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From the Editor's Desk

Pioneering Progress: Genetics and Breeding Transforming Poultry Farming

In the dynamic realm of agriculture, a groundbreaking revolution is unfolding in poultry farming, powered by the remarkable strides made in genetics and breeding. Over the past few decades, these scientific advancements have spearheaded a transformative era, catapulting industry into a new era of efficiency, sustainability, and profitability.

Selective breeding techniques have been used to improve desired features in poultry for a long time, but new developments in genetic research have massively sped up this process. Scientists can now precisely identify and modify the genes in charge of features like disease resistance, growth rate, and egg-laying capacity thanks to cutting-edge genomic technology. Farmers are benefiting from healthier, more productive flocks as a result, which use fewer resources and produce less waste.

The effects of these developments go far beyond increased production. Genetics plays a crucial role in addressing ethical concerns, such as how animals are treated, which have attracted a lot of attention. We are observing a favourable shift towards sustainable and accountable agriculture by establishing more compassionate agricultural methods and reducing dependency on antibiotics.

Furthermore, the impact of genetics and breeding on food security cannot be underestimated. As the global population continues to grow, the demand for nutritious and affordable protein sources surges. Poultry, with its efficient conversion of feed to protein, has become a critical pillar in addressing this challenge, and genetic advancements have amplified its potential to nourish billions worldwide.

In conclusion, the convergence of genetics and breeding is revolutionising poultry farming in unprecedented ways. Through the strategic implementation of cutting-edge technologies, the industry is fostering a sustainable, ethical, and productive future. As we look ahead, it is evident that this pioneering progress will not only reshape the way we farm poultry but also serve as an inspiring blueprint for other sectors seeking to navigate the challenges of the 21st century.

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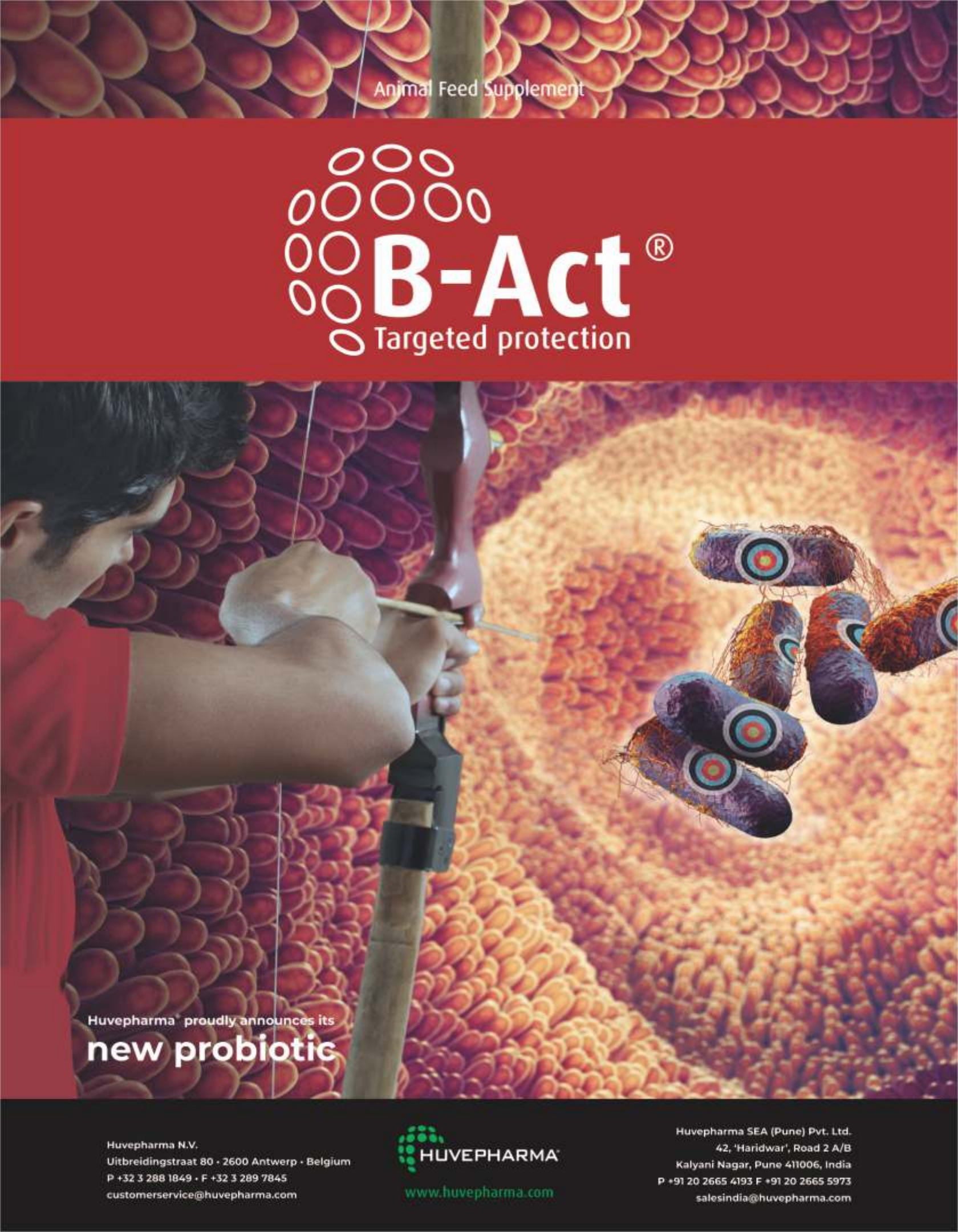

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Life Cycle of Coccidiosis in Poultry and Their Mitigation Strategies

Jai Prakash[1] and B.I. Saini[2]
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Introduction: Coccidiosis is the most common disease of poultry resulting over great economic losses due to mortality in India and worldwide. Poultry coccidia are generally host specific and the different species parasitize specific parts of the intestine. Coccidia are distributed worldwide in poultry, game birds reared in captivity and wild birds.

Aetiology: Nine species of Eimeria have been described that infect Gallus gallus var. domesticus at various locations along the intestinal tract: E. tenella., E. acervulina, E. brunetti, E. hagani, E. maxima, E. mivati,E. necatrix, E. praecox, and E. mitis.Except E. hagani and E. mivati the other 7 causes clinical coccidiosis.

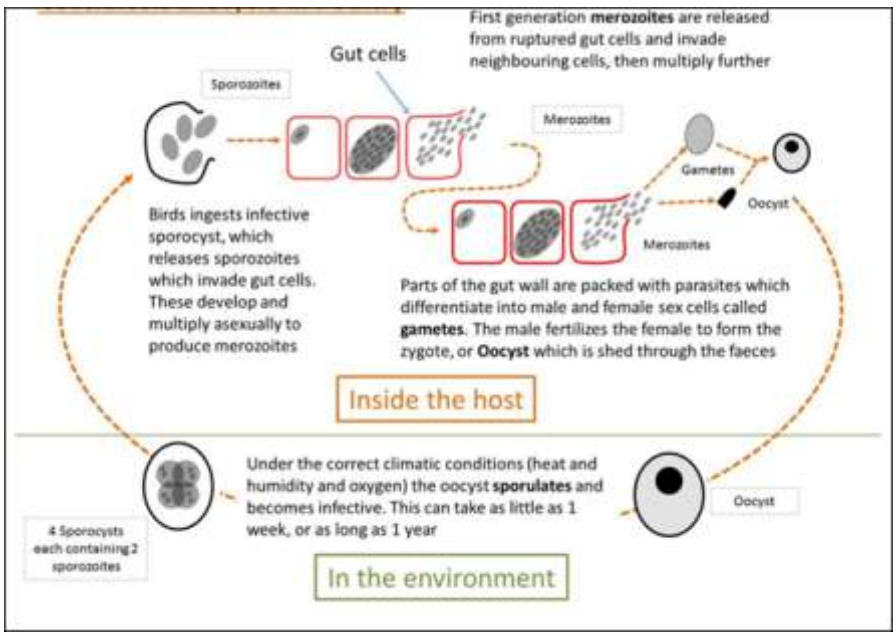
Predisposing Factors: Like improper poultry house management including –

a. High stocking density (overcrowding)
b. Bad quality of litter and unscheduled lighting management
c. Poor nutritional status and age of the birds
d. More antinutritional factors (ANF's) available in their feed
e. Environmental factors affecting the survival of the oocysts. Viz Season (Rainy and winter season management)
f. Number of oocysts ingested by the bird and type of coccidia strain
g. Eimeria developmentalsite within the body of host

Way of Transmission:

- Young chickens pick up the infection from contaminated premises including wet or moist litter, soil, houses, utensils and

Life cycle of coccidia in poultry:



through farm workers etc.

- These premises may have been contaminated previously by other young infected birds or by adult birds that have recovered from the condition.
- Wet areas around water fountains are a source of infection. Oocysts remain viable in litter for many months. In this way, they can contaminate a farm from year to year.
- Oocysts are killed by freezing, extreme dryness and high temperatures.

Pathogenesis: Coccidiosis rarely occurs in layers and breeders as they have generally acquired immunity to this disease. The disease is seen in 3-6 weeks old broilers, before they have acquired immunity. The most virulent strains will cause diarrhoea and a sudden increase in flock mortality. Less virulent strains will result in poor growth and reduced feed efficiency (Poor FCR). The most common and pathogenic form of the disease is caecal coccidiosis caused by E. tenella followed by intestinal coccidiosis caused by *E. necatrix*.

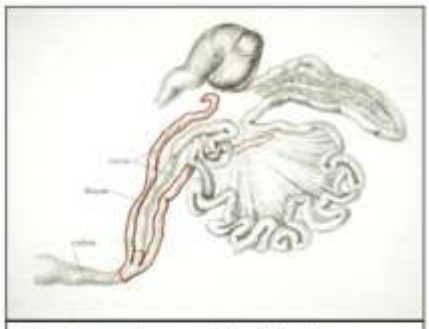


Fig: E. *tenella* parasitized site in intestine of chickens

Fig: Haemorrhagic condition of intestinal wall

Clinical Signs

- Weight loss in birds due to decreased feed and water consumption.
- Decreased growth rate with high percentage of sick birds.
- Severe diarrhoea, bloody diarrhoea
- Decreased egg production
- High mortality (In commercial flocks 25% mortality is seen due to naturally occurring infections).
- Lesions are present along the intestinal tract and often have a distinctive location and appearance that is useful in diagnosis.
- Mild infections may cause depigmentation and potentially lead to secondary microbial infections particularly Clostridium species.
- Survivors of severe infections recover in 10–14 days but never recover lost performance.

Diagnosis

Coccidial infections are readily confirmed by demonstration of oocysts in faeces or intestinal scrapings; however, the number of oocysts present has little relationship to the extent of clinical disease

Prevention and treatment: Depending on the type of poultry production, the approaches for an effective control of coccidiosis are different.

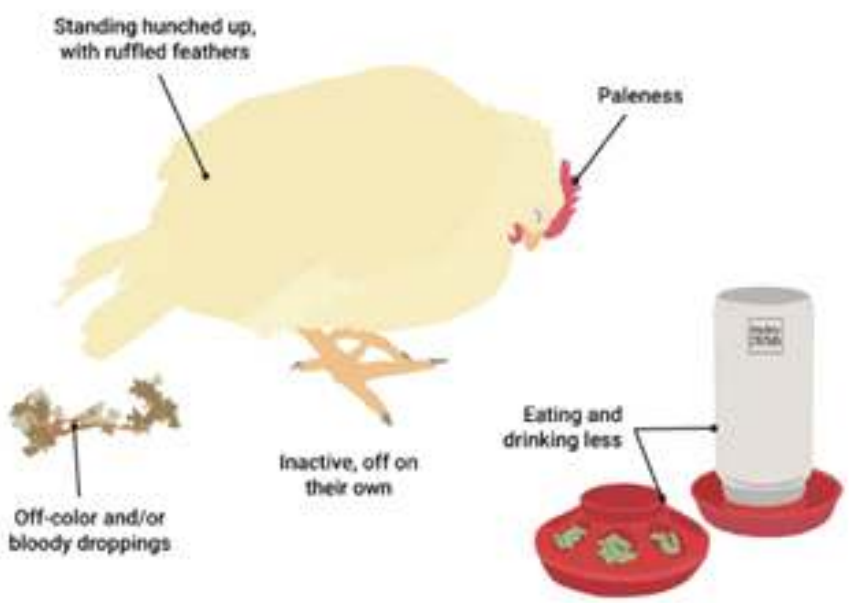
Methods of coccidiosis prevention or treatment –

- Vaccines
- Coccidiostats
- Coccidicides

1. **Vaccines:** Now a days two types of vaccines are used with the aim of controlling coccidiosis -

- Live Non-attenuated
- Live attenuated vaccines.

The main risk of using live non-attenuated vaccines (Coccivac,Immucox, Adventand



Inovocox) is the live parasites that can develop a severe reaction in birds. Many times, their use is accompanied by chemical treatments to control the inherent pathogenicity of the parasites.

2. Coccidiosis prevention by natural feeding sources -

- The supplementation of vitamins A and K promotes the recovery.
- Supplements of skim milk, butter milk or whey were effective in reducing the severity of coccidial infection.
- Polysaccharide extracts from two mushrooms (Lentinus edodes and Tremella fuciformisi, and a herb (Astragalus membranaceus) when given as feed supplement to chickens, significantly enhanced both cellular and humoral immunity to E. tenella.
- **Betaine:** A naturally occurring amino acid derivative, when used in conjunction with salinomycin was found to have a significant effect on invasion by E. acervulina and E. tenella.

Treatment–

It is very difficult to prevent coccidiosis by sanitation alone. Many anticoccidial drugs are available commercially like -

- **Amprolium** use as coccidiostat in poultry and its recommended dose for treatment and prevention is approx. 120 to 240 mg/ml concentration or in feed at concentration of 125 mg/kg feed for 3 to 5 days.
- **Ionophores,** which have an effect on membrane function of the parasite and act as both coccidiocides and coccidiostats (monensin).
- **Quinolones,** which have an effect on energy metabolism of the parasite and act as both coccidiocides and coccidiostats.
- **Coccidiostatic** thiamine analogs, which have an effect on co-factor synthesis for the parasite

Shuttle programs -

- A common practice to partially solve this problem is to use anti-coccidial 'shuttle' programs that rotate through different periods of the bird's life.
- This method has a good chance of eliminating the parasites that demonstrated resistance to a single antimicrobial. A variation of the same principle consists on changing coccidiostats between flocks.
- Most suitable drug is used for starter, while another drug is used for grower and finisher.
- Drug withdrawal period is the most important consideration for drugs that will be used in finisher feeds.

