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Poultry Fortune

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Poultry Fortune

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M. A. Nazeer

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14	0.467	0.494	1.06	0.67	-	-
17	0.723	0.775	1.07	0.78	-	-
21	0.995	1.238	1.24	0.86	1.50	378
24	1.329	1.722	1.30	0.94	1.46	415
28	1.581	2.212	1.40	1.08	1.50	399
30	1.820	2.560	1.41	1.17	1.45	419
31	1.920	2.734	1.42	1.22	1.44	423
32	2.022	2.901	1.43	1.27	-	435

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Cargill, Heifer aim to improve nutrition and income levels through backyard poultry farming and increased consumption of poultry products

Dear Readers,

The November 2020 issue of ***Poultry Fortune*** is in your hands.

In the News section you may find news about - Cargill and international development organization Heifer International together have been positively impacting local communities in India through the Hatching Hope Global Initiative. Launched in November 2018, the project aims to improve nutrition and income levels through backyard poultry farming and increased consumption of poultry products in Mayurbhanj, Odisha. Aligned to United Nations Sustainable Development Goal of Zero Hunger, Hatching Hope has so far impacted over 30,000 farmer households through improved backyard poultry production resulting in better flock health and bird size and improving income and nutrition across 1.5 million people in the district over two years.

On 9 October 2020, NECC Madhya Pradesh zone distributed boiled Eggs on the occasion of World Egg Day to the patients and health workers of Govt Elgin Hospital, Jabalpur.

The National Green Tribunal has directed the Central Pollution Control Board (CPCB) to revisit the guidelines for classifying poultry farms as Green category industry and exempting their regulation under various laws. The green panel asked the CPCB to issue fresh appropriate orders within three months and if no further order is issued, all the state pollution control boards will require enforcement of consent mechanism under the Air, Water and Environment Protection Acts.

Vitamin D deficiency is mostly seen in winters as people stay indoors, but this year due to the isolation and Covid-19 protocols, many people have remained indoors aggravating the situation. The last six months have seen many of them remain indoors and senior citizens have not ventured out even for their morning walks. Children too have been out very little given parental fear of the virus.

While 2020 has been a year of volatility and uncertainty, in its most recent report, the International Monetary Fund (IMF) offered a more positive outlook for 2021, projected five percent global economic growth. Brett Stuart, President of Global Agri-Trends, shared his thoughts on this growth, as well as what to watch for in 2021 in terms of protein markets, at the Canadian Beef Industry Conference, held virtually for the first time this year.

In the Articles Section, article titled *"Impact of COVID-19 on backyard poultry during lockdown (Phase I and II) - Indian scenario"* written by Dr S. V. Rama Rao, Vijay Kumar and U. Rajkumar highlighted that Impact of backyard chicken meat price was found minimal as compared to price of eggs. The backyard poultry chicken sale price (per kg) was declined from 1.5 to 15.2 % whereas, price of eggs reduced by 44 to 50% in different part of the country during the lockdown period due to COVID 19 pandemic. The flock size was reduced from 3 - 27.2% and the degree impact was dependent on farm size and location.

Another article *"Phytogenics – Be one step ahead with plant derived Feed Additives"* written by Jan Dirk van der Klis and Ester Vinyeta highlighted that when it comes to feed additives (plant extracts, enzymes, pro- and prebiotics, organic acids and many more), the livestock industry is in undated with numerous options, not only promoting performance of the animals and improving profitability, but also improving the quality of feed and of animal-derived products. In this context, phytogenic (plant derived) feed additives are predicted to have a promising future in animal nutrition due to their broad range of efficacies, and to their effects on sustainability and safety.

Readers are invited to send their views and comments on the news, 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 regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
Poultry Fortune

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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Hatching Hope Global Initiative Empowers 30,000 Small holder Women Farmers in India

Delhi: Cargill and international development organization Heifer International together have been positively impacting local communities in India through the Hatching Hope Global Initiative. Launched in November 2018, the project aims to improve nutrition and income levels through backyard poultry farming and increased consumption of poultry products in Mayurbhanj, Odisha. Aligned to United Nations Sustainable Development Goal of Zero Hunger, Hatching Hope has so far impacted over **30,000 farmer households through** improved backyard poultry production, resulting in better flock health and bird size and **improving income and nutrition across 1.5 million people in the district over two years**.

Traditionally driven by women farmers, supporting backyard poultry production by Hatching Hope enhances gender equity across rural households in India. The program has already trained over **1,600 Self Help Groups (SHG) to strengthen women-led institutions** and facilitated building of new SHGs that can provide their members access to information, services and support needed to start their businesses. By removing barriers to women's economic independence, Hatching Hope supports women farmers to become successful poultry producers, earn a living income and improve resilience for their communities. Preliminary data collected on consumption and sale patterns from about 100 farmers suggests that the average **consumption of protein rich food per household has been approximately 20% higher from the previous year.** This increase could be associated with improved awareness of nutritional benefits and adoption of improved poultry production promoted through the mass media campaign, augmenting accessibility of poultry production in the region. Adoption of improved production techniques has also supported farmers to avoid volatility in consumption and sale during unfavorable market conditions or disasters, thus making them more resilient.

Imre Havasi, Managing Director of Cargill's Animal Nutrition business in India said, "Hatching Hope has been helping women backyard poultry farmers and lifting communities out of poverty in Odisha. Through the initiative, Cargill and Heifer have successfully been able to help farmers become sustainable, efficient animal producers and successful entrepreneurs, who are actively participating in the poultry value chain."

In India, Hatching Hope has promoted improved poultry feed with the **establishment of 30 small-scale feed mills at community level in Odisha**. Using a formula jointly developed by the Heifer and Cargill India technical teams, the mills produce a locally prepared, high-quality and affordable feed mix that improves the health and weight of birds, while **cultivating business opportunities for local producer entrepreneurs** to meet the demand for poultry feed.

"Hatching Hope has supported small holder farmers to become efficient producers and aware consumers, which has ensured sustainable incomes and food security for the most vulnerable producer communities," said Avni Malhotra, Country Director of Heifer India. "This change has been possible through Heifer's partnership development to increase investing in women-led institutions and promote entrepreneurship opportunities for women at the community level."

Hatching Hope is also **piloting small-scale hatcheries** to increase poultry production by reducing the brooding period. The program also **trains farmers in developing backyard poultry production as a family business** and establishing Farmer Producer Organizations while connecting them to the poultry value chain by improving market access.

Through mass media and advocacy campaigns, communities in over **400 villages in Mayurbhanj** have been educated about the nutritional benefits of poultry consumption. Further leveraging digital platforms and mass media channels this will be scaled to reach up to 3.2 million people in newer geographies in Odisha by 2022. **Innovative tools like android application 'Storyteller', IoT toys and digital talking comics are being developed** to maximize reach across local communities.

Working directly with women small holder farmers in India, Mexico, and Kenya, Hatching Hope aims to improve nutrition and economic livelihoods of 100 million people globally by 2030 through production, promotion, and consumption of poultry. In India, the program will reach 62 million people.

Cargill's work through this program is just one example of how Cargill is working with nonprofit and NGO partners around the globe to ensure people have access to nutritious food. Across all the communities where Cargill's employees live and work, the company provided more than 39 million meals to global and local food bank partners this past fiscal year. Cargill employees remain committed and energized to help ensure food security for their neighbors through personal and corporate monetary contributions paired with product donations.

Visit https://www.cargill.com/about/community-engagement to learn more

about Cargill's work with global and local partners to build vibrant communities and nourish the world.

About Cargill

Cargill's 155,000 employees across 70 countries work relentlessly to achieve our purpose of nourishing the world in a safe, responsible and sustainable way. Every day, we connect farmers with markets, customers with ingredients, and people and animals with the food they need to thrive.

We combine 155 years of experience with new technologies and insights to serve as a trusted partner for food, agriculture, financial and industrial customers in more than 125 countries. Side-by-side, we are building a stronger, sustainable future for agriculture. For more information, visit Cargill.com and our News Center.

About Heifer International

For 76 years, Heifer International has worked with more than 36 million people around the world to end hunger and poverty in a sustainable way. Working with rural communities in 21 countries in Africa, Asia, and the Americas, including the United States, Heifer International supports farmers and local food producers to strengthen local economies and build secure livelihoods that provide a living income. For information, visit http://www.heifer.org.

Poultry farms cause pollution, can't be exempted from regulation: NGT

The National Green Tribunal has directed the Central Pollution Control Board (CPCB) to revisit the guidelines for classifying poultry farms as Green category industry and exempting their regulation under various laws.

The green panel asked the CPCB to issue fresh appropriate orders within three months and if no further order is issued, all the state pollution control boards will require enforcement of consent mechanism under the Air, Water and Environment Protection Acts.

"Till then, even without such consent mechanism, the state pollution control boards may strictly enforce the environmental norms and take appropriate remedial action against any violation of water, air and soil standards statutorily laid down," a bench headed by NGT Chairperson Justice A K Goel said.

The tribunal said sustainable development is a part of the right to life and the state authorities are under obligation to protect the environment as per sustainable development concept.

Responsibilities of the states to the environment are by Public Trust Doctrine. The Water Act, the Air Act, and the Environment (Protection) Act have been enacted in the wake of international conventions and override all other legislations.

"They create an obligation on the regulatory authorities to enforce the environmental measures. There is no discretion to exempt the mandate of the Water Act for activities having the potential to cause water pollution," the bench said.

The NGT said the operation of poultry farms has the potential to cause damage to the environment which needs to be regulated.

It noted the submission of the National Environmental Engineering Research Institute that poultry production is associated with a variety of environmental pollutants, including oxygen-demanding substance, ammonia, solids, besides it attracts flies, rodents, dogs and other pests that create local nuisances and carries diseases.

"Poor management of manure, litter and wastewater etc. adversely affects the living in the vicinity. Odour is generated for fresh and decomposed waste products such as manure, carcasses, feathers and bedding litter. Furthermore, intensive poultry production may be responsible for greenhouses gasses, acidification and eutrophication," the tribunal noted.

The NGT was hearing the plea filed by animal activist Gauri Maulekhi seeking quashing of the CPCB's 2015 guidelines exempting commercial poultry farms from the provisions of the Water (Prevention and Control of Pollution) Act and delegating the power to local authorities.

As per the guidelines, farms which have more than one lakh birds are required to take clearance under the section 25 of the Water (Prevention and Control of Pollution) Act, 1974, while poultries with 5,000 birds have to register themselves with the local authorities.

The plea claimed that poultry farms caused extensive pollution in the surrounding areas as they have thousand of birds in intensive confinement, resulting in huge accumulation of waste.

This huge quantum of waste is seldom disposed scientifically. The poultries impact the ecology and the living of those who surround the farm. Pests which are attracted to the farms make it difficult for the people living in the vicinity, it said.

"To keep thousands of birds alive in such intensive confinement and unclean surroundings it becomes important to administer non-therapeutic antibiotics regularly. The administration of these antibiotics adversely affects the health of those who live around the farms and those who consume the birds or eggs," the plea said.

It has also sought directions to regulate the use of antibiotics in poultry farms so that these drugs are not administered indiscriminately.

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ENDOTOXIN REDUCERS

EndoBan®	Endotoxin reducer
EndoBan® FT	Endotoxin + mycotoxin reducer

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PIGMENTS

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Nutracid Protecto	Coated acids
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Research around the World

Eggs may be an important part of the Solution for Mothers and Children

Childhood stunting impacts approximately 144 million children under the age of 5 around the world, a condition that "puts children at greater risk of dying from common infections; it is also associated with poor cognitive development." Almost all stunting occurs within the first 1000 days of life, a period of rapid growth and development. The impact of stunting can be lifelong, as cognitive and social development may also be impacted, so prevention is critical. Improved nutrition is one factor that has the potential to positively impact growth and development for children, and around the world, current research demonstrates eggs may be part of the solution.3

In 2015, a randomized controlled trial was conducted in Cotopaxi Province, Ecuador to evaluate early introduction of eggs and the impact on growth in young children. This intervention provided one egg per day to infants (beginning at 6 to 9 months of age) in the treatment group over a 6-month period. The children in this egg treatment group had improved growth outcomes compared to the control, including a 47% decreased prevalence of stunting.

As a follow-up, another study was conducted in rural Malawi in order to evaluate if these initial results could be replicated in other populations at risk of stunting.5 Again, infants aged 6-9 months were randomized to an intervention of one egg per day, or a control group, over a 6-month period. Although this intervention did increase reported egg consumption in the treatment group, there was no impact on linear growth and no effect on stunting prevalence. The investigators noted that the children in Malawi had a higher mean baseline length-for-age than previously observed in this population, which might have limited the ability to measure a difference. Importantly, though, fish consumption was very common in Malawi. This is a significant difference between the Ecuador and Malawi studies, as the authors mention that in Ecuador, consumption of animal sourced foods other than the intervention eggs was low.

Preliminary data from the study in Malawi also indicate that children who were in the egg intervention group consumed more choline as compared to the control group, although median intake levels remained below Adequate Intake levels.6 This observation raises new research questions, as a difference in physical growth was not detected in the intervention group that consumed eggs, but brain development and cognition were not measured. Choline is one nutrient critical for brain health and development,7,8 and there is preliminary evidence that choline intake during pregnancy, and possibly lactation, could possibly have lasting beneficial neurocognitive impact.9,10 More research is needed, however, to evaluate how adequate choline intake might improve cognitive outcomes in children at risk of stunting. Further, the study in Malawi indicates the combination of animal-sourced foods could be important in the context of interventions aimed at reducing risk of stunting in young children.

