

Poultry Fortune

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SMN P.F	Tamil Nadu	22	West Bengal L.D.C	West Bengal	24	Srinivasa Farms Pilaipoli Unit	Telangana	25
Rambabu P.F	Rajasthan	22	ISK P.F	Tamil Nadu	24	Sri Venkata Rama P.F	Andhra Pradesh	25
Goyal Layer Farm	Uttar Pradesh	22	Sembil P.F	Tamil Nadu	24	Anjanthi Poultries	Andhra Pradesh	25
Jamejo Agro	Uttar Pradesh	23	Lakshma Reddy Agro Farms	Andhra Pradesh	24	Sai P.F	Gujarat	25
Global Poultry Product	Punjab	23	Devi Durga P.F	Andhra Pradesh	24	Krupa P.F	Gujarat	25
Naman P.F	Rajasthan	23	D.S.R. P.F	Andhra Pradesh	24	Thakre P.F	Maharashtra	26
Khan Layer Farm	Uttar Pradesh	23	N Jhansil Rent P.F	Andhra Pradesh	24	Sri Kanka Durga Foods Pvt.Ltd	Andhra Pradesh	26
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Ajay Kumar Singh Layer	Uttar Pradesh	24	Asif Ali	Bihar	25	Karamman P.F	Tamil Nadu	26
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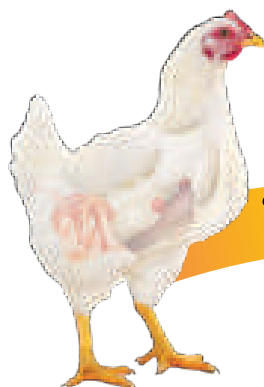
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- Editor



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Editorial

- PFI demands to increase growing charges in Broiler Integration to 70% from 25% to farmers.

News

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- Kerala Government calls for caution as avian flu is confirmed in many districts.
- Kerala: Bird flu outbreak in state-run poultry farm kills 1800 birds.
- India set to export record 50 million eggs this month.
- Royal Pas Reform appoints Eric Stodel as new CEO.
- MDR E. coli found in poultry farm soil and water, but meat safe in Telangana: Study.
- Novus India launches Breeder Management and Nutrition: Moving the industry forward book.
- Glimpses of Indian Herbs participation in the expo at Hyderabad.
- Novus Acquires Biotech Company Agrivida to Develop New Feed Additives.

- Novus Names Co-Innova Animal Nutrition Technology (Shanghai) as Distribution Partner in China.
- Indian Veterinary Association announces Dr Shirish Nigam as National Co-Convenor of Entrepreneur's Wing.
- 2023 Alltech Agri-Food Outlook shares global feed production survey data and influencing trends in agriculture.
- J&K Govt to boost Poultry sector; Increase Annual Output from Rs 709 crore to Rs 1,982.
- Namakkal Poultry Farmers Hope Export of Eggs to Malaysia to Rise.

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+91-819 729 8530 / 994 531 1779

Santhosh Kumar
santhosh.k2@anthembio.com

Anthem Biosciences Pvt. Ltd.,
#49, F1 & F2 Canara Bank Road, Bommasandra Industrial Area Phase-I, Hosur Road, Bangalore-560099, Karnataka, INDIA

PFI demands to increase growing charges in Broiler Integration to 70% from 25% to farmers

Broiler sector is facing significant challenges as a result of metabolic disease, which is responsible for the high morbidity and death rates of chicken. To solve these issues, we must concentrate on management strategies including ensuring a thermoneutral environment, modulating growth curves through feed restriction programmes and utilizing antioxidants.



Dear Readers,

The February 2023 issue of **Poultry Fortune** is in your hands. In the news section, you may find news about

Poultry Federation of India organised its 33rd Annual General Body

Meeting on 22 December 2022 at Chandigarh. Mr Ranpal Dhanda, President, PFI, expressed his gratitude to various Ministers of Government of India and Department of Animal Husbandry and Dairying for their work for the upliftment of poultry farmers through the published Commercial Contract Guidelines for Broiler Production and demanded to increase growing charge to 70% from 25% for the farmers as mentioned in the guidelines. He also requested Ministers of Government of Punjab to implicate and follow those guidelines in their state.

Chief Guest of the occasion, Mr Kuldeep Singh Dhaliwal, Cabinet Minister, Agriculture and Farmers Welfare, Government of Punjab was present. Mr Ranpal Dhanda raised a serious issue regarding contract farming. He further indicated that poultry farmers cannot survive in present situation as companies are not giving fair price to the farmers and the farmers cannot even earn their expenses. Flock after flock their losses are increasing. He presented a calculation of fixed cost and variable cost for the flock. It indicates that farmers loose Rs 27 per bird in a single flock when all the actual costs are taken into consideration. He requested the Minister to kindly take into consideration all the costs before implementing these guidelines on a serious note.

Novus India launched their latest book, **Breeder Management and Nutrition: Moving the industry Forward** during an occasion held at Hyderabad recently. The book's 14 chapters were carefully

curated to serve as a reference for current broiler breeder production best practices and considerations as well as to be a catalyst for new ideas in management, nutrition and industry sustainability.

Novus International, Inc., announced a new partnership with Co-Innova Animal Nutrition Technology (Shanghai) on 17 January 2023 to serve customers in China.

Indian Veterinary Association announced Dr Shirish Nigam as the National Co-convenor of Entrepreneur's Wing of IVA. Looking into the changing dynamics of animal husbandry sector and to augment support to members in their entrepreneurial journey, it was decided to start an Entrepreneur's Wing at IVA with a vision to facilitate proactive policy making to support animal husbandry sector related business activity across value chain by connecting the dots between companies, enterprises and policy makers. Another part of the vision is to look at possibilities of how India can be global leader in exporting animal health and nutrition technologies. Dr Shirish Nigam, Managing Director, EW Nutrition India Pvt Ltd & Angel Investor - Animal Health & Nutrition expressed his pleasure in joining IVA.

Alltech released its 2023 Alltech Agri-Food Outlook on January 23, highlighting global feed production survey data. Despite significant macroeconomic challenges that affected the entire supply chain, global feed production remained steady in 2022 at 1.266 billion metric tons, a decrease of less than one-half of one percent (0.42%) from 2021 estimates. The annual survey, now in its 12th year, includes data from 142 countries and more than 28,000 feed mills.

Kerala Government calls for caution as Avian Flu is confirmed in many districts. On January 7, 2023 avian flu had been confirmed in Azhoor grama panchayat in Thiruvananthapuram district. The district administration had issued orders that

Contd on next page



Poultry Fortune

Our Mission

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

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

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

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

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

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Tel: +91 040 - 2330 3989, 70329 19554. Website: www.poultryfortune.com

all poultry and other pet birds in the affected wards be killed and that all eggs, meat, bird fodder and litter be destroyed. In a statement issued on January 8, the Health Department said that the public needed to maintain caution and follow the directives of the authorities, so that there were no chances of the Avian Flu passing on to humans. Usually, human transmission of avian flu does not happen, but viral mutation can make this a possibility.

In the Articles section – *Metabolic Disorders in Commercial Broilers and Prevention Methods*, authored by Dr Rambabu.D said that the broiler sector is facing significant challenges as a result of metabolic disease, which is responsible for the high morbidity and death rates of chicken. Broiler chickens forced selection for rapid growth places a greater stress on their cardiovascular system, which predisposes the birds to metabolic disorders like Leg tremors, ascites and the sudden cardiac death syndrome. To solve these issues, we must concentrate on management strategies including ensuring a thermoneutral environment, modulating growth curves through feed restriction programmes and utilizing antioxidants.

Due to rapid rate of advancements in the genetic potential of chicken for development and efficiency, metabolic issues have been a constant in poultry production for at least the previous few decades. In broilers, metabolic disorders are more prevalent. Leg issues are frequently the outcome of rapid early growth and can therefore be associated to metabolic illnesses when they are observed in the absence of infectious agents. The key link between it and metabolic diseases in birds is an increased workload on the cardiovascular system. Cardiovascular disorders, which in broiler chickens cause a significant portion of flock mortality and musculoskeletal disorders, which cause less mortality but slow growth (thereby reducing profit) and cause lameness, which is still a significant welfare concern, are the two main body systems affected by poultry metabolic diseases.

Another article titled ***Prevention of Coccidiosis: Shuttle Program Solutions by Glocrest***, authored by **Dr Ramdas S. Kambale** informed that Avian coccidiosis is a parasitic disease caused by protozoa of the genus *Eimeria* spp. Eradication of coccidia has proved impossible and the transmission stage of the parasite – known as oocysts – can be found in the litter of most commercial broiler houses. The transmission of this coccidia within the facility or even between farms is carried out in a feco-oral way or through vectors, whether they are contaminated materials or by live vectors, such as rodents, worms, flies or beetles. In order to minimize the risk of resistance to coccidiostats, it is common to carry out rotation or shuttle programs, in which different synthetic coccidiostats and ionophores are used in each production cycle or even within the same cycle.

Article titled ***Use of Herbal Choline – New Era in Poultry***, authored by **Dr Mahesh Rajurkar** discussed that looking at current scenario of poultry day by day feed cost is increasing. To reduce production cost replacement of certain feed additives with Herbal medicine is the need of the time. Various branded and trusted organizations in India are manufacturing herbal based feed supplements from the world of photochemistry. These products are highly research based products – which are exported to various countries. There is great demand for these herbal feed supplements abroad. Still in domestic market – in India these products are not highlighted. However to control

or to reduce production cost in poultry herbal feed additive is need of the time. To overcome these challenges replacement of synthetic choline with Herbal choline may act as cost effective.

Another article titled ***Emerging Challenges & Opportunities for Sustaining Future Expansion of Poultry Sector***, authored by **Mr Ricky Thaper** said that Livestock sector plays a critical role as a subsector of agriculture in the Indian economy. The sector has huge potential in terms of its contribution in total economy, employment generation and world trade. The sector comprising poultry meat, eggs, dairy and fisheries / aquaculture witnessed a compound annual growth rate of 8.15 per cent. As per the estimates of National Accounts Statistics, 2020 for sector wise Gross Value Added of agriculture and allied sectors, the contribution of livestock in total agriculture and allied sector GVA (at constant prices) has increased from 24.32 per cent (2014-15) to 29.35 per cent (2019-20). Livestock sector contributed 4.35 per cent of total GVA in 2019-20. Development of the livestock sector has led to improvement in per capita availability of milk, eggs and meat.

In the last three decades, the India poultry market has undergone significant transformation and the region has emerged as one of the major sectors of the economy. The poultry market in the country is being largely driven by the rising disposable incomes and changing consumer food habits. In the post Covid-19 pandemic phase also the demand for the protein rich food like poultry meat and eggs have increased sharply. The growing awareness regarding health and wellness is further driving the demand for a protein-rich diet.

Article titled ***Behaviour Pattern of Poultry***, authored by **R. Sakthivadivu, R. Amutha and P. Thirunavukkarasu** informed that Behaviour (Ethology) is the character through which the birds can respond to the external stimuli of their environment. The external stimuli may be from other birds, environment in which they are placed, people or any other thing or occurrence. The following factors are responsible for the behaviour of the birds. A) **Genetic** - Some strains of birds are more docile wherein the character responds to selection pressure. B) **Experience** - Birds know instinctively how to eat, but they are not aware of what to eat or where to find it. C) **Age** - When the bird reaches an appropriate age, the behavioural characters like, development of the peck order and reproduction behaviour are established. D) **Older birds** - Cannibalism is very common in aged birds. E) **Environment** - The high intensity of light tends to increase the activity of birds, especially at a very young age and encourages them to seek feed and water.

Results in Layer and Broiler farming can be achieved as per specifications when the breeder guidelines are followed. Farmers and Integrators have to give sufficient time and attention to farm management and check the developments there time to time to ensure results. When you invest your hard earned money into it, a little more care and attention can prevent losses and help in profitable farming all the time.

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

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PFI holds its 33rd AGM at Chandigarh

Punjab Minister asks Broiler Integrators to pay appropriately to their contract farmers

Sonepat: Poultry Federation of India (PFI), an apex and renowned association of Poultry Farmers, Breeders, Equipment Manufacturers, Pharmaceutical Companies and all allied Industries, organized its 33rd Annual General Body Meeting (AGM) at Hotel Hyatt Regency, Chandigarh on December 22, 2022.

