

POULTRY**PLANNER**

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From the Editor's Desk



Disease Prevention in Poultry

Poultry are quite susceptible to a number of diseases. Some of the more common diseases are fowl typhoid, fowl cholera, chronic respiratory disease, infectious sinusitis, infectious coryza, newcastle disease, fowl pox and infectious bronchitis.

Nutricious feed, access to fresh, clean water and adequate housing are very important to the health of flock. Prevention and control of poultry diseases is one of the most important factor for the profitability of poultry farming business.

Disease can be prevented effectively by an integrated approach of vaccination, proper management and strict biosecurity. Proper security measures can greatly reduce the chance of disease outbreaks. Poor sanitation also causes disease problems. Isolation is a basic principle for preventing diseases in flocks. Once a site is contaminated, carryover from previously infected flock may become a reoccurring problem. Regular cleaning and disinfecting between flocks will help reduce outbreaks.

Good ventilation, dry litter and proper temperature will provide conditions conducive to good health. Regular disinfection of farm premises and equipment with potassium permanganate (1:1000), sodium hydroxide (2%) or Lysol (1:5000) are useful in preventing disease.

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Salmonella

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E. Coli

F4 (K88), F5 (K99), F6 (987P), F10, F41

Clostridium Perfringens

Type A, C, B, D, E

Staphylococcus Aureus



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Probiotics: A Natural Solution to NE in Broilers

CHR HANSEN
Improving food & health

Necrotic Enteritis (NE) is a potential catastrophe for broiler production. Nutritional solutions can help, in particular the supplementation of probiotics. Find out here how it works.

By Anna Karwacinska, Marcelo Lang
and Florence Rudeaux,
chr. Hansen A/s

Diseases often mean economic losses for broiler producers, especially when they go undetected for long periods of time. Necrotic Enteritis (NE) is among the most serious diseases affecting broilers and a common driver of increased production costs. NE is a very common infection of the gastrointestinal tract caused by the toxin-producing pathogen *Clostridium perfringens*. The toxins produced by this microorganism damage the intestinal wall, impairing villi functionality and architecture, which reduces their capacity to absorb nutrients. NE can be catastrophic for producers, especially in its clinical form where the level of infection is severe and may result in high mortality, even in the absence of other symptoms. Sub-clinical NE should also be taken into account as it leads to a slow but steady growth rate reduction and an increase in feed and treatment costs. The occurrence

and severity of NE outbreaks depend on the presence of predisposing factors that trigger overgrowth of toxin-producing strains of *C. perfringens* in the intestinal tract of the chicken. The most commonly recognised predisposing factors for NE are: coccidiosis infection, dysbiosis, high dietary levels of non-starch polys-accharides (NSP), indigestible protein, among others.

Probiotics for a healthy, stable gut flora

The use of antibiotic growth promoters (AGPs) used to be a standard practice in the broiler industry. Besides increasing weight gain in broiler chickens, AGPs also controlled the occurrence of NE. However, the decision to ban AGPs made in 2006 by the European Union ultimately led to an increase in the frequency of NE outbreaks. Consequently, additional effort have been

undertaken to find new strategies to overcome this disease. Probiotics are naturally occurring, harmless bacteria that can be supplemented to animals to improve their gastro intestinal activity. By boosting digestive enzyme production, probiotics enhance nutrient absorption and broiler growth rate. Probiotics modulate the intestinal microbiota and can effectively promote intestinal integrity. A number of studies showed that supplementing probiotics to chickens reduced the negative effects of *C. perfringens* challenge. In particular, the *Bacillus licheniformis* based probiotic GalliPro® Tect (hereafter called probiotic) has been successfully used as an alternative to antibiotics.

Results of broiler trial

A zoo technical trial showed that broilers supplemented with the probiotic had 20% lower mortality

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- Effectively controls SUDDEN DEATH SYNDROME
- Assists in promoting general health and well being.

