

Email: salesindia@huvepharma.com

Website: www.huvepharma.com



Suguna Foods Appoints **VIGNESH SOUNDARARAJAN** as The New MD



Vignesh Soundararajan

“**Suguna Foods, India's largest poultry enterprise, announced the appointment of Vignesh Soundararajan as the new managing director.** The position will be effective from April 1st, 2022.”

He will lead the farm, feed, and process food division of Suguna Foods operations in India as a part of his new role. Suguna Foods believes that the appointment of new MD would aid the company's expansion and diversification within the poultry segment and ensure that the brand has a strong presence throughout the nation.

Sundararajan previously worked with Suguna Foods as a Management Trainee and then rose to the role of executive director in Suguna Foods' retail division, which catapulted the retail segment in South India.

The chairman of Suguna Group, on this appointment, commented, “Sundararajan and I are truly satisfied with the transformation we have brought to the poultry industry through Suguna and how we have empowered farmers across the nation. From backyard farming to integrated growers' poultry industry has come a long way in being a significant contributor to the Agro-Food industry.”

He added, “The industry has also played a significant role in building a healthy and strong population. The foundation on which Suguna's legacy has been built and we are confident that Vignesh as the new Managing Director will continue this momentum which will benefit the farmers, industry, customers, partners, and people.”

Launch of millTALK – YouTube Series by Kemin Animal Nutrition and Health South Asia



Video marketing is catching up quickly in B2B sectors. Kemin South Asia has initiated, yet another video content marketing video series in the name millTALK, explainer videos on the concept of feed milling by Sarwar Ali, Marketing Manager.

The series is launched on the YouTube platform and short glimpses of which are being uploaded on Kemin's social media pages. The first episode was on the impact of shrinkage, the loss of material during manufacturing & material handling processes in the feed mill.

- Watch <https://lnkd.in/gRj4w5hk>

The second was on cold mash conditioning and how it helps improve the quality of feed and bird performance

- Watch: <https://lnkd.in/eYVP-UUC>



Zoetis is a global animal health company driven by a singular purpose to nurture our world and humankind in advancing care in animals. We stand by our customers and their businesses by providing solutions across the continuum of care to predict, prevent, detect and treat diseases. The company develops and manufactures animal-health medicines and vaccines for companion animals, dairy, and poultry.

Zoetis provides Vaccines, Anti-Infectives, Disinfectants, Embrex biodevices, MFA, Anticoccidials and Toxin Binders. Today, the company has over 300 product lines globally, operating in more than 100 countries.

Zoetis India is dedicated to deliver quality products for the health of Animals. The Indian poultry market size reached a value of \$ 24 billion in 2021. The industry is further expected to grow at a CAGR of 8.1% in the forecast period of 2022-2027 and to reach a value of approximately \$ 40 billion by 2027. Every industry has its own challenges for growing further. Currently Mycoplasma and E. Coli are the major issues which are bothering the industry most and farmers are losing their profits because of unprecedented level of Mycoplasma and E. Coli in the farm. There are multiple options available in market to tackle these issues, but somehow the farmers are not very happy with current solutions.

Poultry division is an integral part of **Zoetis India**. Since several decades **Zoetis** (earlier Pfizer) has provided several solution against various health issues in the form of vaccines, MFA's (medicated feed additives), Parasiticides and Anti-infective. The trust that has been bestowed by farmers that a product coming from **Zoetis** will be the best in class and will positively impact the bird's performance. Considering this scenario and to address the issues **Zoetis India** launched **LINCO-SPECTIN® 100** on 3rd March 2022. **LINCO-SPECTIN® 100** is introduced under Anti-infective range and has specific action against CRD (Chronic Respiratory Diseases), CCRD (Complicated Chronic Respiratory Diseases) and Colibacillosis.

We are the **1st** to launch it...