Event commenced with registration in the morning and a very warm welcome address given by President, Mr Ranpal Dhanda. First of all he expressed his gratitude to all visitors (650+) who came on time on such cold and Foggy morning and also thanked Sponsor companies for their contribution in various categories. He also expressed his sincerest gratitude to various Ministers of Government of India and Department of Animal Husbandry and Dairying for their work for the upliftment of poultry farmers through the published Commercial Contract Guideline for Broiler Production and demanded to increase growing charge to 70% from 25% for the farmers as mentioned in the guidelines. He also requested to Ministers of Government of Punjab to implicate and follow these guidelines in their state.

Mr Ravinder Singh Sandhu, Secretary, addressed the delegates about the activities of Poultry Federation of India during the year and further assured that Poultry Federation of India in ensure much more drastic steps which shall help the Indian Poultry Farmer in future as well. Accounts were presented by Ricky Thaper, Treasurer, which were concurred and approved by the member delegates. The session ended with a Public address by Mr Ramesh Chander Khatri, Chairman, who appreciated all delegates and the team for their rigorous efforts for the betterment of the poultry farmers.

The AGM session was followed by technical session wherein presentations on varied aspects were given by various speakers namely Dr P. K. Shukla, Dr Deepak Singh, Dr P. Mahesh, Mr Susil Silva Dr Ajit Ranade, Mr Vijay Sardana, and Dr Lipi Sairwal respectively. The content of these presentations covered various fields including the incentives and schemes for promotion of poultry farming by Government of India.

The Chief Guest of the AGM was Mr Kuldeep Singh Dhaliwal, Cabinet Minister,

Rural Development & Panchayats, NRI Affairs, Agriculture & Farmers Welfare, (Government of Punjab) and Guest of Honor Mr Laljit Singh Bhullar, Cabinet Minister, Transport, Animal Husbandry, Fisheries and Dairy Development (Government of Punjab).

During the welcome address of Chief Guest Mr Ranpal Dhanda raised a serious issue regarding contract farming. He further indicated that poultry farmers cannot survive in present situation because companies are not giving fair price to the farmers and they cannot even earn their expenses. Flock after flock theirs losses are increasing. He presented a calculation of fixed cost and variable Cost for a flock. That indicates that farmers' loss Rs. 27 per bird in a single flock when all the actual costs are taken into consideration. He requested the Hon'ble Chief Guest to kindly take into considerations all the costs before implementing these guidelines on a serious note.

Post his address, Broiler Federation, Punjab conveyed their concerns regarding contract farming to the Hon'ble Chief Guest which was in tune with the aspects covered by President,

Poultry Federation of India. He further presented the research papers and recommendations by a GADVASU, Ludhiana, Punjab that studied the financial aspects and found in its report that the contract farmer is actually making severe losses.

Upon these deliberations, the Chief Guest Mr Kuldeep Singh Dhaliwal promised that this exploitation of farmers should stop across India and Punjab will be the first state to take action against such exploitation of poultry farmer setting an example for the entire country. He further gave his assurance that the Government shall support the Punjab Poultry Farmer and entire poultry sector in all concerns in future as well. He further expressed his desire for opening of first Poultry Produce Market in Punjab as poultry farmers of Punjab face an immense challenge due to non availability of such markets in the state and also assured of making deliberations regarding market fees on Bajra, Maize etc that should bring relief for the poultry sector in Punjab and entire India. He also emphasized that Poultry chicken and egg is the best and purest form of protein which is essentially required for eradication of malnutrition in India.

Concurring the assurances given by the Hon'ble Chief Guest, the Guest of Honour, Mr Laljit Singh Bhullar stated that the Government of Punjab will become the first state in the entire nation that will bring various rulings that shall favor the Indian

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poultry farmer and will always stand by the poultry farmers of Punjab including the implementations of the guidelines for contract farming. He also assured that the government of Punjab is more than willing to work towards the poultry farmer and Government of Punjab will try to set an example to the entire nation for the betterment of poultry farmer of the state. Being a farmer himself, the Hon'ble Guest of Honor expressed his support to

Poultry Federation of India across India for improving the economic state of the poultry farmer of entire nation.

The event concluded with a vote of thanks by Mr Sanjeev Gupta, Vice President (HQ), Poultry Federation of India who also expressed his gratitude to both ministers for their support for the welfare on poultry farmer. The event was hosted by Dr Devender Hooda, Executive Member, Poultry Federation of India.

Fixed Cost for 10,000 Birds:

1.	Cost of Half Acre Land (20 Lac) considered as Zero	= 0
2.	Cost of land development Approximately 22 000 X 3.5 Feet soil (77 000 x 6)	= 462,000
3.	Construction other than Poultry Shed (Boundary wall, feed store, labour quarter, tubewell etc)	= 300,000
4.	Construction cost for 10 000 Sq. Feet farm (including parda, jaali, equipment feeder, drinker, electrical fitting, Water Fitting etc)	= 30,00,000
5.	Ventilation Fans (5 Fans and Control Panel etc)	= 200,000
6.	Cooling Pad (with motor and accessories)	= 90,000
7.	Miscellaneous Expenses	= 10,000
8.	Generator (30 Kw)	= 550,000
9.	NOC (Pollution, Town Plan, Panchayat)	= 40,000
10.	Mortality Disposal Incinerator	= 200,000
	Total Fixed Cost	= 48,52,000

Below are the interest cost per year

Bank Interest 9% pa and other banking fees	= 436,680
Rent of ½ Acre per month (Rs 30,000 yearly)	= 30,000
Total expenses	= 466,680

Per bird interest on fixed cost in one year:

$466,680 / 10,000 / 5 = \text{Rs } 9.33$ Per Bird, Per Flock (5 Flocks in One Year)

Variable Cost per Flock for 10,000 birds:

1.	White wash, Disinfection & Fumigation (Safedi, Chuna)	= 10,000
2.	Bedding for litter (Rice Husk, Saw Dust etc 2500 kg X Rs 11 / kg)	= 27,500
3.	Brooding Expenses (Heating by gas burner, saw dust/ buraada, diesel)	= 20,000
4.	Maintenance of Housing Building	= 8,000
5.	Maintenance of Water Lines and feeding Systems	= 3,000
6.	Maintenance Cost (Tools, Machines & Equipments)	= 8,000
7.	Labour Cost (2 Pair Male + Female= 32000 X 2.5)	= 80,000
8.	Electricity Bill (2.5 months x 15 K.W.)	= 37,500
9.	Farmer Expenses (Motorcycle petrol, motorcycle service etc)	= 5,000
10.	Gen Set Diesel Expenses	= 14,000
11.	Mortality Disposal Incinerator Expenses (Wood)	= 8,000
12.	Miscellaneous Cost	= 5,000
	Total Cost	= 226,000

- We shall now assume 7% mortality in flock of 10000 and average weight of bird as
- 2 K.G. in every flock. This is not possible but we assume it.
- $10,000 - 7\% = 9,300 \times 2 = 18,600$ Kg weight sold
- The figure of 7% average mortality ratio is very rare to achieve today
- Per Kg cost of production = $226,000 / 18,600 = \text{Rs } 12.15$ per Kg (Rs 24.3 Per Bird)

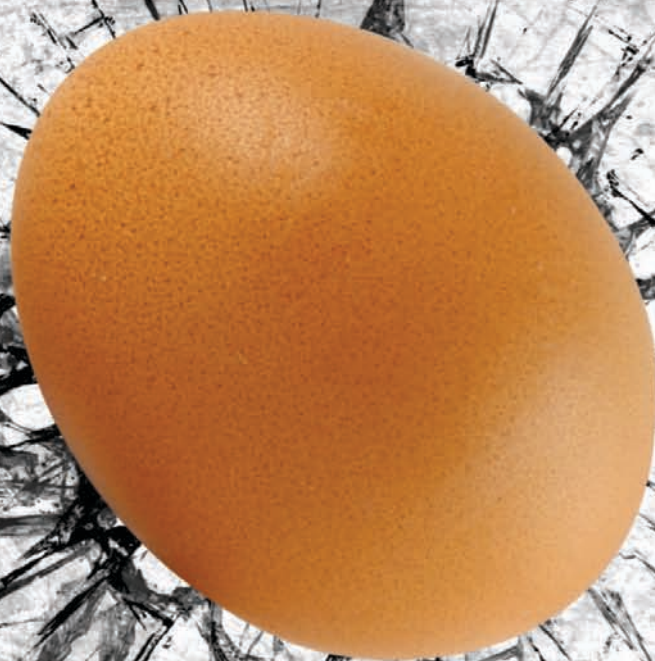
Summary:

	Rs
Interest on Fixed Cost (Per Bird)	9.33
Variable Cost (Per Bird)	24.30
Depreciation on Machinery & Building	11.65
Total Cost	45.28 Per Bird, Per Flock

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Kerala Government calls for caution as avian flu is confirmed in many districts

People who are involved in the care of farm birds as well as those who keep pet birds asked to take special care



Kerala Chief Minister Pinarayi Vijayan

Thiruvananthapuram: The Health department has directed all districts to be on the alert as reports of avian flu have been confirmed in many districts.

On January 7, avian flu had been confirmed in Azhoor grama panchayat in Thiruvananthapuram district. The district administration had issued orders that all poultry and other pet birds in the affected wards be killed and that all egg, meat, bird fodder, and litter be destroyed.

In a statement issued here on January 8, the Health department said that the public needed to maintain caution and follow the directives of the authorities so that there were no chances of the avian flu passing on to humans. Usually, human transmission of avian flu does not happen but viral mutation can make this a possibility.

The Health department has increased the surveillance of all fever and respiratory diseases in the affected areas and any person experiencing any lung-related issues should immediately inform the local doctor.

The Health and Animal Husbandry departments are keeping a close watch on the situation and are jointly organising preventive measures. As all birds, and not just poultry, can be affected, people who are involved in the care of farm birds as well as those who keep pet birds need to take special care.

Those handling birds need to wear personal protective equipment and wash hands regularly. Poultry and eggs may be consumed only after being cooked properly, according to the news published in The Hindu.

Kerala: Bird flu outbreak in state-run poultry farm kills 1800 birds

As initial tests indicated the outbreak of bird flu, the samples were sent to the high-security lab in Bhopal (Madhya Pradesh) for accurate diagnosis which confirmed avian influenza, a government statement said.



There were over 5,000 chickens on the farm and of them 1,800 died so far due to the infection.

Kerala: Around 1800 chickens died after bird flu broke out in a state-run poultry farm in Kozhikode district of Kerala, official sources said.

The presence of H5N1 variant, which has an additional proliferative capacity, was confirmed among the poultry in the local farm managed by the district panchayat here on Wednesday, the sources said.

J Chinchu Rani, Kerala Minister for Animal Husbandry, gave instructions to take urgent preventive measures as per the Centre's guidelines and protocol in this regard, they said.

As initial tests indicated the outbreak of bird flu, the samples were sent to the high-security lab in Bhopal (Madhya Pradesh) for accurate diagnosis which confirmed avian influenza, a government statement said.

There were over 5,000 chickens on the farm and of them 1,800 died so far due to the infection. The culling and other further procedures would be done with the coordination of various government departments under the aegis of the district authorities, it added.

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India set to export record 50 million eggs this month

Malaysian egg shortage driving sales

India is set to export a record 50 million eggs this month, boosted by sales to Malaysia, where there have been acute shortages as soaring feed prices caused by the Ukraine war forced many small-scale farmers to cut output, Reuters reported, citing industry officials.

Middle Eastern countries, including Oman and Qatar, are the main buyers of eggs from India, but over the past few months, Indian hatcheries have received large orders from surprising quarters as output fell in some of the world's top suppliers.

The biggest surprise order came from Malaysia, which otherwise used to export eggs to Singapore and other Asian countries.

To secure egg supplies as prices rose to record highs, Malaysia's Minister of Agriculture and Food Security Mohamad Sabu visited Namakkal, in the southern Indian state of Tamil Nadu, where several leading hatcheries are based.

"For the first time, Malaysia is buying large quantities of eggs from India, and it seems that India's egg exports to Malaysia will remain strong during the first half of 2023," Sasti Kumar, joint managing director at Namakkal-based Ponni Farms, one of India's leading egg exporters, told Reuters.

India shipped 5 million eggs to Malaysia in December, and will ship 10 million in January and up to 15 million in February, according to Kumar.

The imports from India have helped Malaysia bring prices down from the record highs seen in late December. Having suffered a shortfall of 157 million eggs in November, the market gap was down to just one million in December, the Malaysian minister said in a statement earlier this week.