Control by managemental practices

- Ensure high standards of hygiene and sanitation for working persons.
- Keep different age groups birds separately.
- Do close observations of each bird and treat as soon as the first symptoms are seen.
- Ensure that litter is dry but not dusty – avoid any causes of wet litter.
- Keep litter dry round watering points – do not allow drinkers to overflow.
- Ensure good hygiene of feeding and drinking equipment.
- Vaccinate if the risks of disease are high.

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Advances in Nutrigenomics for Sustainable Poultry Production

[1]M. K. Singh, [2]Jinu Manoj, [3]D.K. Singh, [4]Amit Kumar, [5]A. Fahim, [6]Priyanka Rani and [7]Shrey Aditya Saxena

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Nutrigenomics is the scientific exploration of how nutrition affects an animal's genome. In this context, nutrients act as dietary signals that are detected by cellular sensors. These sensors, in turn, impact the expression of genes and proteins. Therefore, the patterns of gene expression, protein expression, and metabolite production in response to specific nutrients can be considered "dietary signatures." Nutrigenomics aims to investigate these dietary signatures in particular cells, tissues, and organisms to gain insights into how nutrition impacts the maintenance of homeostasis, leading to changes in metabolite production. The interaction between an organism and its diet is a close and intricate physiological process involving the coordinated functioning of multiple organ systems working together. The underlying purpose of applying nutrigenomics is to create foods and feeds tailored to match the genotypes of animals. By utilising gene chips that contain the genetic information of animals, one can assess the impact of specific nutritional supplements and how they influence the interactions between genes in the body. The primary objective of nutrigenomics is to modify gene activity, leading to increased activation of beneficial genes while suppressing the activity of detrimental ones. This approach involves the careful selection of nutrients to fine-tune the genes and DNA present in every cell and tissue of an animal. Nutrigenomics, therefore, provides a more comprehensive understanding of how genetic information is expressed and regulated by the dietary composition of feed, encompassing nutrients, micronutrients, and phytochemicals found in the feed.

Notion of nutrigenomics in poultry

Nutrigenomics plays a vital role in poultry production by establishing connections between nutrition and genetics in breeding programmes. It aids in enhancing bird performance, optimising feed efficiency, promoting better health, and improving meat quality. Over the past few years, numerous nutritional programmes have been conducted to investigate the impact of diets during the neonatal and early-life stages.

- Nicotinic acid plays a significant role in lipid metabolism in female chickens and acts as a correlation between the expression patterns of the hepatic genes apolipoprotein A-I (ApoA-I) and

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apolipoprotein B (Apo B).

- Certain bioactive substances present in feed, various trace elements, and vitamins also act as crucial factors for maintaining poultry health. Vitamin E, for example, serves as a transcriptional regulator of genes involved in lipid oxidation and antioxidant expression in broiler chickens. This leads to reduced stress and improved meat quality.
- Algae-based diets can alleviate chicken stress through their positive impact on gene expression.

Table.1 Diet related gene expression in chicken

S.No.	Feed intake	Gene expression
1.	Immunomodulators (Corticosterone, ascorbic acid and 1,3-1,6 β-glucans).	Cytokine gene expression (IL receptors 4 and 15) in spleen-1β, IL-2, toll-like
2.	Comparison of organically grown feed and conventionally grown feed	49 genes were found to be differentially regulated in jejunum. Genes related to immune system (chemokine ah221, B-G protein, immunoglobulin heavy chain) were also differentially expressed
3.	Mannan-oligosaccharides in feed	Expression of 77 protein synthesis gene, including superoxide dismutase 1, lumican, β 2-microglobin, apolipoprotein A-1, fibronectin 1 etc.
4.	Poultry feed containing lead	Different gene expression in two groups: Yellow-Feathered nutrient (HN and LN) Chicken (WYFC) and White Recessive Rock Chicken (WRRC). The gene expressions of Rheb, TOR, S6K1 and 4E-BP1 in muscle were the highest in the WYFC fed with low nutrient LN diets are optimal for the long-term housing of chickens

The gut system and the antibiotic dilemma

Transcriptomic analysis of intestinal tissue or the intestinal mucosa leukocytes has revealed the efficacy of certain compounds on the GIT immune response and protection. Examples of such compounds include carvacrol, cinnamaldehyde, and oleoresin from Capsicum spp., as well as anethole, garlic metabolites, and turmeric. These substances can modulate the immune response and contribute to the overall health of the gastrointestinal tract in poultry. These compounds have the ability to influence the expression of genes involved in immunity and various physiological processes, such as energy and protein metabolism. This supports the idea that phytochemicals derived from plants possess immune-enhancing properties in chickens.

Prebiotics, such as yeast cell wall products, have been shown to regulate the expression of genes related to oxidative phosphorylation and other important cellular stress response genes in jejuna tissue. When compared to a common antibiotic (bacitracin), gene expression profiles in broilers supplemented with yeast cell wall products revealed activation of biological functions and pathways related to improved health and metabolism. In the research focusing on the enterocyte proteome in broilers fed Enterococcus faecium, it was discovered that there were various proteins with different expression levels associated with the immune and antioxidant systems. This finding suggests that these chickens required fewer nutrients and less energy to cope with immune and antioxidant stresses (Luo et al., 2013). These recent findings from nutrigenomics studies present promising opportunities for developing effective drug-free alternative strategies for

controlling poultry infectious diseases.

Gene expression-transcriptomics

Transcriptomics provides valuable insights into gene expression patterns, but careful data analysis is essential to drawing meaningful conclusions about the effects of nutrient intake on biological processes. One notable advantage of RNA-seq over microarray approaches is that it does not require prior knowledge of the transcripts present in a sample. Microarrays, on the other hand, need to include known transcripts in their construction. RNA seq involves high-throughput sequencing of cDNA derived from polyadenylated RNA, and gene expression levels are quantified through transcript counting. As a result, RNA seq serves as a powerful discovery platform, identifying the majority of transcripts expressed in a given sample.

Targeted microarrays to intricate relationship between nutrition and gene expression

North Carolina State University designed a focused array with 320 carefully selected long oligonucleotides, enabling accurate measurement of key genes and pathways of interest. This customized array allows for high replication numbers, making it a valuable and cost-effective resource for investigating expression patterns in specific genes. It offers a more efficient and targeted approach to studying gene expression in the areas of interest.

By incorporating replicates in microarrays, the increased power of sample size significantly impacts the identification of differentially expressed genes, as evidenced by comparison with other analysis methods. The targeted microarray approach study allows for detection limits as low as ±7%, making it possible to identify and measure extremely small differences in gene expression. The level of accuracy achieved in measuring gene expression for this number of genes surpasses any current technology, considering the cost involved.

Conclusion

Embracing these advanced technologies and methodologies will pave the way for groundbreaking discoveries in nutritional science, leading to a more comprehensive understanding of the impact of nutrition on health and disease. As research progresses, it will be essential to continue refining bioinformatics tools and capacities to fully harness the potential of these advancements in the field of nutrition. In recent years, microarray technology has been widely used in nutrigenomics research for improving food production, quality, and safety in dairy and meat industries. This technology allows for the simultaneous screening of numerous genes, providing a comprehensive view of gene expression patterns. Additionally, it sheds light on complex regulatory interactions, such as the relationship between diet, nutrients, and genes

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Feather Pecking: Prevention and Management

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Introduction: Feather pecking poses some of the greatest welfare and economic threats to poultry production. Feather pecking is a behaviour where one hen uses her beak to peck at the feathers of a conspecific. The genetic traits for feather pecking and egg productivity are positively correlated, so as breeding companies have selected hens for high productivity, they have also increased the prevalence of feather pecking behaviour in the population. Nothing could be more frustrating and devastating than looking at your birds involved in feather pecking and eating in an aggressive manner.

Feather pecking can be divided into two distinct types: gentle feather pecking and severe feather pecking. The location on the body where the peck is received can facilitate an understanding of what type of peck is being performed. Gentle feather pecking involves the feathers being gently pecked at or nibbled and can be subdivided into pecks to various feather targets that are thought to be driven by exploration and repeated pecks to a single location on a feather. Gentle feather pecks can be characterised as light, repeated pecks at the feathers on the tail, wings, back, and neck of the hen. By contrast, severe feather pecking involves the vigorous pecking at and possible removal of feathers. Severe feather pecks can be characterised as hard, fast, and singular pecks on the tail, back, vent, and neck of the hen. It is severe feather pecking that constitutes the greater welfare concern. This detrimental behaviour is difficult to control and can damage feather cover, decreasing feed efficiency, as well as increasing the probability of injury and potential cannibalism. Once feather pecking behaviour begins, it can be difficult to stop, and mortality due to feather pecking and cannibalism has been reported to reach up to 30%.

Importance of feather cover for chickens:

- Beauty to behold, well feathered bird makes a good pet, very attractive especially for children and chicken pet lovers alike.
- Feathers are involved in temperature regulation and play an important role in providing protection against outside weather, and physical injuries
- Good feather cover reduces the cost of feeding as less feed is required to keep the bodyworm. Many times, feather pecking can damage the feather cover of the hen, resulting in increased feed costs of up to 40%.
- Feathers are helpful for dustbathing and preening.
- Feathers are used for flight and buoyancy, as seen in waterfowl, turkeys, guinea fowl, etc.

Causes of Feather Pecking:

- **Poor nutrition:** Especially in laying hens, this can be a result of inadequate protein and fibre in their diet, which could trigger this behaviour in order to make up for the inadequacies.
- **Stressor:** e.g., heat stress, cold, disease, transportation, mixing, removal of litter, etc. Chicken houses poorly built can lead to discomfort for the birds, which can trigger aggressive feather pecking. Heat, cold, disease, and a lack of adequate amounts of feed and water can result in feather loss and poor feathering in your birds. Poor health (e.g., injuries, red mite, and worm burdens) is also associated with increased feather pecking. Hens who have experienced litter and subsequently had that litter removed or experienced a lapse in litter availability responded strongly and negatively to litter removal, as demonstrated in their increase in feather pecking behaviour. Further, birds with restricted access to litter to prevent floor eggs were more likely to perform feather pecking. Therefore, regular removal of litter from hen housing may stimulate feather pecking, and the risks associated with feather pecking should be weighed against the benefits associated with litter removal.
- **Inability to exhibit natural behaviour:** Common with birds kept

in cages and in confinement Without litter material for dust-bathing, perching exercise, etc., free-range birds are less prone to feather pecking and eating. Stocking density has been observed to influence feather pecking behaviour. Small flocks housed at high density were observed to perform more feather pecking than larger flocks at lower densities.

- **Absence of good litter:** Providing quality litter is vital for foraging behaviour and for the birds to exhibit natural behaviours such as dust bathing. Feather pecking is thought to be redirected foraging or ground pecking behaviour as a result of frustration. The absence of good litter or capped litter causes frustration, and the birds then need to find something else to forage on to relieve their frustration and boredom. This situation could lead to feather eating and pecking.

Other causes: Other causes of feather loss can include damage to feathers by equipment in the house, especially on the head and neck, and high levels of egg production.

Prevention and Management of feather pecking:

- **Space:** Provide ample space to help minimise competition among feeders, drinkers, and nest boxes. Prevent equipment from causing wear on feathers.
- **Access to the outdoors and range:** Hens with access to more or longer pop holes are provided with feed scattered on the floor and have lower rates of feather pecking. Rates of gentle feather pecking decrease with range use, and increasing range use may also reduce severe feather pecking.
- **Providing perches:** Providing perches is important to hen welfare. Less feather pecking was observed in flocks with access to perches as well as substrate for foraging and dustbathing. Providing perches not only provides the hen with skeletal and muscle health benefits but also facilitates hen movement and encourages natural hen behaviour irrespective of housing conditions.
- **Feed management:** Feeding high-fibre, high-protein, low-energy diets, or roughages reduced feather pecking. Protein is an essential element of the diet, and several studies have highlighted a link between inadequate dietary protein and injurious pecking. Good layers use a lot of protein in producing eggs; as a result, feed with poor protein content could affect feather cover and encourage feather eating and pecking as the birds will always want to improvise. Feed that is poor in fibre can increase the level of feather pecking and eating, as the birds will want to replace the inadequate fibre in their diet with feathers.
- **Air Quality, Lighting, and Temperature:** Birds are very sensitive to changes in their environmental conditions. Providing a constant and regulated lighting environment and an appropriate thermal comfort zone is an important component of mitigating feather pecking behaviour.
- **Biosecurity and Disease prevention:** Prevent and control disease and pest challenges, including red mite.

Others: Routinely inspect your birds calmly and frequently to help them reduce stress and fearfulness among your flock. Try to always maintain dry, friable litter at all times; occasionally rake and add fresh litter; use good absorbent litter material. Always inspect water drinkers for leakages and breakages and replace promptly to avoid wet and damp litter. One of the commonest causes of injurious pecking is change." Make any changes gradually, especially in housing, facilities, and feed.

Conclusions:

Feather pecking is a worldwide animal welfare and economic problem. For the prevention and management of feather pecking, the welfare of the birds has to be taken seriously. This includes their quality feed, disease control, and housing facility. The beak trimming can mitigate the damage from feather pecking. The production environment should be constructed in such a way and manner that any stressor that could increase feather pecking is eliminated or reduced to the barest minimum, such as the introduction of perches in their shed, adequate ventilation, and good and quality absorbent litter material for dustbathing and preening, helping the birds to exhibit natural behaviour.

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The Unique Approaches for Antibiotic Free Poultry Production

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The Government of India recently issued a comprehensive ban on the use of antibiotic growth promoters (AGP) in layer feed, as stated in a notification published on February 27, 2023 (GOI, 2023). This move comes in response to the presence of antibiotic residues in animal-based food and the subsequent adverse effects on human health, particularly regarding antimicrobial resistance (AMR). Recognising the urgency of the matter, India had already officially banned the use of AGPs with a withdrawal period back in 2012. AMR poses a significant concern for both animal and human health and has become a pressing global issue. Several countries took action against AGP use in the late 19th century, acknowledging its threat to human health. The countries that have banned AGP use in feed are listed in Table 1.