LINCO-SPECTIN® 100

A New Approach Towards Prevention of Challenging Mycoplasma Spp. (*M. gallisepticum* and *M. synoviae*) and *E. coli*

LINCO-SPECTIN® 100 launch was the first virtual launch by **Zoetis India Poultry team**. The launch was attended by 168 participant. Launch started with a welcome note by Dr Sandip Joshi (Business Unit Director – Poultry) and Ganesh Vandana. Mr. Hari Prasad (GM – India & BNS) gave opening remarks where he spoke about the Industry and current solutions required for industry. Dr. Arkhom Cheewakriengkrai (Vice president Southeast Asia, India, and distribution North Asia) gave inaugural speech where he expressed his views about care for animal and mankind, customer obsession and how **Zoetis** works for solution providing approach keeping customers' requirements as priority. With small AV the Pack shot of **LINCO-SPECTIN® 100** was unveiled.

Dr. Bhushan Gangurde (GPM – Poultry) introduced the speakers to the participant. We had two eminent speakers for the launch presentation on **LINCO-SPECTIN® 100**. First speaker was Dr Anupam Kr. Srivastav

(National Technical Manager – **Zoetis India & BNS**) who discussed the current challenges in industry, and also presented, how current market is affected by Mycoplasma spp. and E. coli. After sharing all the important market scenario, we have asked our next Speaker Dr. Dieter Vancraeynest (Senior Director Global Commercial Development – Zoetis Inc.) to speak upon **LINCO-SPECTIN® 100** most effective Anti-infective against Mycoplasma

spp. and E. coli. Dr. Dieter highlighted unique features of **LINCO-SPECTIN® 100**, mode of action, dosage, and administration. Both speakers shared lot of data on **LINCO-SPECTIN® 100** and its effectiveness against both M. gallisepticum and M. Synoviae along with E. coli. The data suggested that the combination Lincomycin and Spectinomycin is much more beneficial compared to other molecule available in market. The **LINCO-SPECTIN® 100** has a shelf life of 5 years. **Zoetis India** also recommended use of **LINCO-SPECTIN® 100**. as a cleanup/flushing program before use of Mycoplasma Vaccine Vaxsafe® MG and Vaxsafe® MS.

Zoetis India is very much confident that **LINCO-SPECTIN® 100** along with Vaxsafe® MG and Vaxsafe® MS is definitely new approach towards challenging Mycoplasma spp. and E. coli and this will provide the real peace of mind for the poultry farmers.

For more details on **LINCO-SPECTIN® 100** please contact Zoetis field colleagues



Animal husbandry minister Kuldeep Singh Dhaliwal sees the need for encouraging youth toward livestock farming



On 28th March 2022, Punjab's Animal Husbandry, dairy development, and fisheries minister Kuldeep Singh Dhaliwal directed officers of his office to attract the state's youth to venture into the livestock farming sector. The minister said that measures must be taken by framing a policy at the earliest to encourage youth to join the livestock sector to make the state self-sufficient.

In the first meeting with department officials, Kuldeep Singh Dhaliwal stated that due to the high cost of fodder, feed, and other things, livestock farming is no more profitable; many livestock farmers are shifting towards other sectors. He also added that the state should make substantial efforts to provide high-quality feed and medicines at lower rates to livestock farmers for a profitable business.

As the minister noted, strengthening the

marketing infrastructure is essential so that farmers can more easily sell their livestock and other products like eggs and meat. In this respect, he asked the officials to provide him with a roadmap so that an initiative could be implemented as soon as possible.

According to the minister, horse trading in the state was booming, and many individuals had established stud farms due to growing NRI interest.

Ceva to launch first IB variant vaccine in India



Presently, the disease of infectious bronchitis (IB) is a primary concern for poultry producers in India. Dr Jayaraman K., Poultry Expert India & Subcontinent, emphasized that IB variants are a significant concern for poultry

production. The current standard vaccination program does not suffice to control the problem; therefore, standard vaccination of the Mass strain is common and needs to be combined with vaccinations against IB variant strains.

Ceva has launched two new vaccines to protect Indian chicken producers against IB: CevaClBird and CevaVitabron L. CevaClBird is a live attenuated vaccine that activates a robust immune response against IB virus strain 793 B. The CevaVitabron L vaccine combines the PHY.LMV.42 enterotropic strain of Newcastle disease with the Massachusetts H120 strain of IB.