Malaysia's egg production would recover in a few months as the government has increased a subsidy, said Tan Chee Hee, president of the Federation of Livestock Farmers' Association of Malaysia.

Meantime, prices in India have shot up to a record 565 rupees (\$6.96) per 100 eggs. Up by nearly a quarter on year ago levels, the high cost of eggs has added to India's concerns over food price inflation.

Exports are rising amid robust local consumption during the winter months, said Prasanna Pedgaonkar, general manager of poultry-focused Venky's.

At the same time, Pedgaonkar said, domestic supplies have fallen by around a tenth as small-scale Indian farmers, like their counterparts in

Malaysia, have curtailed production after incurring losses in the past two years due to the high price of feed and the impact of the pandemic.

India's domestic prices could eventually make exporting eggs less profitable, in which case foreign buyers will have to look elsewhere, said C Panneerselvam, an exporter also based in

Namakkal who sold one million eggs to Malaysia last month.

But for the time being, demand is not abating.

Eggs supplies are limited in Asia and countries such as Singapore and Sri Lanka could be next in line to buy from India in coming months, said Kumar of Ponni Farms.

Courtesy: The Poultry Site

Royal Pas Reform appoints Eric Stodel as new CEO



Royal Pas Reform has appointed Eric Stodel as the company's new Chief Executive Officer (CEO), effective January 1, 2023.

Stodel (57) brings a wealth of management experience to Royal Pas Reform. He has held a wide variety of senior CEO and COO positions over the past twenty years in the aerospace, machinery, electronics, consultancy and software sectors – both in the Netherlands and abroad. He has a proven track record of achieving profitable sales growth and innovation-driven business transformations across multiple international markets.

Commenting on his appointment, Stodel says: "Royal Pas Reform is a wonderful company, which distinguishes itself in the global hatchery market with its highly innovative, integrated solutions. The teams' impressive wealth of knowledge and experience gives me lots of energy to grow the company even further on the world map and to realize our ambitious development plans."

Bart Aangenendt, CEO of Hydratec Industries, the parent company of Royal Pas Reform, says: "I am confident about the future of Royal Pas Reform under Eric's leadership. There is undoubtedly great potential to further strengthen and expand our position as a supplier of integrated hatchery solutions."

Stodel holds a Master of Science degree in Industrial Engineering and Business Administration at the University of Twente, is married and has the Dutch nationality.



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MDR E. coli found in poultry farm soil and water, but meat safe in Telangana: Study



Hyderabad: Unhygienic practices have resulted in the presence of multi-drug resistant (MDR) E. coli in soil and water samples of poultry farms in Telangana and Andhra Pradesh, a research by city-based ICAR-National Research Centre on Meat has revealed. However, no MDR E. coli was found in the meat samples.

Of the 38 E. coli isolates recovered from 120 samples collected from various sources of broiler chicken farms in Telangana and Andhra Pradesh, 34 were found to have alarmingly high antibiotic-resistant genes.

The researchers said that

the heatmap with cluster analysis exhibited that majority of the E. coli isolates recovered from different sources and regions clustered together

based on their phenotypic resistance, suggesting co-sharing of resistance. "A significant statistical association between antibiotic resistance with

large flock size, poor biosecurity practices, poor workers' hygiene and poor disinfection practices was noticed.


Further research is required to ensure prudent use of antimicrobials in the poultry sector," researchers led by Bhiwa Rawool said in the study published in Comparative Immunology, Microbiology and Infectious Diseases journal. NRCM director Dr S B Barbuddhe said, "None of the chicken samples tested positive for MDR E. coli. It was found only in the environmental samples at the poultry farms. But unhygienic practices in the meat industry can contaminate the meat with water or fodder or any other material with drug-resistant bacteria." He said: "We have developed nanotechnology mixed with phytochemical plant extract to replace antibiotics. We have successfully tested to eliminate E. coli and Salmonella. More studies are being done on poultry to test the efficacy."

WHAT ICAR-NRCM RESEARCH REVEALS

- Of 38 E. coli isolates from 120 samples, 34 had high antibiotic-resistant genes

- Majority of E. coli isolates recovered based on phenotypic resistance suggesting co-sharing of resistance

- Statistical link between antibiotic resistance with poor biosecurity practices & workers' hygiene

 None of the chicken samples tested positive for MDR E. coli. It was found only in the environmental samples at the poultry farms. But unhygienic practices can contaminate the meat

— Dr SB Barbuddhe | NRCM DIRECTOR





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Proven effective against the tested organisms at used dilutions

Test Organism:

E. coli, *Pseudomonas aeruginosa*, *Salmonella typhi*,
Staphylococcus aureus, *Shigella flexneri*, *Proteus mirabilis*,
Klebsiella aerogenes, *Bacillus subtilis* spores, *Candida albicans*,
Aspergillus, *Streptococcus*

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Novus India launches Breeder Management and Nutrition: Moving the industry forward book

Novus's latest publication showcases insights and experience of industry experts around the world



Former of the University of Adelaide, Johan Buyse of KU Leuven, Juan Carlos Abad and Robin Jarquin



Book Launch

Bengaluru: The Novus India team held a successful launch of our latest book, *Breeder Management and Nutrition: Moving the industry forward*, during Poultry India Expo 2022 at Hyderabad. One hundred twenty breeder operators, media and business partners from India, Bangladesh and Nepal shared their overwhelming responses to the new publication during the event.

Novus Executive Manager for Global Poultry Solutions Hugo Romero-Sanchez, PhD., was joined by a fellow book author virtually to present highlights from the book on the topics of

and male breeder nutrition.

The book's 14 chapters were carefully curated to serve as a reference for current broiler breeder production best practices and considerations as well as to be a catalyst for new ideas in management, nutrition and industry sustainability.



Novus Team



Those in the industry and academia will likely recognize the book's contributors: Eddy Decuyper of KU Leuven, Aitor Arrazola of Perdue University, Rickvan Emous and Annemarie Mens of Wageningen Livestock Research, Henk Enting of Cargill, Dinabandhu Joardar of Cargill, Edgar O. Oviedo-Rondón of North Carolina State University, Rebecca

of Cobb-Vantress, David Cavero Pintado and Xabier Arbe Ugalde of H&N International and Stanislaw Budnik, Juxing Chen, Silvia Peris, Hugo Romero-Sanchez and Mercedes Vázquez-Añón of Novus.

"It was important to have contributors from recognized academia, as well as experts from the industry and breeding companies, to properly cover the vast array of topics ranging from practical management, nutrition (quality and quantity), welfare, (epi) genetics and physiology," Buyse said.

To download a free digital copy of the book, visit <https://lnkd.in/gDeH9SMn>



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Breeder Knowledge session



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synthetic Choline Chloride



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deposition in carcasses



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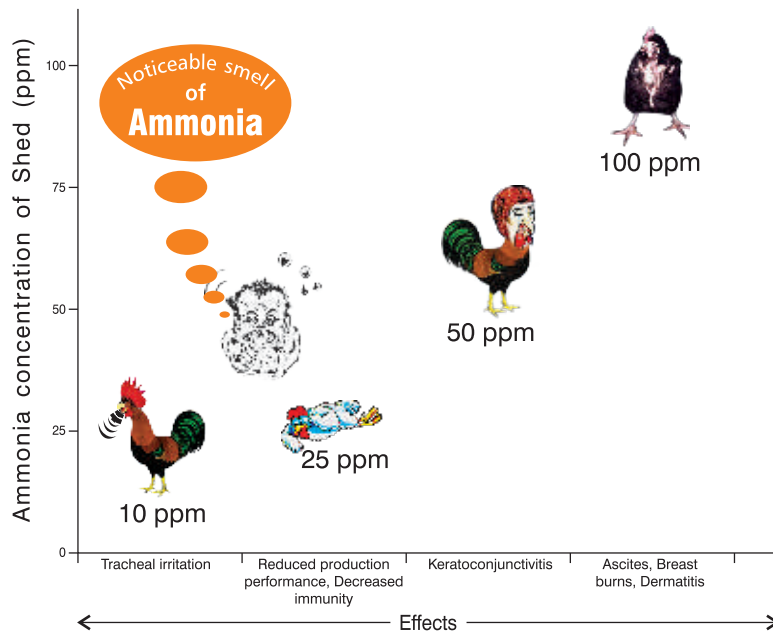
Substantial cost saving



Glimpses of Indian Herbs participation in the expo at Hyderabad

AmmoFree Premix

For ammonia control in poultry house

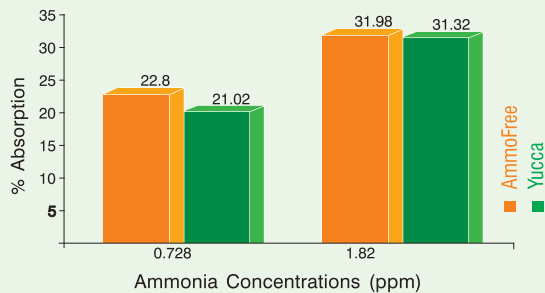


At 25 ppm Ammonia in poultry shed

- ▶ Noticeable smell and eye irritation
- ▶ Upto 25% reduction in growth and production

SCIENTIFIC VALIDATION

Effect of AmmoFree and Yucca extract on absorption of Ammonia



Effect of AmmoFree* at broiler farm in winter (14° - 15°C) with noticeable ammonia concentration

Group	Livability (%)	Birds showing respiratory discomfort	Faecal NH ₃ (g/kg dry faeces)	
			Day 21	Day 42
Control	95.00	7	3.86	3.92 (+1.55%)
AmmoFree 100g/ton	96.67	X	3.95	2.71 (-45.75%)

Trial at Commercial Poultry Farm under technical guidance of Dr. Rama Subba Reddy

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- For minimising the level of atmospheric and systemic ammonia and other noxious gases.
- To create healthier living conditions, reduce stress levels and to improve farm environment.
- For enhancing the level of beneficial gut microflora and to reduce disease susceptibility especially intestinal and respiratory diseases.
- For better farm productivity and profitability.

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double dosage when the level of ammonia is more than 25ppm.

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Novus Acquires Biotech Company Agrivida to Develop New Feed Additives

SAINT CHARLES, MO (January 10, 2023) – Global animal health and nutrition company Novus International, Inc., announced its acquisition of biotech company Agrivida Inc. Through the purchase, Novus takes ownership of the proprietary INTERIUS™ technology Agrivida developed to embed feed additives inside grain.

This move by Novus comes two years after it began a commercial partnership with Agrivida to support the sale of the start-up's flagship product, GRAINZYME®.

"Since December 2020, we've taken the time to understand and explore what INTERIUS™ technology is capable of," says Novus President and CEO Dan Meagher. "With this technology we believe we can revolutionize the feed additive industry through the expression of high-value, functional proteins inside grain, providing new products that are sustainable, both environmentally and operationally."

While the category of functional proteins includes enzymes, which Agrivida has already accomplished through GRAINZYME®, the Novus Innovation team is expanding the product offerings to include antibodies embedded in grain.

"Single-domain antibodies present an opportunity to naturally address the health challenges producers face in antibiotic-reduced and antibiotic-free production. These antibodies are a challenge to produce cost-effectively and deliver to the animal in a sustainable way," says Novus Vice President and Chief Innovation Officer Al Zimmerman. "INTERIUS™ technology addresses these challenges by removing costly fermentation and coating processes as well as offers the potential to stack different antibodies and/or enzymes in a single corn product solution for the animal. Traditionally these efforts would require blended products, which would mean more processing and cost. The INTERIUS™ technology delivers this benefit in a single ingredient - corn."

Instead of manufacturing feed additives by fermentation, INTERIUS™ technology tells the grain how to make the additive directly in the grain. The grain is grown, harvested and ground, and fed to the animal like any other corn in diet. Zimmerman says by having the additive inside the grain, the molecules are more efficiently absorbed by the animal, allowing producers to improve both performance and their return on investment.

The acquisition includes Agrivida, Inc., and its operations in Massachusetts and Nebraska. The Agrivida team, including founders R. Michael Raab and Jeremy Schley-Johnson, will join Novus bringing with them their innovative approach to developing functional proteins.

Raab, who is also Agrivida's chief technology officer, says he's excited about the opportunities to come.

"Joining Novus will accelerate the deployment of new animal health and nutrition solutions through the INTERIUS™ platform. As Agrivida alone, our bandwidth to

develop and commercialize products was limited by our resources and global expertise. As part of Novus, we can now bring multiple products to market and attain a global reach to deliver new, technology-based solutions faster than before."