Despite the ban on AGP use in animal feed, there is still a considerable use of antimicrobials in food and animal production. China (23%), the United States (13%), Brazil (9%), India (3%), and Germany (3%) are the top five consumers of antimicrobials for food and animal production. Globally, India accounts for 3% of

Table 1. Countries imposed ban on use of antibiotic growth promoters

Sr. No.	Country	Year AGP use restricted from	Remarks
	Sweden	1986	Ban of sub-therapeutic AGP in feed
	European Union	1997	Avoparcin banned
	Denmark	1998	Sub-therapeutic in feed AGP banned
	Holland	1998	Olaquindox banned
	Switzerland	1999	Sub-therapeutic in feed AGP banned
	Philippines	2000	Olaquindox, carbadox, nitrofurans and chloramphenicol banned
	European Union	2006	Complete ban on sub-therapeutic AGP used in feed
	Thailand	2006	All AGP banned in line with EU
	Bangladesh	2010	All AGP banned in new feed act
	South Korea	2011	All AGP banned
	India	2012	Official ban with AGP withdrawal periods
	Japan	2013	Monitoring by WHO on ban of AGP use
	Canada	2014	Elimination of preventive use of category I antibiotics
	United States of America	2017	Official AGP ban
	China	2020	Official AGP ban

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Staphylococcus Aureus

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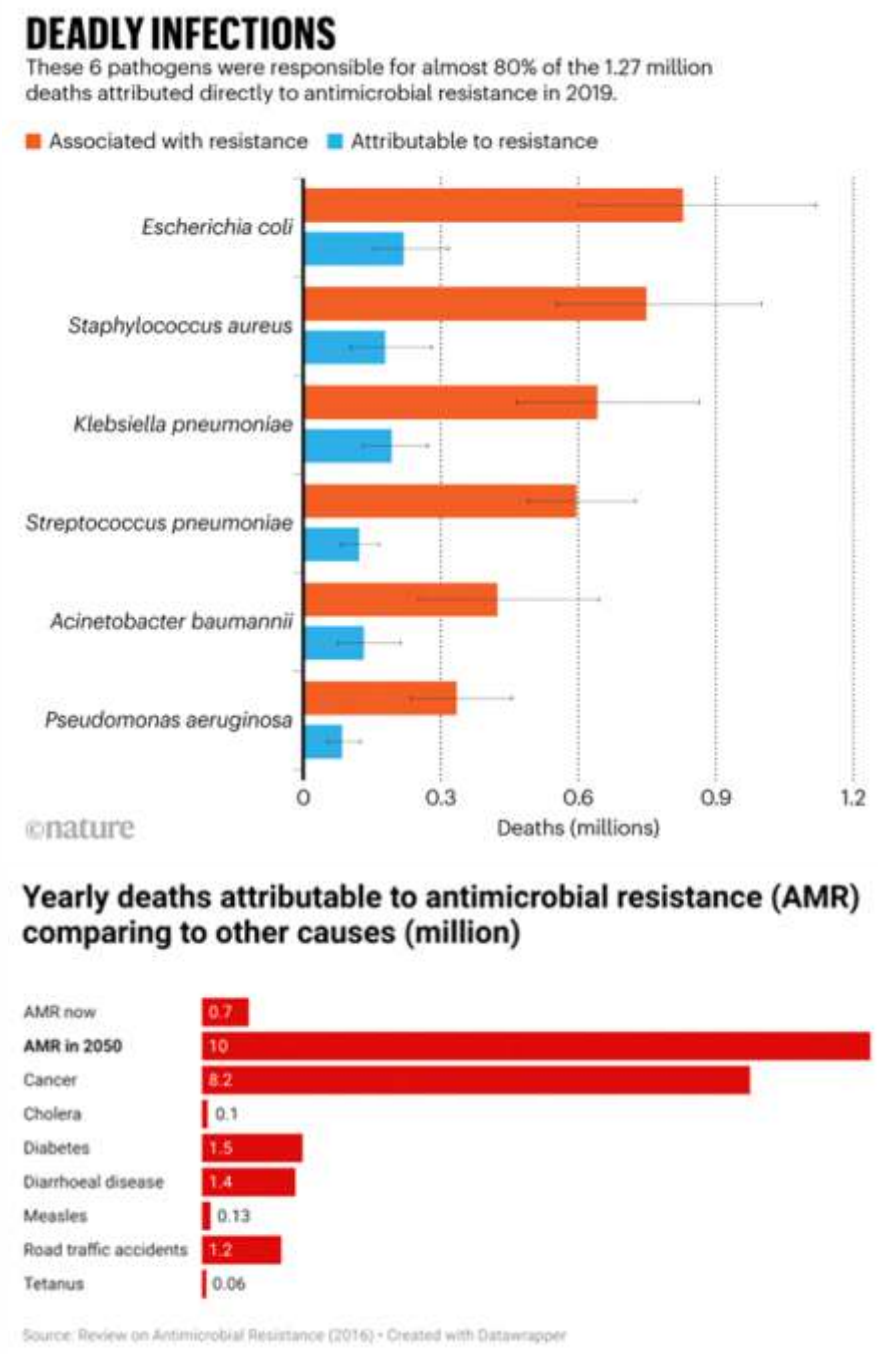
global consumption and ranks among the highest consumers worldwide. Penicillins, tetracyclines, and quinolones are the most widely used antibiotics globally, with higher usage in countries with meat-heavy diets. The use of antimicrobials in animal feed is projected to increase by 82% in India by 2030, with a specific tripling in their use in chickens.

The use of antibiotics in poultry began decades after the discovery of penicillin in 1928, primarily to treat parasitic and bacterial infections and enhance growth efficiency. Sir Alexander Fleming, the discoverer of penicillin, warned in a 1945 interview with the New York Times about the potential consequences of misusing penicillin, stating that "microbes are educated to resist penicillin." Antimicrobial substances, produced by microorganisms, existed long before their use as medicinal drugs. These substances were created by microorganisms to kill other microorganisms, establishing a foundation for their own survival and propagation. This concept aligns with the principles of survival of the fittest, making it unsurprising that antimicrobial resistance has likely existed for as long as bacteria have. Bacteria exposed continuously to antimicrobials develop strategies for survival, and the development of resistance is one such strategy. While antibiotic resistance is a natural phenomenon, the misuse of antibiotics in both humans and animals accelerates the process, as emphasized by the World Health Organization (WHO). Continuous antibiotic use for enhanced production and growth efficiency exposes resident bacteria to these antimicrobials for prolonged durations, leading to antibiotic resistance.

Originally, it was believed that acquired resistance in bacteria only occurred through mutation in existing genes, confining the resistance trait to the mutant clone and limiting the spread of resistance to that clone (vertical transmission). However, in the 1960s, it was demonstrated that resistance could also develop through the acquisition of existing genes. In this case, the resistance trait, facilitated by mobile genetic elements, can spread to other bacterial clones, bacterial species, and even other genera (horizontal transmission) (Amabile-Cuevas and Chicurel, 1992).



Review on antimicrobial resistance (2016).

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Bacteria's highly adaptable nature enables them to develop resistance to existing antibiotics, leading to a concerning cycle where the search for more potent antibiotics becomes increasingly expensive. Without intervention, the rise of superbugs poses a significant threat to human health, causing millions of deaths annually, with the numbers still rising.

AMR becoming the major threat predicting it will be the cause of highest deaths in 2050.

Achieving antibiotic-free poultry production is not an easy task. Once AGPs are banned, there are several challenges that need to be addressed in the future. Some of these challenges include: 1) preventing birds' exposure to infectious agents; 2) effectively treating disease occurrences; and 3) controlling infectious diseases through immunological means. Avoiding exposure to infectious agents is extremely challenging. Post-outbreak treatments have variable effectiveness, depending on different physiological parameters and environmental conditions, but are generally less effective than preventive control. Immunological methods to control infectious diseases have recently gained attention as an ideal way to safeguard against subclinical infections. However, there has been limited success in protecting animals against bacterial pathogens that affect the intestinal and respiratory tracts using these methods.

Certain common checkpoints are affected when transitioning to antibiotic-free poultry production, such as poor gut health, reduced bird immunity, and decreased growth performance.

1. **Gut health:** The gut is a vital organ for nutrient utilization and overall health. A healthy gut involves more than just the absence of clinical diseases; it is about sustainably producing birds that can reach their full genetic potential. The absence of AGPs leaves birds more susceptible to gut health issues.
2. **Poultry immunity and growth performance:** Another challenge when transitioning from traditional to antibiotic-free poultry production is poultry diseases, particularly enteric diseases like coccidiosis and necrotic enteritis (NE), caused by species of Eimeria and Clostridium perfringens, respectively. It is also essential to consider viral challenges that may lead to secondary bacterial issues, taking advantage of the weakened immune system. In addition to diseases, other stressors such as feed, water, environmental factors, and behavior can negatively impact overall poultry health, growth, and immune function. Significant stressors or the cumulative effect of multiple small stressors, combined with low, moderate, or high disease challenges, can lead to problems. In such cases, the bird's natural immunity may not be sufficient to manage the threats, highlighting the importance of preventive rather than reactive measures.

Several alternatives to antibiotics have been developed, tested, and are still being researched. Some of these alternatives show promising results, while others are only moderately effective.

A. Probiotics: Probiotics, also known as direct-fed microbials (DFMs), are live microorganisms that, when administered in adequate amounts, confer health benefits on the host according to FAO/WHO (2001) classification. Probiotics used in poultry include genera such as Lactobacillus, Streptococcus, Bacillus, Bifidobacterium, Enterococcus, Aspergillus, Candida, and Saccharomyces (Kabir, 2009). Probiotics can enhance host, health in various ways, such as producing metabolites like lactic acid, modifying microbial metabolism, and improving cell integrity of the epithelium (Yaqoob et al., 2021). Unlike prebiotics, probiotics are microorganisms that can alter host health by colonizing the gastrointestinal tract (GIT) and providing a more balanced microbiota (Murate et al., 2015). The benefits of probiotics include improved performance, modulation of the intestinal microbiota, pathogen inhibition, enhanced intestinal integrity, immunomodulation, and improved microbiological and sensory characteristics of broiler meat (Alagawany et al., 2021; El-Saadony et al., 2021). The efficacy of probiotics is not specific, and the results vary depending on the quality of feed and water.

B. Essential Oils: Essential oils

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are derived from plants through water and/or steam distillation, and they possess valuable properties such as antimicrobial, antiviral, antioxidant, and antiparasitic capabilities (El-Tarabily et al., 2021). Many plant sources of essential oils have been studied for their efficacy as feed additives. For example, Tecnaroma Herbal Mix PL essential oil blend, containing herbs such as thyme, basil, and oregano, was supplemented in increasing amounts in broiler chickens (Khattak et al., 2014). The addition of essential oil positively impacted avian performance and carcass characteristics (Khattak et al., 2014). Essential oils have the ability to reduce pathogen levels, such as gram-negative E. coli and Salmonella bacteria, in the gut. However, bacteria can gradually adapt to these molecules and become resistant.

C. **Organic Acids:** Organic acids are weak acids that do not completely dissociate in the presence of water. Prominent types include carboxylic acids such as lactic acid, propionic acid, acetic acid, formic acid, sorbic acid, citric acid, oxalic acid, uric acid, and butyric acid. Organic acids are not antibiotics but, when used in conjunction with excellent nutrition, management, and biosecurity practices, they can help maintain intestinal health in poultry, leading to improved livability, feed conversion ratios, weight gain, live weight, and immunological responses (Adil et al., 2011). Each type of organic acid has unique properties and can be used for different purposes in poultry production. Like essential oils, continuous use of the same organic acids can lead to bacterial resistance over time.

D. **Phytobiotics:** Phytobiotics include plant extracts and compounds from herbs and spices, offering multiple benefits such as antimicrobial properties and immune support. Herbal extracts and spices play a significant role in improving health and productivity in poultry (El-Saadony et al., 2021). The positive impacts of plant extracts or active substances in bird feed may involve stimulating appetite, increasing feed intake, enhancing endogenous digestive enzyme production, stimulating immunity, and having antiviral, antibacterial, anthelminthic, and antioxidant activities. Identifying the active compounds and maintaining their concentration in the final product pose challenges. Often, commercially available products lack specific information about the key molecules within the plant extracts or compounds that contribute to their efficacy. Consequently, consistent results from such compounds are difficult to guarantee.

E. **Bacteriophages:** Bacteriophages have recently gained commercial importance in food and animal production for bacterial control. Bacteriophages are viruses much smaller than bacteria that kill bacteria by injecting their genetic material into bacterial cells, allowing them to replicate and multiply inside the bacterial cells before causing cell lysis. This process destroys the bacterial cell, preventing the possibility of adaptation or the transfer of information necessary for developing resistance. One of the key advantages of bacteriophages is their species specificity for attachment to bacteria. This allows bacteriophages to selectively kill pathogenic bacteria while allowing beneficial bacteria to proliferate, promoting better gut health and maintaining natural pH and microbial balance. Bacteriophages have no residual effects in the final product and do not cause toxicity. Bacteriophages continue to increase in population until the last pathogenic bacteria are eliminated.

In my opinion, when selecting a sustainable solution for antibiotic-free poultry production, the following qualities should be considered in the product:

1. Natural or organic origin
2. pH and temperature stability
3. Selective destruction of pathogenic microbial species
4. Prevention of bacterial resistance development
5. Absence of residue in animal produce
6. No toxicity when overdosed
7. No requirement for withdrawal periods

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Common Poultry Diseases and their Management

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Introduction

In 2018, the Indian poultry market comprising of broilers and eggs was worth INR 1,750 billion. The market is further projected to reach INR 4,340 billion by 2024, growing at a CAGR of 16.2% during 2019-2024. Today, India is the one of the world's largest producer of eggs and broiler meat. India ranks 3rd in egg and 7th in chicken meat production in the world (Watt Executive Guide, 2015). Among the livestock sector Poultry industry contributes for about 1 per cent of the national GDP and about 14% of the Livestock GDP. Growth rates in egg (4-6% per annum) and broiler production (8-10% per annum) in India during the last 40 years. The growth rate of layer market is 6-7 percent per annum and broiler market is 8-10 percent per annum.

Bacterial diseases

1) **Salmonellosis:** caused by Salmonella pulloram.

   Clinical signs: Hatched chicks are often found dead. Chicks are depressed and huddled together and go off feed. Some show Some show whitish diarrhoea which stick to the vent with omphalitis. In severely affected flocks some birds may show lameness and nervous signs due to organism localising in these areas. In adults disease remains subclinical. The organism frequently localises in the ovaries resulting in low egg production and hatchability.

   Treatment

   Multivitamin therapy must be provided as supportive therapy. Furazolidone can be provided in feed for 10 days and in water furaltadone can be provided for 6 to 7 days. Brooder temperature can be increased.

   Control: Removing the carrier birds, purchase bird only from flocks known to be free of disease. Incubate and hatch egg free from disease.

2) **Colibacillosis:** caused by E. coli.

   Clinical signs:

   Air sacculitis- normally seen in 6-9 weeks of age.

   Colisepticemia- This is an acute systemic infection, onset is sudden, chicks die in good physical condition. This can affect bird of any age.

   Enteritis- Necrotic enteritis, chicken exhibit diarrhea, dehydration.

   Salpingitis- Embryos die before hatching or some die after hatching. In chronic cases drop in egg production.