Overall, these studies build on existing evidence that eggs, and other a**nimal sourced foods,** have the potential to be an important part of the solution for **sustainable nutrition** for **mothers and children around the world.**

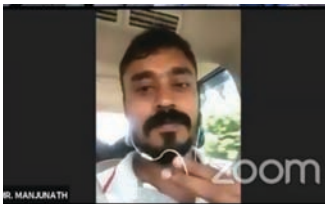
MP NECC zone distributes Eggs to mark World Egg Day

On 9 October 2020 NECC, Madhya Pradesh distributed boiled Eggs on the occasion of World Egg Day to the patients and health workers of Govt Elgin hospital, Jabalpur. Zonal Chairman Mr Ravi Mishra, Local Chairman Mr Pravesh Verma, Phoenix Group General Manager Mr Pallab Paul, Dr Rajesh Tiwari, Anil kanade, Samarsingh Gaikwad were present on the occasion.

A view of Egg distribution by NECC, Madhya Pradesh zone on the Occasion of World Egg Day on 9 October 2020

CPDO&TI, Hessarghatta organizes 5-day Entrepreneurs Day, EPAW

Hessarghatta: Central Poultry Development Organisation & Training Instittute under Government of India, Ministry of Fisheries, Animal Husbandry & Dairying, a premier Institute located at Hessarghatta, Bengaluru organized a five day online **Entrepreneurship in Poultry – Awareness Week (EPAW)** from **19th – 23rd October, 2020.**

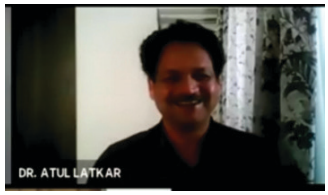


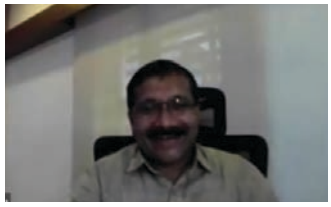
According to a note from Dr Mahesh P. S, Director, CPDO&TI, the programme was planned to impart the knowledge for entrepreneurs focused on Business models in Indian Poultry, Commercial Poultry Farming & Rural Poultry Farming, Credit proposals for Bank, Government of India Schemes, and understanding of profitable poultry models, Nutrition, Disease Management and Medications etc.

EPAW was planned to create awareness among prospective entrepreneurs, Bankers, graduates and veterinarians across India. The schedule was very comprehensive covering all the aspects above mentioned. **Prof Gopal Naik, IIMB** inaugurated the programme on 19th October, 2020 and narrated ample opportunities in the value chain of poultry sector. **Dr Mahesh P.S.**, Joint Commissioner, GoI & Director presented an overview of poultry sector and **Dr Krishnan** illustrated the basics and nuances of poultry farming on the first day.

Prof Prathap Kumar and **Prof B.S.V. Reddy** former Deans of Veterinary College briefed the audience about management aspects and salient features of Poultry Nutrition. **Dr Baburaj**, DGM, Venkys India elaborated on common poultry diseases, medications and vaccinations followed by **Dr Lipi Sairiwal**, Assistant Commissioner GoI briefed on Government of India Schemes in poultry.

On 22nd October, 2020 Entrepreneurs day was conceptualized for getting the first hand information from the hard working successful entrepreneurs in poultry sector. Concluding day on 23rd October, 2020 **Dr Jeevan Sonawane**, Director, Novelvet presented on Incredible Eggs and Chicken – Facts and Myths. Dr Mahesh presented on availing credit facilities in Nationalized Banks and various business models of poultry in detail as a final session.

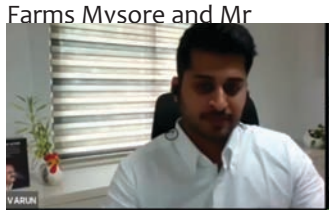




All these recordings are date wise posted on our Facebook page with the link https://www.facebook.com/cpdoti.bangalore. All are requested to browse any time at your convenience.

ENTREPRENEURS DAY:

Dr Mahesh invited following successful entrepreneurs for a one-to-one presentation for the audience on 22nd October, 2020. Dr Atul Latkar, Managing Director, Kasturi Farms, Nasik, Dr Arun Rai, Managing Director, Bharat Agro, Mangalore, Mr. Varun, CEO, Sneha Group Hyderabad, Dr P. Nallappa, Managing Director, Jagadish Farms, Bangalore, Mr. Manikam, Managing Director, Megha Farms Mysore and Mr Manjunath, CEO, Happy Hen Farms, Bangalore were the panelists.



Dr Atul Latkar, experienced veterinarian having decades of experience in private sector started a journey as entrepreneur under the brand name Kasturi Farms in Nasik. In his presentation he elaborated various business opportunities in Layer Farming more specifically in pullet rearing business. He demonstrated that crisis like Corona can be turned into

Approximate cost to construct 30,000 Broiler Breeder project

S.No.	Particulars	Cost per bird (Rs.)	%
1.	Land leveling & preparation	33	2.6
2.	Foundation expenditure	5	0.4
3.	Building Steel	117	9.4
4	Building material (sand, jelly, cement & concrete blocks)	195	15.8
5.	Labour to build	160	13
6.	A/C roof sheets	62	5
7.	Truss, purline & Fabrication	105	8.5
8.	Chain link mesh	40	3.2
9.	Cages	350	28.4
10.	Electrification	92	7.4
11.	Diesel (tractor, welding generators, concrete mixer)	6	0.5
12.	Miscellaneous (supervisory, curing, labour work, security, food expenses)	40	3.2
13.	Bore wells , water pipelines, drainage system etc.	30	2.4
	TOTAL	1235	

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1989
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2010
Alura launches Alpha D3 in poultry

2010
Alura bring Alpha D3 to India

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opportunity for expanding the layer pullet business into complete layer business for his group. He claims presently as a leading pullet (18 wks ready to lay layer birds) supplier across India.

Dr Arun Rai, Veterinarian who also started his career in private sector joined hands with like minded partners to start their own venture Bharat Agro at Mangalore. Their entrepreneurship began in a small way with broiler farms, custom hatching. Later they have expanded into breeding farms, processing plant, commercial shops, rendering plant, biogas facility, rainwater harvesting, large hatchery, premix plant and a huge feed mill for the group. Dr Arun Rai briefed in detail keys for success for the entrepreneur namely, Honesty, Sincerity, Hard work etc to name a few. **(detailed video / audio presentations of all the speakers can be viewed at our face book page posted on 22nd October, 2020).**

Mr Varun introduced his group as 3500 crore turnover company with a team of 5,000 employees managing 100 plus own chicken retail outlets along with over and above 2500 franchisee outlets in south India. Sneha group, a big conglomerate having all the operations of Breeding Farms, state of art feed mills, commercial broiler farms, largest processing plant in India (12,000 birds per hour), handling daily 3.5 lakh birds in Hyderabad. During the chat with Dr Mahesh, Varun answered many queries about their group efficiency, advice for small retailer, future of broiler industry in India etc. Mr. Varun said that, "It's no more a secret for anybody's fitness but to opt for chicken and egg in their daily diet to meet body protein requirement of the human being. Personally he endorsed that he consumes lot of eggs, 3 – 5 kilos of chicken per week along with five days of rigorous workout as a commitment being a CEO for such a large group Sneha. He is very active in social media with Sneha Select as a group app of choice as a one stop solution for protein needs.

Dr Nallappa a staunch believer of hard work and always be seen in poultry farm elaborated about his journey from broiler farmer to large breeder entrepreneur. In his presentation he categorically presented stepwise instructions for construction of broiler breeder project under cage system for 30,000 female breeders. His presentation includes a pictorial look back from Pooja to housing of breeders at his unit. (Detailed video / audio presentations of all the speakers can be viewed at our face book page posted on 22nd October, 2020). In his concluding slide he gave a cost estimate for each of the activities in construction on a per bird basis. For cage about Rs. 350/- per bird (30%), Building material Rs.195 (16%), Building Steel Rs. 117/- (10%), Truss Purlin fabrication Rs. 105/- (9%) to name a few. An overall estimate of Rs. 1,250 to 1,300 is the project cost for only construction of such project.

Mr Manikam and **Mr Vasanth**, son of Manickam heading Megha Group briefed the audience about opportunities in modern layer farming and how to brand eggs to reach super market across India. Megha farms is a trend setter in adaptation of technology in layer farming namely automation, packaging, branding designer eggs etc in Karnataka. Megha farms has now forayed into broiler breeding and commercial broiler integration along with layer activities. Both expressed the need of support from the government for technology adaption and innovation for the entrepreneurs which is lacking at present.

Mr Manjunath explained in detail their startup which was conceptualized in two minutes has come a long way to present branded free range eggs in the market priced at Rs. 25 to 30 per egg. His group is operating more in Tamilnadu started with 100 eggs production per day to a level of 10,000 eggs per day presently. Mr Manjunath acknowledged the contribution of CPDO&TI in hand-holding their group and supplying Kaveri as a rural egg layer bird for the venture. Manjunath requested support of government for free range certification in India, presently he is getting certificate from Europe or USA.

Dr Mahesh concluded the programme by interaction with the panelists and answering many queries by the audience. All in all every day an average of **1,500 viewers** were recorded both in Zoom and facebook page of CPDO&TI. The event was well appreciated. The team CPDO&TI guaranteed to conduct such many more programmes in the coming future.

Mr Anwar Basha, Senior faculty of CPDO&TI executed the job of admin of conducting EPAW very effectively. The other team members of CPDO&TI worked hard in making this programme successful. The entire programme was live broadcasted on CPDO&TI facebook: www.facebook.com/cpdoti.bangalore. All the recordings of 5 days are uploaded on the same day as a ready reference for the facebook visitors.

Locked at home, many face Vit-D deficiency

Virus protocols to remain indoors aggravates situation

Vitamin D deficiency is mostly seen in winters as people stay indoors but this year due to the isolation and Covid-19 protocols, many people have remained indoors aggravating the situation.

The last six months have seen many of them remain indoors and senior citizens have not ventured out even for their morning walks. Children too have been out very little given parental fear of the virus.

With winters approaching, there is again fear that they will not be able to move out and their vitamin D levels will be compromised. Sunlight is a major source of vitamin D for the body.

In winters, there is less and weaker sunlight and the exposure levels are reduced as people do not venture out much due to the cold. For this reason, there is a concern as the standard bone diseases like osteoporosis, fragility and others will see a rise due to prolonged staying inside homes.

Before the lockdown, it was estimated that 80 per cent of the Indian population suffered from vitamin D deficiency. Post-lockdown and with Covid-19 protocols, it is estimated that the percentage has further increased.

Vitamin D deficiency results from one or more factors like inadequate sunlight exposure, inadequate nutrition or malabsorption.

Those who are obese, require anti-epilepsy medication and steroids require vitamin D supplements as their body absorption is a challenge. With Covid-19, the situation in all these categories has aggravated and they are being recommended a daily dose of vitamin D.

Dr Aditi Gupta, senior consultant, said, "Due to the pandemic, people are not able to understand that symptoms like fatigue, bone pain, muscle pain, irritation and sour moods are also related to less vitamin D in the body. While exposure to sunlight is an issue, they must opt for vitamin D-rich foods."

Vitamin D supplements are important as they also help in reducing viral loads. With the onset of winter and the prevalence of influenza, old Corona virus and SARS-Cov-2 increase and it is recommended that people take supplements and vitamin D-rich foods.

Nutritionist Ali Mohammed said, "For vitamin D to be metabolised in the body, magnesium is also important. Avocado, nuts, fatty fish, black beans, pumpkin seeds, tofu are rich in magnesium. This acts as a translation of vitamin D3 to active vitamin D hormone. This helps to improve absorption in the body. Other foods like cod liver oil, eggs, mushrooms and meat are also rich in vitamin D."

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Farm bills: India's fields are on fire

The tearing hurry with which agriculture market reforms have been pushed through, without even consulting farmers, has resulted in huge farm protests in Punjab and Haryana

At a time when I see euphoria among mainstream economists over the new set of agricultural reforms, media reports say that the Commission for Agricultural Costs and Prices has observed that only 12 per cent of India's paddy cultivators were able to sell their produce at the guaranteed minimum support price during the 2018-19 kharif marketing season. If the remaining 88 per cent farmers were also able to sell paddy at the MSP, the rural economy would have witnessed an upswing.

The uneven picture of paddy procurement is not very different from that of wheat procurement in the rabi marketing season where the bulk of procurement operations is confined to Punjab, Haryana and now Madhya Pradesh.

This is primarily because the network of regulated markets has remained confined to the traditional Green Revolution belt of the northwestern region. Against the requirement of 42,000 regulated mandis within a five-kilometre radius, there exists close to 7,000 mandis only under the Agriculture Produce Market Committee (APMC) Act. Nor has MSP price delivery been expanded to cover more regions and more crops. This reflects a historic asymmetry in procurement operations, with the procurement share of paddy in Punjab and Haryana being 95 per cent and 70 per cent, respectively, whereas the share of procurement in Uttar Pradesh (3.6 per cent), West Bengal (7.3 per cent), Bihar (1.7 per cent) and the northeastern states have remained minuscule. With most farmers getting a distress price, farm incomes have remained very low in these states. This prompted the CACP to suggest: "Therefore, concerted efforts should be made to extend the benefits of procurement to small and marginal farmers in general and eastern and NE States in particular."

The importance of this recommendation can be gauged from the fact that deprived of the right price, truckloads of paddy from UP (and earlier from Bihar) are being transported to be sold in Haryana where farmers at least get an assured MSP. This is not the first time that paddy and wheat from UP and bajra from Rajasthan are being brought to be sold in Haryana, which has a robust marketing infrastructure network. With procurement operations restricted in most states, the majority of farmers have remained dependent on markets. If markets were as efficient as is being made out, and provided farmers with a higher price, the question that needs to be asked is why does agriculture continue to be in the grip of a severe crisis?