The combination of the two vaccines, according to Ceva, protects a wide range of global IB strains, including Mass, QX, Q1, Italian, Egyptian, Malaysian, and Taiwanese variants.

The combination increased weight gains, FCR, and decreased depletion in layers and breeders based on trials. The vaccine combination in layers and breeders was shown to be effective primers for an inactivated-IB Massachusetts booster before the onset of lay.

Rapid expansion of processing capacity in India's poultry sector

Alok Raj, the Principal Consultant at

APTEC Technology Consulting, believes India will continue expanding its poultry processing capacity. Raj also addressed Asian Agribiz stating that Asian Agribiz is not only a traditional player that is building new plants but also meat



startups and new entrants. "They are bringing old plants back into operation. At the same time, producers themselves are raising their capacity to supply these startups.

As economies in Asia flourished alongside the demand for animal protein, livestock farming and production in India have transformed automated systems. A report stated that consumers are expected to increase their consumption of poultry meat due to lower prices, product consistency and adaptability, and higher protein/lower fat content.

Changing lifestyles and eating habits in India will benefit the poultry industry shortly. It has taken a decade for the meat and poultry industry to undergo a significant transformation, and organised players have positively impacted farmers.

As a result, government incentives for poultry farmers to adopt modern technologies and become more productive are helping them overcome traditional barriers, such as limited capital, a lack of sufficient understanding of long-term impacts, and difficulty with profit margins.

Professor Geetha-Lakshmi becomes the tamil nadu

agriculture university's first lady chancellor



Professor V. Geethalakshmi received a prestigious honor as she was appointed as the first women Vice-Chancellor of Tamil Nadu Agricultural University (TNAU) by Governor R.N. Ravi on March 28, 2022.

As per the press release, a three-year term will begin on the day she takes office after the governor's

appointment. A report stated that her aim includes making the Tamil Nadu Agricultural University scale more excellent heights.

Having taught for 26 years, Prof. V. Geethalakshmi has a wealth of experience, and she has guided 14 doctoral research scholars. She has generously contributed to universities through her initiatives for signing 11 memoranda of understanding with national and international institutions.

Prof. V. Geethalakshmi is also an author and has written over 11 books and carried out 33 research projects. Her other academic achievement includes 115 research publications in peer-reviewed publications and journals. Additionally, she was influential in creating three new varieties of crops and eight new technologies, and various capacity-

building training programs.

The contribution of Prof. V. Geethalakshmi is significant and can shape the economy at large through profound teaching and rich experience. As Prof. Geethalakshmi noted, she is the first woman in the country to be selected as the Vice-Chancellor of an agricultural university.

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EGG Daily and Monthly Prices of March 2022