   Coligranuloma- Granuloma of liver, duodenum, and mesentry.

   Omphalitis- Mushy chick disease

   Treatment: Broad spectrum antibiotics with supportive vitamin therapy.

   Control: Manitain high standard of management. Avoid overcrowding, dry, dusty conditions. Avoid built up of ammonia. Supply clean chlorinated water. Bird should be fed well balanced diet. Remember pelleted feed has fewer E. coli than mash. Avoid

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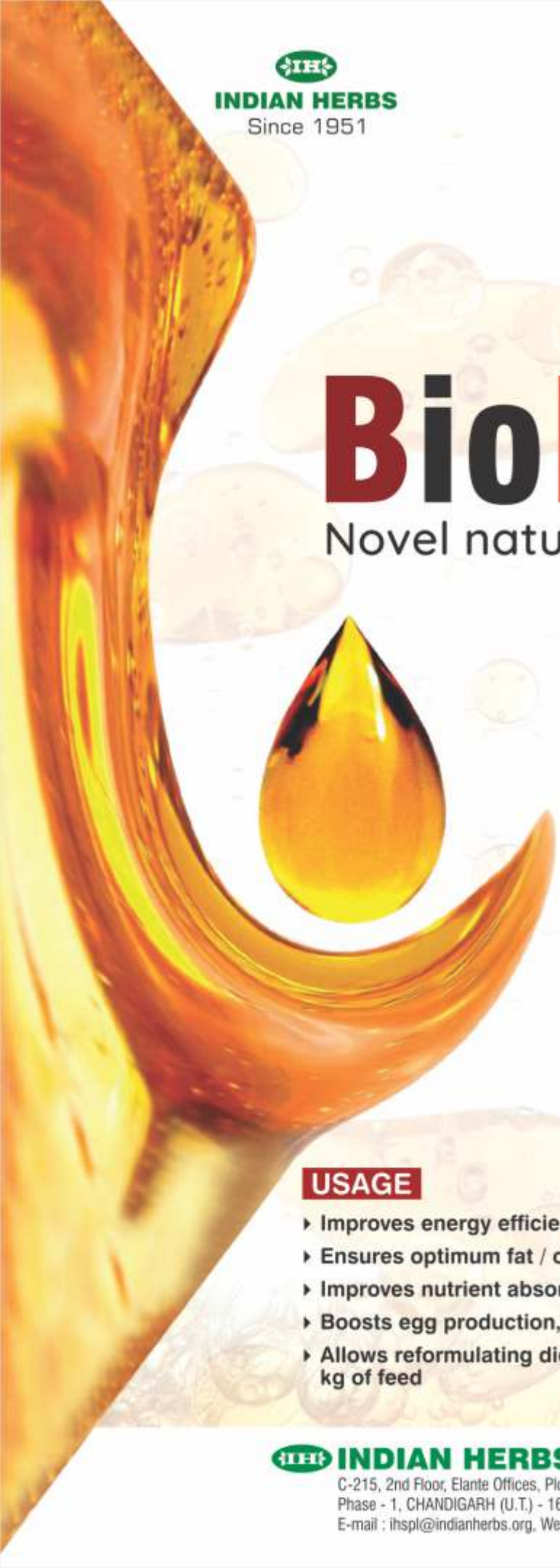

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faecal contamination of egg. Broiler breeder hen vaccinated at 6-12 weeks of age, repeated at 14-18 weeks of age.

3) **Infectious coryza:** caused by Hamophilus paragallinarum

Clinical signs: Oedema of face with conjunctivitis. Serous or mucosal discharge. Swollen wattles more evident in males. Lower respiratory tract infection causing rales. Drop in egg production. Foul odour detected in a flock which become chronic.

Treatment: Sulphas are effective. Streptomycin and erythromycin can be given in drinking water.

Control: Dispose of infected or recovered bird. Practise all in all out management. Vaccination can be done at 16 weeks of age. Two injactions given about 4 week apart before 20 weeks of age.

Viral diseases

1 **Fowl Pox:** Caused by avipoxvirus. Characterised by eruption and scab like lesions on the skin, combs, wattles and diphtheritic lesions in the mouth and the upper part of trachea.

Clinical signs

i. **Cutaneous form:** there are local inflammation of featherless parts of skin, sometimes feather follicles with formation of nodules. Lesions have area of inflammation at the base and eventually covered by scab like lesions.

ii. **Diphtheritic form:** lesions appear on areas covered with mucous membrane. Diphtheritic membrane covering the ulcerated areas.

Treatment: No specific treatment. Where secondary infection is likely to occur, prophylactic medication with broad spectrum antibiotic for 3-5 days is recommended.

Control: Vaccination is only effective.

Pigeon pox vaccine: Administered by feather follicle metghod at day old. Repeat at 3 months of age.

Fowl pox vaccine: It is given by wing stab method. It can be used from day old to 3 months of age.

2 **Ranikhet disease:** Caused by Paramyxovirus.

Clinical signs

Doyle's form (digestive): Incubation period is 5-6 days, sudden death recorded, respiration increased, death by prostration, watery greenish diarrhoea, muscular tremors, spasm, torticollis, paralysis of legs and wings. Mortality is usually 90%.

Beach's form (pneumo encephalitis): Respiratory distress, coughing and gasping, diarrhoea not observed, paralysis of legs, wings and torticollis. Egg production falls or stops. Mortality is usually 10%.

Beaudette's form (pneumoencephalitis and respiratory): Mostly in adults marked by cough and rarely gasping. Egg production falls or stops. Birds may not return to normal production.

Hitchner's form: It is unapparent in adult birds. Respiratory signs may not clear, mortality negligible, nervous sign are not recorded.

Control: Best way is vaccination. However vaccination cannot be considered as an alternatice to good management practices, biosecurity or good hygiene. LaSota and B1 most widely used vaccines.

Vaccination: Day old chicks with F1 vaccine-7th day, RDVK strain can be given after 5th week, 28-30 day- LaSota in drinking water. RD vaccination at 7th or 8th week. RD booster between 16th or 18th week.

3 **Avian Influenza (Bird Flu):** Cuased by type A influenza virus. Subtype H5N1 has caused most outbreaks.

Clinical signs: Signs are variable. It can also be manifest as respiratory, enteric, reproductive or nervous system disease. Decreased food consumption and drop in egg production are some of earliest signs. Signs are coughing, sneezing, ruffled feathers, swollen heads, nervous signs and diarrhea. In some cases bird may die without clinical signs.

Prevention and control: Prevent direct contact with free flying birds and protect domestic poultry from contact with the faeces of wild birds. Avoid live markets and educate employees about danger posed by these markets.

4 **Infectious Laryngo-Trachitis:** It is caused by Herpesvirus

Clinical signs: Nasal discharge, coughing, gasping and moist rales. Characteristic posture of extending the neck and open mouth breathing.

Treatment: No drug is shown to be effective.

Control: Use of biosecurity measure, rodents and dog control should be done. Vaccination done at 1-3 day of age in high risk areas.

Parasitic diseases

1) **Coccidiosis:** It is caused by group of protozoan parasites.

   Clinical signs: Symproms vary with species of coccidian. Eimeria tenella causes cecal coccidiosis. It is severe disease causes blood droppings, high mortality, reduced weight gain and emaciation. E. necatrix causes intestinal coccidiosis. It is also harmful. Droppings contain blood, mucus and fluid. E. brunetti is found in lower part of intestine, neck of ceca, colon and rectum. It is less serious. E. maxima is moderately harmful and causes poor weight gain, diarrhea. E. acervulina is also moderately harmful. There is reduction in rate of weight gain.

   Treatment: Most commonly used drugs are Sulphas, Amprolium Hydrochloride, Monensin, Salinomycin, Clopidol etc.

   Control: Broilers- continuous medication of anticoccidial drugs.

   Breeders- high level of coccidiostat during first eight week.

   Layer- housed in cages, high level of coccidiostat during growing period while chickens are raised on litter.

   Cocci vac: This allows immunity development through controlled exposure.

2) **Worm Infestation**

   Internal parasitic worms are common in poultry and will always be present in small numbers. However, when present in excess they can seriously affect the health and productivity of birds.

   Control

- Medicines such as vermex, carbon tetrachloride, tetrachilorethylene and piperazine citrate can be used.

3) **External Parasites**

   There are many different external parasities harboured by poultry. The commonest are mites, fleas, lice and ticks.

   Symptoms: Chickens are restless and nervous, peck at their own feathers, have pale combs and wattles and there is low egg production.

   Control
   Tick, lice, and flea powder should be rubbed into the feathers and skin of the birds. When each batch of birds is cleared spray the entire house and surrounding ground with malathion or any suitable pesticide. A regular spray of creosote will kill these pests and, at the same time, preserve the structure of the house.

Nutritional deficiency diseases

Vitamin A

Chicks- wobbly gait, deposits of urates in kidney, pustules in mouth. Hens- reduced egg production, nutritional roup.

Vitamin D3, Ca and P: Leg deformity, soft bone reduced growth, ricket, poor egg production and hatchability.

Vitamin E: Encaphalomalacia and exudative diathesis.

Thiamine: Head retraction, polyneuritis.

Riboflavin: Curled toe paralysis

Manganese: Perosis

Metabolic diseases

1) **Gout:** Characterized by presence of high level of uric acid in the blood. Deposition of urates on the surface of various internal organs or joints (especially hock joint).

   Causes: Kidney dysfunction leads to hyperuricaemia, dehydration, excessive dietary calcium or calcium: phosphorus imbalance, vitamin A deficiency, increased intake of protein, intake of excessive amount of salt.

   Clinical signs: In articular gout, joints are much swollen, with deposition of masses of chalk-like material. Usually wing and leg joints are affected. Affected bird cannot move and so die of starvation. Articular gout occurs mostly in male birds but visceral gout occurs both in male and female.

   Prevention and control: Avoid feeding of high level of calcium in advance of sexual maturity. Reduce high level of protein. Increase maize, and formulate the feed. Give plenty of water containing electrolytes.

2) **Ascitis:** Accumulation of fluid in the abdominal cavity of chickens.

   Clinical signs: It may show itself a sudden death. Mortality is greatest after 4 weeks. Affected birds are smaller than normal and depressed with ruffled feather. They have pale head, shrunken comb, feather lose their bright white sheen.

   Treatment: There is no effective treatment foe ascitis. Frusemide, vitamin E and organic Se reduces mortality in ascitis.

   Control: Reduce feed intake or use very low energy feed. Use mash rather than pelleted feed. Prevent chilling of birds, ensure adequate ventilation, avoid dust and ammonia. Na in feed should not exceed 2000 ppm. Minimise toxin contamination of feed.

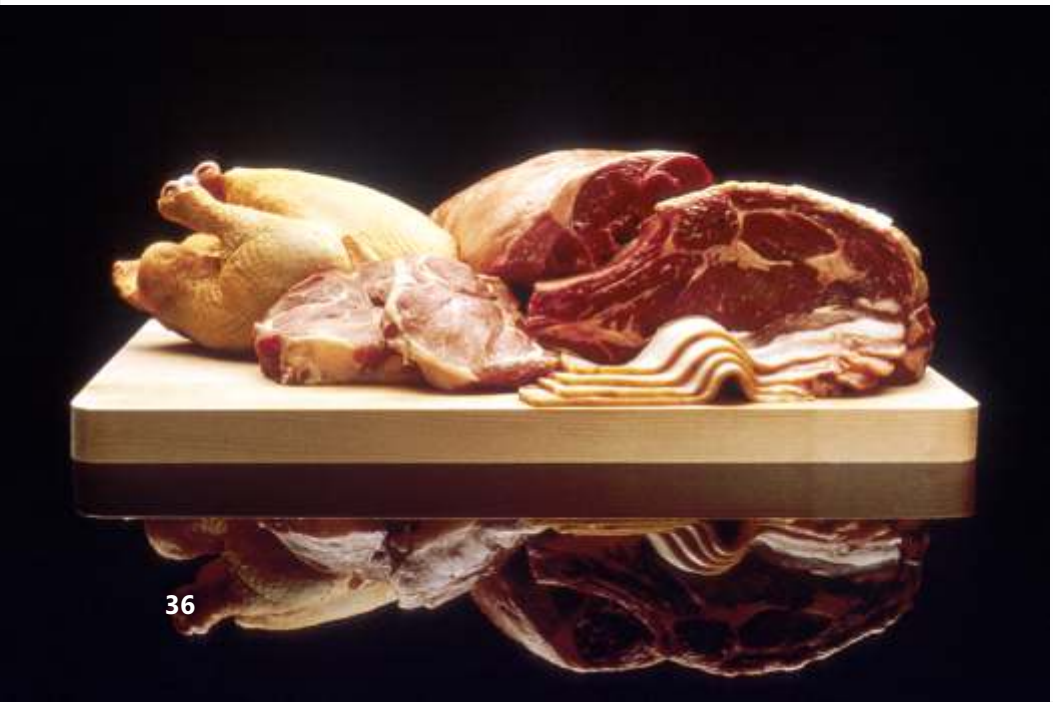
Breeding for better meat quality: The impact of genetics in poultry flavor and texture

Divya Thearia
Assistant editor
Poultry Planner Magazine

Introduction

In the ever-evolving world of poultry farming, improving meat quality has become a top priority for producers to meet growing demands from discerning consumers. Poultry texture and flavour play a crucial role in meat quality, exploring the key factor role in determining customer satisfaction, and as such, genetic advancement in genetic selection has emerged as a powerful tool in enhancing these attributes. This page delves into the influence of genetics on poultry and the key factors that breeders must consider achieving superior texture and flavour.

- **The genetic basis of meat quality:** The foundation of meat quality lies in birds' genetic makeup. Poultry breeders focus on identifying and selecting specific genes associated with desirable meat characteristics, including tenderness, juices, and flavour. Understanding the genetic basis allows breeders to pinpoint the trait they wish to improve and develop breeding-targeted programmes.
- **Genetic Markers and Selection:** Advances in genetic research have resulted in the identification of critical markers connected to meat quality features. These markers enable breeders to assess the genetic potential of individual birds for specific qualities, expediting the breeding process for greater meat quality. Poultry breeders can make better decisions about which birds to breed by including these indicators in their selection criteria.
- **Flavour Profile:** Striking the Perfect Balance: Fatty acids, amino acids, and volatile chemicals are only a few of the many molecules found in meat that interact to create flavour. The flavour profiles of various breeds and genetic lines vary, ranging from delicate and subtle to robust and savoury. Breeders strive to achieve the ideal balance while considering elements such as food, age at processing, and processing methods.
- **Beyond Genetics:** Environmental and Management Impacts: Environmental aspects and management techniques are just as important as genetics in determining meat quality. The entire growth of the bird and, consequently, the quality of the meat are influenced by nutrition, housing conditions, and animal welfare. For the birds to completely express their genetic potential, poultry farmers must strike a balance between genetic advancements and creating the best environment possible for the birds.
- **Texture and tenderness:** Texture is yet another crucial component of the quality of poultry meat. Consumers frequently dislike tough, chewy meat, while they highly value delicate meat. Meat softness is mostly influenced by genetics, which also determines muscle fibre structure, collagen concentration, and marbling. Poultry growers can guarantee a more consistent and pleasurable eating experience by selectively breeding birds with excellent textural features.
- **Consumer perception and customer demands:** Consumer preferences are constantly shifting in the modern poultry industry. For poultry producers hoping to stay ahead of the competition, understanding the dynamics of dietary preferences and market demands is essential. Poultry growers may capture specialised markets and foster brand loyalty by coordinating genetic advancements with consumer expectations.