The tearing hurry with which agriculture market reforms have been pushed through, without even consulting farmers for whom these laws are designed, has resulted in huge farm protests in Punjab and Haryana. The government, the industry and some economists are claiming that by providing for 'one country, one market' by removing the inter-state and intra-state barriers in agriculture trade and making trading outside the APMC market boundaries to be free of any taxes so as to bring in competition, these laws will help attract private investments while the markets would provide farmers with higher prices. Although APMC markets and the provisions of MSP have remained untouched in the new laws, agitating farmers say that the real intention is to gradually dismantle the APMC mandi network and, in the process, do away with the delivery of MSP to farmers. With several committees pointing to MSP becoming a barrier in price discovery, their fear is certainly not unfounded. APMC mandis have been blamed for monopolizing trade and licensed middlemen in the mandis accused of exploiting farmers. There is no denying that over the years APMC mandis have seen certain distortions emerging but farmers say the need is to reform the mandi structures and not to render these markets redundant.

Leaving farmers to face the vagaries of markets has not been useful anywhere in the world. Knowing that unregulated markets will further exacerbate the farm crisis, protesting farmers are demanding a right-based security net. The demand is for another law that makes MSP a legal right for farmers. Since MSP is announced for 23 crops every year, but is effectively implemented for two crops only — wheat and paddy (also to some extent for cotton, mustard and some quantities of pulses) — farmers want no trading to be allowed below the MSP. The real freedom for farmers will be if all paddy and wheat farmers as well as farmers growing other crops are assured of receiving the MSP. Even for contract farming, the price should not be below the MSP announced. Given that private companies are promising to provide higher prices to farmers, this should not be a problem.

Farmers raise slogans during their ongoing Rail Roko or Stop the Trains agitation, against the central government over newly passed agri-bills, at Devi Dass Pura village, 20km from Amritsar, on 29 September 2020.

Proteon unveils BAFACOL, a bacteriophage - based feed additive protect poultry against *E. coli* infections

E. coli infections are among the most common infections affecting poultry of all ages and categories.

Overuse of antibiotics has led to emergence of antibiotic resistant E. coli strains in poultry which can have a serious consequence on human health.

Bacteriophage technology helps preventing bacterial infections naturally, improving the health of poultry and reducing usage of antibiotics

October 29, 2020 – Leading global biotechnology company Proteon Pharmaceuticals, a leader in bacteriophage technology for livestock, has launched BAFACOL, a new poultry feed additive which provides a natural guard against avian pathogenic *E. coli* bacteria. The product offers an innovative solution for Indian poultry farmers to improve the health and safety of their flocks.

Poultry sector is currently one of the fastest-growing sectors in agriculture in India. However, bird's health (and consequently bird's productivity) can be affected by rampant threat of bacterial infections such as colibacillosis which is caused by avian pathogenic *E. coli*(APEC). There are different strains of *E. coli* present in the intestines of flocks. While most of them are harmless, certain strains are specialized in pathogenicity due to the acquisition and expression of virulence genes. *E. coli* strains which are major cause of infections in birds are called APEC or avian pathogenic *E. coli*.

Colibacillosis is a major cause of mortality and morbidity in poultry species. Indiscriminate antibiotic usage to treat a variety of bacterial infections has led to a higher prevalence of antibiotic-resistant *E. coli* strains in chicken. Considering that poultry is one of the most popular meat and that avian *E. coli* are more resistant to antibiotics than bacteria from other animal species, it can be extremely dangerous to human health.

Proteon Pharmaceuticals' BAFACOL is an innovative feed additive comprising five lytic bacteriophages that selectively target APEC.

Introducing the new product in India during an online session, Ms Justyna Andrysiak, Chief Product Development Officer at Proteon Pharmaceuticals said, "BAFACOL is a cocktail of five lytic bacteriophages that are highly effective only against virulent avian pathogenic *E. coli* bacteria without affecting negatively the beneficial microflora of the gut".

"BAFACOL is an environmentally sustainable product that ensures healthy growth of poultry without the need to overuse antibiotics. It can be used in both organic and industrial poultry production to reduce the mortality rate occurring due to avian pathogenic *E. coli,*" she added.

Recently, a *in vivo*trial was conducted with BAFACOL at Agrivet Consultancy P Ltd., Kolkata, on broiler chickens for a period of 35-days. The results showed that the product is effective in controlling colibacillosis which showed lower mortality rates compared to the untreated groups. Dr Sudipto Haldar, R&D Director at Agrivet Consultancy said "A controlled experiment was conducted to evaluate the effects of BAFACOL as a therapeutic and prophylactic agent against APEC infections. The test induced positive results confirming that BAFACOL may be considered as an alternative to antibiotic treatments in poultry production to combat colibacillosis"

With the poultry market projected to grow to INR 4,340 billion by the year 2024, it is obvious that the demand for poultry products is set to rise in India. The rampant antibiotic usage in poultry and the wide consumption of poultry products threatens to increase antibiotic resistance in human beings.

Bacteriophages are naturally occurring organisms that attack only specific bacteria, while remaining completely safe for animals, humans and the environment. Phage preparations are a new hope for modern agricultural industry and can help the farmers to prevent bacterial diseases. In nature they co-evolved with bacteria, and every single bacterium has a phage opponent that can control its population. Phages outnumber bacteria by a ratio of 10 to 1, and also play an important role in recycling the carbon in bacteria. Bacteriophage-based preparations are increasingly gaining interest in the global market as they help farmers raise safe and healthy livestock.

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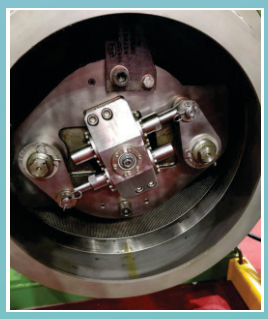

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Covid-19's impact on the global protein market

While 2020 has been a year of volatility and uncertainty, in its most recent report, the International Monetary Fund (IMF) offered a more positive outlook for 2021, projected 5 percent global economic growth.

Brett Stuart, President of Global Agri-Trends, shared his thoughts on this growth, as well as what to watch for in 2021 in terms of protein markets, at the Canadian Beef Industry Conference, held virtually for the first time this year.

Global growth is projected at -4.9 percent in 2020, 1.9 per cent below the April 2020 forecast, according to IMF's World Economic Outlook (WEO) Update, published in June. The Covid-19 pandemic has had a more negative impact on activity in the first half of 2020 than anticipated, said the WEO report, and, as a result, recovery is projected to be more gradual than previously forecast.

In 2021, IMF projects 5.4 percent global growth. Overall, this would leave the 2021 GDP some 6.5 percentage points lower than in the pre-Covid-19 projections of January 2020.

But as Stuart pointed out in his talk, the IMF doesn't know for certain what's going to happen.

"No one is a psychic, but this is the news that the global financial markets trade," he said. "So you can see out there the assumption is for a pretty good recovery in 2021."

Honing in on protein markets more specifically, Stuart wasn't as optimistic. While pork prices have shown some improvement as of late, he points to shorted markets due to African Swine Fever (ASF) as cause for continued concern. Beef markets, however, continue to show promise. But volatility and uncertainty, he said, are here to stay.

If 2020 offered one big take-home message, it's that human labour is risky. To mitigate this risk, Stuart says there's going to be a massive surge in innovation, not just in agriculture, but everywhere. Meat processing plants, for instance, are looking to robots as a possible solution to the labour question. This will mean more standardization in terms of carcass shapes and types, said Stuart.

"As we put more robots in plants, that's going to happen," he said. "[And] bigger discounts for out cattle, I would assume." He also foresees continued change in how consumers purchase and consume protein. Food delivery is here to stay, he said.

"My advice to any company is don't sit and say, 'I'm going to wait until things get back to normal'," he said. "This may be the new normal." In terms of China's ASF-caused protein gap, Stuart doesn't think it's fillable. Exports of chicken, pork and beef have all risen, though. But China is an unstable trading partner at best, he said. "We're in a trade war, expect volatility," said Stuart.

For the beef market, though, there's nothing but good news. The global beef herd is not in expansion; in fact, it's stopped and it has been for years.

"That tells us the supply side is bearish or bullish to the market," he said. "The supply side is good news to our market."

While pork prices have shown some signs of improvement as of late, they have been, along with poultry prices, low. Global beef demand, however, is a different story. Global demand is bullish to prices. Chinese beef demand, plus demand from Hong Kong and Vietnam, is driving imports, most of which are coming from the Southern hemisphere. But China is now wide open to beef imports from the U.S., except where the feed additive ractopamine has been used.

"That's the only restriction," said Stuart. "Otherwise, all cuts, all ages, all USDA plants are approved." "We don't even have to certify beef for China," he added. "Anything can go, but it can't have ractopamine."

Although the U.S. is not yet shipping beef to China, sales have been outstanding, said Stuart.

In what he called 'more good news' for beef farmers, Stuart pointed to the world's big competitors, namely Australia, which had liquidated most of its herd last year due to drought. As the country tries to restock, it has pulled heifers out of the chain, further hindering production.

"Have I given you enough positive news yet?" Stuart asked Canada's beef farmers. "I'm telling you the cow herd is not growing. Global demand is good, and our key competitor is having a big decline in production."

Looking forward 10 years, Stuart sees more good news. More mouths to feed and more money certainly means more demand, but he doesn't think global producers are going to be able to keep up with demand. And while this is good news in the long term, Stuart did say that only those who finds ways to adapt in the current environment will survive the current environment.

"Today, when we're sitting here – Covid, ASF – totally unplowed ground, a place we've never been before, you do not have to be the strongest, you do not have to be the smartest or the biggest, but you darn well better be able to figure our this environment," he said.

For now, though, it's too early to make any predictions about the impact of Covid-19 on protein markets.

"We do not know," he said. "This is uncharted ground; be careful."

"But global beef cow herd growth has stalled, and global beef demand is good," he concluded. "Cattle and hog backlogs are going to last for months in the U.S. into 2021. Volatility and uncertainty are here to rain for now."

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Bird flu outbreak spreads in Europe

Jim Wyckoff's latest poultry industry updates explore the evolving bird flu outbreak in Europe and the US broiler market

Avian influenza outbreaks and the aftermath.

Bird flu reported in Germany, The Netherlands.

The H5N8 bird flu virus has been detected on a poultry farm in Germany's northern state of Schleswig-Holstein, the country's ag ministry said. The virus has been spreading among wild birds in the region. Earlier this year, Germany also detected H5N8 bird flu at a poultry farm in the northern state of Lower Saxony.

Meanwhile, Amsterdam's agriculture ministry culled 200,000 chickens after highly pathogenic bird flu was detected at a farm in the eastern town of Puifijk. Amsterdam reported another case at a poultry farm last week Britain has also been culling poultry after bird flu cases there.

The Netherlands are Europe's largest exporter of chicken meat and eggs, with fresh chicken exports of $1.5 billion in 2019. The US shipped $566 million of fresh poultry in 2019, with Germany shipping $436.2 million, according to "*The World Factbook*."

South Korea bans poultry imports from England

Bird flu was detected at a commercial broiler farm in England's Cheshire country on 2 November, marking the second outbreak this week for the country. The Cheshire outbreak involved the highly pathogenic H5N8 strain of bird flu, while the other outbreak in Kent involved a different strain of the virus.

South Korea has responded by banning imports of poultry products from the region. In recent weeks, the UK has raised its bird flu threat level from low to medium after the virus was detected in two swans in the Netherlands.

Latest updates from the US poultry market

US broiler market at a glance

USDA this week reported US whole broiler/fryer prices are generally trending steady to firm for all sizes. Offerings of all sizes are mostly moderate for current trade needs. Retail and food service demand is light to moderate for end of the month business. Processing schedules are normal to reduced. Floor stocks are sufficient. Market activity is slow to moderate.

In the parts structure, prices are trending steady to firm for wings, and the remainder of parts are mostly steady. Offerings of wings and bone-in breasts are light to moderate with jumbo size wings in the better balance. Dark meat items, tenders, and the balance of parts are moderate. Market activity for parts is slow to moderate. In production areas, live supplies are moderate to heavy. Weights are mixed, but reported as mostly desirable.

US retail chicken highlights

USDA reports this week's US chicken retail summary figures show a decrease in feature rate and activity index, but incentives to purchase have made slight gains. All whole bird items are readily available and bagged roasters are offering a price break for buyers.

Overall, white parts features aren't as prevalent this week, but tenders are pushing to make their presence known. Prices for wings and regular pack tenders are on the rise. The dark meat section attracts attention due to items filling up ad space; prices are unevenly steady. There's not too much action in the freezer aisle this week. The deli continues to occupy the most ad space as rotisserie and 8-pc chicken options make the most impact. Most specialty and organic items are still available despite reduced feature rates.

Global food market update

Global food prices highest since January

Global food prices climbed for the fifth month in a row during October, according to the Food and Agriculture Organisation's food price index. The index climbed from 97.8 points in September (revised) to 100.9 points last month, the highest level since January—before the pandemic struck.

"Much firmer prices of sugar, dairy, cereals and vegetable oils were behind the latest rise in the FFPI, while the meat sub-index fell slightly for the second consecutive month," FAO explained. The organization also lowered its global wheat crop forecast by 2.3 MMT to 762.7 MMT, just shy of the 2016 record. FAO says the cut was driven by lower production expectations for Ukraine and Argentina where dry weather clipped yield prospects.


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Impact of COVID-19 on backyard poultry during lockdown (Phase I and II) - Indian scenario



Vijay Kumar **Rajkumar U** **S. V. Rama Rao**

ICAR - Directorate of Poultry Research, Rajendranagar, Hyderabad-500 030, Telangana.

Highlight Points

Impact of backyard chicken meat price was found minimal as compared to price of eggs. The backyard poultry chicken sale price (per kg) was declined from 1.5 to 15.2 %, whereas price of eggs reduced by 44 to 50% in different parts of the country during the lockdown period due to COVID 19 pandemic. The flock size was reduced from 3 - 27.2% and the degree impact was dependent on farm size and location.