Novus did not disclose the financial specifics of the acquisition.

Meagher says the Novus Research and Development team and Agrivida scientists are currently working on exciting pathways to address producer pains through this sustainable, disruptive technology.

Novus Names Co-Innova Animal Nutrition Technology (Shanghai) as Distribution Partner in China

SAINT CHARLES, MO (January 17, 2023) – Global animal health and nutrition company Novus International, Inc., today announced a new partnership with Co-Innova Animal Nutrition Technology (Shanghai) Co., Ltd., to serve customers in China.

The new Chinese company, Co-Innova Animal Nutrition Technology (Shanghai) Co., Ltd., will serve as Novus's distributor in China for its MINTREX® bis-chelated trace minerals and other products.

Co-Innova is led by Dr Defa "Brian" Sun, former commercial director for Novus China, and was created in collaboration with former sales managers Zhong Xu and Yuan Lei.

"We are thrilled to continue to serve the animal agriculture industry in China and offer the best selection of Novus and Co-Innova to our customers here," says Dr. Sun, CEO of Co-Innova. "Our team at Co-Innova has a rich knowledge of Novus HMTBa products, and we're looking forward to continuing to deliver the very best to our customers here."



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eXolution is now Xcelsio. Our relentless effort to make the world a safer and healthier place has led us to create Xcelsio. After years of cutting-edge research in Korea, we have come up with an advanced formulation to make Xcelsio more potent than before.

Xcelsio comes with a more concentrated cocktail of bacteriophage and is fortified with more Bacillus subtilis. This new and improved formulation, created specifically for use in

poultry, is simply unmatched in controlling pathogenic bacteria—giving you Total Gut Control.

Each of our bacteriophages is painstakingly selected using our proprietary Bacterophage F technology to target and eliminate specific bacteria; leaving other beneficial bacteria completely unharmed. This natural surgical strike on disease-causing bacteria is the safest, non-toxic, and most effective prophylactic alternative to antibiotic growth promoters.

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Natural Feed Additive



BENEFITS TO THE FLOCK

Natural:

No Toxins, No Residues, No Side-effects, No Withdrawal Time

Surgical:

Targets and eliminates specific bacteria, even those resistant to antibiotics

Protective:

Maintains gut bio-balance by retaining beneficial bacteria

Probiotic:

Enriched with Bacillus Subtilis

Flexible:

Compatible with all Performance Enhancers, Growth Promoters, Acidifiers, Anti-Oxidants, Minerals & Enzymes

BACTERIA IT CONTROLS

Salmonella

Typhimurium Gallinarum Choleraesuis, Derby, Dublin, Enteritidis, Pullorum

E. Coli

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

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Type A, C, B, D, E

Staphylococcus Aureus

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Along with the MINTREX® product line and MINTREX® blends, Co-Innova will also offer ACTIVATE® DA nutritional feed acid and CSM 18 enzyme blends. Novus methionine solutions – MHA® feed supplement, ALIMET® feed supplement, and MHA® SP feed supplement – will be available on an indent basis.

"Novus is very happy to be able to partner with our former colleagues to continue serving animal agriculture producers

in China," says Vaibhav Nagpal, Novus Vice President and Managing Director for Asia. "Novus leadership is glad that our products are in the hands of people who understand them and have deep knowledge of our customers in China. We know our customers will appreciate the smooth transition."

For more information on Co-Innova visit: www.coinnova.com.cn, Call +86 21 66600519 or Email: Default@coinnova.com.cn.

Indian Veterinary Association announces Dr Shirish Nigam as National Co-Convenor of Entrepreneur's Wing

New Delhi, 20 December 2022: Indian Veterinary Association (IVA), an apex organization of veterinarians of the country, announced that Dr Shirish Nigam has been named as National Co-Convenor of Entrepreneur's Wing of IVA. Dr Umesh Chandra Sharma, President IVA, mentioned that addition of Dr Shirish Nigam into the Executive Body will add valuable industry experience to the association.

All India Veterinary Association came into existence in the year 1922 during a conference of veterinarians, in Moradabad, UP, which was presided by Professor Dr Karam Dane from Punjab. With its HQ in New

Delhi, today association has more than 60,000 veterinarians from across the country. Every State and Union Territory has its own association, which is affiliated to the apex organization.

Looking into the changing dynamics of animal husbandry sector and to augment support to members in their entrepreneurial journey, it was decided to start an



Dr Umesh Chandra Sharma, President, IVA

Entrepreneur's Wing at IVA with a vision to facilitate proactive policy making to support animal husbandry sector related business activity across value chain by connecting the dots between companies, enterprises and policy makers. Another part of the vision is to look at possibilities of how India can be global leader in exporting animal health and nutrition technologies.

The executive committee meeting of Indian Veterinary Association (IVA) held on 20 August 2022 had unanimously decided to appoint office bearers to Entrepreneur's wing of IVA. Dr Umesh Chandra Sharma, President IVA, Dr D. Thanigaivelu, Secretary General IVA as well as Dr Vijay Kumar, Treasurer, IVA welcomed Dr Shirish as National Co-convenor of Entrepreneur's Wing of IVA and look forward

to working with him to build & grow veterinary entrepreneurship in the country.

Dr Umesh Chandra Sharma, President IVA, added, Dr Shirish is an accomplished leader having deep veterinary business operations expertise with more than 25 years of rich experience in sales, marketing and general management in multiple global animal health organizations and offers a relevant and unique skill set to the entrepreneur's wing.



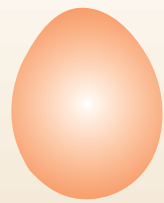
Dr Shirish Nigam, Managing Director & Angel Investor - Animal Health & Nutrition

"I am delighted to join IVA as National Co-Convenor of Entrepreneur's Wing as it will provide ample opportunity to serve the profession and work with talented group of thought leaders".

For more information, please visit: <https://www.ivaofficial.org/>



Executive Committee, Indian Veterinary Association



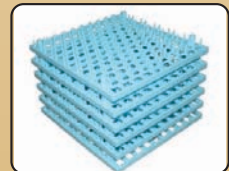
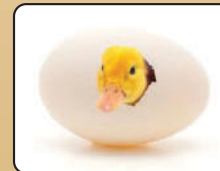
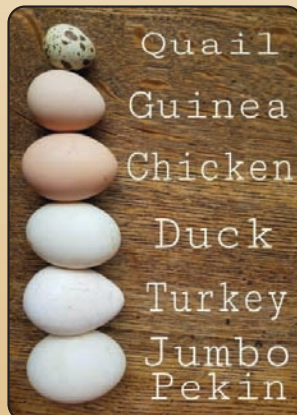
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2023 Alltech Agri-Food Outlook shares global feed production survey data and influencing trends in agriculture

Data collected from 12th annual global feed survey estimates world feed production remains steady with a slight decrease of 0.42% to 1.266 billion metric tons. Pet feed shows most significant growth while beef feed begins to moderate

Agri-Food Outlook | 2023



The 2023 Alltech Agri-Food Outlook revealed global feed production survey data and trends.

LEXINGTON, Ky.: Alltech released its 2023 Alltech Agri-Food Outlook on 23 January 2023, highlighting global feed production survey data. Despite significant macroeconomic challenges that affected the entire supply chain, global feed production remained steady in 2022 at 1.266 billion metric tons (BMT) in 2022, a decrease of less than one-half of one percent (0.42%) from 2021's estimates. The annual survey, now in its 12th year, includes data from 142 countries and more than 28,000 feed mills.

Europe bore the brunt of the impact, including significant disease challenges, severe weather and the impacts of the

invasion of Ukraine. The global COVID-19 pandemic has had major impacts on the agri-food sector, contributing to supply chain challenges and accelerating the adoption of new technology and environmental sustainability practices.

The top 10 feed-producing countries over the past year were China (260.739 million metric tons [MMT]), the U.S. (240.403 MMT), Brazil (81.948 MMT), India (43.360 MMT), Mexico (40.138 MMT), Russia (34.147 MMT), Spain (31.234 MMT), Vietnam (26.720 MMT), Argentina (25.736 MMT) and Germany (24.396 MMT). Together, the top 10 countries produced 64% of the

world's feed production, and half of the world's global feed consumption is concentrated in four countries: China, the U.S., Brazil and India. Vietnam experienced a great recovery in terms of its feed tonnage in 2022, entering the top 10 ahead of Argentina and Germany and crowding out Turkey, which reported reduced feed tonnage. Russia overtook Spain, where there was a significant reduction in feed production.

Key observations from the survey:

- Feed production increased in several regions, including Latin America (1.6%), North America (0.88%) and

Oceania (0.32%), while Europe decreased by 4.67%, Africa by 3.86% and the Asia-Pacific region also dropped 0.51%.

- Globally, increases in feed tonnage were reported in the aquaculture, broiler, layer and pet food sectors, while decreases were reported in the beef, dairy and pig sectors.
- Although it experienced a narrow reduction in feed production, China remains the largest feed-producing country in the world, followed by the United States and Brazil.

Notable species results:

- The **poultry** sector experienced increases in both layer and broiler feed production.
- Avian influenza, other diseases and the high costs of raw materials affected the **layer** sector in many markets, especially in Asia, Europe and Africa. On the other hand, growth in the sector was boosted due to bigger challenges in other sectors that led to increased demand for eggs. Overall, layer-sector feed production increased by 0.31%.
- While the overall tonnage in the **broiler** sector increased by 1.27%, there were significant differences from country to country. Overall, feed production growth in the broiler sector was reported mainly from the Middle East, North America and Latin America.
- **Pig** feed production was down globally in 2022 by

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almost 3%. ASF and high feed prices depressed pig production in many countries. However, in Vietnam, China, South Africa, Brazil and Mexico, better pork prices and other market conditions led to growth in the sector.

- **Dairy** feed tonnage decreased by 1.32%, mainly due to the high cost of feed combined with low milk prices, which caused farmers to reduce their numbers of cows and/or rely more on non-commercial feed sources. Some exceptions included Ireland, where drought caused farmers to rely more on commercial feeds, and New Zealand, where milk prices were higher.
- **Beef** feed production decreased slightly by 0.34% globally. The downward trend continued in Europe, but increases were seen in almost all other regions. In Australia, the reduction in feed tonnage was a result of plentiful grass and not a reflection of any changes in the demand for beef.
- The **aquaculture** sector experienced a total global feed production growth of 2.7%. The Top 5 aquaculture feed countries are China, Vietnam, India, Norway and Indonesia. Significant increases were reported in China, Brazil, Ecuador, the Philippines and the U.S. Aquaculture feed production was one of a few sectors that saw growth in Europe.

- **Pet** feed production had the highest increase among the sectors, with a global average 7.25% rise in production. This significant increase is largely due to the rise in pet ownership amid the COVID-19 pandemic. North America and Europe continue to be the top pet feed-producing regions.

Notable regional results:

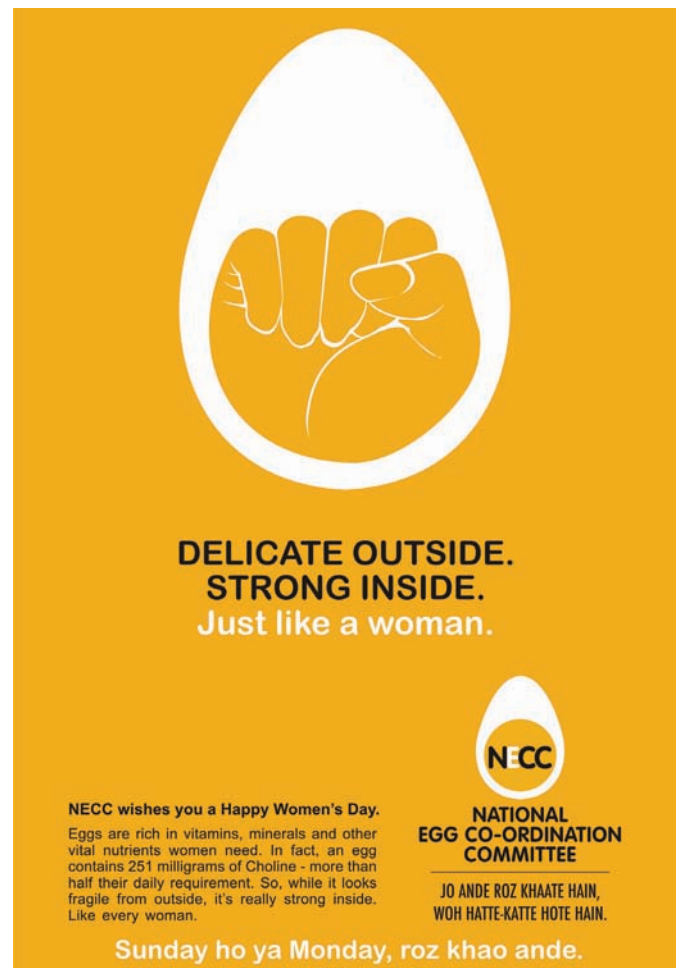
- **North America** reported an increase of 0.88% (2.272 MMT) and the U.S. remained the second-largest feed-producing country globally, behind China. Growth was reported in the broiler, beef and pet food sectors.
- **Latin America** experienced growth of 1.6% (3.066 MMT), and Brazil remained the leader in feed production for the region and ranked third overall globally. Most of the growth was reported by Mexico, Brazil and Chile.
- **Europe** saw the largest decrease in feed production of 4.67% (-12.882 MMT) in its feed production due to issues that include the invasion in Ukraine and the spread of animal diseases, such as African swine fever (ASF) and avian Influenza (AI).
- **Asia-Pacific** remained flat as decreases reported in China, Pakistan, Thailand and Malaysia were offset by increases in Vietnam, the Philippines, Mongolia and South Korea. The region is home to several of the top 10 feed-producing countries, including China, India and Vietnam.