Conclusion

By considerably improving meat quality characteristics, including flavour and texture, genetic improvement has proven to be essential in revolutionising the poultry sector. Poultry farmers may provide consumers with a more pleasurable and fulfilling culinary experience by implementing genetic markers and focused breeding programmes. The future of poultry farming and the quality of poultry meat on our plates will be shaped by cooperation between geneticists, poultry breeders, and consumers as the hunt for high meat quality continues.

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Impact Assessment of Genetics and Breeding in Enhancing the Broiler Production Performance

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Introduction:

Broiler production, the process of raising chickens for meat consumption, has undergone remarkable transformations over the years, shaping the global poultry industry. The broiler industry plays a key role in the delivery of high-quality protein and lipids to the world population. Per capita consumption of chicken meat of both developed and underdeveloped nations increased greatly. Unlike red meats, there are no religious or cultural constraints associated with poultry meat consumption. Additionally, global prices of chicken meat and chicken meat products have remained relatively cheaper than beef and pork. The reason for these low prices is due to the broiler industry being able to attain high productivity and efficiency over the years.

For example, in 1957, a 42-d-old broiler weighed 586 g with a feed conversion ratio (FCR—g of feed/g of BW gain) of 2.8. While today, a broiler of the same age weighs 2,900 g with an FCR under 1.70 (Zuidhof et al., 2014). The cause behind these improvements is linked to enhance production technologies that boost performance such as improved genetics and breeding, better understanding of nutrition and feeding, and overall improved management techniques. Improved genetics and breeding account for approximately 80 to 90% of the above-mentioned production improvements observed today. However, it is important to understand that to maximize the genetic potential of a bird, proper nutrition and management of the environment must be provided; thus, all aspects need to work in conjunction with each other.

Genetics and Breeding as Performance-enhancing Technology:

Breeding companies have used population genetics through quantitative selection practices since the 1940s to improve productivity and efficiency in the poultry industry today. The organizational structure of today's breeding companies is very similar around the world as it follows a pyramidal structure (Figure 1). The top

Fig. 1: Broiler production unit

Figure 2 A typical modern broiler chicken breeding program, represented as a pyramid in which each level represents a generation. On the left is the approximate number of chickens produced in each generation. On the right is the approximate timeline to move genetics from the top of the broiler-breeding pyramid to the consumer

of the pyramid is occupied by a relatively small population of pure line elite stock and a larger population of broilers at the base. Additionally, the genetic lag time from pure line to meat-type birds is 4 yr. Furthermore, pedigree birds from 35 to 40 pure lines, which represent the genetic stock of the industry, supplied billions of broilers to the market. These pedigree populations are first categorized into male and female lines and then undergo intensive genetic selection to obtain incremental improvements in the major economic traits. In the male lines, genetic selection is emphasized on traits such as growth rate, edible meat yield, and feed efficiency. While in the female lines, traits such as growth rate, edible meat yield, egg production, and feed efficiency (to a lesser extent) are emphasized.

The broiler industry was characterized as an age-for-weight market industry with slaughter at a fixed target weight; therefore, emphasis was placed on rapid growth and early carcass development. Over the last 20 yr, breeding companies have gone a step further by placing emphasis on breast meat yield, and as a result, eviscerated yield has also increased considerably. This is in response to changes in consumer preferences for further processed items and an increase in demands in the food service sector. In more recent times, consumers have become more conscious of their eating habits. This creates a demand for the "white meat" portion (breast meat) of the bird because of a lower fat content compared with dark meat of the same broiler carcass.

Genetic selection programmes over the past 60 years have led to rapid growth rates and increased meat yield in

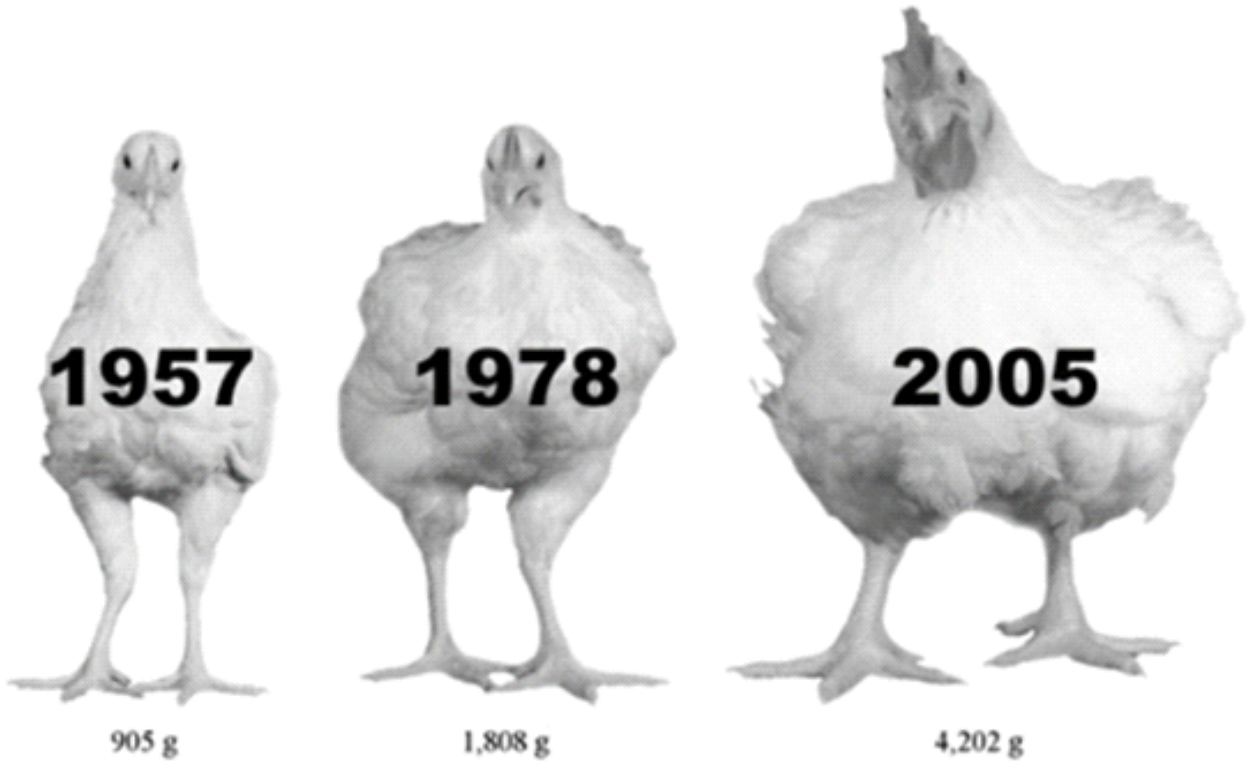

Fig.3: Body weight of broiler increased 905 g (1957) to 4200 g (2005)

broilers (meat chickens), dramatically decreasing slaughter age and the amount of feed and energy required to raise these birds to market weight (Bradshaw, Kirkden, and Broom 2002; Tallentire, Leinonen, and Kyriazakis 2016). Growth rates have increased by over 400% between 1957 and 2005 (Zuidhof et al. 2014), with 85–90% of this increase being attributed to genetic selection and the remainder attributed to diet (Havenstein, Ferket, and Qureshi 2003).

Intensification of production in the poultry sector has been more dramatic than in other livestock species (Bessei 2018). Worldwide, over 66 billion broilers are slaughtered annually (FAO 2017), with the United States, China, the European Union and Brazil being the biggest producers (Mottet and Temptio 2017). With a growing human population, there will be a corresponding increase in the demand for meat, and greater pressure on agricultural industries to be more efficient. With the continued focus on growth rate, feed efficiency and meat yield, the genetic predisposition for compromised welfare in broilers can be expected to increase in severity (Dawkins and Layton 2012).

Current trends:

Production performance in the broiler industry is constantly evolving due to research conducted in genetics and breeding. A recent study by Zuidhof et al. (2014) compared genotypes representative of those in the broiler industry of the years 1957, 1978, and 2005. From 1957 to 2005, body weight was improved by 460% (0.90 vs. 4.20 kg) and feed conversion rate reduced by 50% (2.854 vs. 1.918; g of feed/g of BW gain) over a 56-d grow-out period, corresponding to a compound annual rate of increase in 42 d live body weight of 3.30%.

Future considerations:

- Genetics will continue to be the main driver for production performance improvements in the broiler industry.
- It is hard to believe that genetic improvement has not reached a biological threshold. However, according to recent projections from Agri-Stats, Inc. presented by Donohue (2015), by the year 2034, the broiler body weight of a 2.34-kg (5-lb) bird will be reached by the end of a 28.8-d growing period.
- This will be the result of genetic improvement to reach this weight, and the growing period is projected to be reduced at a rate of 0.56 d/yr.
- The main benefit of selecting birds for faster growth rate is improved feed efficiency.
- This means that the faster broilers reach the desired market size, the greater the percentage of nutrients from the diet go to lean mass accumulation as opposed to body maintenance.
- As broilers get older, feed conversion rate decreases because more feed is consumed and a greater proportion of nutrients go to maintenance.
- The seed stock of poultry genetics is more centralized than ever before because a few companies own the market. On the contrary, broiler production is a global phenomenon.
- The environmental and managements conditions in these regions are vastly different than those where seed stock was raised. This creates the opportunity for genetics companies to work on genotypes that are more appropriate to the conditions of the above-mentioned countries.

Conclusions:

Intense genetic selection for economically important traits including body weight, growth rate, feed efficiency, and ultimately traits associated with carcass-processing characteristics have contributed to the increases in productivity and efficiency obtained in the broiler industry. Although these improvements have come with some unintended results (reduced reproductive performance, skeletal abnormalities, ascites, and increased abdominal fat), they are typically ameliorated with management and nutrition, and genetic selection will continue to be the main driver for improvement.

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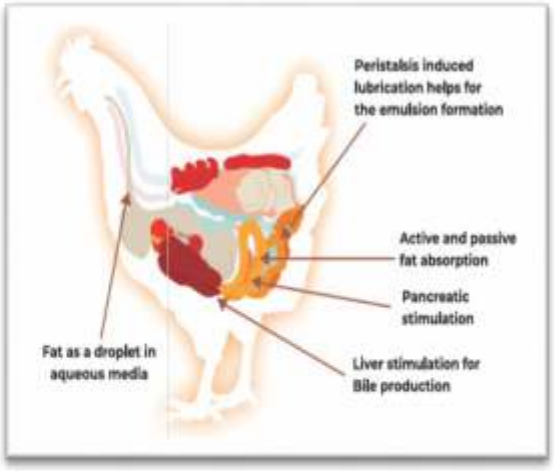
LIPROVET

Accomplishing fat utilization beyond emulsification



LIPROVET

Fat, the indispensable component of the diets despite bringing the feed texture and digestibility challenges, support the body mainly for energy & hormone synthesis that directly affects performance traits and farm profitability. Despite emulsifier helps to ease the digestion & absorption, the best poultry diets today essentially needs a comprehensive approach for the fat metabolism in the body offering homeostasis, lipotransport & effective fat utilization. Today it is essential to support fat metabolism along with hepatic-regulators, lipotropic agents and osmoregulators for supporting for effective fat utilization by the bird.

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Importance of Light Management System in EC Broiler Houses

Lighting management plays a major role in making EC broiler house efficient. The EC broiler houses have an established light management practice for two decades in developed countries. It is slowly penetrating the Indian poultry industry.

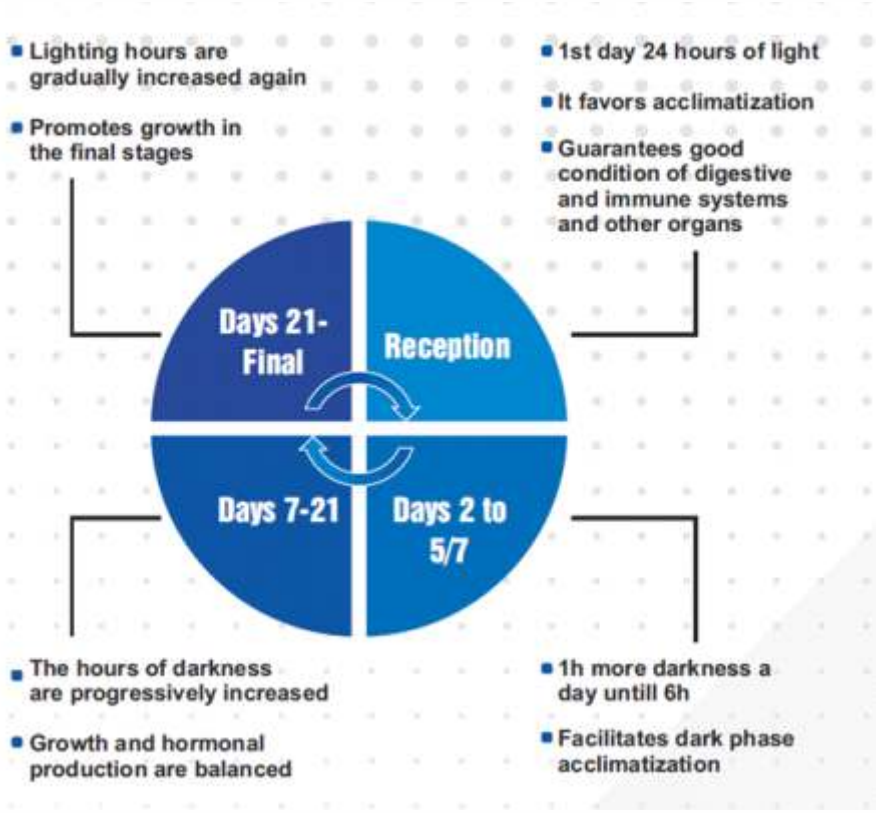
EC Broiler houses are modern scientifically designed poultry houses used for commercial broiler / layer rearing. Unlike open broiler houses the EC broiler houses solely dependent on artificial lighting and requires an efficient Lighting management program.