The Indian poultry sector contribute about 17 billion USD to India's Gross Domestic Product (GDP) and is one of the major agriculture sectors providing employment and livelihoods to about 6.5 million people. According to the Indian government's National Action Plan for Egg and Poultry-2022 (NAPEP), backyard poultry accounts for 20% of India's poultry sector. Across the country, around 30 million farmers are engaged in backyard poultry (Estimates the 19th Livestock Census of India). Poultry farming is one of the fast growing Agri-sector in our country with an annual cumulative growth rate of about 9.6% in broiler meat and 6 - 7 % in egg production. There was about 46 % growth rate recorded in backyard poultry in 20th Livestock Census whereas commercial poultry grown by only 4.5%. Due to several false information created and circulated in the social media, which has created panic in the minds of meat chicken consumers is the major threat for the poultry industry. From last few years Indian poultry sector is facing frequent crisis. Present COVID-19 crisis aggravated the situation and which hit the consumption of chicken meat and eggs resulting in a price crash. The first case of COVID-19 in India was reported on 30 January 2020, subsequently the panic of virus spread through social media without having any basic scientific knowledge. To contain the spread of COVID 19 in India, government had imposed lockdown from 24th March, 2020 and it was continued in many phases. Phase I and II (24th March- 03 May, 2020) were the initial two phases in which effective measures were imposed to break the chain of virus transmission. Chicken meat and egg consumption reduced significantly due to closure of available recourse points. Coronavirus disease (COVID-19) pandemic drastically reduced meat consumption and purchasingpatterns of the consumers globally. Present article describes the degree of impact on family poultry (backyard farmers) during early phage of lockdown across different regions of India.

The authors conducted a pilotstudy during first and second week of May, 2020 through semi-structured interview schedule by using electronic means of communications. States of India and respondents were selected randomly on available data base. Forty-two respondents (14 from each group) from these three types of family poultry producers i.e., extensive scavenging (5-50 birds), semi-intensive (50-200 birds) and small-scale intensive (more than 200 birds) were selected from Andaman, Bihar, Karnataka, Kerala, Manipur, Rajasthan and Tripura states.

Before COVID-19 situation of respondents of backyard poultry production

Backyard poultry farming is recognized as a powerful tool for the improvement of socio economic and nutritional status among rural poor people of the society. Backyard poultry is the source cheap of protein (eggs and meat) which are important for eradication of malnutrition, generation of self-employment and supplementary income. Production, reproduction and growth potential of backyard poultry is low, but backyard poultry farmers prefer these birds due to better survivability, adaptability to adverse climatic condition, minimal housing facility requirements as well as premium value of their egg and meat. Now days, there

are many improved varieties which are reared under family poultry such as Vanaraja, Gramapriya, Srinindhi, Rajsree etc. The average flock size of different family poultry production system varies from 24 to 389. Normally, eggs of backyard poultry were sold at higher price than that of commercial eggs and it varied from Rs 12 to 18 in different part of the country. Birds were also sold at higher price than that of commercial chicken in the market and price range from Rs 162 to 340/ kg depending on location.

During COVID-19 situation of respondents of backyard poultry production

All types of family poultry producers i.e., extensive scavenging, semi-intensive and small-scale intensive got affected due to COVID 19 but degree of impact varied differently. During the lockdown period flock size of extensive scavenging and semi-intensive did not change considerably, but great reduction (27.2%) was observed in small scale intensive producers. Impact on backyard poultry chicken observed on fall of sale price (per kg) in the range of 1.5 to 15.2 %. Price of chicken varied from Rs 150- 335 /kg in different part of country. The price of eggs was reduced to about half as reported by almost all categories of backyard farmers and price rage fallen to Rs 6 to 10 at different locations. The perishable nature of commodity forced farmers to sell egg at lower price, while birds were kept on hold for some time. Overall, bird reared in backyard system has limited impact on selling price but price of eggs was declined by about 50%.

Figure 1. Impact of COVID -19 on sale price of chicken in different sectors of family poultry

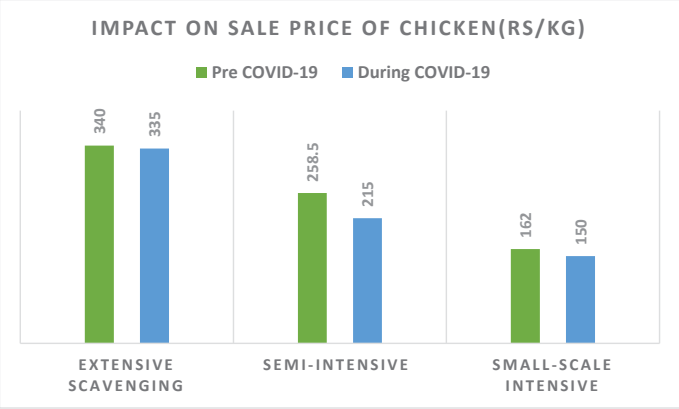


Figure 2. Impact of COVID -19 on sale price of egg in different sectors of family poultry

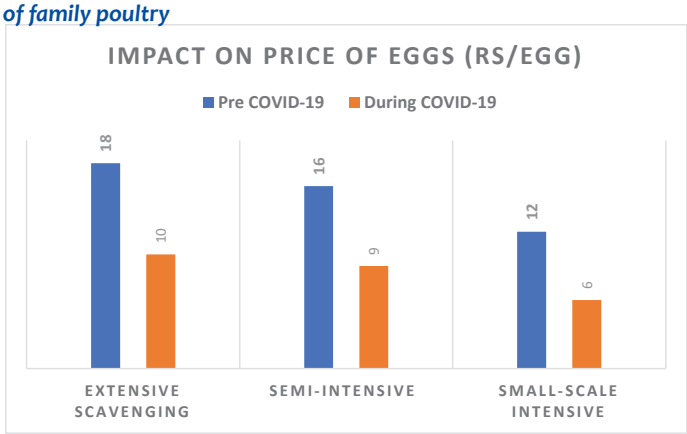
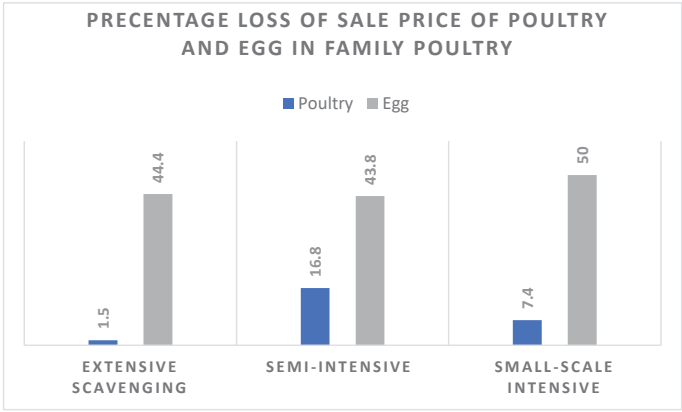


Figure 3. Percentage loss on unit sale of chicken meat and eggs in family poultry



Suggestions to improve the situation

- Dispelling the false notions and myths among common consumers about poultry farming and poultry produces (egg and chicken meat). Due to wide spread myths among all sectors of human population, the poultry producers are rejected FIRST due to rumours without verifying the facts.
- Scientific bodies, academic institutions and concerned government agencies should take proactive approach to educate consumers about egg and meat value and dis-spell the myths that are circulated in social media.
- Encourage consumers to eat processed meat, eggs and their products, which usually fetch better premium than same of egg and meat as regular commodities.
- Mass vaccination of all backyard poultry birds against ND is essential to prevent outbreak of the disease during stress period like severe summer.

COVID-19 has affected all stakeholders of poultry value chain severely during the lockdown. Proper support should be provided to this sector to regain and support livelihood of millions of people directly and indirectly engaged in this sector.

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Phytogenics – Be one step ahead with plant derived feed additives

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When it comes to feed additives (plant extracts, enzymes, pro- and prebiotics, organic acids and many more), the livestock industry is inundated with numerous options, not only promoting performance of the animals and improving profitability, but also improving the quality of feed and of animal-derived products.

In this context, phytogenic (plant derived) feed additives are predicted to have a promising future in animal nutrition due to their broad range of efficacies, and to their effects on sustainability and safety.

Increasing upcoming resistance of bacteria, arising from continuously supplemented sub-therapeutic levels of antibiotic growth promoters in livestock feeding caused the European Union to ultimately impose a ban on the use of antibiotics in animal nutrition in 2006, with other countries worldwide following suit. At the start of 2017, a ban on antibiotic growth promoters will also become effective in the US. Consequently, alternative feed additives are receiving increased attention among scientists, nutritionists, feed manufacturers and farmers.

Proven for centuries

The use of plants and their compounds has a long history in human nutrition and medicine, being used as flavors, food preservatives and medicinal plants. Phytogenic feed additives (PFAs) comprise a wide range of plants, like herbs, spices and plant-derived essential oils (hydro-distilled extracts of volatile plant compounds, mainly hydrocarbons, containing most of the active substances of the plant) and oleoresins (extracts based on non- aqueous solvents). The chemical composition of PFAs underlies a certain variation due to their ingredients and other influencing factors like climate, location, harvest, stage, and storage conditions, explaining the differences in efficacy between PFAs that are available on the market so far. However, it should be realized that not all PFAs available on the market are standardized on major actives and/or based on all-natural plant ingredients but might also contain synthetic nature-identical components.

The 'scientific gold standard' in the feed industry

Phytogenics show a wider range of activities in animal nutrition than synthetic substances. This advantage is based on the synergistic effects of all agents within plants. This natural synergy, grouped with sustainability and safety, is what makes phytogenics a top solution platform in animal nutrition.

Fully based on phytogenic components and not on nature-identical, single active ingredients, to date, only one such plant-derived feed additive has received zootechnical registration by the European Union, Fresta® F. This is seen as the scientific 'gold standard' in the feed industry, because in the course of strict approval processes, not only the safety but also the performance enhancing effects as 'natural growth promoter' of the product have been officially confirmed by the European Food Safety Authority (EFSA).

PFAs show a wide range of potential benefits, all targeting the enhancement of performance of livestock. The following gives an overview of proven benefits:

- **Increased enzymatic activity in the intestinal tract**

Numerous herbs and spices are shown to increase pancreatic enzyme production and bile secretion in the intestinal tract. For instance, curcumin, piperin, ginger and capsaicin clearly stimulate pancreatic enzyme production, whereas fenugreek, mustard, cumin and coriander stimulate bile production. Increased enzyme production improves the rate of digestion of the feed, thus improving its nutritional value.

- **Improved nutrient utilization**

Apart from a better nutrient digestibility, data from broiler trials indicate an improved nutrient utilisation (similar body weight gain at reduced feed intake). However, these effects can vary due to type and origin of the essential oils or herbs and the inclusion level in the feed.

- **Antioxidant effects**

Aromatic plants from the plant family Labiatae (rosemary, thyme, oregano and sage) have been extensively studied for their antioxidant activity. This activity is not only related to the phenolic compounds which have free-radicals scavenging properties but also non-phenolic compounds may show considerable antioxidant activity by enhancing gene expression of antioxidant enzymes.

These antioxidant effects are protecting the organism at cell and tissue level, especially during stressful conditions like weaning, reallocation, feed changes, poor ventilation and heat stress conditions. Moreover, positive effects of dietary supplementation with oregano, rosemary and sage on shelf life of poultry meat, as well as eggs, have been reported.

- **Antibacterial effects**

According to some studies, extracts of herbs and spices exert clear antibacterial activity against foodborne pathogens. However, minimum dietary inclusion levels in poultry are generally too high to be able to rely on these antibacterial effects and to be economically feasible. Nevertheless, levels needed to inhibit the expression of virulence factors by

pathogenic bacteria (quorum sensing inhibition) are far lower and have been shown to be a promising field of application.

• Effects in intestinal mucosa

Several studies indicate positive effects on the intestinal morphology in poultry. Increased transepithelial electric resistance of duodenal mucosa was observed when broilers were fed thymol supplemented diets. Moreover, pungent substances like black pepper, chili and garlic improve blood flow, which might reduce the adverse impact of ischemia of the gastrointestinal tract on intestinal integrity.

The success of plants is no accident

Increased pressure in terms of food safety, raising concerns about bird health and environmental protection, rising feed costs, increasing antibiotic resistance, strong global tendencies to reduce antibiotic growth promoters – these factors explain why phytogenics are seen among the top solution platforms in animal nutrition for the near future. Due to their content of an infinite variety of active ingredients, phytogenic substances represent one of the most interesting and important classes of current and future feed additives.

References are available on request

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Strategies to Combat *E.* Coli in Poultry Farms

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Highlight Points

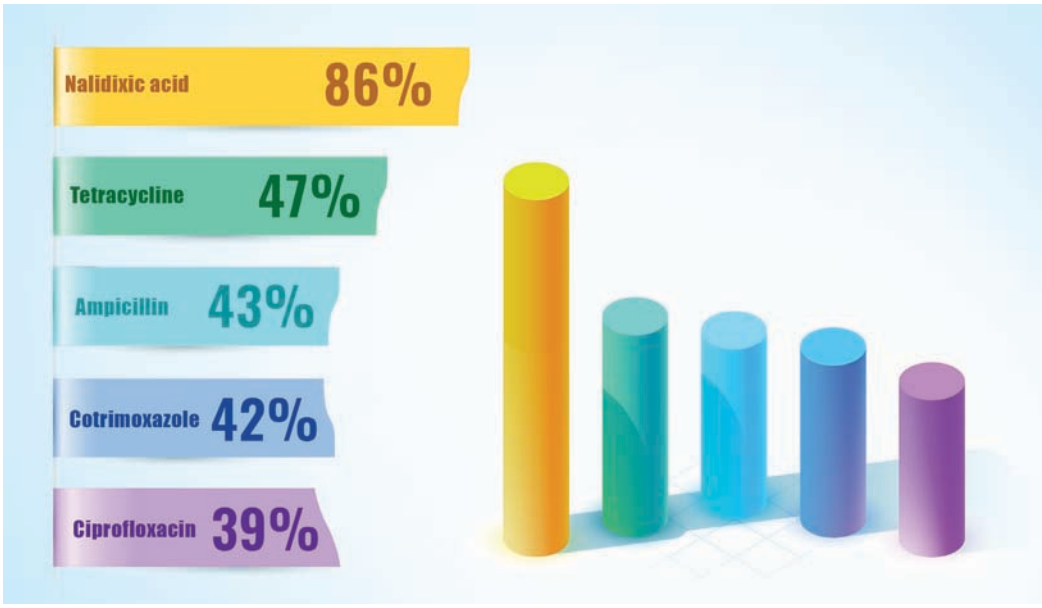
E. coli is a gram-negative bacterium that belongs to the intestinal microflora of livestock, including poultry. These bacteria are capable of surviving long periods outside the host and are present in almost all bird environments, particularly the litter and house dust. Opportunistic infections may occur under certain conditions (stress, weakened immune system, accompanying diseases and infections), however, pathogenic bacteria may also enter the body from the external environment. Poultry feed & water is often contaminated with coliforms and are the most common route of infection with new serotypes. Outbreaks often occur in broilers, layers & breeders causing enteritis, affecting the fallopian tube causing inflammation & colisepticemia are the most common cause of birds' mortality.