- **Africa** experienced a decrease of 3.86% in feed tonnage (-1.718 MMT), mainly because of reductions reported in Egypt, Morocco, Kenya and Nigeria. South Africa, on the other hand, saw an increase of more than 2%, and Namibia also reported higher feed tonnage in 2022.
- The **Middle East** region is up significantly at 24.7% (6.301 MMT), as a result of more accurate reporting and efforts by the Saudi Arabian government to increase broiler production as part of its Vision 2030 plan.
- **Oceania** was flat, with a small reduction reported by Australia that was offset by a slight

increase reported by New Zealand.

Alltech works together with feed mills and industry and government entities around the world to compile data and insights to provide an assessment of feed production each year. Compound feed production and prices were collected by Alltech's global sales team and in partnership with local feed associations in the last quarter of 2022. These figures are estimates and are intended to serve as an information resource for industry stakeholders.

To access more data and insights from the 2023 Alltech Agri-Food Outlook, including an interactive global map, visit alltech.com/agri-food-outlook.



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J&K Govt to boost Poultry sector; Increase Annual Output from Rs 709 crore to Rs 1,982

Jammu: The Jammu and Kashmir government will undertake various measures under its “sustainable development project” to boost the poultry sector of the Union Territory and increase the annual output from Rs 709 crore to Rs 1,982 crore.

Jammu and Kashmir spends around Rs 1,200 crore every year on imports of items related to the poultry sector.

A roadmap for poultry development in J&K is one among the 29 projects that were approved by the Jammu and Kashmir administration. These projects were recommended by a committee for holistic development of agriculture and allied sectors worth over Rs 5,000 crore.

“Every year the Union Territory experiences a flight of capital on account of poultry imports to the tune of Rs 1,273 crore. Among these table eggs account for Rs 473 crore, day-old chicks for Rs 110 crore, poultry feed worth Rs 300 crore and broiler birds for Rs 390 crore,” additional chief secretary, agricultural production department, Atal Dulloo told PTI.

He said that this can be an opportunity for setting

up local enterprises and creating jobs for the educated youth.

“A total of 420 enterprises and 4,250 direct jobs are being created under this project over the next five years,” Dulloo added.

To put the poultry sector on the path of sustainability and self-reliance, the agriculture production department has approved a “roadmap for poultry development in J&K” under its mission for holistic development of agriculture and allied sectors in the Union Territory, he said.

“The new interventions under the roadmap shall boost the gross output of the poultry sector in J&K from Rs 709 crore to Rs 1,982 crore per year and ensure that the poultry industry is well-positioned for continued growth and development in the coming years,” Dulloo said. According to officials, the Union Territory imports 440 lakh day-old chicks every year worth Rs 110 crore.

To overcome this, 125 parent breeding farms (each 3,000-parent capacity), with hatcheries and in-house feed manufacturing plants, will be established within a span of five years each having a production

capacity of 4 lakh day-old chicks, they said.

“The project encompasses all the three verticals in the poultry industry including producing day-old broiler chicken to feed the broiler industry, establishing layer farms in intensive and free-range mode to meet the demands for eggs and boost quality feed manufacture through establishment of feed processing units,” said Dr Azmat Alam Khan, Professor in Poultry Sciences said.

Similarly, Jammu and Kashmir spends Rs 473 crore on import of table eggs annually. These eggs again are imported from far and wide and on average

reach J&K after 15-30 days of being laid, he added. Under the project 200-layer farms, each of 10,000 bird capacity are being established to produce 60 crore eggs within a span of five years, the officials said.

One of the main challenges being faced by poultry farmers in Jammu and Kashmir is the high cost of feed, which can make production expensive, they said.

To address this issue, the approved project has set a target of producing 85,000 metric tonnes of poultry feed in five years by establishing 35 units (7 feed units per year) of 1 tonne per hour capacity, they said.

Namakkal Poultry Farmers Hope Export of Eggs to Malaysia to Rise

Namakkal: Malaysian Minister of Agriculture and Food Security Mohamad Sabu's visit to Namakkal gives poultry farmers a hope that egg exports from Namakkal will increase in the coming days.

Namakkal, known as “Egg Town” and “Poultry Capital,” has around 1,100 poultry farmers and produces five to six crore eggs per day, transporting 1.50 crore to 1.75 crore eggs to Kerala, 45 lakh eggs to the Noon Meal Scheme, 40 lakh eggs to Bengaluru, and



Malaysian Minister of Agriculture and Food Security, Mohamad Sabu at a poultry farm in Namakkal.

the remaining eggs are sent to various parts of Tamil Nadu and other States on a daily basis.

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Metabolic Disorders in Commercial Broilers and Prevention Methods

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Dr Rambabu.D

Associate Professor, Dept. of Poultry Science, College of Veterinary Science, Korutla, PV Narsimha Rao Telangana Veterinary University, Jagtial District, Telangana

Highlight Points

The broiler sector is facing significant challenges as a result of metabolic disease, which is responsible for the high morbidity and death rates of chicken. Broiler chickens' forced selection for rapid growth places a greater stress on their cardiovascular system, which predisposes the birds to metabolic disorders like Leg tremors, ascites and the sudden cardiac death syndrome. To solve these issues, we must concentrate on management strategies including ensuring a thermoneutral environment, modulating growth curves through feed restriction programmes and utilizing antioxidants.

Introduction

The broiler sector is facing significant challenges as a result of metabolic disease, which is to blame for the high morbidity and death rates of chicken. The increased stress on the cardiovascular system caused by forced selection for quicker growth in broiler chickens predisposes the animals to metabolic disorders as ascites, sudden death syndrome, and limb paralysis. To solve these issues, we must concentrate on management techniques including providing a thermoneutral environment, modifying growth curves through feed restriction programmes and utilizing antioxidants.

Due to the rapid rate of advancements in the genetic potential of chicken for development and efficiency, metabolic issues have been a constant in poultry production for at least the previous few decades. In broilers, metabolic disorders are more prevalent. Leg issues are frequently the outcome of rapid early growth and can therefore be associated to metabolic illnesses when they are observed in the absence of infectious agents. The key link between it and metabolic diseases in birds is an increased workload on the cardiovascular system. Cardiovascular disorders, which in broiler chickens cause a significant portion of flock mortality and musculoskeletal disorders, which cause less mortality but slow growth (thereby reducing profit) and cause lameness, which is still a significant welfare concern, are the two main body systems affected by poultry metabolic diseases.

Broiler FLKS (fatty liver and kidney syndrome)

The condition known as "fatty nephrosis" or "pink disease," which affects the liver and kidneys, was originally identified in Denmark. It is a metabolic disorder that affects broiler and layer chicks between two and three weeks old due to a biotin deficit. Low levels of the biotin-dependent enzyme pyruvate carboxylase lead to minimal gluconeogenesis in the liver via pyruvate, which is the root of the issue.

The liver's glycogen reserves are quickly depleted and a deadly hypoglycemia develops when the bird experiences

a modest stress such as extreme heat or cold, poor lighting, or a brief fast. The lipid content of the liver and kidneys has increased 2- to 5-fold, and the affected chicks are hyperlipemic, demonstrating a rise in the plasma levels of free fatty acids and triglycerides. Because chicken has limited access to the biotin found in wheat and some other cereals, there is a frequent correlation between wheat-based diets and fatty liver and renal disease. The condition is no longer present in broilers fed commercial diets due to enough dietary biotin's ability to prevent FLKS.

Ascites

Ascites is brought on by an imbalance between the elimination and creation of peritoneal lymph, which results in a buildup of serous fluid in the body cavity and the condemnation or death of the corpse. The usual lesions that cause lymphatic drainage obstruction, decreased plasma oncotic pressure, increased vascular permeability, and increased hydrostatic pressure in the vascular system may also contribute to the pathogenesis of ascites. A right ventricular failure (RVF) or liver injury-related increase in portal pressure is the most common cause of ascites in birds. Fast growth rates increase the demand for oxygen, which increases the workload on the heart and predisposes broilers to developing pulmonary hypertension syndrome. As a result, fast-growing strains are more likely to develop

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ascites than slow-growing strains. Due to the rapid growth of chicken embryos during the final 7 days of incubation, which causes a 60% increase in oxygen consumption between the beginning of pulmonary breathing and hatching, maintaining adequate ventilation and oxygen supply in the hatcher and setters' advice is necessary to control ascites and is also a useful method for enhancing the hatchability of broiler eggs.

The need of temperature monitoring during brooding is highlighted by the fact that low temperatures increase the risk of ascites by raising pulmonary hypertension and metabolic oxygen demands. For the first 14 days following hatching, it is advised to feed a low protein/low calorie diet to the birds to control ascites. In broilers predisposed to ascites, increased levels of free radicals (super oxide anion radicals, hydroxyl radicals, hydrogen peroxide, and singlet oxygen) may accelerate the progression of the condition. Major antioxidant compounds like vitamin E, selenium, vitamin A, vitamin C, and glutathione play a crucial role in protecting damage at the cellular level, preventing the induction of hypoxia, and subsequently lowering the incidence of ascites. These compounds are present in the circulation or at the level of the respiratory membrane.

Sudden death syndrome

Sudden death syndrome (SDS), also known as "acute death syndrome" or "flip-over illness," typically affects commercial broilers that are healthy and rapidly growing. As the name implies, birds with this condition exhibit abrupt death. When their growth rate is highest, bulkier male birds tend to develop this condition. Fast-growing broilers have more muscles than visceral organs, which are not proportionally developed. This results in an insufficient supply of oxygen to the muscles, which causes hypoxia. Lack of aerobic metabolism in hypoxic conditions results in increased lactate generation, which then causes systemic acidosis, a drop in blood pH and cardiovascular problems that ultimately lead to cardiac failure, which raises the risk of sudden cardiac death syndrome. Most infected broilers are discovered dead resting on their backs because SDS symptoms in birds include brief wing beating and spasms just before death. As a result, the illness is frequently called "Flip-Over Disease".

In comparison to intermittent lighting, broiler houses with higher feed intake and continuous lighting for extended periods of time have higher mortality from sudden death syndrome. SDS cannot be effectively treated or prevented, but its incidence can be decreased by management strategies that limit the early maximal development potential. By decreasing the number of daylight hours each day or by limiting the amount of feed consumed to 75% of what would be consumed if given the freedom to choose. During their first 14 days of life, broilers should be fed a low-protein, low-energy diet to help them grow more slowly and with less oxygen demand, potentially reducing their risk of developing sudden death syndrome. Since the first seven days of a broiler's life are crucial for optimal growth, the diet must remain unaltered throughout this time to ensure adequate growth. Thereafter, changes to the diet should be made carefully to prevent harm to the broiler.

Leg Issues

The prevalence of non-infectious limb issues such as chondrodystrophy or angular bone abnormalities, valgus-varus deformities (often referred to as twisted legs), spondylolisthesis, or kinky back is likely connected to broiler chickens' rapid growth. Longer periods of time are needed than are permitted by rapid growth for the development of robust tissue, bone remodelling, and alignment. By reducing feed consumption without raising the mineral concentration in the pre-starter diet, management strategies to lower metabolic illnesses are used, however this negatively affects healthy bone development and puts broilers at risk for various leg issues.