According to the department of poultry at the University of Saskatchewan, chickens perceive light in a very different way to humans. Chickens receive light through the pineal gland. It then travels to the pituitary gland and the hypothalamus. This process directly influences the growth of birds, along with a chicken's need for a regulated day-and-night cycle. It plays a crucial role in improving a bird's immune system, their mobility, alertness and leads to better growth.

Therefore, light management system is an essential tool to regulate broiler production and welfare by modulating various behavioural and physiological pathways. Artificial lighting for broilers consists of 3 aspects: light distribution, photoperiod, wavelength, and light intensity.

Light levels (intensity or illuminance) and the duration of light (photo period) are important factors in poultry production. Intensity influences cannibalism and aggression, along with feed and water intake, while photo period influences reproductive and egg production cycles, total feed intake, and growth rate.

Designing an EC Broiler houses requires understanding of biology of chickens and mechanization of processes like feeding, drinking water system, etc. One should understand how to manipulate the micro-environment in the EC House to get good results. From prior research, it is recognized that a broiler performance and welfare are



optimum between 17 and 20 hours of light exposure. This is different from conventional belief that using long daylengths for broilers will maximize growth rate. It is verified that white light should not be left on for 24 hours as chickens will perceive it as sunlight and will not sleep during the night.

Dark hours are important for the chickens to have better growth rates, lower feed conversion fewer skeletal defects and improved immune function, compared to birds reared under continuous light. In addition, if the birds gain weight too quickly too early in their lives, it puts undue stress on their metabolic and skeletal system. Darkness helps fortify the birds before their period of the greatest weight gain. This is usually after 7-10 days of settling into EC Broiler houses. At this point, the chickens are allowed to gain more weight before end of cycle. Altogether, Chickens need a combination of both daylight and darkness to stay healthy and produce eggs.

Light is also a valuable resource for newborn chicks. The right amount of light exposure can positively affect their growth and produce more uniform birds. Feeding is also directly impacted as adequate light helps chicks find feeders and, therefore, receive the right amount of nutrition to aid growth. Because their eyes are so sensitive, they can see tiny light fluctuations that are imperceptible to humans. Fluorescent lighting to chickens is like strobe lighting to us, so they often become irritable under these lights.

Broiler chickens exhibited a preference for 20 lux light intensity for feeding compared to 5 lux light intensity. Typical light levels found in broiler operations are about 10 to 20 lux (1 to 2 foot-candles)

For the first seven days of placement, the birds need 23 hours of light to allow them to locate feed and water and stimulate intake. Subsequently, light hours are gradually reduced to ensure broilers have a maximum of four to six hours of darkness to ensure adequate growth and development. Figure 1 properly depicts the daylight and darkness cycles typically used in EC Broiler houses.

The cycle can be easily implemented by Overdrive's Light management System. Overdrive's LMS includes a MOSFET Dimmer and dust-free 5 star rated IP66 EH80 Luminaires. With right dimming technology usually MOSFET and proper dimming and programmable lighting system will lead to reduced mortality rate, improved Biological Yield and reduced excess feed consumption significantly.

The following light management program is widely followed in North America-

TYPICAL LIGHT MANAGEMENT PROGRAM IN US

Small Broiler

A lighting schedule is required to prevent knockdown and to maximize performance. The following schedule is recommended:

AGE	Hour of Light / Dark	Dimmer Reading
Day 1	24 / 0	100%
Day 2	23 / 1	100%
Day 4 - 7	21 / 3	100%
Day 8 - 14	18 / 6	100%
Day 15 - 17	18 / 6	1.00 FC
Day 18 - 20	18 / 6	.75 FC
Day 21 - 27	18 / 6	.50 FC
Day 28 - 31	20 / 4	.50 FC
Day 32	22 / 2	.50 FC

With right MOSFET Dimmers and Dimmable lights, farmers can efficiently/ automatically change/manage light intensity, colour, distribution of light and day length in their poultry houses without manual intervention. Here the product selection is important and one need to be careful in selecting the right product to suit harsh poultry environment which shall offer smooth, flicker free dimming experience with long life.

The typical image of the Programmable dimmer controlled led lighting management product available in market :

Usually with right product and usage the return on your investment is 3-4 months.

To summarize, Light is an essential parameter considered while designing an EC Broiler House. Secondly, having and implementing a optimum lighting program is crucial for growth of birds and to get good yield. Thirdly, selection of dimmer and lighting product is important to get the best possible return on investment. Remember, investment in lighting is investment in excellent future for poultry industry in India!

The Livestock Expo 2023: Fostering Growth and Collaboration in Livestock Technology

The inaugural edition of 'The Livestock Expo 2023' was held successfully at the India Expo Centre & Mart Greater Noida in Delhi NCR, India. The event was a success in terms of attracting business visitors from nearly every region of the Indian subcontinent as well as from other countries.

Mr. Ranpal Dhanda (President, Poultry Federation of India), Mr. Azad Singh Rathi (President, Broiler Breeder Association-North), Mr. Ricky Thaper (Treasurer, Poultry Federation of India), Mr. Ravi Sabarwal (Chairman, Broiler Breeder Association-North), and Dr. Harinder Singh (Director, Excellent Enterprises Pvt. Ltd.) officially opened the Livestock Expo.

The show featured a high proportion of exhibits with both domestic and international visitors, as well as a comprehensive product range from India's market leaders. Top brands such as Amul, Novus, Virbac, Hindustan Equipment Appliances, Zeus Biotech Pvt. Ltd., Vetnova (West Bengal Chemical Industries Pvt. Ltd.), Parkash Industries, and UK-German showcased their products.

NSIC, CLFMA of India, All India Food Processors' Association, Broiler Breeders Association (North), All Kerala Poultry Federation, Poultry Farmers Broilers Welfare Federation, and many more domestic and International partners supported the event.

The Livestock Expo 2023 was an excellent platform to meet and network with the trade industry. It was a well-managed exhibition with a good number and high quality of visitor footfall. The majority of visitors were professionals looking for new partners for mutually beneficial collaboration.

The majority of participants were extremely pleased with the organising team and said that they would be participating again in the next edition of the show.





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Centre of Excellence for Animal Husbandry – ceah Bengaluru Organises Various Professional Training Programmes Namely CRO, SSOT, HOET, Internship and ODWS During 1st Quarter of 2023-24

CEAH-Bengaluru – Animal Husbandry Academy of India is setup under Government of India, Ministry of Fisheries, Animal Husbandry & Dairying, and Department of Animal Husbandry & Dairying as a consortium of 5 organizations at Hessarghatta vide Order No. F.A-430011/3/2023-Estt(HQs), dated, 14th March, 2023. This Academy is formed as per the guidelines of DoPT for National Programme for Civil Service Capacity Building (NPCSCB) under "Mission Karmayogi" of Government of India.

CEAH-Bengaluru is spread over 642 acres distributed in four campuses at Hessarghatta. Campus – 1 consists of Central Poultry Development Organization & Training Institute (CPDO&TI), Campus – 2 consists of Central Frozen Semen Production & Training Institute (CFSPTI) and Central Cattle Breeding Farm(CCBF), Campus – 3 consists of Animal Quarantine and Certification Services(AQCS) and Campus – 4 consists of Regional Fodder Station(RFS).

CEAH Bengaluru has state of art automation units at poultry, Modern dairy sheds, ET lab, Sex-sorted semen lab, International Animal Quarantine facility, biggest fodder unit in the country with latest technology adoption for irrigation. The Academy consists of four campuses with conference halls, class rooms, officers and farmers hostels with boarding and lodging facilities.

CEAH Bengaluru organises various professional training programmes namely **CRP, SSOT, HOET, INTERNSHIP AND ODWS** during 1st quarter of 2023-24 for various State of India inviting Veterinary Officers, Subject specific experts, M.Sc. graduates, Livestock officers and women and farmers across the country.

Comprehensive Refresher Programme(CRP): This is a flagship programme of CEAH Bengaluru offering 360 degree perspective of Animal Husbandry for young veterinary professionals in creating knowledge enriched smart veterinarian in the country. The course involves not only interactive sessions but visits, activity based learning, communication skills, leadership skills and business models of successful entrepreneurs in the areas of Dairy, Poultry, Piggery, Sheep & Goat. Apart from this networking of Govt. of India Institutions, ICAR Animal Science Institutions and Schemes of State Government, Central Government along with Project appraisal and detailed project report areas are being covered.

So far State of Karnataka (1 batch), Telangana (2 batches), Andhra Pradesh (1 batch), Goa (1 batches) have been trained. For the upcoming months till September, States of Andhra, Telangana, Goa, Tamilnadu (TANUVAS have even booked for Assistant Professors) are scheduled. So far, 105 trainee veterinary officers have been trained at CEAH Bengaluru.

Semen Station Officers Training(SSOT): This Course is specifically offered by CEAH – CFSPTI for young officers of Semen Stations across the country. The course includes all the technical issues related to Frozen Semen Technology, Bull assessment, Quality Control issues and minimum standards of Semen Stations. The states of Karnataka, Andhra Pradesh and Uttarakhand have deputed 10 officers for the programme.

Internship for M.Sc., Graduates: CEAH Bengaluru

offered a special crafted internship for M.Sc. Graduates of Premier University of Bangalore namely St. Joseph's University. The internship was designed to meet the curriculum requirement of Animal Husbandry Sector in India, various Husbandry Practices in Dairy, Poultry, Fodder, Export/Import issues. They were exposed to on the spot practical training and briefed about large scale opportunities of science graduates also to enter the mainstream of Animal Husbandry Sector. St. Joseph's deputed 10 students of M.Sc., along with two faculty who also underwent the internship programme on Animal Husbandry at CEAH.

Hands-on Experience Training (HOET): This training programme was designed on the request of Directorate of Lakshadweep for their staff at Animal Husbandry Department namely, Stockmen and Livestock Inspectors. During the 5 days programme of HOET which is similar duration to CRP and SSOT, the trainees were exposed to sample collection of blood, urine, Swab samples etc in both Dairy and Poultry. They were also trained on Animal Handling, Insemination, treatment etc along with visits to all the units of CEAH. They were specifically taken to SRDDL, Bengaluru and Veterinary Dispensary at nearby village to have hands on experience at field level.. Lakshadweep deputed 6 of their staff for the first batch.

Course Fee for the 5-days programme namely, CRP, SSOT and HOET is Rs. 5,000/- per candidate which is inclusive of Boarding, Lodging, Training Kit and Course Material for the programme.

One Day Workshiop (ODWS): This programme is designed as an exposure cum workshop for farmers, women entrepreneurs and veterinarians across the country. The programme is planned for an exposure visit of each campus of CEAH namely, Regional Fodder Station(RFS), Central Cattle Breeding Farm(CCBF), Central Frozen Semen Production & Training Institute (CFSPTI), Central Poultry Development Organisation & Training Institute (CPDO&TI) along with AQCS. The trainees will be exposed to theoretical and practical aspects at the field in the areas of Dairy, Poultry and Fodder. This course is free for Farmers and Women and chargeable with a course fee of Rs. 1,000/- for entrepreneurs and veterinarians across the country.

Ceah Podcast Series: CEAH Bengaluru has launched Podcast Series on a monthly basis. This is hosted in the CEAH Youtube Channel namely CEAH Bengaluru Academy. The podcast is designed to illustrate the journey of successful entrepreneurs in various areas of Animal Husbandry Sector. The first podcost series in May-2023 was on Poultry Sector – Sri. Kishore Kumar Hegde, Managing Directror, Lifeline Group. Second in June 2023 on Dairy Sector – Sri. Ravindra Navale, Founder of IDFA and the third podcast in July 2023 on Sheep and Backyard Poultry – Sri. Dr. B.R. Athani, Managing Director, Future Greens.

CEAH Bengaluru invites everyone to visit Campuses and can request for need based training programme by writing to:

Dr. Mahesh P.S. M.V.Sc., PGPPM(IIMB),

Joint Commissioner & Director

CENTRE OF EXCELLENCE FOR ANIMAL HUSBANDRY –CEAH Bengaluru

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Chickens of Imagination: Chickaroo to Chickacock

Once upon a time, in a small village in rural India, there lived a farmer named Surya. Surya was known for his habit of daydreaming and his love for his chickens. He spent his days tending to his flock and dreaming up all sorts of creative ideas.

One day, Surya stumbled upon a dusty old book about genetics in his village's library. While reading the book he started thinking about testing and creating the most unique and hilarious breed of chickens ever seen. He saw himself crossing different breeds with his chicken.

In the realm of imagination he saw a "Chickaroo" a chicken with long, bouncy kangaroo legs, hopping around the farmyard with incredible speed and agility. When he tried to catch the Chickaroo it turned into a "Chickaffe" a chicken with an elongated neck, towering above the other animals on the farm.

Surya was astonished to see the Chickaffe using its extended neck to peck at the treetops. When Surya called out the Chickaffe was startled and started strutting around the barnyard with its giraffe-like neck an started morphing into a "Chicktopus".

The Chicktopus with its tiny chicken head and yellow tentacles started performing a comical dance as it attempted to navigate the farmyard leaving a trail of colorful surprises. The dancing Chicktopus while make an exit suddenly turned into a "Chion" a chicken with a majestic mane and a tiny roar. The Chion with its fierce appearance and chicken-like size and waddling gait winked at Surya.

Surya was astounded and in the blink of an eye the Chion turned into a "Chickguin" a sleek, black and white chicken, complete with tiny wings and a waddle. The Chickguin with the penguin's unique style of locomotion, attempted to slide on its belly across the farmyard.

The sliding Chickguin emerged as a "Rabicken", a small creature with a with the feathered body and beak of a chicken and a rabbit's long ears and fluffy tail, combined. Hopping in the farmyard it called out to Surya and said, "Can you get me some carrots?"

Before a dumbfounded could respond it turned into a "Chickacock", a chicken with the vibrant, iridescent plumage of a peacock and started strutting around the farmyard, proudly displaying its magnificent tail feathers, but with the chicken's signature bobbing and scratching movements. It was a hilarious and dazzling sight! Suddenly, there was a thunder and a downpour started and his unique brood of chicken started disappearing.

Surya opened his eyes and found himself wet as his mother had thrown a pail of water over him and was calling him out to wake up. Thus, ended his journey into the farmyard full of crossbred chicken and Surya is left wondering whether he should go ahead and experiment with breeding chicken with other animals.

Why poultry farm business is shutting down in Nigeria?

According to the Poultry Association of Nigeria, many poultry farms across the nation are currently closing their doors as a result of the ongoing increase in the price of maize, a key feed ingredient in the industry. Based on this, PAN said that Nigeria's poultry industry was doomed to failure if the government didn't intervene to save it.