Name Of Zone / Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Average	
NECC SUGGESTED EGG PRICES																																	
Ahmedabad	400	400	400	400	400	410	410	390	390	392	395	397	402	405	410	412	415	415	420	425	430	430	433	436	436	436	436	436	400	400	400	400	411.65
Ajmer	341	341	341	341	341	341	343	343	343	355	355	358	363	366	369	369	369	369	369	371	372	372	365	350	350	345	345	335	331	351	351	353.39	
Barwala	351	351	351	351	351	351	351	351	351	357	357	360	363	366	369	371	371	371	371	374	376	376	376	357	350	350	350	333	333	333	333	356.65	
Bengaluru (CC)	390	390	390	390	390	390	390	370	370	370	380	385	385	390	390	390	390	395	395	400	405	410	415	420	420	420	420	420	410	400	396.77		
Brahmapur (OD)	375	375	375	375	375	375	380	380	380	380	380	382	382	384	386	389	392	395	398	400	404	406	406	406	406	406	406	406	386	376	376	387.61	
Chennai (CC)	410	410	410	410	410	410	410	390	390	390	390	390	395	395	400	400	400	405	405	415	415	425	425	425	435	435	440	440	440	440	412.74		
Chittoor	403	403	403	403	403	403	383	383	383	383	383	388	388	393	393	393	398	398	408	408	418	418	418	418	428	428	433	433	433	433	433	405.74	
Delhi (CC)	370	370	370	370	370	365	365	365	365	365	377	377	385	390	390	390	390	390	390	390	390	395	395	395	395	380	375	375	360	360	350	377.39	
E. Godavari	355	355	355	355	355	355	360	360	355	358	361	364	367	370	373	376	379	382	385	388	390	392	394	394	394	394	394	394	375	365	365	372.87	
Hyderabad	340	340	340	340	350	355	335	335	337	340	343	346	349	352	355	358	361	364	367	370	373	376	379	382	384	384	384	370	360	350	350	357.06	
Ludhiana	348	348	348	348	348	348	348	348	348	348	358	358	361	363	367	367	367	367	367	367	374	376	376	366	366	353	346	346	335	333	333	355.68	
Mumbai (CC)	405	405	405	405	405	415	415	400	400	400	405	405	410	410	415	415	420	420	425	430	435	435	440	445	447	447	447	447	435	425	415	420.26	
Muzaffarpur (CC)	400	400	400	400	400	400	400	400	400	405	410	414	414	419	424	424	424	424	424	424	433	433	433	433	419	419	410	405	400	390	390	411.52	
Mysuru	395	395	395	395	395	395	390	370	370	370	380	385	390	390	390	390	393	398	398	403	410	415	420	425	425	425	425	425	425	412	400	399.81	
Nagpur	370	370	370	360	360	360	360	360	360	360	380	380	380	380	390	390	390	390	390	390	397	397	410	410	410	410	410	390	380	370	360	382.39	
Namakkal	380	380	380	380	380	380	360	360	360	365	365	370	370	375	375	375	380	380	385	385	395	395	395	405	405	410	410	410	410	400	400	384.84	
Patna	400	395	395	395	395	395	400	395	395	405	407	407	410	414	414	419	419	419	419	419	429	429	429	429	419	419	405	405	395	390	390	408.26	
Pune	395	395	395	395	395	400	400	390	390	392	395	398	401	404	407	410	413	416	419	422	425	428	431	434	437	439	439	439	430	420	410	411.74	
Ranchi (CC)	410	405	405	405	405	405	405	405	410	414	414	414	419	419	424	424	424	424	424	433	433	437	437	429	429	419	414	405	400	400	416.00		
Vijayawada	365	365	365	365	365	370	370	355	358	361	364	367	370	373	376	379	382	385	388	390	392	394	394	394	394	394	394	394	375	365	365	375.45	
Vizag	375	375	375	375	375	375	375	375	375	375	375	378	380	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	380	380	380	387.03	
W. Godavari	355	355	355	355	355	360	360	355	358	361	364	367	370	373	376	379	382	385	388	390	392	394	394	394	394	394	394	394	375	365	365	372.87	
Warangal	342	342	342	344	354	359	340	340	342	345	348	351	354	357	360	363	366	369	372	375	378	381	384	387	389	389	389	373	363	352	352	361.35	
Prevailing Prices																																	
Allahabad (CC)	390	381	381	381	371	381	381	381	381	386	390	390	390	390	400	405	405	405	414	414	414	414	414	410	405	395	390	390	381	381	393.58		
Bhopal	370	350	350	345	345	345	355	355	355	355	360	365	365	375	375	375	375	375	375	375	375	390	390	375	395	365	365	365	365	365	365	365.65	
Hospet	350	350	350	350	350	350	350	330	330	330	340	345	345	350	350	350	355	355	360	365	370	375	380	380	380	380	380	380	370	360	356.77		
Indore (CC)	375	370	360	345	350	350	360	360	360	360	370	375	375	375	390	385	390	390	390	390	400	400	400	400	380	380	365	355	355	350	350	372.74	
Jabalpur	364	360	345	348	348	353	356	356	345	352	362	364	368	368	370	375	378	385	385	388	388	388	388	380	380	380	365	365	365	365	365	367.71	
Kanpur (CC)	381	381	381	381	371	371	371	371	371	390	390	390	390	400	400	400	400	400	400	400	400	400	400	400	400	400	400	386	386	371	371	387.87	
Kolkata (WB)	440	440	425	425	425	425	425	428	430	433	438	440	442	445	447	450	452	452	452	455	455	455	455	455	455	455	455	433	420	420	420	439.26	
Luknow (CC)	868	403	403	403	400	400	400	400	400	400	410	410	410	417	417	417	417	417	417	417	417	423	423	423	423	423	417	417	413	413	403	403	426.03
Raipur	360	360	360	360	360	360	365	365	365	365	370	375	375	375	375	380	380	380	380	380	392	392	392	395	392	394	370	370	370	355	355	355	372.32
Surat	400	400	400	400	400	405	405	400	400	400	400	400	405	410	415	415	420	415	425	430	435	435	440	445	447	447	447	447	410	410	410	416.71	
Varanasi (CC)	417	406	406	406	397	406	406	406	406	413	420	420	430	430	430	430	433	433	433	433	440	440	440	423	417	417	400	400	400	400	400	417.35	