Twisted legs and angular bone deformities are connected to rapid growth and seem to be caused by a lack of time for the distal tibio-tarsal bone to regenerate. By delaying early development and extending daily rest (dark) times, it can be decreased. Tibial dyschondroplasia is caused by a lack of vitamin D, which is essential for chondrocyte proliferation. The ratio of calcium to phosphorus in the diet also plays a critical role in determining the frequency and severity of the condition in broiler chicken. Vitamin D₃ supplementation reduces the disease's clinical symptoms primarily by triggering chondrocyte maturation.

Broiler hens' spiking mortality syndrome

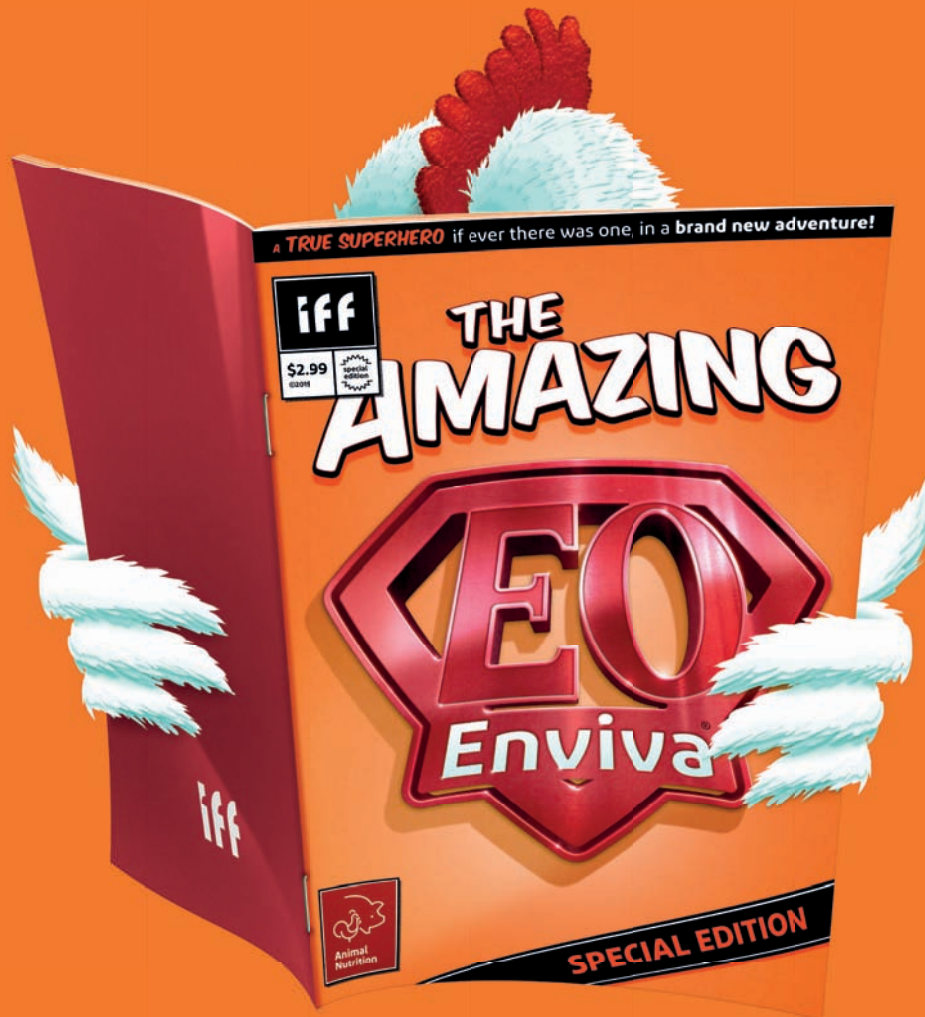
In this disease, birds are unable to stand or lift their heads, and it affects quickly growing broiler chickens with a sharp surge in mortality between 12 and 18 days of age. Death is mostly caused by hypoglycemia, which happened as a result of melatonin deficit owing to a lack of prolonged periods of darkness. Due to their higher pace of growth, males are more vulnerable than females.

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Prevention of Coccidiosis: Shuttle Program Solutions by Glocrest

Email: ramdas@glocrestpharma.com

Dr Ramdas S. Kambale

CEO & Board Member, Glocrest Pharmaceutical Pvt Ltd

Avian coccidiosis is a parasitic disease caused by protozoa of the genus *Eimeria* spp.

Eradication of coccidia has proved impossible and the transmission stage of the parasite — known as oocysts — can be found in the litter of most commercial broiler houses. The transmission of this coccidia within the facility or even between farms is carried out in a feco-oral way or through vectors, whether they are contaminated materials or by live vectors, such as rodents, worms, flies or beetles.

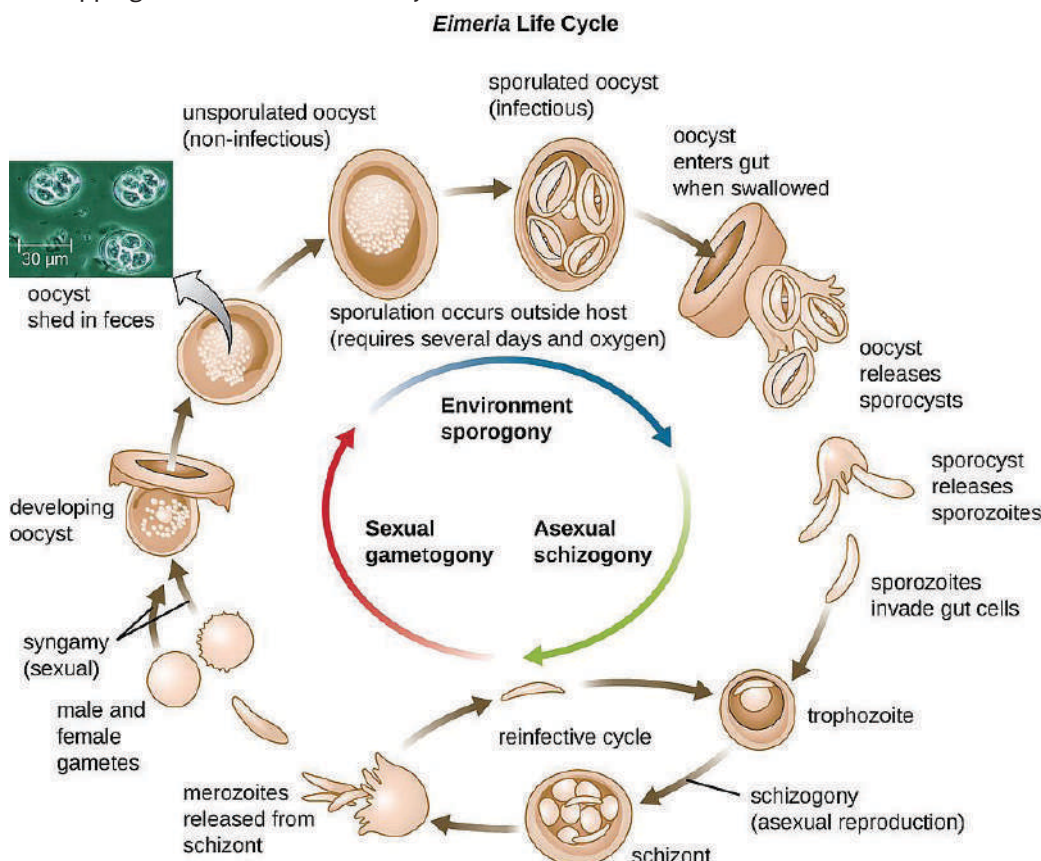
- Clinical coccidiosis in which the affected birds show typical symptoms of the disease, such as bloody droppings and increased mortality.

- Subclinical coccidiosis because the affected birds do not show visible symptoms of the disease but when a random sample of birds is examined, the presence of the gross lesions and the coccidia are found.

In order to minimize the risk of resistance to coccidiostats, it is common to carry out rotation or shuttle programs, in which different synthetic coccidiostats and ionophores are used in each production cycle or even within the same cycle.

Combination products, consisting of either a synthetic compound and ionophore, example:

- Monensin + Nicarbazin + Vit K₃ + Curcumin extract – **CocciCare**



- Maduramicin + Nicarbazin + Vit K₃ + Curcumin extract – **CocciCare-M**

- Lasalocid sodium + Vit K₃ + Curcumin extract – **CocciCare-L**

Shuttle and Rotation programs

In general, ionophores have a similar mechanism of action against the parasite, whereas chemicals have different modes of action; therefore, a strain that develops resistance to an ionophore may be controlled by a chemical, and vice versa. The poultry industry has taken advantage of this with the introduction of shuttle and rotation programs that have helped slow the development of resistance.

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A shuttle program involves utilizing a different drug in different feeds provided to the growing chick. For example, one frequently employed shuttle program involves the use of Nicarbazin in the starter feed and an Ionophore in the finisher diet. A rotation program involves using different drugs in successive flocks.

Ideally, a cleanout should follow the first two flocks to help reduce the numbers of any drug-resistant parasites that may be present. The drug-sensitive vaccine strains will repopulate the poultry house when the vaccine is employed, which helps improve the efficacy of in-feed anticoccidials in subsequent flocks.

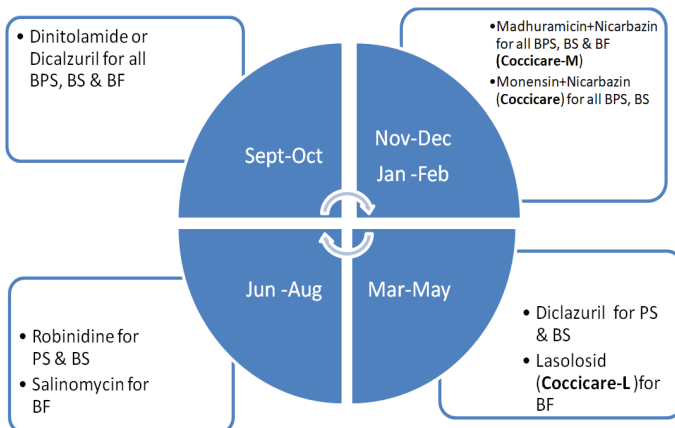
For many years coccidiosis prevention and control relied on the use of synthetic anticoccidials, commonly referred to as chemicals. In many cases, resistance to these drugs quickly occurred - within 1 to 3 years - and they became ineffective. Of this group, only nicarbazin remains effective today.

When the same ionophore anticoccidial is added to the starter and grower feeds, this is popularly referred to as a straight program. These are commonly used in spring and summer. In some straight programs, the concentration of the anticoccidial may be increased in the grower feed to provide maximum protection at the time of peak coccidial oocyst shedding (3-4 weeks). This is known as a step-up program, in other cases, the concentration of the anticoccidial may be decreased in the finisher feed, this known as a step-down program.

In other cases, a chemical anticoccidial is added to the starter feed, grower feed and an ionophore anticoccidial to the finisher feed, this is popularly referred to as a shuttle program.

Curcumin Extract:

One of the natural compounds is curcumin, the extract from herbal plant Curcuma longa, known for its antioxidant and anti microbial properties which may be effective in reducing Coccidia infection in poultry.



Note: This shuttle program may vary based on prevalence and recommended by Veterinarians.

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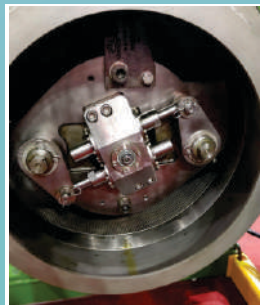


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Use of Herbal Choline – *New Era in Poultry*

Email: drmahesh_2002@rediffmail.com



Dr Mahesh Rajurkar

Looking at current scenario of poultry day by day feed cost is increasing. To reduce production cost replacement of certain feed additives with Herbal medicine is need of time. Various branded and trusted organizations in India are manufacturing herbal based feed supplements from the world of photochemistry. These products are highly research based products – which are exported in various countries. There is great demand for these herbal feed supplements in abroad. Still in domestic market – in India these products are not highlighted. However to control or to reduce production cost in poultry herbal feed additive is need of time.