In a statement on Monday, the association said, “At the moment, the poultry industry in Nigeria is on the verge of total collapse if urgent intervention is not channelled to it without further delay.We are aware that the government has declared a state of emergency on the food security situation of the country, but the situation of the poultry industry calls for an urgent intervention to save the industry from total collapse.”

The statement, which was co-signed by PAN's National President Sunday Ezeobiora and Director-General Onallo Akpa, claimed that farmers were forced to stop production due to an increase in the price of maize. It said, “The high surge in the price of maize and the near absence or scarcity of the product are causing farmers to close down their poultry farms at the moment because it is no longer sustainable to feed the birds and be in business. This is threatening the further development of the Nigerian poultry industry.”

According to data obtained from the National Bureau of Statistics, the price of one Agric medium-size egg rose to N89.17 as of May 2023 from N40.84 as of May 2020. This was as the importation of maize, a major component of poultry feeds, fell to $1.82 million as of the end of 2022 from $87.08 million as of the end of 2020, according to data from the International Trade Centre. Findings also revealed that the price of eggs, a daily protein source for many Nigerians, had soared by over 118.34 percent after maize importation fell by 97.91 percent.

The farmers said that maize is important in poultry feed, and the increase in the price of maize because of an import ban had translated to a rise in the price of eggs for the average Nigerian. The Federal Government imposed a prohibition on imports of maize into Nigeria in 2020 after the Central Bank of Nigeria (CBN) added maize to its list of items that are restricted from accessing foreign exchange. While the ban on imports of maize has had a negative impact on domestic production, it has also been linked to the ongoing banditry prevalent in the north of the country.

Alltech research paper on Mycotoxins recognised as one of three winners of 2022 Best Paper awards by Toxins

Toxins, a prestigious international research journal, has named one of Alltech's mycotoxin research papers as one of three winners of their 2022 Best Paper awards. The paper, "Co-Occurrence of 35 Mycotoxins: A Seven-Year Survey of Corn Grain and Corn Silage in the United States," was written by Dr. Alexandra Weaver, global technical support; Nick Adams, global director; and Dr. Alex Yiannikouris, research group director, along with an independent researcher Dr. Daniel Weaver.

"Research and innovation are at the core of our business at Alltech, and we are proud of this recognition of the innovative work being conducted by our global mycotoxin management team," said Dr Mark Lyons, president and CEO of Alltech. "Mycotoxins are ubiquitous on farms, and they pose a serious threat to the productivity of even the best-managed livestock production operations." Mycotoxin management should be on the radar of every feed producer and farmer."

The winning paper by Alltech describes how mycotoxins contaminate maize grain and silage in the United States, highlighting the importance of assessing multiple mycotoxins, including emerging mycotoxins and mycotoxin metabolites, when developing risk management programmes.

Mycotoxins contaminate crops all over the world and have a negative impact on animal health and performance. Multiple mycotoxins can co-occur, potentially increasing the animal's negative impact. Alltech conducted a seven-year survey of new crop maize

grain and silage in the United States to assess the multiple mycotoxin profile of maize. Between 2013 and 2019, 711 grain and 1117 silage samples were collected and analysed at the Alltech 37+ Analytical Laboratory for the simultaneous presence of 35 mycotoxins using ultraperformance liquid chromatography-tandem mass spectrometry.

Multiple mycotoxins were found in both maize grain and maize silage in the United States, according to the study. In fact, at least two types of mycotoxins were found in 90.2% of grain samples and 96.5% of silage samples.

The study also discovered that some of the more common mycotoxins they discovered, such as fusaric acid and deoxynivalenol, may not be routinely analysed by many programmes, emphasising the importance of testing for multiple mycotoxins when developing management programmes.

Mycotoxin challenges have increased in recent years, paralleling the occurrence of extreme weather events such as droughts, floods, and heat waves. According to the 2022 Alltech Harvest Analysis, 100% of samples in the United States contained two or more mycotoxins. 79% of mycotoxins were found in Europe.

"Selection for this award demonstrates the interest in and importance of testing for multiple mycotoxins," Dr. Alexandra Weaver said. "By better understanding the full mycotoxin profile of a feedstuff or ration, we can make more informed decisions about mycotoxin management."

DLG joins the “Agrievolution Alliance”

The German Agricultural Society (DLG), an international organisation dedicated to promoting agricultural knowledge sharing, has joined the international agriculture equipment manufacturers' association "Agrievolution Alliance" as a strategic member.

The Agrievolution Alliance, founded in 2012 by the Italian agricultural machinery association Federunacoma, was conceived in 2008 by the Italian agricultural machinery association Federunacoma. The confederation is made up of associations and organisations from agriculture equipment manufacturers all over the world, with the goal of supporting over 6,000 agricultural machinery manufacturers and promoting the benefits of mechanisation for global sustainable agriculture. AEM, the Association of Equipment Manufacturers, in Wisconsin, USA, manages the Agrievolution Alliance.

DLG is the first professional farming society to join the Agrievolution Alliance through its subsidiary DLG Service GmbH. The DLG's core mission is to work for the good of the industry, and this strategic membership expands on that mission while also enabling collaboration on key issues and initiatives.

Since 2011, DLG Service GmbH, DLG's exhibition subsidiary, has been in charge of organising the world's leading trade fairs, including Agritechnica and EuroTier, which are held biennially in Germany. Membership in the Agrievolution Alliance broadens the international network of the DLG's trade fairs to include agricultural machinery manufacturers from around the world.

DLG is a politically independent and non-profit society with over 30,000 members that is open to all. Its goal is to promote agricultural and food technological and scientific progress.

The DLG organises over 30 regional arable and livestock exhibitions worldwide, in addition to its leading international trade fairs, EuroTier for livestock farming and Agritechnica for agriculture machinery and plant production, both of which are held biennially in Hanover, Germany, and draw on an international network of food and agriculture experts as well as subsidiary companies in nine countries.

www.agrievolution.com contains information about the Agrievolution Alliance.

Denvik Technology is confident in their poultry management solution's ability to "peck a punch"

With Ornithon, a complete smart solution for modern chicken farms, Denvik Technology, an IoT solutions provider with an impressive customer list that includes names like FLSmidth, Elgi, and Grundfos, hopes to build on its success in the equipment automation space.

But what made the company, which has built a reputation for quality and trustworthiness with the deployment of its equipment automation solutions across 35-plus countries over the last 15 years, choose the poultry industry for diversification? Mohideen, the company's Director said, “Lot of processes today on a poultry farm are manual, time-consuming and error prone. Getting optimal output from birds is complex and requires accurate and timely tracking of various environmental parameters...ammonia, temperature, humidity...accurate growth monitoring, and scheduling

timely interventions to detect early issues/outbreaks, etc. Solutions available now are stand-alone and do not provide integrated and holistic monitoring of operations. This is where Ornithon can make a difference with its intelligent, holistic cloud/IoT-based solution. It allows for farm management to get instantaneous alerts and schedule timely interventions whenever there is any parameter/process deviation."

While many of the difficulties the sector encounters are common to many markets, others, like India, are not. "In India, a lot of poultry sheds tend to be open sheds. Compared to closed sheds, open sheds have lower egg output, lower profitability, and higher bird-mortality as it is more difficult to monitor and control several key parameters. Sometimes bird mortality rates in an open shed can be 10-20 per cent higher as compared to closed sheds. With Ornithon, poultry farmers can easily convert their open shed setup to a closed one for greater efficiencies, higher revenue, and lower bird mortality rates. In fact, in large poultry farms in Tamil Nadu, after Ornithon's deployment, monthly revenues increased by 11 per cent, egg production was up by 14 per cent and bird mortality rate was down by 3 per cent," said Mohideen.

On the company's targets, he said, "The bottom-up total addressable market in initial target regions i.e., the Middle East, India, and Europe, is around $540 million, our assessment shows. Conservatively, we are targeting a 5 per cent market share in the next 7 years."

Does the business, which just obtained money from CI Hub for international expansion, want to bolster its position in the market?Mohideen said, "As a team, we have always been focused on scaling the business with solid unit-level economics. We have largely used debt to fund our expansion plans in the past. We are looking at onboarding strategic investors who have expertise/interest/network in the domain and would like to partner with us in the longer run. These investors could potentially be companies, high net worth individuals or family offices."

Popeyes, the renowned US fried chicken giant, lands In Hyderabad: The City of Pearls in India Gets a Taste of Its Cajun Flavour

The renowned US fried chicken giant Popeyes has a location in Hyderabad's Satyam Mall, Ameerpet.

According to a press release from FoodWorks Limited, the brand's introduction to India began with the opening of its Bengaluru flagship restaurant, which was followed by expansion into Chennai, Manipal, and Coimbatore. The brand's entry into Hyderabad marks yet another noteworthy accomplishment and emphasises its expanding appeal among fans of fried chicken across the southern Indian regions.

Ameer Khetarpal, CEO and MD of Jubilant FoodWorks Limited, said, "Citizens of Hyderabad can now enjoy the bold Cajun flavours of fried chicken, burger (sandwich) in a brioche bun and French fries at the first store in Asian Satyam Mall."

Popeyes' success is attributed to its meticulous hand-breading, battering, and marinating of freshly purchased local chicken for a full 12 hours in distinctive Cajun seasonings - a classic fusion of cayenne pepper, garlic, onion, black and white pepper, and celery, guaranteeing a truly memorable culinary adventure with each bite.

10.7% of the Brazilian poultry behemoth BRF is purchased by SALIC

With the purchase of 180 million shares of BRF, the largest producer of chicken in Brazil, by Saudi Agricultural and Livestock Investment Co., or SALIC, the Kingdom is poised to make a name for itself in the global food business.

The Public Investment Fund-owned firm, according to the Saudi Press Agency, purchased a 10.7 percent interest in BRF for SR1.27 billion ($340 million), indicating its dedication to the Kingdom's food security.

According to the SPA report, the company's objectives to increase its local and international footprint include this investment. To secure the sustainability of specific fundamental food commodities, it also stems from Saudi Vision 2030, which supports long-term national development.

Since chicken is one of the most important products on the Saudi market, SALIC sought to directly access the key food supply through its

network of international relationships and investments.

Nevertheless, Saudi Arabia has been aiming to increase its yearly poultry self-sufficiency rate from the anticipated 43 kilogrammes per capita at present.

The food giant noted that by bridging gaps along the value chain and utilising global experience to increase the efficiency of local production, its investment in the BRF will also help its strategic initiatives to strengthen the local agri-food sector.

To obtain animal protein sources and meet food security goals in this sector at the local and international levels, SALIC emphasised that its investment in the poultry industry represents an expansion of its holdings in significant worldwide corporations.

In addition to acquiring a 42.4 percent stake in the Saudi company Naqua, the world leader in aquaculture, the company also stated that in 2016 it began a strategic investment and a qualitative partnership with the Brazilian firm Minerva Foods, one of the biggest international red meat companies.

BRF, which has been in business for 85 years, is the second-largest seller of halal goods globally and the third-largest producer of chicken in the world. With a capacity of over five million tonnes of chicken products annually and more than 90,000 employees throughout 130 nations, it is also the most popular brand of poultry goods in Brazil.

Why Japan suspends the import of poultry from a second Brazilian state

Following the discovery of a case of highly pathogenic avian influenza (HPAI) in a home chicken, Japan has

stopped imports of chicken from Brazil's Santa Catarina state, according to the Brazilian meat lobby ABPA on Monday. This has caused a new issue for the nation's meat processors.

Following the confirmation of bird flu at a non-commercial farm in the Brazilian state of Espirito Santo, Japan stopped purchasing chicken from that region last month.

Agri Minister Carlos Favaro will address import requirements for chicken products with Japanese authorities during a trip to Japan next week, the Brazilian government later confirmed the ban.

Less than 3% of Brazil's overall exports, according to the ABPA, which represents companies that process pigs and poultry, including JBS SA (JBSS3.SA) and BRF SA (BRFS3.SA), are shipped each month from Santa Catarina plants to Japan.

When Japan banned products from Espirito Santo, the lobby group said that stance was not "in line with the guidelines of the World Organization for Animal Health (WHOA)." Regional or national bans would only be effective if the highly virulent virus reached a commercial farm, which authorities claim has not happened in Brazil yet.

The biggest exporter of chicken in the world is Brazil. On May 15, the nation announced the first HPAI outbreaks in wild birds. Since then, dozens of outbreaks of this disease have been reported in at least seven states.

After Parana, Santa Catarina is the nation's second-largest processor of chicken meat. Every significant Brazilian food exporter has facilities in the region. A case of bird flu in wild birds was first reported in Espirito Santo, a big supplier of eggs, around two months ago.

Russia pumps extra money into a new crossbreed complex

The Smena-9 breeding centre is being built in the Moscow Oblast with an additional 1.5 billion roubles (US$20 million) from the Russian government, and it is expected to start operating by the end of the year.

According to a note attached to the decree signed by Russian Prime Minister Alexey Mishustin, the government believes that constructing the breeding complex will help Russia reduce its reliance on imported breeding stock and improve the nation's food security.

The Smena 9 centre will be built with 4.5 billion roubles (about $60 million) from the Russian budget in 2022. The new tranche will bring the project's overall cost to 6 billion roubles (around $80 million). The additional funds were required, but the government didn't say why.

By 2025, Russia expects the Smena-9 crossbreed to represent 15% of the market for chicken breeding stock in the country. This amount is projected to increase to 50% over the following five years.

According to Vladimir Fisinin, president of the Russian Union of poultry producers, the Smena-9 broilers' average daily growth during field trials

was judged to be close to 75 grammes, which is thought to be a fair rate. He also mentioned how quickly the complex's construction was moving along.

"At the territory of the complex, 22 facilities are being built, including 2 sites with 4 poultry houses for growing young animals, 2 sites with 6 poultry houses for adult birds, the latest hatchery of 5,600 square metres with 3 isolated compartments to comply with biosecurity requirements, as well as the latest indoor manure processing complex, covering about 6,000 square metres," said Fisinin.

According to the Russian Ministry of Education and Science, Smena 9 is superior than the most well-liked international crossbreeds. For instance, the live weight of grill chickens at 35 days of age is 4.7% greater compared to Ross 308, while the average daily increase is 2.1%. Additionally, Smena 9 is believed to have a higher productivity index and a reduced mortality rate.

When the complex is expected to start operating is unclear. The officials stated in 2022 that it should begin operation by May 2023. According to the Russian Poultry Union, instructions for poultry farms on how to properly maintain Smena 9 broilers have already been produced.

Tender is invited by the city corporation to collect and treat chicken waste

City cooperation requested bidders to gather and treat chicken from city-based chicken shops. Additionally, it has requested bids for the collection of household biomedical waste.