What is *E. coli*?

E. coli is a gram-negative bacterium that belongs to the intestinal microflora of livestock, including poultry. These bacteria are capable of surviving long periods outside the host and are present in almost all bird environments, particularly the litter and house dust. Opportunistic infections may occur under certain conditions (stress, weakened immune system, accompanying diseases and infections), however, pathogenic bacteria may also enter the body from the external environment. Poultry feed & water is often contaminated with coliforms and are the most common route of infection with new serotypes. Outbreaks often occur in broilers, layers & breeders causing enteritis, affecting the fallopian tube causing inflammation & colisepticemia are the most common cause of birds' mortality.

Economic losses and estimates

The economic losses due to pathogenic *E. coli* infection can be both: direct and indirect. Weight loss, decreased egg production, increasing mortality and secondary infections affect the livestock production systems. Moreover, disinfection, cleansing, disposal, and excessive use of antibiotics can lead to additional expenses for poultry farmers. The indirect effects comprise the influence on the domestic economy, including interference with major industries, increase in antibiotic resistance, and impact on other sectors.



Susceptibility in poultry farms

Not all age of birds is equally susceptible to the bacterium. When chickens are18 to 30 weeks old, egg production is at its peak. They are still developing, and their bodies are under a lot of stress, making them more prone to various infections. Laying hens that are more than one year old are also quite vulnerable. They breathe in the Avian Pathogenic *Escherichia coli*-laden dust that is quite prevalent in dried out faeces, which tend to accumulate in the layer house in most Indian poultry farms due to poor farm management practices. Pullets are susceptible when their bodies begin to produce hormones that are necessary for egg production. It is a stressful time and their immune systems are not functioning at full capacity, making them an easy target for the colonization of pathogenic bacteria such as *E. coli*. In broilers when reared in deep litter system the prevalence of *E. coli* infection increases due to more exposure to contaminated litter.

Control measures

Biosecurity measures play a key role in controlling the spread of *E. coli*. Keeping the bacteria out of the flock is not practical or possible since intestinal colonization is common in warm-blooded animals. Fortunately, external infections can be limited through feed, water, and environmental sanitation, as well as good air quality. Pelleted feed has a lower percentage of *E. coli* bacteria compared to mash feed. Rodent faeces are a ubiquitous source of *E. coli*. Furthermore, contaminated water supply can also contain high numbers of bacteria. One of the possible way to curb the spread of pathogenic microorganisms is to chlorinate the drinking water and use closed watering systems.

Maintaining litter and air quality can greatly reduce the risk of colibacillosis infection. The damage caused to the respiratory mucosa of the flock has a direct correlation to the degree of ammonia exposure. Dust also increases the risk of an infection. The combination of ammonia and dust results in the inhalation of bacteria in high numbers, making it difficult for birds to clear them from their respiratory tract.

Treatment

Although *E. coli* infection is commonly treated with antibiotics, a survey of commercial poultry producers found that chickens raised for eggs and meat have high levels of antibiotic-resistant bacteria. The survey found that more than half of the *E. coli* isolates were resistant to multiple drugs and nearly 60% of them contained broad-spectrum beta lactamase, an enzyme that provides resistance to beta-lactam antibiotics. Broiler farms are twice as likely to be exposed to antibiotic-resistant bacterial strains compared to layer farms due to the high level of antibiotic usage. Independent farms are more likely to develop antibiotic-resistant *E. coli* than contracted farms, that are mostly owned by large producers and have to follow strict production protocols, including better veterinary care and hygiene methods. On the other hand, independent farms misuse antimicrobials.

Nalidixic acid	86 percent
Tetracycline	47 percent
Ampicillin	43 percent
Cotrimoxazole	42 percent
Ciprofloxacin	39 percent

Figure 1: Levels of antibiotic resistance

The problem will only get worse. An increase in income and an increase in demand for poultry products would cause an exponential increase in the use of antibiotics in food production. Poultry producers Farm owners must take rigorous action and implement government regulations to control the massive use of antibiotics on poultry farms in India. The transition to a more sustainable way of production should also be promoted by setting up funds to subsidize biosecurity measures at farm level. Poultry farmers should switch to feed additives containing bacteriophages. Since they target specific pathogenic bacteria without affecting the host, they are the most valuable tool in the arsenal of poultry producers in the fight against multi-drug resistant bacteria. Bacteriophages are being adopted successfully by poultry producers around the world, recently introduced to the market in India by Proteon Pharmaceuticals and it is time to main stream this solution.

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Combined effect of Serratiopeptidase with Lysozyme in broiler feeds

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Highlight Points

The enclosed article presents the results of feeding trial in broilers with enzyme serratiopeptidase along with Lysozyme through water. Serratiopeptidase is reported to have steroid like effect as anti-inflammatory agent and immunity booster whereas lysozyme is known to have antibiotic property. Therefore, combination of antibiotic with steroid was expected to have complementary effect on birds' performance. With this view the feeding study was carried out both at small scale at development farm and at larger scale at commercial farm. The results of the study were on expected lines and same is discussed in this article.

Introduction: Use of proteolytic enzyme Serratiopeptidase also called as Serra peptidase is found in literature as far back as forties for its use in therapeutic usages. In the seventies, Industry looked it as a potential anti-inflammatory enzyme obviate the need of steroids generally used for this purpose. It was found to be effective in boosting immunity and for respiratory disorders. Very effective as combination formula or as co-prescription with antibiotics in preventing/ treating chronic respiratory disorder (CRD) in poultry. Steroid like effect found as its anti-inflammation property of Serratiopeptidase explains the enhancement of antibiotic effectiveness.

Due to absence of cell wall, mycoplasma causing diseases in poultry are not eliminated by any known antibiotic but the presence of Serratiopeptidase makes them effective. Serratiopeptidase is not an antibiotic.

It's mode of action is through reducing inflammation, eating away dead tissues found around infected cells, thinning the mucous accumulated in lungs/respiratory tract and as immunity enhancer. It facilitates durable cure for CRD, E-Colitis in the presence of antibiotic, however, since both the test additives are proteinaous in nature their effectiveness as anti-inflammatory, immunity booster and anti-pathogenic may remain confined to the elementary canal and their effectiveness is likely to be seen in efficient utilization of feed. Therefore, a study was undertaken with Serraciopeptidase in combination with lysozyme having antibiotic like activity, in broilers. The results and observations of the study are presented herewith.

Nature and the Scope of the study: The feeding trial was carried out on 105 birds (Cobb Breed) each in control and in the experimental groups and in about 2000 birds of Ross breed each in Control and experimental groups. In both breed, birds were reared on deep litter using coco peats. Study was carried out for 5W at development farm and for six weeks at integration farm under standard conditions of management following the recommended schedule of vaccination and 22 hours of light period, leaving 2hours during the day for birds to relax without feeding. All the birds at development farm were weighed every week whereas at the integration farm they were weighed at the end of six weeks when the birds were lifted for sale. However, sample weighing of 5% of birds in commercial farm was done every week to check if the birds are growing at desired rate

The feed and water was given *adlibitum.* The test enzyme mixture of Serapeptidase and lysozyme as supplied by M/s Anthem Biosciences were given to birds in experimental group through water. Enzyme is soluble in water. The control group, However, was continued without any enzyme mix.

Enzyme mix water in Development farm: The experimental group at Development farm was given with enzyme mix water from the day1 to day35 the end of the trial.

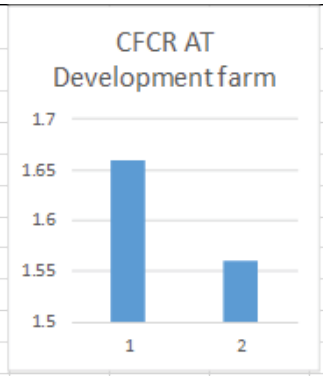
Enzyme mix water in Commercial farm: The experimental group at Commercial farm was given with enzyme mix water from the day25 to day42 the end of the trial.

The feed consisted of normal ingredients namely maize, soya bean meal, DCP as source of phosphorus, LSP as source of calcium, ionophores as coccidiostat, vitamin mix and trace minerals. The specs of feed used are given in Table-1 below.

Table:1

Specifications			
Lines.	Pre-Starter	Starter	Finisher
Crude Protein - %	23	21.5	19.5
ME - Kcals / kg	3090	3150	3210
Calcium - %	0.97	0.87	0.8
Available Phosphorous - %	0.52	0.44	0.4
Lysine - %	1.44	1.25	1.19
Methionine + Cystine - %	1.08	0.99	0.91
Threonine - %	0.98	0.88	0.76
Valine - %	1.1	0.95	0.88
Sodium - %	0.16	0.16	0.165
Potassium - %	0.82	0.78	0.76
Chloride -%	0.158	0.15	0.15

Results of Feeding Trial at				
	Development farm		Commercial farm	
Breed	Cob 400Y		Ross AP95	
No.Chicks	105	105	2000	2000
Period	Control	Exp.	Control	Exp.
DOC wt.(g)	40-42	40-42	38-40	38-40
Av.wt.(Kg)				
W1	0.177	0.177	-	-
W2	0.445	0.435	-	-
W3	0.762	0.801	-	-
W4	1.268	1.274	-	-
W5	1.84	1.92	-	-
W6	-	-	1.797	1.89
Mortality%	2.1	2.8	9.7	8.8
Av.Feed/bird	2.977	2.961	4.023	4.054
FCR	1.62	1.54	2.24	2.14
CFCR	1.66	1.56	2.29	2.17
CFCR improved		10 points		
	2.29	2.17		



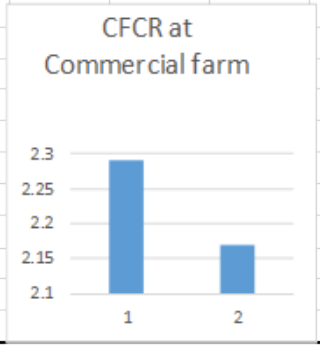


Table-2

Results and Discussion: Results as shown in table-2 indicate that the mixture of Seratiopeptidase with lysozyme has distinct improvement in feed efficiency in the group received test enzyme mix as compared to the birds in control. Use of Lysozyme has been found to have positive effect on performance of birds, however in the presence of Seratiopeptidase effect is additional on the overall performance. Corrected FCR(CFCR) for same body weight of 2Kg is improved many fold both in feeding trial at Development farm wherein Cobb birds were used and also at Commercial farm trial where in 2000 Ross birds were used. Commercial feeding trial indicate that the test enzymes can also be used during finisher stage starting from day 25 of age. The improvement of 10 points of CFCR in Development farm and 12 points in Commercial farm is very close to each other indicating reproducibility of the results.

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Robotics in Poultry Processing Industry

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Highlight Points

This article is about robotic technology and robots are used in the advanced poultry processing plants which will minimized the labour with enhanced efficiency of product output. The paper discussed about the benefits of robots used in the poultry processing industry and enlights the need of robots or automation in poultry processing facilities. Currently using various types of robots in poultry processing plants also discussed briefly.

1) Introduction

The continued growth of the poultry market and the increased demand from both rural and urban consumers in all parts of India including retailers and food service operators for higher quality and safe and wholesome chicken products is placing more and more pressure on the poultry processing industry. India has exported 3, 50,817.80 MT of Poultry products to the world for the worth of Rs. 574.61 Crores/80.34 USD Millions during the year 2019-20 and major export destinations are Oman, Maldives, Indonesia, Russia and Vietnam (APEDA, 2020). This success has come as a result of aggressive marketing and an ability to hold down cost through a variety of production and processing efficiency enhancement. Many of the processing efficiencies have been made through the use of automation technologies. In processing plants, many high repetitive manual tasks have been made safer and more efficient through the introduction of numerous mechanical automation technologies. Today, the poultry processing industry is face with challenges that seem to call for more sophisticated automation. Robotics has the potential to help the poultry industry meet many of these challenges.

2) Benefits of Robot

Robotics, the engineering science and technology of robots, involves the design, manufacture and application of robots. A robot is any machine that performs repetitive tasks with some degree of automation. Robots are used in many different industrial situations to relieve human physical and/or mental effort while improving efficiency of production. Equally important, robots can work in situations that may be hazardous to humans. The following benefits of robots are here under listed:

- Reduction in the operation and capital costs of chicken processing entities.
- Labour cost reduction through implementation of innovative processing technology.
- Improved hygiene and visual appearance through reduced biological load.
- Increased yield through accuracy of innovative chicken processing technology.
- Enhanced shelf-life and appearance resulting from eliminated water exposure, surface bone dust and reduction in handling of chicken cut-up parts.
- Improved cut surface finishing, repeatability and accuracy of chicken meat automation over systems controlled by hand.
- Increased production and manufacturing flexibility.
- Improved quality of work for employees.
- Improvement in workplace health and safety.
- Elimination of risk of operator strain injury or trauma injury from traditional techniques.
- 24/7 service and support insuring production certainty.
- Proven solutions and expertise.