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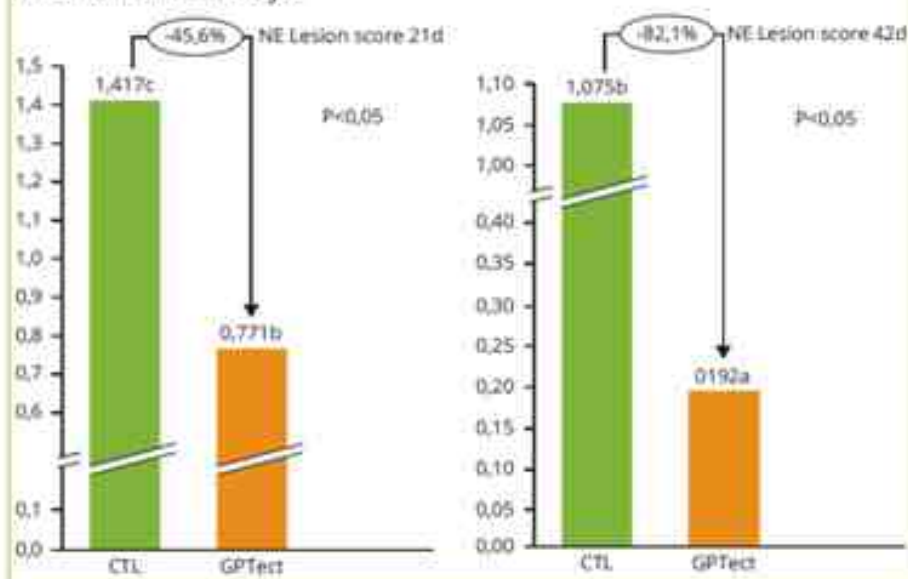
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Figure 1 - Results from a scientific trial where broilers were exposed to two treatments: a) Control treatment without supplementation (CTL), and b) feed supplemented with the probiotic GalliPro® Tect (GPTect). NE lesion scores were assessed after 21 and 42 days.



rate compared with non supplemented broilers when both groups were artificially challenged with *C. perfringens*. Results from a second controlled study showed a reduction of 30% in the NE lesion score of broilers after 21 days of supplementation with the probiotic. Another trial showed that NE lesion scores were 46% lower in groups of broilers supplemented with the probiotic for 21 days when compared with control groups (non-supplemented). Moreover, after 42 days of feed supplementation, NE lesion scores were 82% lower in supplemented broilers than in non-supplemented ones (Figure 1)

Bacillus licheniformis-based probiotic

NE is a heavy burden on broiler production, causing economic damages of US\$ 2 billion every year. GalliPro® Tectprobiotic is a natural feed supplement that can greatly decrease such economic losses by improving the gut microbial balance and the overall health of the gastrointestinal tract. It helps to reduce the impact of predisposing factors that trigger *C. perfringens* infections, which consequently leads to higher production efficiency, improved animal health, and reduced treatment costs.



About Chr. Hansen

Chr. Hansen is a global bioscience company that develops natural solutions for the food, nutritional, pharmaceutical and agricultural industries. As a company it aims to deliver innovative natural solutions that advance food, health and productivity for the benefit of us all. All solutions are based on strong research and development competencies coupled with significant technology investments and close customer relationships. Chr. Hansen is the owner of one of the world's largest commercial collections of bacteria, numbering almost 40,000 strains. From this collection bacteria are screened, selected and improved to meet specific requirements in food, dietary supplement, animal feed and plant protection.

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UTTARA IMPEX PVT. LTD. has set-up an Advanced Nutrition Lab for the Indian poultry farmers to help them to analyse the raw material and poultry feed. The laboratory is equipped with an Advanced FT-NIR machine, Toxin Analyser and Advanced Protein Analyser.



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Turmeric Oil/Curcumin inclusion in broiler feed holds promise compared to regularly used in-feed antibiotic growth promoters

- A scientific research study

Dr. Sekhar Sushil Basak

Innovista Feeding Solutions Pvt. Ltd. Kolkata



Research on natural growth promoters has been of worldwide interest. India being a hub for spices and essential oils derived from natural resources has great potential to cater to the world, products and services in this space given its abundant knowledge of herbs and spices and the huge production potential and affordability to the common poultry farmers. Innovista has played an active and crucial role in showcasing to the world its initiatives on research on natural products derived out of spices and essential oils.

There is growing interest in developing natural alternatives to antibiotic growth promoters in order to maintain both birds' performance and health. Natural compounds lack the undesirable effects that synthetic compounds can have on consumers which has caused the food industry to become increasingly interested in natural sources of substances (Singh et al., 2010). It has been stated that the supplementation of antibiotics in regular diet reduces the morbidity and mortality, as well as overall growth of broiler chickens. Using these commercially available antibiotics may show it adverse effect on the public health by developing the antibiotic resistant micro flora. Poultry industry needs to develop an alternative method to provide antibiotic potential to the chickens, in order to enhance the rate of production.