The entire Kochi and other nearby local bodies used to dump in the yard before to the significant incident at Brahmpuram on March 2. Various agencies have been engaged to treat meat waste.

Corporation authorities has entrusted with private firm with the responsibility to collect biometrical waste from the households of the city and hand it over to Kerela Enviro Infrastructure Ltd (KIEL).

"There is collection of biomedical waste households. That's why we have decided to entrust the job with multiple agencies" said the mayor M Anil Kumar.

The collaboration began collecting biomedical waste from residences in June. Residents can donate their biomedical waste to KIEL and collaborate by paying Rs 12 per kg of garbage. The cooperation is also paying the GST on it. Just transit costs must be covered by the residents. Diapers and all other biometric waste, like as sanitary products, are collected.

The deadline for submitting bids for the collection of household biomedical waste is July 27.

Waste bags were still laying around the city in various locations since individuals used to throw their trash on the streets. There have been instances where waste, particularly plastic, has been set on fire. Those who leave trash on the streets are subject to fines from the collaboration.

Caged egg phase out endorsed for 2036 as states left to finalise end date

Australia's agriculture ministers have approved a revised version of the Australian Animal Welfare Standards and Guidelines for Poultry, with the goal of phase-out battery eggs by 2036. This decision is good for poultry farmers and consumers, as the market is already shifting with retailers and large manufacturing companies moving

towards more humane methods of raising hens and getting the types of eggs they need. The federal agriculture minister, Murray Watt, stated that states and territories would be responsible for putting the new regulations into effect. The goal is to phase out battery eggs by 2036.

The business is concerned that the approved 2036 date may result in a price explosion due to a shortage of eggs, similar to what occurred in New Zealand. In response to a business decision to stop selling caged eggs by 2025, supermarket prices for eggs have increased by more than 50%. Despite government laws permitting colony cages, which house between 20 and 60 birds and contained scratch pads, perches, and nest places to encourage more naturally-behaving birds, colony cages continued to be used despite the phase-out of battery cages.

The packaged egg sector, which supplies bakeries, hotel chains, cruise lines, and the larger hospitality industry, accounts for 50% of the country's total egg production. Australia has lagged behind other nations in the phase-out of cage eggs, with major grocery chains Coles, Woolworths, and Aldi each promising to phase out or outright prohibit the use of battery cages in their supply chains by 2025. State farming organizations will need to work with their individual state minister to work through this situation.

New standards define caged eggs as conventional cages or battery hens or battery cages. The new guidelines allow for the continued use of cages in poultry farming and egg farming, but they won't be the kind of cages we're all used to seeing on TV in years gone by. The new guidelines include nesting sites, perches or platforms, and a scratching area to encourage layer hens

to behave more organically. The council also recommended minimum light intensity limits and other environmental enhancements for the wellbeing of meat chickens.

Vaccination can help chickens be more effectively protected from highly virulent avian influenza.

The H5 subtype of the highly pathogenic avian influenza virus (HPAIV) has evolved from seasonal outbreaks to a persistent, almost universal panzootic in wild birds. In addition to increasing the risk of secondary transmission and human exposure at the poultry-human interface, this increases the push for HPAIV penetration into poultry holdings.

International scientists have shown how adding valuable supplements to numerous levels of appropriate surveillance can help achieve immunisation with zero-tolerance for infection. In the most current issue of Biologicals, scientists from Germany, the Netherlands, Italy, Indonesia, and Hong Kong reported their findings.

Recent developments toward a massively increased circulation of HPAIV in wild birds and in the poultry industry in many regions across the world have moved vaccination into focus as a complementary prevention tool in major parts of the globe. HPAI vaccination has never been successful in controlling HPAIV on its own. Biosecurity, continuous evaluation of vaccination uptake and efficacy, adequate surveillance of vaccinated flocks to ensure the freedom from field infections, and typing of detected field strains to improve vaccine design are all equally required.

Utilising the right vaccines, vaccination as an additional layer of defence for poultry farms aims to lessen clinical consequences of HPAIV infection, stop the spread of the virus, reduce financial losses and issues with animal welfare, and reduce exposure risks to zoonotic HPAIV at the avian-human interface.

It is essential to properly prepare and implement surveillance systems that are specific to the type of vaccination used and the epidemiological conditions (zones and compartments) of a given nation. In a population of vaccinated flocks, active surveillance elements (such as serosurveys of vaccinated flocks to monitor herd immunity or assess vaccine coverage, environmental sampling at live bird markets) are more pertinent than in a population of unvaccinated flocks for the accurate detection of HPAI virus or demonstrating freedom.

Yet, passive surveillance (i.e., virological analyses of diseased or dead poultry) remains crucial since it may help early detection of vaccine failures resulting in vaccinated infected flocks showing clinical signs of infection.

The avian influenza vaccine effort has increased support from France.

This week, Marc Fesneau, France's Minister of Agriculture and Food Sovereignty announced funding for five crucial initiatives to finish the compensation programme for immunisation against avian influenza. The state reiterated its commitment to helping the poultry industry, which was severely impacted by avian influenza in 2022–2023.

A de-densification strategy targeting palmipeds in Pays-de-la-Loire and Deux-Sèvres is being implemented to reduce duck density until vaccination is implemented. The strategy aims to gradually reduce the density of ducks in farms until vaccination is implemented, limiting the risk of a new epizootic wave. The measure aims to reduce the number of unvaccinated ducks in 45 municipalities and only vaccinated ducks from October 2023. The measure also applies to 40 strategic sites for avian genetics. The advance system will be opened before July 21, covering up to 50% of estimated losses. MASA supports selection-breeding link companies and breeding herd farmers affected by the avian influenza. The compensation scale for slain poultry for the 2022–2023 crisis has been updated from the production costs of the 2022 fourth quarter, which saw the highest concentration of slaughters.

With the definition of the recommended vaccination schedule, preparation for the deployment of the HPAI vaccine campaign moves forward in accordance with the previously announced schedule. All commercial duck farms in the metropolitan area (except for Corsica) (Beijing, Barbarie, and Mulard) will be required to vaccinate their animals at all times of the year.

For breeding duck farms producing day-old birds or hatching eggs solely for the domestic market, vaccination will still be optional. To avoid obstructing specific export trade flows, vaccination of breeding ducks whose products are intended for export is prohibited.

Each farm that receives vaccinations must be subject to meticulous health monitoring, including regular assessments and a monthly visit from the health veterinarian.

By paying 85% of the total cost of this ground-breaking and ambitious undertaking, MASA will contribute to the success of the immunisation campaign.

As a reminder, immunisation cannot stop all emerging epidemics. It is an extra protection strategy in addition to the ones already in place, which include the following: adherence to biosecurity measures at all points of contact with the industry; health surveillance that ensures early disease identification; and a decrease in livestock farming densities to prevent the virus from spreading.

EGG
Daily and Monthly
Prices of July 2023

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	555	555	555	530	510	480	480	480	480	480	480	480	480	483	485	487	487	487	460	460	425	425	425	425	425	430	440	445	445	445	445	473.19
Ajmer	492	495	452	452	431	421	421	410	410	410	400	390	400	421	425	430	430	430	400	370	370	370	362	370	385	395	405	390	375	375	375	408.45
Barwala	473	473	446	446	421	421	392	392	392	392	392	372	384	389	396	400	400	400	375	365	365	365	352	357	375	385	385	385	360	363	363	392.77
Bengaluru (CC)	600	580	580	580	570	540	500	500	480	460	460	465	475	490	495	500	505	505	505	485	485	485	465	440	445	445	455	460	465	465	465	495.16
Brahmapur (OD)	553	553	520	520	470	470	470	470	445	445	445	445	450	460	470	480	490	490	480	460	460	445	435	435	435	445	450	455	460	460	460	468.58
Chennai (CC)	610	600	590	590	580	560	560	530	530	500	480	480	480	490	510	520	520	520	520	520	500	500	500	470	470	470	470	470	480	480	480	515.48
Chittoor	603	593	583	583	573	553	553	523	523	493	473	473	473	483	503	513	513	513	513	513	493	493	493	463	463	463	463	463	473	473	473	508.48
Delhi (CC)	492	492	492	465	465	438	435	410	410	410	410	410	390	404	410	415	418	418	418	393	383	383	383	370	375	394	405	405	405	379	379	414.71
E.Godavari	535	535	500	500	450	450	450	450	425	425	425	425	430	440	450	460	470	470	470	440	440	425	415	415	415	425	430	435	440	440	440	449.03
Hospet	560	540	540	540	530	500	460	460	440	420	420	425	435	450	455	460	465	465	465	445	445	445	425	400	405	405	415	420	425	425	425	455.16
Hyderabad	540	520	520	500	470	470	470	450	425	425	425	425	430	435	445	450	455	455	455	425	425	425	400	400	405	410	415	420	420	420	420	443.55
Jabalpur	555	555	555	555	500	500	475	475	450	450	425	425	425	435	440	450	455	455	455	435	435	415	415	390	400	410	410	410	400	400	400	450.16
Kolkata (WB)	565	560	540	520	520	510	510	490	490	490	480	490	500	520	550	550	550	535	500	490	490	480	470	470	485	501	511	516	516	500	480	509.00
Ludhiana	472	472	472	455	445	433	405	405	390	390	390	390	390	396	398	403	405	405	405	392	374	365	365	365	365	380	385	385	385	375	370	400.87
Mumbai (CC)	605	605	585	585	560	530	530	530	510	485	485	485	485	490	495	505	510	515	515	515	485	485	485	460	460	465	470	475	480	480	480	508.06
Mysuru	600	580	580	580	570	530	500	500	480	460	462	467	475	490	500	505	512	512	512	487	487	487	465	440	445	445	455	460	465	465	465	496.16
Namakkal	540	530	530	520	500	470	470	470	450	430	435	440	445	450	455	460	465	465	465	445	445	445	420	400	400	400	410	415	420	420	420	452.58
Pune	605	605	595	585	575	545	535	535	530	510	495	495	495	501	501	511	511	511	511	500	485	475	475	465	465	465	470	475	480	480	480	511.81
Raipur	549	549	549	525	510	495	495	495	475	465	455	445	445	455	465	475	475	475	460	450	450	435	415	415	415	415	415	415	415	395	395	460.87
Surat	565	565	565	565	535	500	500	500	500	500	500	500	500	500	500	500	500	500	480	480	450	450	450	450	450	450	450	450	450	450	450	490.48
Vijayawada	535	535	500	500	450	450	450	450	425	425	425	425	430	440	450	460	470	470	470	440	440	425	415	415	415	425	430	435	440	440	440	449.03
Vizag	550	550	515	515	475	475	475	475	435	435	435	435	450	460	470	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475.81
W.Godavari	535	535	500	500	450	450	450	450	425	425	425	425	430	440	450	460	470	470	470	440	440	425	415	415	415	425	430	435	440	440	440	449.03
Warangal	542	522	522	502	472	472	472	452	427	427	427	427	432	437	447	452	457	457	457	427	427	427	402	402	407	412	417	422	422	422	422	445.55
Prevailing Prices																																
Allahabad (CC)	543	543	543	533	524	500	486	476	467	457	448	448	448	448	452	452	452	452	443	438	433	429	424	419	419	419	429	429	429	419	419	458.74
Bhopal	545	545	545	545	515	495	470	470	460	460	440	440	440	440	460	470	470	470	470	445	445	435	435	420	415	420	420	420	420	420	390	459.19
Indore (CC)	525	525	500	480	460	460	460	460	440	440	430	430	440	460	460	460	460	460	440	410	410	410	400	410	410	425	430	420	420	410	410	443.71
Kanpur (CC)	500	500	500	500	476	462	452	443	443	433	433	433	433	433	443	443	443	443	433	424	414	414	400	400	400	410	410	410	420	395	395	436.71
Luknow (CC)	533	533	533	533	523	500	490	480	467	467	467	467	467	467	467	467	467	467	467	467	450	450	450	433	433	433	433	433	433	433	433	469.13
Muzaffurpur (CC)	535	535	525	510	500	480	470	465	465	457	457	457	457	457	457	460	465	456	465	435	435	420	420	420	430	445	450	450	440	430	430	460.58
Nagpur	580	560	550	520	530	530	515	510	430	430	430	430	430	450	475	475	490	490	480	450	440	440	420	420	420	430	445	445	425	430	430	467.74
Patna	535	535	525	510	500	480	470	465	465	457	457	457	457	457	457	460	465	465	465	435	435	420	420	420	430	445	450	450	440	430	430	460.87
Ranchi (CC)	553	552	548	533	514	480	490	481	467	462	462	462	462	467	467	467	467	467	467	457	457	448	448	438	438	438	448	448	448	438	438	471.35
Varanasi (CC)	540	540	533	533	510	483	468	467	457	447	440	440	440	447	450	450	450	450	440	433	433	423	417	400	417	430	440	440	440	430	423	455.19

Editorial Calendar 2023

Publishing Month: **January** Article Deadline : **28th, Dec. 2022** Advertising Deadline : **30th, Dec. 2022** Focus : **Winter Disease Management**	Publishing Month: **February** Article Deadline : **28th, Jan. 2023** Advertising Deadline : **30th, Jan. 2023** Focus : **Health & Nutrition Management**	Publishing Month: **March** Article Deadline : **26th, Feb. 2023** Advertising Deadline : **28th, Feb. 2023** Focus : **Vaccination & Immunization**	Publishing Month: **April** Article Deadline : **28th, March 2023** Advertising Deadline : **30th, March 2023** Focus : **Summer Management**
Publishing Month: **May** Article Deadline : **28th, April 2023** Advertising Deadline : **30th, April 2023** Focus : **Cold Chain Management**	Publishing Month: **June** Article Deadline : **28th, May 2023** Advertising Deadline : **30th, May 2023** Focus : **Feed Production**	Publishing Month: **July** Article Deadline : **28th, June 2023** Advertising Deadline : **30th, June 2023** Focus : **Layer Farming**	Publishing Month: **August** Article Deadline : **28th, July 2023** Advertising Deadline : **30th, July 2023** Focus : **Genetics & Breeding**
Publishing Month: **September** Article Deadline : **28th, August 2023** Advertising Deadline : **30th, August 2023** Focus : **Biosecurity Practices**	Publishing Month: **October** Article Deadline : **28th, September 2023** Advertising Deadline : **30th, September 2023** Focus : **Winter Breeding Management**	Publishing Month: **November** Article Deadline : **28th, October 2023** Advertising Deadline : **30th, October 2023** Focus : **Environment Control**	Publishing Month: **December** Article Deadline : **28th, November 2023** Advertising Deadline : **30th, November 2023** Focus : **Industry Outlook**

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