3) Need of Robotics/Automation in Poultry Processing Industry

Poultry processors today are facing a number of critical challenges in particular; plants are experiencing unprecedented competition for their labour forces, escalating concern over the potential for repetitive motion injuries in the workplace, and increased demand for an ever broadening product line. Automation has played a key role in helping the poultry processing industry improve its labour utilization rate while holding down costs. Many of the functions have been automated using either fixed or mechanical automation. A new generation of technologies are being sought by the industry, technologies that exhibit flexibility, sensitivity to product variability and that can screen the product for appropriate quality. Mechanical systems have been the mainstay in poultry automation. Typical systems have employed mechanical drives, fixed cycles along with the capability for manual adjustment. On-board electronics integrated into poultry automation technology has only recently become available due to difficulties with the harsh operating environments in most plants. Early success in this introduction appeared in the areas of product weighing, sorting, and price labelling. A number of mechanical systems are employing microprocessor technology primarily for data collection. However, significant advances are being made toward new generation of automation technology both by equipment manufacturers and researchers.

4) Types of Robots using in Poultry Processing Plant

a) Robot to Automate Poultry Deboning Process

In the past, the evisceration was a long, slow and labour–intensive process but with automation, the process has become fast and able to handle high capacity with little labour and at the same time, increase bio-security and hygiene. The quality and speed of the evisceration of the birds can have a direct effect on the stages down the line where further value is added through cut-up and deboning, because it is the stage that provides the basic raw material for value–added products. During the process, the carcasses are prepared and cleaned and on some lines, washed and even disinfected to ensure a highly safe commodity product is presented for further processing. The ability of the machines at the various stages of the evisceration and cleaning process also to clean themselves prevents the possibility of cross–contamination. The giblets can be harvested automatically for further use and processing and the automation also allows full traceability of batches of birds from the time they enter the plant through to further processing. Following the evisceration process, carcasses can then be automatically rehung on a new line to take them through chilling in preparation for the cut up and deboning stage.

Researchers at the Georgia Tech Research Institute (GTRI) have developed a prototype system that uses advanced imaging technology and a robotic cutting arm to automatically debone chicken and other poultry products.

Fig. 1 Automatic deboning Robot

The Intelligent Cutting and Deboning System employ a 3-D vision system that determines where to cut a particular bird. The device automatically performs precision cuts that optimise yield, while also greatly reducing the risk of bone fragments in the finished product. Each bird is unique in its size and shape GTRI developed the sensing and actuation needed to allow an automated deboning system to adapt to the individual bird, as opposed to forcing the bird to conform to the machine.

b) Washable Robot for Poultry Processing Plant

Robots have begun to be deployed in many areas of food production, but their use for handling fresh meat has been hampered because such machines would also have to withstand cleaning with high-pressure water spray and corrosive sanitizing chemicals.

Researchers develop a robot that would pack fresh meat into trays, but with a design and construction able to withstand the harsh conditions created by routine washing in a way more consistent with how other equipment is cleaned. The robot's job is to grasp raw meat products from a conveyor and place them onto foam packaging trays. The task requires considerable dexterity to pick up the products without causing damage, place them within the boundaries of the trays in an aesthetically pleasing manner, and provide one more visual inspection.

The current prototype uses special protective coatings and plating on its metal parts, shaft seals on its motors and other moving parts, and special watertight bearings that are little affected by the wash-down process. The tray-filling stage of the poultry processing line may require up to a half-dozen human workers and often results in a bottleneck to the process. The hope is that automation of this type would result in increased throughput and lower costs for the industry. In addition, the wash-down technologies devised in this project could find their way into other areas untouched by automation because of cleaning requirements.

Fig. 2 Washable robot for Poultry Processing Plant

C) Case Packing Robot

Case packing system that places tray packs of product into shipping cases. The machine is located immediately after the weigh-price-label machine in line poultry processing plant. Researchers have designed the system to address the cost and performance issues of using robotics in packing operations, with an emphasis on keeping both purchasing and operating costs low. Researchers are presently working to address the performance and mechanical issues that were identified during the test. A commercial version of the system was made available for working in various poultry processing plants.

Fig. 3 Case Packing Robot

d) Automated Cone Loader Robot

In modern poultry processing plant, manual labour is required to transport the front halves of chickens that are received from the chiller onto the moving cone line for further processing. Until recently, robotic applications were ineffective due to the unreliable position of the work piece at the base of the drop chute. Recent developments in image processing have made it possible for the robots to operate in an unstructured environment. For this work, a commercial 3-D camera system was used to provide the position information needed to move the robot to the bird as well as identify the orientation of the bird. In order to implement this system, a new end-effector was developed to grasp and manipulate the irregular and non-rigid texture of the raw product.

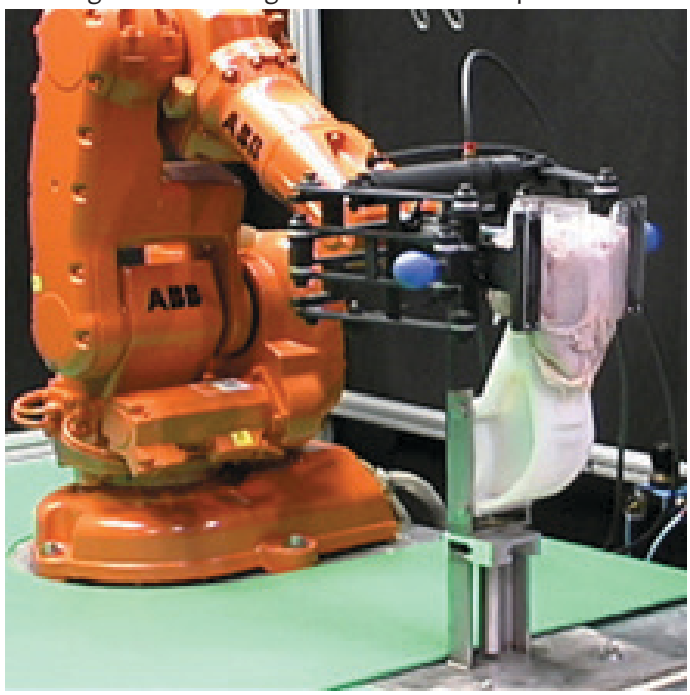

Fig. 4 Automatic cone loader Robot

e) Robotic Shackle Loader

In a majority of poultry plants, an immersion water chiller is used to chill birds. After exiting the chiller, the birds are manually transferred to a shackle line for further processing. This is an extremely tedious task that typically requires two to four people to meet production requirements. The task is further complicated by the unstructured nature of the process. Birds are dropped from the chiller in random positions onto a rehang table. Here they are manually rehung onto a shackle line, often while also being graded.

There are growing problems with this process. For one, the continual reliance on the human worker to perform this

type of task is putting stress on an already limited labour pool. In addition, the constant potential for injury, due to the repetitive nature of the job, adds to concerns. Finally, there is the desire to integrate product distribution and grading under a more automated format that enhances process performance. The research focus of the automated shackle-loading project is to integrate a vision system into a robotic work cell to identify the position and orientation of the bird and guide the robot such that it can grasp the bird and place it onto a shackle. Because there is such variability in the location and orientation of the bird as well as the size of each bird, it is critical to have a vision system to handle these variations. The research has shown the ability to perform both tasks by successfully designing an end-effector and developing a vision system. The pneumatic end-effector is made completely of USDA-approved materials and meets sanitation requirements. It is capable of grasping and loading different weight ranged birds.

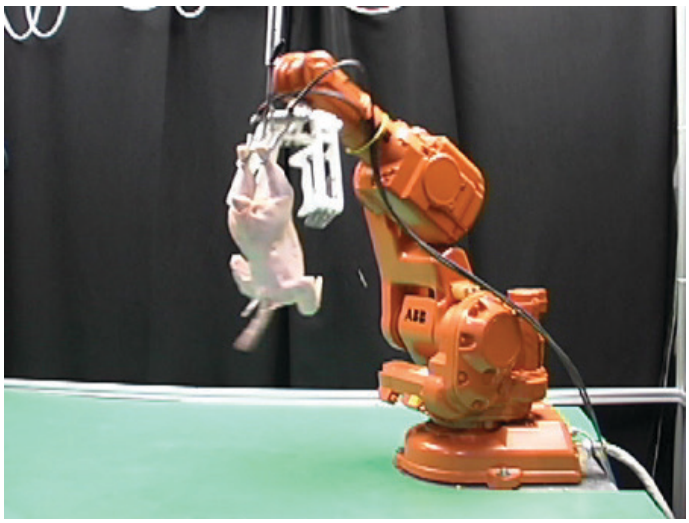

Fig. 5 Robotic Shackle Loader

5) Future Trends

Researchers' current efforts are focused on providing a commercially available solution to the various needs of processed poultry industry. The advances that have been made in the past ten years in grasping and practical implantation in chicken processing plants have been significant. These developments have application to a variety of problems in the poultry processing plant. The development of grasping systems that allow a robot to manipulate the raw chicken product in a reliable manner opens the door to automating further tasks in a poultry processing plant. The addition of rapid, reliable vision systems to identify product and provide to a robot, the exact position and orientation of the product (be it a whole bird or cut-up product) provides the missing component in developing true intelligent automation for the poultry processing industry. Future tasks for automation in the poultry processing industry has the potential of helping to solve various problems in other industries such as the red meat and vegetable industries.

6) Conclusion

Designing robotic systems for poultry processing plant for various processing applications is a complex initiative that should be handled by system integrators and robot product manufacturers that have a vast track record of successful task completion. There are multiple levels of regulations that must be addressed during the design, installation and daily operation of the system in various capacities of poultry processing plants which is essentially suited to Indian poultry processing plant conditions. With the vast array of government guidelines and private sector resources available, however, thorough planning and consultation with the qualified experts should result in a robotic system that greatly enhances the processing capacity of birds within less time and overall productivity of the involved process.

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Gut Health and Antibiotic Resistance in Poultry

Tanushyam Ghosh
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Highlight Points

Gut health relies on the balance between the host, the intestinal microbiome, the intestinal environment, and the diet. It can be affected by everything from feed and water hygiene to bird and farm management practices. In birds with a healthy gut, the feed gets thoroughly digested and the nutrient components are completely absorbed. Any disruption can cause incomplete digestion and nutrient absorption, leading to gut imbalance and malabsorption. Suboptimal digestion and nutrient absorption increase the availability of nutrients for pathogenic bacteria, causing an infection.

Gut health relies on the balance between the host, the intestinal microbiome, the intestinal environment, and the diet. It can be affected by everything from feed and water hygiene to bird and farm management practices. In birds with a healthy gut, the feed gets thoroughly digested and the nutrient components are completely absorbed. Any disruption can cause incomplete digestion and nutrient absorption, leading to gut imbalance and malabsorption. Suboptimal digestion and nutrient absorption increase the availability of nutrients for pathogenic bacteria, causing an infection.

The good bacteria in the intestine form a protective barrier, preventing the growth of pathogenic bacteria like campylobacter, salmonella and clostridium perfringens. The friendly bacteria dominate the receptor on gut cells, making it difficult for the pathogenic bacteria to attach themselves. When this balance is disturbed due to the feed mismanagement, poor hygiene practices, and suboptimal breeding environments, it leads to the proliferation of pathogenic bacteria, which can spread easily and cause significant economic losses, apart from posing a major health concern. To combat pathogenic invasions, promote faster growth and improve conversion rates, poultry producers tend to add antibiotics to the feed. These are intended to keep the harmful bacteria in check and promote healthy growth. However, rampant and indiscriminate use of antibiotics in poultry farms across the country has led to the rapid proliferation of multidrug resistant bacteria, which not only cause infections that are difficult to treat but also transfer their resistance across a wide range of bacterial species.

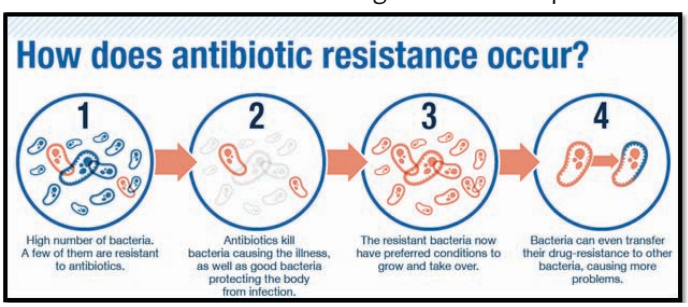

Figure 1 – The mechanism of antibiotic resistance

Problem of antimicrobial resistance

As poultry production continues to increase, animals are becoming more resistant to antimicrobial drugs. Analysis of epidemiological studies focusing on the most common pathogenic bacteria found that the antimicrobial drugs that are most commonly used to help livestock gain weight, like tetracyclines, sulfonamides, and penicillins, are also the ones with the highest resistance rates. Over the course of the last decade, the number of drugs to which pathogenic bacteria have become resistant to has tripled. The largest hotspots of antimicrobial resistance in animals are in fact in Asia, which is home to 54 percent of the chickens in the world. Last year, the Indian government banned the use of colistin, which is widely used as a growth promoting agent, on animal farms.

As early as 2015, scientists discovered a colistin-resistant gene that can pass between bacteria and confer drug resistance on bugs that have not been exposed to the drug. It is believed that the gene originated in Chinese livestock bit has since been found across five continents. To what extent the ban will be enforced at the state level remains to be seen. In any case, it is high time that the government takes strict legislative action to control the rampant use of antibiotics to curb the problem of increasing antimicrobial resistance that is fast becoming one of the major points of concern in poultry farms across the country. The government should also support the transition to sustainable poultry production by setting up funds to subsidize farm-level biosafety improvements. Meanwhile, poultry farmers should consider using natural and synthetic antibiotic alternatives to help maintain the gut health of livestock.

Alternatives to antibiotics

When considering an alternative to antibiotics, poultry farmers should ensure that they have all the growth promoting benefits without any of the detrimental side effects. A viable alternative should act on harmful pathogens, have anti-inflammatory properties, be beneficial to the healthy gut bacteria, and improve the poultry performance.