It is reported recently that turmeric falls in such class of medicinal plant that provides an alternative method of natural antibiotic to feed poultry farm. Turmeric is a natural herb of the ginger family, Zingiberaceae. Wide range medicinal properties of this plant have

been advocated. Turmeric supplementation could effectively acts on growth, egg production and health status of chickens. Turmeric is one of the widely used and grown spices in India, which have attracted the attention of many researchers as an antimicrobial. It has been extensively used in poultry diets.

The present research was carried out on "Effect of Dietary Supplementation of Curcumin on Broiler Performance" at Poultry Research and Training Centre (PRTC), by Nikita Narendra Deshmukh Post Graduate Institute of Veterinary and Animal Sciences, Akola under Maharashtra Animal and Fishery Sciences University, (MAFSU) Nagpur, Maharashtra (India) for six weeks period w.e.f. 27th January 2021 to 10th March 2021. Turmeric oil which is used as the source of curcumin was procured from M/s Innovista Feeding Solutions Private Limited, Kolkata, West Bengal as Cucumol.

Three hundred day old chicks were distributed into five treatment groups, randomly with each treatment having three replicates of 20 chicks each. In

control group (T1) birds were offered basal diet as per BIS (2007). In group T2 basal diet with antibiotic of BMD group was added, groups T3, T4 and T5 were offered basal diet added with 0.5ml, 1ml and 1.5ml Curcumin/kg feed, respectively. Weekly live body weight and feed residual for weekly feed intake was calculated every week. In 6th week one bird from each group was slaughtered for evaluation of carcass and gut health parameters.

Table 1 The details of different dietary treatments using turmeric oil

Treatment groups	Details of Treatments	No. of birds/replicate	No. of replicates/treatment	No. of birds/treatment
T1	Control diet	20	3	60
T2	Basal diet containing antibiotic growth promoter of BMD* group	20	3	60
T3	Basal diet added with 0.5ml turmeric oil containing 6% curcumin/kg feed	20	3	60
T4	Basal diet added with 1ml turmeric oil containing 6% curcumin/kg feed	20	3	60
T5	Basal diet added with 1.5ml turmeric oil containing 6% curcumin/kg feed	20	3	60

*Bacitracin methylenedi-salicylate (0.5g/kg diet)

Groups fed diet added with turmeric oil had improved live body weights at sixth week of age, with highest live body weight observed in group T4.

Cumulative weight gain was higher in all turmeric oil added diet groups with highest in group T4 as shown in table below.

Following is the graphical representation

Table 2 Weekly live body weights (g/b) of broilers fed different levels of turmeric oil

Treatment group	Age (in weeks)						
	Day old	I	II	III	IV	V	VI
T1-(Control)	41.72±0.43	149.78±2.42 ^c	418.03±6.94 ^b	819.86±12.62	1335.84±17.15	1889.61±30.81	2479±28.27 ^c
T2-(BMD)	42.08±0.49	160.83±3.10 ^b	449.48±8.81	827.49±16.86	1376.58±28.86	2107.97±37.68	2562.40±38.74 ^{b,c}
T3-(0.5ml TO)	41.46±0.38	159.73±2.81 ^a	452.66±6.97 ^a	832.45±12.47	1394.71±20.83	2142.13±36.70	2598.87±29.99 ^b
T4-(1.0ml TO)	41.43±0.43	162.78±2.67 ^{ab}	448.98±8.19 ^a	828.21±16.49	1381.71±19.80	2174.91±37.31	2707.36±42.47 ^a
T5-(1.5ml TO)	42.72±0.48	169.28±2.62 ^a	458.88±6.43 ^a	838.28±15.08	1395.33±20.45	2196.67±36.77 ^a	2588.97±37.98 ^b
CD	NS	13.195*	20.788*	NS	NS	103.616**	99.181**
CV%	8.223	7.579	13.038	13.680	12.026	13.579	10.535

^{a,b,c} Means with different superscripts in a column differ significantly. **P<0.01, *P<0.05, NS=Non-significant TO=turmeric oil, BMD=Bacitracin methylenedi-salicylate