To overcome these challenges replacement of synthetic choline with Herbal choline may act as cost effective. Composition of herbal choline is as follows:

1. Ocimum Sanctum
2. Andrographis Paniculata
3. Silybum marianum
4. Glycine Max
5. Azadirachta indica

Above composition with proper portion may used as Herbal choline to replace synthetic choline.

Ocimum Sanctum:

It acts as growth promoter in poultry. The reduced oxidative stress due to supplementation of this plant to broilers is found to enhance growth rate & thus result higher body weight. The increase of body weight of chicken due to feed with ocimum sanctum containing anti-oxidants compound found in tulsi.



Image of Ocimum Sanctum

Andrographis paniculata:

Andrographis paniculata is medicinal plant traditionally used for treatment of cold, fever several infectious diseases in china, India and other south east Asian countries. The plant is claimed to possess immunological, anti-bacterial, anti-inflammatory and hepato protective properties.

Silybum Marianum:



Image of Silybum Marianum

Recent intensive poultry production there is great demand to use natural alternative feed additives. One of these alternative is photobiotic. Silybum Marianum is plant that has been used for many years as natural remedy for the liver diseases. **Silymarin is major dried extract of silybum marianum.** Silymarin has many characteristics such as antioxidant, anti-inflammatory, immune stimulant, and hepatic cell stabilizing effects. In poultry production silymarin has been used in broilers as growth promoter and in layers to improve egg quality and quantity. It has been also used as **hepato tonic** as a result of potent antioxidant activity. Enhancement of **immune system and intestinal health** observed after using of silymarin in poultry diets.

Glycine Max:

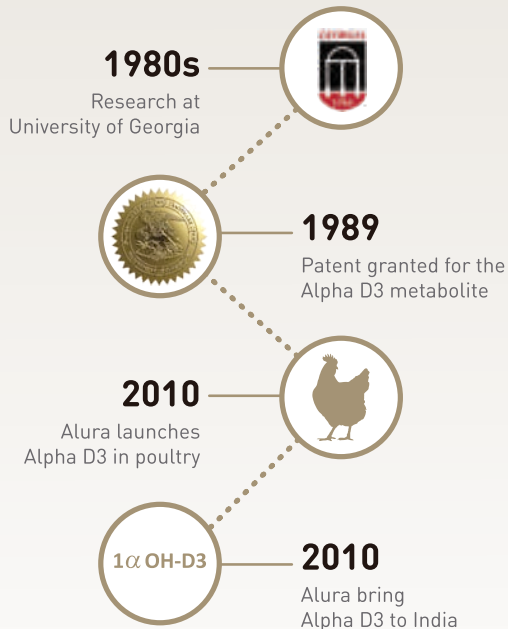
It improves feed consumption, absorption and better utilization of feed to get good FCR in poultry.

Azadirachta indica (Neem):

The active compounds found in Neem plant have wide and varied effects on human health as it is effective as it works as antimicrobial, antibacterial. Neem is perennial tree native of India also found in number of countries of south Asia. It has smell of garlic and bitter taste. Neem leaves contains antimicrobial compounds, anti-inflammatory, anti-fungal, anti-viral compounds. One of the most important item in neem is sodium nimbidate which is anti-inflammatory.

(Some Information and images are taken form internet).

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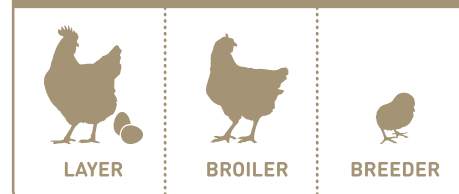
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Emerging Challenges & Opportunities for Sustaining Future Expansion of Poultry Sector

Sustained consumer demand continues to drive the poultry meat sector, while there is a need to step up investment in infrastructure in the value chain as well as ensuring reliable feed supplies.

Email: ricky.thaper@ibgroup.co.in



Mr Ricky Thaper
Treasurer,
Poultry Federation of India.

Livestock sector plays a critical role as a subsector of agriculture in the Indian economy. The sector has huge potential in terms of its contribution in total economy, employment generation and world trade. The sector comprising poultry meat, eggs, dairy and fisheries witnessed a compound annual growth rate (CAGR) of 8.15 per cent. As per the estimates of National Accounts Statistics, 2020 for sector wise Gross Value Added (GVA) of agriculture and allied sectors, the contribution of livestock in total agriculture and allied sector GVA (at constant prices) has increased from 24.32 per cent (2014-15) to 29.35 per cent (2019-20). Livestock sector contributed 4.35 per cent of total GVA in 2019-20. Development of the livestock sector has led to improvement in per capita availability of milk, eggs and meat.

According to FAOSTAT production data for 2020-2021, India ranks 3rd in egg production and 6th in broiler production in the world. Egg production in the country has increased from 78.48 billion in 2014-15 to 122.11 billion 2020-21. **The per capita availability of eggs is at 91 eggs per annum in 2020-21.** Meat production in the country has increased from 6.69 million tons in 2014-15 to 8.80 million tons in 2020-21. **The average per capita consumption of meat in the country is around 5.7 kg per annum.**

As per the Department of Animal Husbandry and Dairying, more than 85% of India's poultry meat is produced by organised commercial farms and the rest is produced by backyard poultry, mostly in the rural areas. Out of commercial broiler production, major poultry companies who follow vertically integrated operations have a share of around 60-65%. The poultry sector at present provides employment opportunities to around 6 million small and medium farmers (who own farms with 5,000-10,000 broiler size).

Driving demand of Poultry Meat

In the last three decades, the India poultry market has undergone significant transformation, and the region has emerged as one of the major sectors of the economy. The poultry market in the country is being largely driven by the rising disposable incomes and changing consumer food habits. In the post Covid19 pandemic phase also the demand for the protein rich food like poultry meat and eggs have increased sharply. The growing awareness regarding health and wellness is further driving the demand for a protein-rich diet.

According to industry estimates, the Indian poultry industry in 2022 was valued at around \$28 billion. **Aided by the increasing popularity of online services and growing online food delivery channels, the market is expected to witness a further growth in the next 5 to 10 years with a growth in CAGR of 8.1%.**

As per Agricultural and Processed Food Products Development Authority (APEDA) data, in 2021-22, India exported 3,20,240 tons of poultry products valued at Rs 529 crore (\$ 71 million). Traditional export destinations have been Oman, Maldives, Indonesia, Vietnam and Russia. Malaysia for the first commenced importing eggs from Namakkal, Tamil Nadu recently. Though both the quantity and value of the exported processed poultry products have increased during the last few years and further efforts are being made to increase poultry exports from India, the trade is very small in comparison to the global trade.

To support the livestock sector, the government has initiated several measures. The Animal Husbandry Infrastructure Development Fund (AHIDF) of Rs 15000 crore is being implemented from June 2020. The key objectives of the



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scheme is to fulfill the objective of protein enriched quality food requirement of the growing population of the country and prevent malnutrition. As far as poultry development is concerned the fund has provisions for technologically assisted layer farms with environmentally controlled systems, broiler breeder farms with environmentally controlled systems and hatcheries with environmentally controlled facilities. The support is also provided for Meat processing and value addition infrastructure and establishment of animal feed plants including poultry feed.

Under AHIDF, farmer producer organizations (FPOs), Micro Small and Medium Enterprises, Section 8 Companies, Private Companies and individual entrepreneur availing credit facilities will get 90% loan for which 3% interest subvention is provided by the Central Government. The Central Government is also providing Credit Guarantee of 25% of total borrowings for those projects which are fulfilling the definition of MSME projects.

The National Livestock Mission has been revised and realigned with an outlay of Rs 2,300 crore for the five years commencing from 2021-22. The mission aims at development of entrepreneurs in rural poultry. The central Government is currently providing 50% subsidy up to Rs 25 Lakhs to establish parent farm, rural hatchery, brooder cum mother unit for production of hatching eggs with minimum 1000 parent layers and chicks and rearing of the said chick up to four weeks in the mother unit.

The Self Help Group, Farmers Producer Organizations organization's (FPO)/Farmers Cooperatives organization's (FCOs) /Joint Liability Groups (JLGs) and Section 8 companies can avail financial assistance under the mission. Department of Animal Husbandry and Dairying has developed an online portal for a completely digitized Process with all the important documents to be uploaded on the portal nlm.udyamimitra.in.

Key future challenges

Rising consumption of poultry meat, supply of feed in the coming years has to be sustained to avoid volatility in the feed prices. Poultry feed comprises mainly maize and soya meal and the country needs to increase supplies of feed in the coming years. Another key challenge is that soybean productivity has largely stagnated in the last few years. In August 2021, as an exception due to domestic supply constraint, the government had allowed import of 1.2 million tons of genetically modified (GM) soybean meal to help the poultry industry tide over higher feed prices.

The government must take steps to increase feed supplies and allow cultivation of GM hybrid soybean so that future feed supplies could be assured. **For the future demand of poultry meat, the government must liberalize imports of GM soybean meal and maize.**

Trust on creating infrastructure of Poultry Processing

Processing and marketing of poultry range from live bird markets to highly sophisticated, fully automated, adhere to International Standards Organization (ISO) certified facilities and ready-to-eat convenience products. Lack

or inadequacy of refrigeration is probably the biggest challenge poultry industry faces. The poultry industry in the country is consistently growing due to the use of modern technology and there has been a gradual shift in demand from live bird to fresh chilled and frozen poultry product market. The government must step in supporting the sector in creating infrastructure for reducing losses in the poultry value chain. The better transportation infrastructure for live birds and more cold storage facilities for the processed meat will go a long way in modernizing the industry while sustaining the future growth prospects of poultry meat. Although the wet market continues to dominate the poultry industry, there has been a significant increase in e-commerce with the expansion of home delivery of various poultry meats and processed meat. **Now there is an urgent need for setting up of modern poultry processing plants to cater to both domestic as well as export markets.**



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Behaviour Pattern of Poultry

Email: drramutha@yahoo.com

R. Sakthivadivu, R. Amutha and P. Thirunavukkarasu

Livestock Farm Complex, Veterinary College and Research Institute, Namakkal - 637 002, Tamil Nadu

Behaviour (Ethology) is the character through which the birds can respond to the external stimuli of their environment. The external stimuli may be from other birds, environment in which they are placed, people or any other thing or occurrence. The following factors are responsible for the behaviour of the birds.

Factors leading behaviour responses

1. Genetic - Some strains of birds are more docile wherein the character responds to selection pressure.
2. Experience - Birds know instinctively how to eat, but they are not aware of what to eat or where to find it.
3. Age - When the bird reaches an appropriate age, the behavioural characters like, development of the peck order and reproduction behaviour are established.
4. Older birds - Cannibalism is very common in aged birds.
5. Environment - The high intensity of light tends to increase the activity of birds, especially at a very young age and encourages them to seek feed and water.

Different sensory capability and behaviour patterns of poultry are as follows:

A. Sensory capacities

1. Vision

Poultry has well-developed visual, auditory, olfactory, and tactile senses (Nicol, 2015), as well as potentially magneto reception (Freire *et al.*, 2005). The visual ability of concerned, birds use their right eye for smaller details, and left eye for novel stimuli, predators, and distinguishing familiar from unfamiliar conspecifics (Laura Garnham and Hanne Lovlie, 2018).

Poultry has good short and long-distance vision (Stamp Dawkins and Woodington, 1997), complemented by detection of a broad range of colours, including ultraviolet (UV), which is thought to be used for rapid movement detection. On the day before hatching, chicks can learn and react to olfactory cues (Jones and Roper, 1997).

2. Hearing

Chicks can gain the ability to hear the sound around on 12th day of incubation (Jones *et al.*, 2006) with frequency from as low as below 20 Hz to as high as 4000 Hz. Low frequency sounds play an important role in female-chick communication (Nicol, 2015) and aid in the imprinting process. A high frequency sound level (e.g., 80 db) has been associated with a reduction in egg laying and invites behavioural changes, which will affect the welfare of the birds.

3. Taste

The number of taste buds in birds ranged from 8 to 32 from day old chick to 3 month old cockerel, respectively. Chicks are indifferent to common sugars and have a wider range of tolerance for acidity and alkalinity. In general, birds are highly sensitive to flavour of additives when supplemented with water than in feed, since aqueous solutions are more appropriate for investigation of taste.

4. Smell

The sense of smell is lacking in birds although they have poorly developed olfactory epithelium.

5. Tactile

Poultry have a good tactile sense, particularly in the beak, which is used to manipulate various items (Nicol, 2015). Beak trimming is a common practice recommended to avoid feather pecking in the poultry rearing (Jendral and Robinson, 2004).