- **Probiotics** – Probiotics help increase the population of friendly bacteria, promoting competitive exclusion and keeping the pathogenic microbes in check. Second generation probiotics also produce antibacterial compounds that have specific actions on colonizing pathogens.
- **Essential oils** – Some herbal and botanical product contain bioactive compounds that are also known to have beneficial effects on the gut microbiome and intestinal integrity. They help stimulate the feed intake, promote digestive secretions, and have antimicrobial and anti-inflammatory effects.
- **Bacteriophages** – These are viruses that utilize the metabolic system of the host to exclusively infect pathogenic bacteria, without having an adverse effect on the host. This makes them the most valuable commodity in the fight against multidrug resistant bacteria. They make for the most efficient feed additives and are being increasingly adopted to great success by poultry producers across the world.

Maintaining a health gut in the flock is the key to optimal growth and feed conversion ratio. The gut is a complex environment and regional variation in farming practices add a different dimension of complexity to this problem. Along with efficient farm, feed and bird management, producers must make it a priority to switch over to antibiotic alternatives if they want to count their chickens before they hatch.

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SALMONELLA – An obvious threat to poultry production

Dr Sanjay Bisht, Dr Kanika Ghildiyal and Dr Sabiha Kadari

The modern bird is capable of higher efficiencies of production, provided the nutrition, health and management aspects are taken care of adequately. Maintaining an optimal gut health, is one of the routes to achieve this. Gut health optimization encompasses various factors like keeping the pathogenic microbes at bay, providing good quality raw materials, providing good quality water, adopting good biosecurity measures etc. Of the various pathogenic microbes, that can impact the productive performance of birds, Salmonella spp., is of critical importance, given its zoonotic nature. Even with various technological advances, Salmonellosis still remainsas one of the leading causes of food-borne disease throughout the world; being the second most commonly reported food borne disease and is a significant cause of morbidity, mortality and economic losses.

Why is a Salmonella control program imperative?

Salmonella been a facultative anaerobe can digest protein and grow even in absence of oxygen in raw materials (vegetable & animal protein), manure pits, dust, water etc.

Their ability to sustain in varied range of pH and temperature, makes it difficult to eradicate them. Also, the levels of antibiotic resistance are generally higher in Salmonella species, with various multi-drug resistance been reported. These antibiotic-resistant Salmonella strains at farm level may spread to humans through direct contact or contaminated meat and eggs thus magnifying the impact.

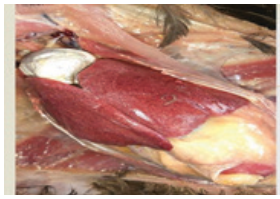
It is a zoonotic pathogen; the second most reported zoonosis, causing gastroenteritis in humans. Though strict regulations and protocols have been set-up in developed nations, a clear strategy yet needs to be devised for developing countries like India, considering practical and economic implications.

The most common route of Salmonella spread is through the contamination of eggs - *Salmonella enterica enteritidisbeen* a recognized food safety concern for egg laying industry.

- Salmonella can be transmitted by horizontal, vertical or trans-shell (egg contaminated through contaminated cloaca) invasions. Thus, an integrated approach needs to be adopted – breeder, hatchery, feed mill, farm, rodent, environmental management etc., if Salmonella has to be eradicated from the poultry production chain.

Below are few of the Salmonella of concern to poultry industry (Table 1),

Table 1- Major poultry diseases caused by Salmonella spp.

Disease	Causative agent	Symptoms and characteristic findings
Pullorum Disease	Salmonella enterica pullorum  Figure 1 Diffused necrosis in liver	High mortality in chickens less than 4 weeks of age (upto 100%). Affected chicken go off-feed, huddle near a heat source, appear weak and have whitish faecal pasting around the vent (diarrhoea).

Fowl Typhoid	Salmonella enterica gallinarum	Mortality is high in older birds Affected birds become pale, dehydrated, and have diarrhea.
Fowl paratyphoid	Salmonella enterica enteritidis  Figure 2 Unabsorbed yolk sac	Mortality in young birds is most often limited to the first few weeks of age. Lesions - an enlarged liver with focal necrosis, unabsorbed yolk sac, enteritis , and caecal core.

AN INTEGRATED "FEED, FARM AND HEALTH" APPROACH TO COMBAT SALMONELLA:

Owing to their ubiquitous and resistant nature, a wide range of factors need to be considered and an integrated approach needs to be adopted, to protect birds from Salmonella infection and its further spread to human.

Exposure to infection can happen right from the production of feed and all the way up to the production of live animals. Thus, to support the poultry producers to accomplish feed-to-food safety concept, emphasis needs to be placed onvarious aspects of feed, farm and health management.

Feed Management :-

Raw materials (RM) to be procured from reliable vendors. To work with RM suppliers, to control Salmonella in their production process (mainly in the dryer).

Adequate hygienic measures to be practiced during logistics of raw materials to feed mill.

Strict quality control (QC) measures to be in place, for receipt of RM. A well-equipped in-house laboratory should be capable of analyzing Enterobacteriaceae counts in the RM. Counts of 10000 cfu/g in RM and that of 100 cfu/g in feed, indicate presence of at least 1 Salmonella.

Apt storage of RM is a mandate to prevent any possible Salmonella contamination from poor storage conditions.

Hygiene audit to identify critical control points (CCPs) in feed mill production process at regular intervals to have a clear picture of microbial contamination. Flushing of feed mill with organic acid concepts to prevent salmonella contamination and/or its further proliferation.

Feed formulation to avoid excess fermentable nutrients in hind gut, that can pave way to microbial growth.

Judicious selection and addition of organic acid concepts, that would prevent salmonella contamination and re-contamination that could probably occur during the cooling process, storage and transportation of feed.

Farm Management :-

Starts with conducting risk analysis and thereby flock sampling to ascertain the level of contamination. Re-assessment to confirm that the microbial loads are below threshold limits.

Effective decontamination of Salmonella infected houses before repopulation is a highly important consideration in a Hazard Analysis Critical Control Point approach for poultry units.

To avoid cross contamination, hygienic practices related to pest control, dust control, hygiene of feeder, waterer, pipeline flushing etc. needs to be followed.

All personnel should be fully trained in good managemental practices (from brooding till liquidation of flock). Personal hygiene needs to be practiced and in order to reduce the risk of contamination in the final product, suitable clothing and footwear should be worn within the farm premises, without transfer to any other part of the facility.

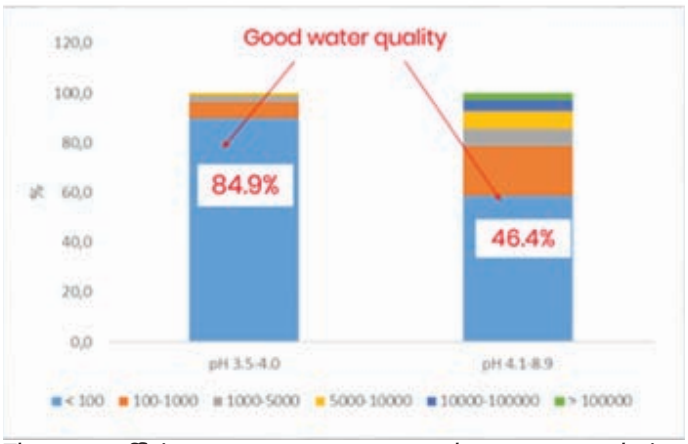
Adequate biosecurity measures should be in designed and implemented.

Crevices in machinery, flooring and walls, and dead ends in piping are potential areas for pathogen accumulation and subsequent contamination of the product. Therefore, special attention should be given for disinfection practices in these areas.

Water is a potential route for Salmonella intake by the birds. Formation of biofilms in pipelines can further aggravate this condition. Reducing water's microbiological load and preventing biofilm formation in the water lines are, therefore, highly advisable. Adequate acidification of water with or without sanitation needs to be carried out to support water hygiene and prevent colonization of Salmonella in the gut.

Water pH of below 4.5 (up to 3.8) needs to be maintained, as Salmonella can survive up to a pH of 4.5. Also, as evident from Fig. 1 below, the enterobactericeae counts in water reduce to a greater extent when water pH is in the range of 3.5-4.0

Fig.1. Enterobacteriaceae concentrations in varying water pH



The most efficient way to ensure, control measures are being employed correctly, is through the use of appropriate Environmental monitoring programs (EMPs) of the

production facility. EMPs are not control programs in themselves but rather a means of verification that other food safety measures in place are effective. A well designed EMP will allow manufacturers to identify potential Salmonella sources and validate the efficacy of sanitation.

Health:

The performance of birds needs to be monitored regularly and documented.

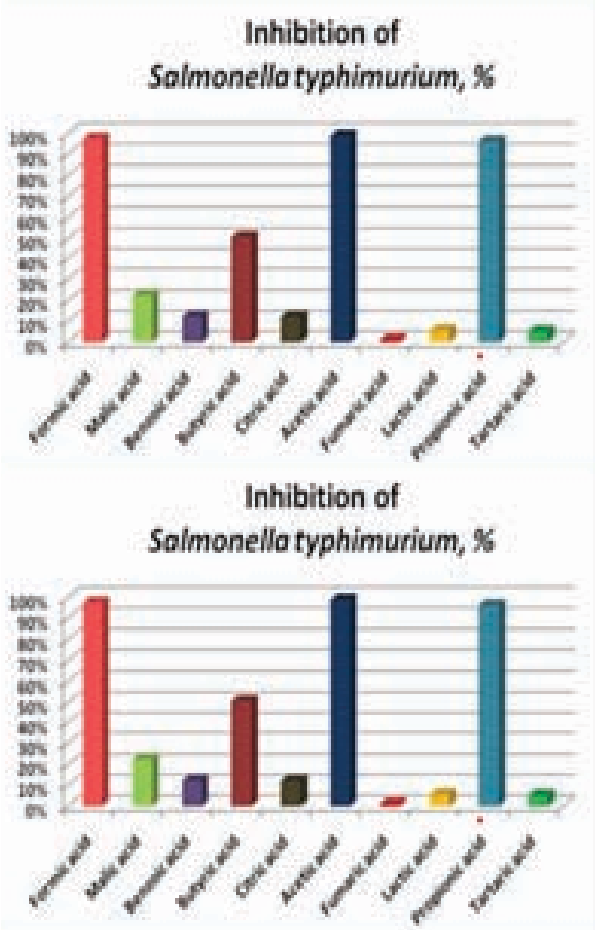
Gut health evaluation has to be carried out on dead/fresh birds, to determine the gut health condition of birds. The litter quality should be watched out and footpad lesion scoring accordingly done, which would give an indication of both litter quality and gut health condition.

Strict vaccination protocol in place to increase the resistance of birds against Salmonella exposure.

Inclusion of suitable feed and water additives to combat microbial uptake and proliferation. Organic acid concepts in feed and water have been proven to have effective control on Salmonella contamination. The organic acid concepts, so added should prevent Salmonella uptake by the bird as well as its proliferation inside the birds' body, on a wide variety of Salmonella strains.

The figure below, gives an indication of inhibitory effect of different organic acids on two different Salmonella strains. Inclusion of select organic acids and their salts in a commercial blend, would provide a synergistic and broad-spectrum killing effect on bacteria.

Fig. 2. Different organic acids have varied inhibitory activity against various bacterial strains



Broiler breeder management needs to be given due importance, as it has a significant say on chick quality.

CONCLUSION:

Salmonella can enter the feed to food chain at various levels, hence, an Integrated Approach that provides a long-term risk management against Salmonella is imperative. Therefore, it is essential that poultry producers/ feed manufacturers have effective control and monitoring procedures in place to track and trace Salmonella. It is high time to realize that consumers need to be delivered safe food on the plate. Also, the changing consumer behaviors, will enable them to demand for the same. In these scenarios, as a proactive approach, adopting an all-inclusiveFeed-Farm-Health process for controlling Salmonella can prove to be a sustainable and cost-effective feed to food safety solution.

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Impact of Mycotoxin on Gut Health in Poultry

Dr B. C. Dutta
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Mycotoxins in feed pose a constant threat to the poultry industry globally. The common feed ingredients forfeed formulation can be contaminated by many mycotoxins.

Mycotoxins are secondary metabolites of common moulds/ fungi produced during their growing period. Some fungi produce mycotoxins on the field, while other produce mycotoxins during the harvest or storage of grains and in finished feed.The most common feed ingredients that can be contaminated by mycotoxins areMaize&its by-products, Wheat &its by-products, Rice &its by-products, Soybean meal, BarleyandGroundnut Cake.

There are two Mycotoxin Surveys done by two leading Poultry Feed Additive Manufacturer, Biomin & Trouw, reveals the terrible condition Asian Poultry Industry is facing.