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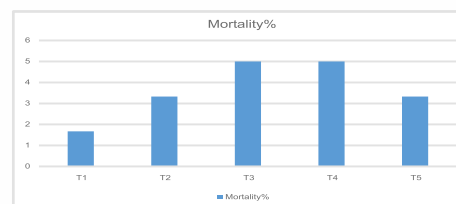
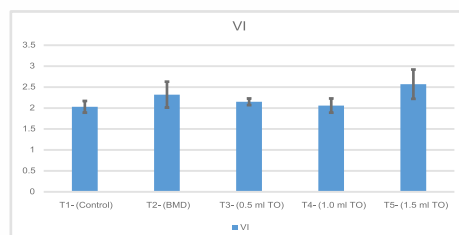
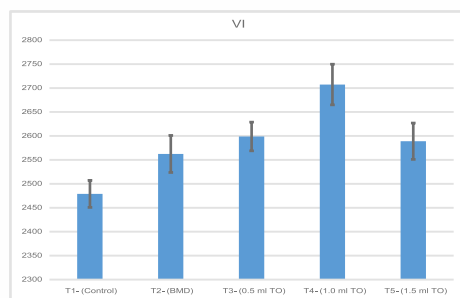


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of the same:

Cumulative weekly feed conversion was

levels under different dietary treatment groups

Following is the graphical representation

gain was higher in all turmeric oil added diet groups with highest in group T4. Enhanced feed intake was recorded in group T4 having 1ml turmeric oil/kg feed. Cumulative weekly feed conversion was

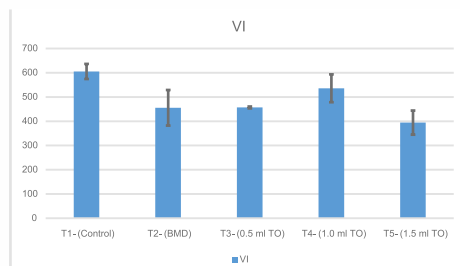
Table3 Weekly weight gain (g/b) of broilers fed different level of turmeric oil

Treatment group	Age (in weeks)					
	I	II	III	IV	V	VI
T1-(Control)	108.07±1.44 ^{ab}	268.25±8.07	401.72±6.13	516.71±34.7	537.53±32.7	605.31±31.1
T2-(BMD)	118.76±4.27 ^{ab}	288.52±11.1	378.79±18.2	548.52±47.5	730.38±84.4	455.50±73.4
T3-(0.5ml TO)	118.28±4.14 ^{ab}	292.93±5.57	379.68±12.7	559.30±50.7	750.58±67.6	456.95±3.84
T4-(1.0ml TO)	121.35±4.60 ^a	290.65±12.3	378.79±18.5	554.38±45.2	790.83±53.0	535.88±57.4
T5-(1.5ml TO)	126.56±1.38 ^a	292.45±3.39	379.40±20.1	560.34±33.3	799.45±52.9	394.39±49.8
CD	10.974 [*]	NS	NS	NS	NS	NS
CV%	5.081	5.294	7.227	13.577	14.556	17.446

^{a,b,c} Means with different superscripts in a column differ significantly. ^{*}P<0.01, ^{*}P<0.05, NS-Non-significant, TO-turmeric oil, BMD-Bacitracin methylene di-salicylate.

seen numerically lower in group T4 during overall trial period shown in table below.

Following is the graphical representation of the same:



Mortality percent was recorded below standard range. The table below shows the results:

Table5 Percent mortality in broilers fed turmeric oil added feed at various

Table4 Weekly FCR of broilers fed different level of turmeric oil

Treatment group	Age (in weeks)					
	I	II	III	IV	V	VI
T1-(Control)	1.13±0.02	1.38±0.06	1.33±0.04	1.58±0.10	1.83±0.13	2.03±0.14
T2-(BMD)	0.98±0.07	1.42±0.05	1.30±0.07	1.50±0.16	1.82±0.25	2.32±0.31
T3-(0.5ml TO)	1.02±0.06	1.36±0.07	1.36±0.07	1.55±0.18	1.74±0.12	2.15±0.08
T4-(1.0ml TO)	0.98±0.02	1.38±0.04	1.31±0.13	1.52±0.15	1.68±0.16	2.06±0.17
T5-(1.5ml TO)	0.98±0.01	1.37±0.04	1.34±0.06	1.54±0.12	1.64±0.14	2.57±0.35
CD	NS	NS	NS	NS	NS	NS
CV%	7.275	6.574	9.819	16.668	16.873	18.217

^{a,b,c} Means with different superscripts in a column differ significantly, NS-Non-significant, TO-turmeric oil, BMD-Bacitracin methylene di-salicylate.