6. Magneto reception

Poultry may possess magneto reception and use its behaviour at around five to six weeks of age when chicks naturally become independent from their mother. The sensory abilities of poultry play an important role in their social (both sexual and non-sexual) behaviour.

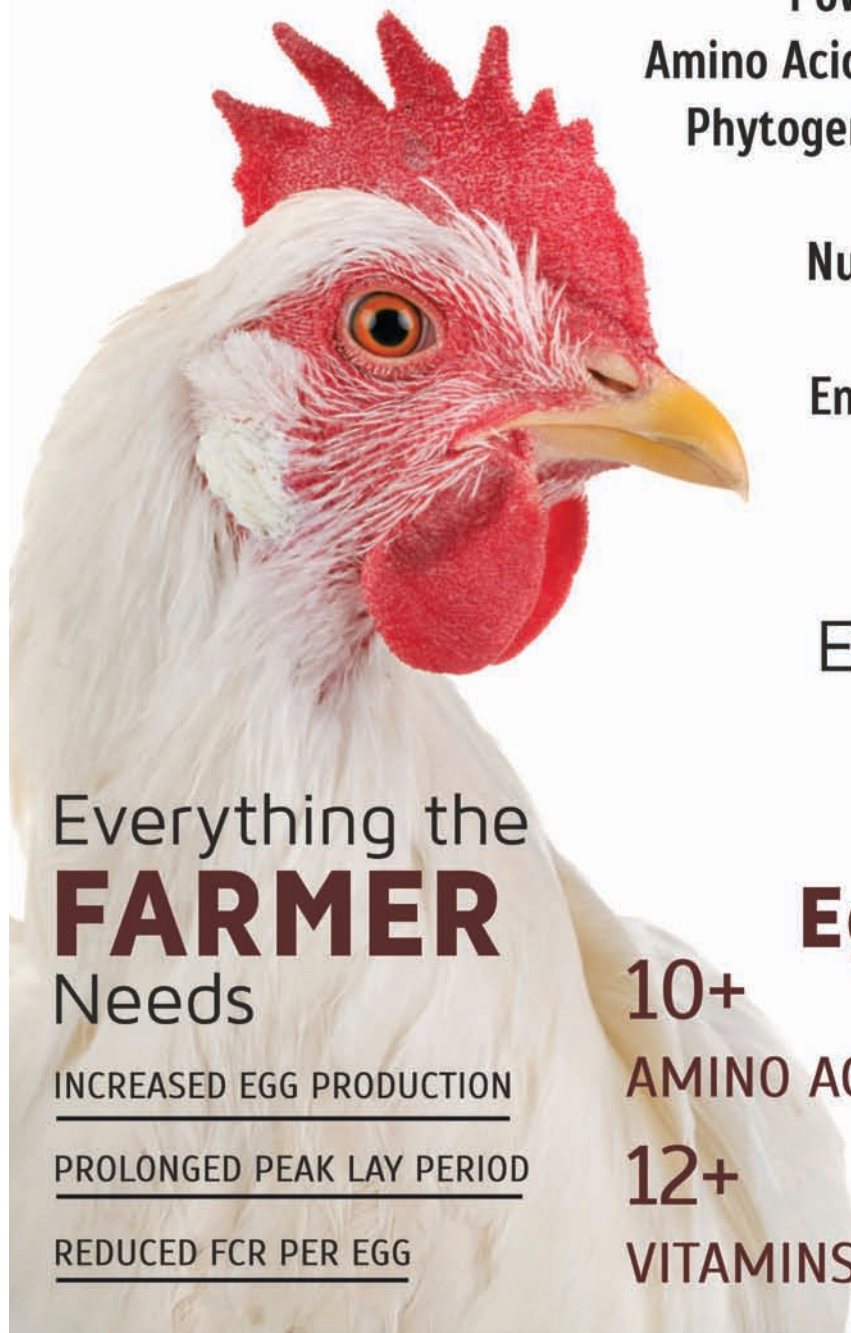
B. Behaviour

1. Ingestive behaviour

Feeding behaviour is directly facilitated by social stimulation and indirectly by sounds associated with feeding, pecking

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such as tap sounds. The unlearned visual pecking such as preference for circular form and for orange-yellow hue is modified by early pecking experience.

The precedence at feed trough is associated with ranking in peck-order when birds are in flock and decreases as the progressive integration of the flock. One or more birds will stimulate others to join for feeding and social facilitation among birds in adjoining wire cages.

Social factors will influence the feeding behaviour of chicken. Preston and Mulder (1989) found that the modification in cage front side space would improve feeding behaviour by reducing agonistic behaviour which was confirmed by Murphy and Preston (1988), by behavioural pattern related to feeding, feed efficiency and drinking is related to equipment design.

2. Cognitive behaviour

Chicks can be imprinted on object other than their mother. Imprinting is the phenomenon in which chicks memorise the property of the first moving object they see and, afterwards, show a preference for this object.

3. Learning and Retention

Assessment of learning ability in birds is not done so extensively or systematically as in the case of mammals. Two aspects will affect the learning; the first one is comparative assessment of chick ability relative to other avian species and also to mammalian forms. A second one is assessment of developmental factors affecting learning.

Young chicks and adult birds can be improved on successive reversal of both spatial and visual discrimination. When the chicks are over trained either on a spatial discrimination, or a spatial discrimination with an additional cue of brightness, the reversal learning is retarded. The learning ability of chicks is influenced by developmental factors which is decreased with age up to 2 weeks to 2 months, depending upon the nature of the task or perhaps, upon task difficulty.

4. Social behaviour

Social organization is a useful phenomenon in poultry husbandry practices, especially in small to moderately sized flocks. Social organization helps in two aspects:

- 1) It reduces non-adaptive energy expenditure, such as fighting; and
- 2) It serves as a basis for regular and predictable dominance-submissiveness relationships.

Dominant-subordinate relationships can be recognized by the posture of the head and spacing of individuals. Once the social group becomes organized, the incidence of agonistic interactions was decreased. Social behaviour is very difficult under commercial poultry husbandry conditions where groups of birds are very large, especially in broiler breeders and egg-type commercial strains.

Territorial behaviour occurs when an individual bird exhibits site preference and to defend for their territorial site. Linear relationship was established between decreasing space and increasing the incidence of agonistic act with a given density of birds. Social learning plays an important role in the survival of poultry (Nicol, 2015).

5. Agonistic behaviour

Agonistic behaviour plays an integral role in the development of social organization in birds involving the level of dominance and submission. Aggressive pecks and outright attacks are prominent in the development of the social hierarchy. Once a social hierarchy is established and is maintained by threat gestures by dominant individuals and submissive postures by subordinates rather than by violent disputes. The social order is of small interest for commercial broiler flocks, because they are generally processed at the age when the establishment of social stratification just begins. The incidence of aggression in a commercial flock can increase greatly when birds have to compete for limited resources (feeder space).

At the age of 24th week, the pattern of increased aggression shifted and it is usually observed during feed-on mornings. Due to the frustration and the resultant increase in aggression induced by feed restriction of young heavy breeders, (Shea *et al.*, 1990) increased the dietary level of tryptophan.

Aggressive acts are directed primarily to the head and neck region of subordinate birds, whereas lower status birds may take part in the cannibalistic pecking of more dominant individuals and are directed to areas away from the head.

6. Sexual behaviour

Sexual behaviour is the main goal of breeder management, to produce fertile eggs. Sexual behaviour in birds / breeders is usually referred to as mating behaviour. When the frequency of mating is less, loss in fertility and hatchability resulted. The male and female are well acquainted. The rear approach with head extended towards or over the female is common. The male may place one foot on the back of a hen, grasp the comb or hackle, or he may drive the female. If the hens are unresponsive, the cock may attract them by tit-biting. These behaviour patterns are collectively called courtship behaviour. Mating may occur at any time of the day, most frequently during the early morning and late afternoon. Chick as young as 2 day old, displays the full juvenile copulatory sequence. The earlier separation of female results in less activity of sexual response especially in caged male. The unfamiliar object evokes fear which masks sexual behaviour.

Male birds fed separately from hens by adopting sex separated feeding which helps in:

- 1) More uniformity and controlled body weight;
- 2) Improved fertility and hatchability;



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3) More percentage of males in semen production between 32 and 42 weeks of age; and

4) Strong foot.

Breeder farms that sell the parent chick recommend clipping the rear toe and a front toe (usually the index toe) on each foot as a practice to avoid injury with sharp toe nail, Ouart *et al.* (1986) studied the effects of toe clipping on mating behaviour and fertility in commercial breeder flocks and found reduced mating frequency and fertility in toe clipped males. Toe clipping seems to interfere with the males' ability to balance, mount, and complete mating, which paves a way for eliminating toe clipping as a breeder management tool (Joseph, 1991).

7. Parental behaviour

Parental behavior is limited to the hen and broodiness decreases as egg production increases, which has to be eliminated. Parental behaviour starts with building of nest, egg laying or nesting behaviour and includes incubation, brooding and feeding of hen. The prolactin hormone induces incubation and broodiness in the hen. The endocrine glands of broody hen contain more prolactin than those of non-broody hens.

Brooding behaviour in hens can be a blessing and a curse. When a hen becomes broody, she will ensure the nest is perfect by plucking out her own feathers for bedding and ready for motherhood and won't budge until she has some baby chick to rise. This usually occurs because of increased prolactin hormone level in the spring, when the hens are getting more daylight, which made broody hens with excellent mothering instinct to their chicks. On the other hand, hens can become broody with infertile eggs, and won't allow anyone to take them.

Conclusion:

Knowledge of the impressive sensory ability of birds can help in designing a house that enable the bird to exhibit a full range of these abilities. Birds show sophisticated social behaviour, in both sexual and non-sexual contexts. Understanding this behaviour of birds could help in providing a good welfare. The display of personality is individually unique in the behaviour of birds. Birds display a range of impressive cognitive ability, disproving the notion that they are cognitively inferior. Overall, an understanding of the behavioural and cognitive sophistication needs of the bird should encourage a more positive and respectful opinion on them. Further, this should inspire people to experience and learn more about this fascinating species, both through research and by keeping them for recreative purpose.

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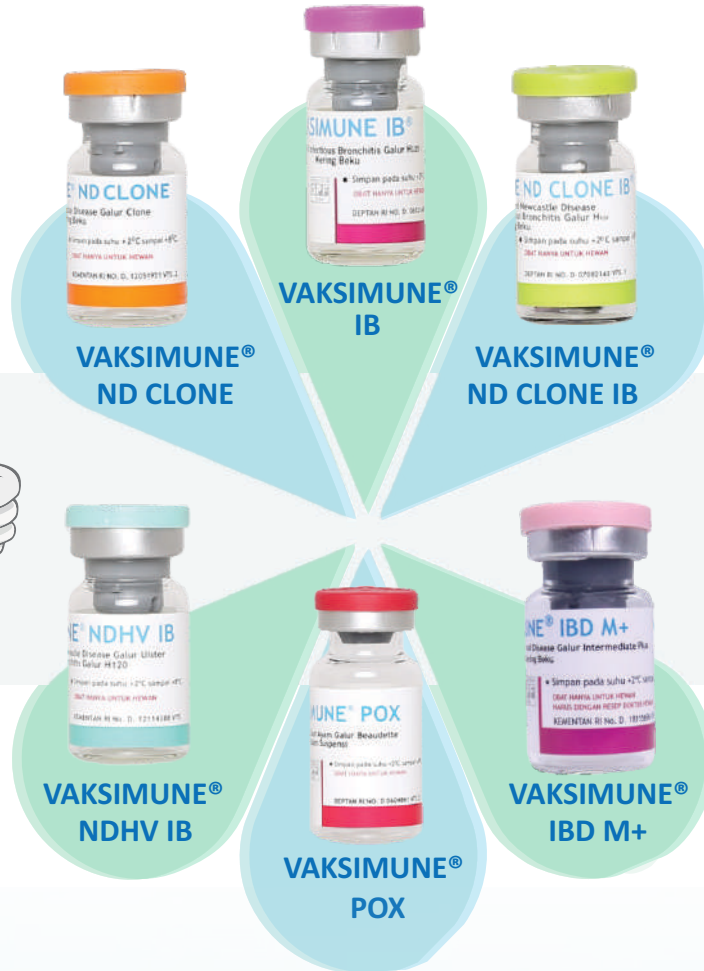
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