Trouw Nutrition Survey from samples taken between January to August 2020

Table 1. Number of Analysis performed and Percent contamination (Global & Asia)

Mycotoxin/ Parameter	AFB1	DON	FB1	ZEA	OTA	T2	Total
Global No	6232	3066	2741	1790	764	700	15293
Asia No	491	128	194	115	199	109	1236
Asia % Contamination	70	73	90	72	67	2	

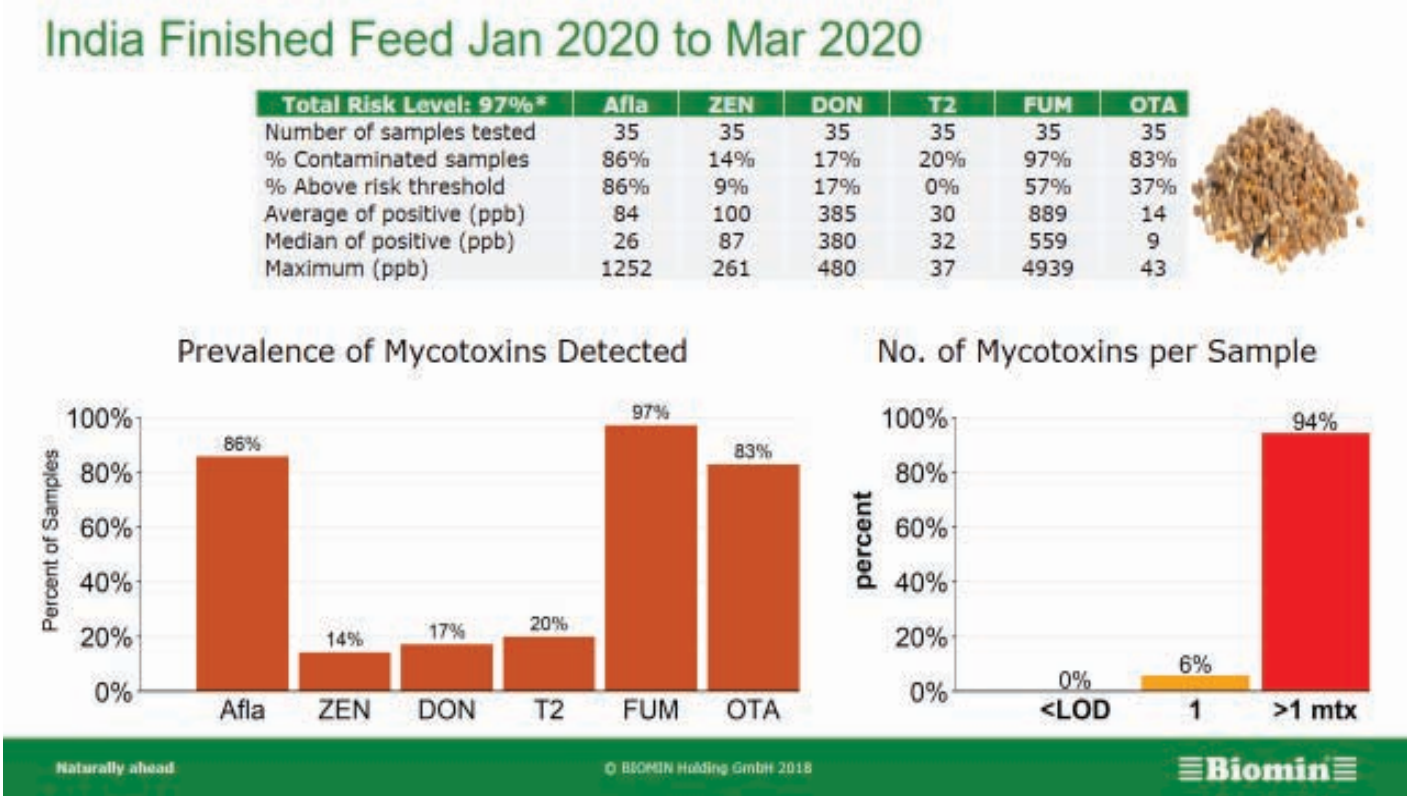
Table 2. Mycotoxin Distribution in Asian countries

Country	AFB1	DON	FB1	ZEA	OTA	T2
India	98 (31)	0 (0)	98 (2101)	67 (30.30)	93 (13.3)	0 (0)
Indonesia	60 (8.9)	65 (213)	85 (2144)	75 (40)	20 (1.0)	1 (0.36)
Bangladesh	56 (4.2)	82 (2214)	67 (3283)	63 (101)	80 (2.7)	0 (0)
China	48 (3.3)	95 (603)	90 (1386)	65 (41)	50 (2.8)	6 (1.80)
Myanmar	47 (5.8)	100 (150)	75 (804)	100 (55)	NA	NA

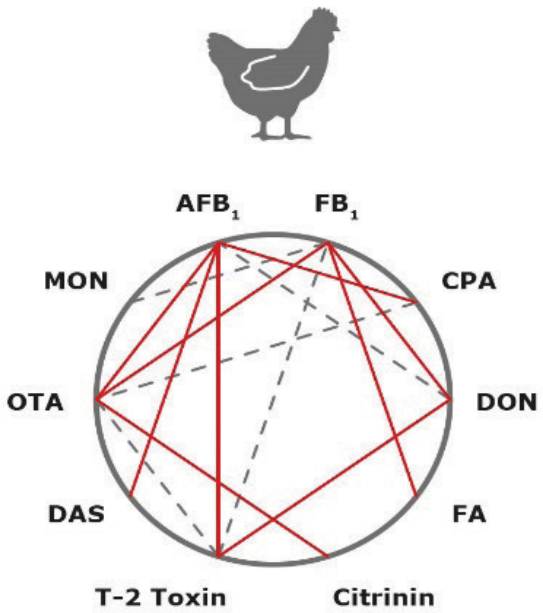
NB: NA = Not Analysed. The Values are % contaminated samples & Concentration in ppb inside brackets

Table 3. Mycotoxin concentrations (ppb) in various commodities in Asia

Commodities	AFB1	DON	FB1	ZEA	OTA	T2
By-products	9.3	1717	613	76	3.4	1.4
Cereal Grains	17	144	1956	29	0.74	0.13
Protein sources	12	472	356	64	13	1.3
Poultry Feed	19	259	2571	40	9.5	0.74
Pig Feed	7.7	125	580	44	1	0
Ruminant Feed	18	NA	1000	NA	4	NA



Poultry have heterogeneous sensitivity to mycotoxins; ducks and turkeys are more sensitive than chickens. Young chickens are more sensitive to the mycotoxins. The effects of mycotoxins in poultry are complex and varies greatly according to their mechanism of toxicity affectingdifferent organs which may lead to death in case of high contamination level. Presence of mycotoxins in combination in feed may have synergistic or additive effects.Even at low levels of mycotoxins in feed, during sensitive period of production cycle or when exposed for longer periods, can impair the immune system leading to the immune-suppression.



Additive (dashed black line) and synergistic (red line) effects of different mycotoxin in poultry (Source: Biomin website)

Aflatoxins (AFB1), ochratoxin (OTA), trichothecenes, and fumonisins (FB1) are known to induce immune suppressive effects in chickens, enhancing their susceptibility to diseases (Singh et al., 1990, Ghosh et al., 1991). Low level of mycotoxins can have an antimicrobial effect and can cause feed passage (Devegowda and Murthy, 2005).

The presence of multiple mycotoxins today, particularly in complete feed, is a rule and not an exception.When occur together, many mycotoxins act in a synergistic or additive manner inside animal's body leadingto unexpected and high toxicity.

Unlike microbes, mycotoxins are heat resistant and survive common feedprocessing operations such as pelleting and extrusion. As a result of all these, the exposure of animals tomycotoxins is unavoidable today and hence prevention strategies should be applied at crop production,feed production and at animal facility levels

Impact of Mycotoxin on Gastrointestinal Tract (GIT) Function

The two survey reports reveal that almost 98% feed ingredients are contaminated with AFB1 & FB1 and 93% are with OTA. Further, Finished Feed were worse than ingredients with 100% are contaminated with Mycotoxins and 94% are with more than one mycotoxin.

Gastro Intestine Tract (GIT) is the biggest organ surface exposed to foreign materials including feed, Mycotoxins.

GIT is responsible for digestion & absorption of all feed materials including water and its ability to function is directly linked to poultry productivity.

GIT is the biggest Immune organ in chicken's body.

Any mycotoxins present in feed are delivered straight to the GI tract of the birds; the organ most affected by mycotoxins.

Among the major mycotoxins, DON (deoxynivalenol), ZEN (zearalenone) and FUM (fumonisins) are often overlooked because their impact on poultry health and productivity is not clearly visible. However, many scientific and commercial trials prove that these *Fusarium* mycotoxins are closely related to some important poultry diseases.

Picture 1. Damage of Intestinal Mucosa

Picture 2. Gizzard Erosion

Picture 3. Fatty Liver

Picture 4. Swollen & damage Kidney

AFB1 causes Fatty Liver and Mal absorption due to reduced production of Bile Salts.

AFB1 damages the Tight Junction Integrity of Intestinal Epithelial cells resulting leakage of nutrients and facilitates entry of pathogen through damaged mucosa

AFB1 reduces the size of Bursa, spleen & thymus and thus affects production of both B cells & T cells, leading to immuno suppression, which ultimately results increased susceptibility to other enteritic diseases like Salmonellosis, E coli, Necrotic Enteritis, Coccidiosis, Adenovirus, Rotavirus, Astrovirus infections.

By damaging epithelial cell integrity, AFB1 directly damages the gut associated lymphoid cells (GALT) and indirectly making the passage open by destroying the barrier to facilitates entry of many more infections.

AFB1 reduces Enzyme activity of digesting Starch, Protein & Lipids in chicken.

FB1 affects proliferation of Intestinal Epithelial cell, reduces villi height & villus to crypt ratio and thus affects the normal atmosphere of intestinal epithelium and intestinal microbial homeostasis resulting increase incidence of NE & Coccidiosis.

FB1 reduces functional activity of intestine resulting nutrient leakage, diarrhoea, poor digestive output, etc.

OTA impacts Tight Junction Integrity and damage intestinal mucosa affects digestive functions T2 Toxins disturbs Intestinal epithelial cell proliferation, Mucous production & Immunoglobulin production and thus affects Intestinal health & nutrient utilization DONimpaired Nutrient absorption and affects Tight Junction Integrity of Intestinal epithelial cell.

Present Mycotoxin contamination scenario compel us to conclude that:

Almost 100% of common Feed ingredients & finished feed in this subcontinent are contaminated with one or more mycotoxins, and the contamination become arule now due to unseasonal rains, draught, hot & humid weather, crop damage by insect and storage inefficiencies.

Most mycotoxins damages Gut epithelium & Tight junction integrity even in suboptimal level, which usually been neglected at Feed Manufacturing point due to the absence of distinct clinical signs.

Combination of bare minimum level of mycotoxin (combined mycotoxicosis) may not produce any clinical signs but can damage Intestinal Epithelium & Tight junction integrity leading to poor gut health; which is a fact but not considered.

Mycotoxin negatively impacts of both Humoral & Cell mediated immunity, damages GALT to further deteriorate immunity, damages Gut Barrier to facilitate entry of pathogen into the system and hence the major, if not the main predisposing factor for all enteric & other diseases resulting not only to Poor Gut Health but also mortality leading to huge loss in poultry business.

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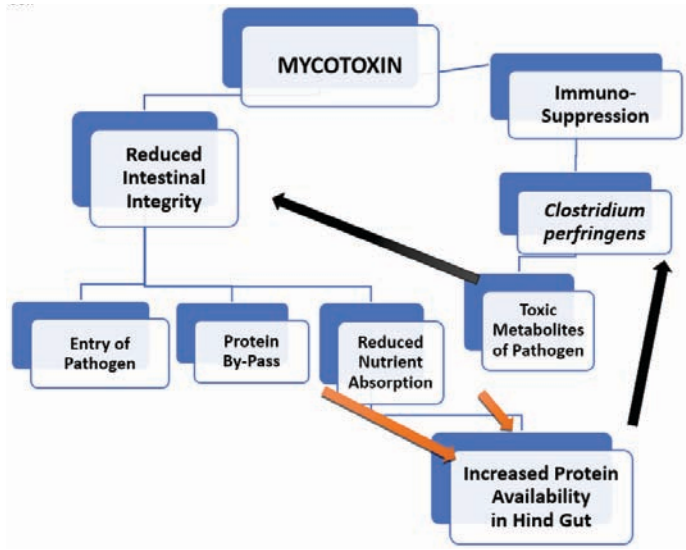

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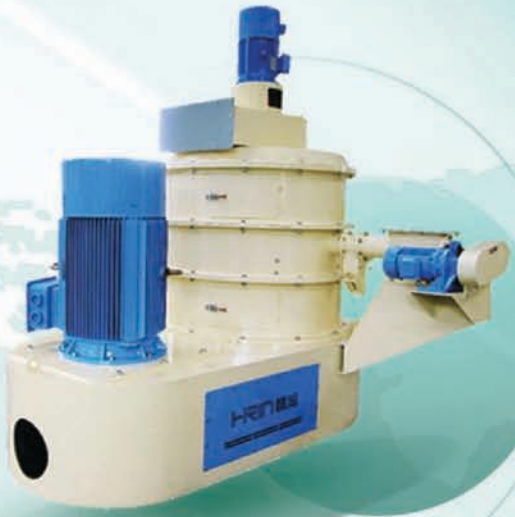

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COMPLETE *solution* for all kinds of *stress...*

Venworld™
THE BEST IN ANIMAL HEALTHCARE

Success story during Summer stress

Enriched **with Electrolyte, Dextrose & Vitamin C**

STRESVEL स्ट्रेसवेल
StreVel®
WATER MISCIBLE POULTRY FEED SUPPLEMENT

Indications:
- Reduce stress.
- Enhances immune response.
- To improve performance.
- Corrects calcium and phosphorus metabolism.

Usage:
- 4-5 ml / 100 chicks for 5-7 days.
- 5ml / 100 Broilers or Layers for 5 - 7 days.

Presentation:
- 100 ml, 500 ml, 1 Ltr. & 5 Ltr.

व्हेनलाईट पाऊडर

VENLYTE™ POWDER

VENLYTE™ acts as energy revitalizer, reduces heat stress and helps in maintaining osmotic pressure (water balance). Also provides energy and supportive therapy for chicks immediately after arrival at farm and during diseases.

Dose Rate – 1 kg / ton of feed

2 gm / lit. of water for 250 birds or 500 chicks

For further information please contact :
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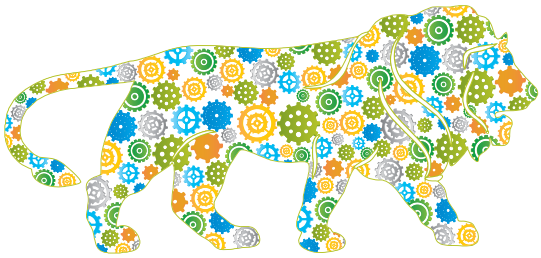

The change is now in India

We ensure **Quality and Traceability** through our company-wide program, Nutrace®

nutrace

Technological innovation that's never seen before

Complete automation that ensures the final product is **untouched by hand**

For all your species needs




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