Editorial Calendar 2022

Publishing Month: January Article Deadline : 30th, Dec. 2021 Advertising Deadline : 3rd, Jan. 2022 Focus : Disease Prevention	Publishing Month: February Article Deadline : 30th, Jan. 2022 Advertising Deadline : 3rd, Feb. 2022 Focus : Nutrition Management	Publishing Month: March Article Deadline : 28th, Feb. 2022 Advertising Deadline : 3rd, March 2022 Focus : Vaccination	Publishing Month: April Article Deadline : 30th, March 2022 Advertising Deadline : 3rd, April 2022 Focus : Heat Stress
Publishing Month: May Article Deadline : 30th, April 2022 Advertising Deadline : 3rd, May 2022 Focus : Cold Chain Mgmt.	Publishing Month: June Article Deadline : 30th, May 2022 Advertising Deadline : 3rd, June 2022 Focus : Feed Production	Publishing Month: July Article Deadline : 30th, June 2022 Advertising Deadline : 3rd, July 2022 Focus : Layers, Cages, Eggs	Publishing Month: August Article Deadline : 30th, July 2022 Advertising Deadline : 3rd, August 2022 Focus : Genetics & Breeding
Publishing Month: September Article Deadline : 30th, August 2022 Advertising Deadline : 3rd, September 2022 Focus : Biosecurity	Publishing Month: October Article Deadline : 30th, September 2022 Advertising Deadline : 3rd, October 2022 Focus : Winter Management	Publishing Month: November Article Deadline : 30th, October 2022 Advertising Deadline : 3rd, November 2022 Focus : Environment Control	Publishing Month: December Article Deadline : 30th, November 2022 Advertising Deadline : 3rd, December 2022 Focus : Industry Outlook

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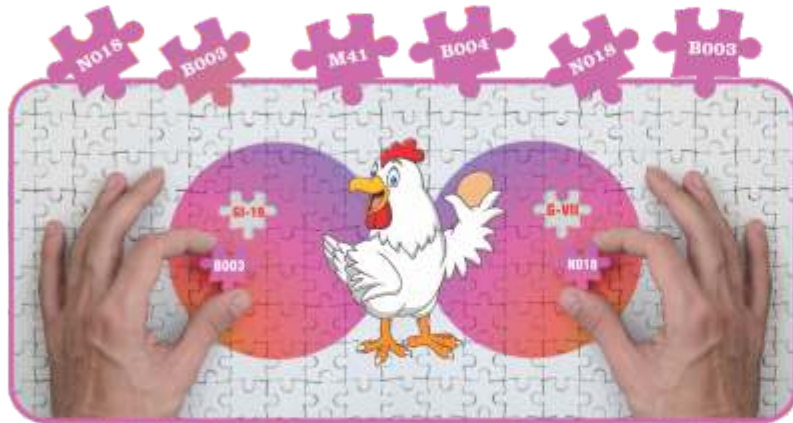
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