Table6 Carcass traits and cut up parts (%) in broilers fed different level of turmeric oil

Treatment groups	Dressing yield	Giblet yield	Eviscerated yield	Carcass cut up parts (% live weight)					
				Breast	Thigh	Drumstick	Back	Neck	Wings
T1-(Control)	79.34±0.29 ^a	3.81±0.08	75.53±0.23 ^a	41.16±0.55 ^a	13.02±1.00	11.14±0.13	15.07±0.13	5.63±0.22	7.25±0.10 ^a
T2-(BMD)	74.79±0.72 ^b	4.18±0.03	70.62±0.71 ^b	41.22±0.66 ^a	14.98±0.46	13.83±0.11	16.85±0.15	6.48±0.62	9.87±0.34 ^a
T3-(0.5ml TO)	81.25±2.64 ^a	4.38±0.19	76.86±2.4	35.26±0.37 ^a	14.15±1.13	12.81±0.87	17.02±0.50	6.90±0.17	9.39±0.15 ^a
T4-(1.0ml TO)	80.78±0.87 ^a	4.23±0.10	76.54±0.8	36.64±0.8	13.75±1.13	12.12±0.24	17.06±0.50	6.85±0.77	10.61±0.14 ^a
T5-(1.5ml TO)	80.91±0.21 ^a	4.35±0.15	76.56±0.14 ^a	42.18±0.62 ^a	14.44±0.10	12.10±0.67	15.72±0.70	6.51±0.71 ^a	9.75±1.11 ^a
CD	4.082 [*]	NS	3.806 [*]	1.829 ^{**}	NS	1.619 [*]	NS	NS	1.666 [*]
CV%	2.822	5.189	2.776	2.558	12.721	7.166	5.899	14.732	9.791

^{a,b,c} Means with different superscripts in a column differ significantly ^{**}P<0.01 and ^{*}P<0.05, NS-Non-significant, TO-turmeric oil, BMD-Bacitracin methylene di-salicylate.

of the same:

Carcass traits were seen to be significantly (P<0.01) affected by treatment. Improved dressing percentage, edible percentage and breast percentage were observed in diet added with turmeric oil. Dressing and edible percentage were recorded highest

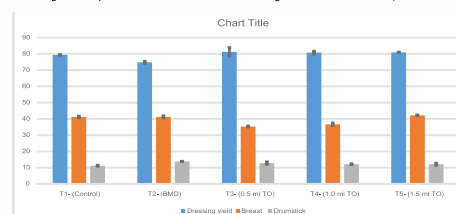
Treatment groups	No. of birds	No. of birds died	Mortality %	Livability %
T1	60	1	1.67	98.33
T2	60	2	3.33	96.67
T3	60	3	5	95
T4	60	3	5	95
T5	60	2	3.33	96.67
Total no. of birds	300	11	3.67	96.33

in group T3 and breast percentage was highest in group T5 which was given Curcumol.

Following is the graphical representation of the same:

The highest net income per kg live body weight was recorded in group T4 fed with 1ml of turmeric oil followed by group T3 and T4 offered 0.5ml and 1.5 ml turmeric oil

We concluded from this research study that Curcumol addition at 1ml/kg diet improved broiler performance, carcass traits, gut health and profit return in broiler production. Cumulative weight



1. Return on sale Rs. 80 per kg body weight	198.32	204.96	207.92	216.56	207.12
2. Net profit per bird (Rs.)	35.34	33.95	40.37	45.79	39.19
3. Net profit per kg (Rs.)	14.26	13.25	15.53	16.92	15.14

seen numerically lower in group T4 during overall trial period. Mortality percent was recorded below standard range. The total coliform count was significantly reduced in turmeric oil added groups with lowest seen in group T5. Carcass traits were seen to be significantly affected by treatment. Improved dressing percentage, edible percentage and breast percentage were observed in diet added with turmeric oil. Dressing and edible percentage were recorded highest in group T3 and breast percentage was highest in group T5. The cost economics showed a higher net profit per bird in group provided feed added with 1ml turmeric oil/kg basal diet.

For more information on the research study please contact:

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Role of Nutrition in Prevention of Poultry Diseases

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Introduction

Enhancing innate immunity is the frontline of disease prevention and control. Nutrition is a key factor in immunity, disease control, and prevention. Passive and active immunity and building antibodies are affected by nutrition, quantitative and qualitative feed constituents, and hygiene. Fatty acids, protein/amino acids, minerals, and vitamins are vitally important for enhancing immunity and health. In general, under stress conditions, low hygiene, disease outbreaks, and the absence of effective treatment and vaccines, enhancing protection, prevention, and control programs it is essential to improve health to ensure sustained animal performance and economic success. The deficiency of nutrients may increase the threat of emerging diseases and thus assuring adequate supplementation with vitamins C, E and D is essential under such condition. However, nutritional intervention programs may enhance immunity and health status but have a limited impact.

Protein and Amino Acid Nutrition

The relationship between nutrition and immunity for chickens is of vital importance from a quality and quantity point of view. An important issue that might affect poultry immunity, health, and performance is dietary constituents. Crude protein is the most expensive item in poultry nutrition, at both the protein level as well as the protein source; essential amino acids are crucial. Due to the nature of the poultry digestive tract, concentrated

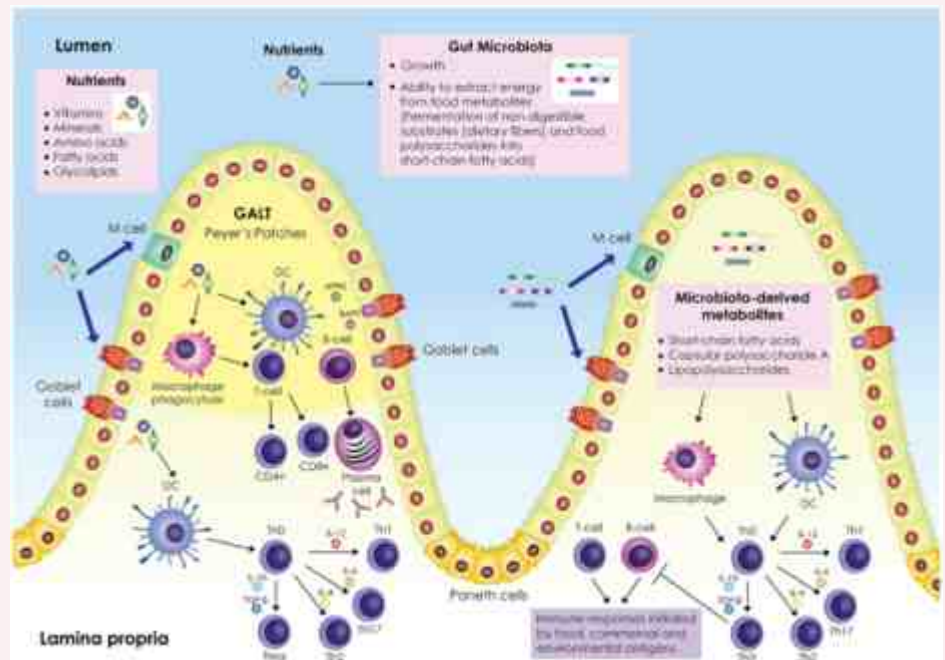


Fig. 1. Interplay between nutrients, gut microbiota and immune system

(Source: *Front. Immunol.*, 2021 | <https://doi.org/10.3389/fimmu.2021.665968>)

feeds are required, and essential amino acids rather than crude protein are vital. Immune function is a complex system that requires higher concentrations of nutrients (amino acids, fatty acids, vitamins, and minerals) than those for productive traits. Besides, immunity is given first priority with regard to nutrient distribution among body functions. Protein and essential amino acids are vitally important for growth and antibody formation and a well-functioning immune system.

Nowadays, poultry diets are formulated based on digestible amino acids rather than crude protein. This goal is achieved by supplementation with industrial amino acids such as methionine, lysine, arginine, tryptophan, and threonine to ensure adequate intake of limiting essential

amino acids. Recent evidence has highlighted that a decrease in dietary crude protein diets could be compensated with limited amino acid supplementation at minimum crude protein level while enhancing the broilers' capacity to cope with infection. A low protein diet supplemented with essential amino acids was found to be useful tool to maintain performance and immunity of chickens when other nutrients were met.

Fats and Fatty Acids

Essential fatty acids, principally n-3 polyunsaturated fatty acids, are essential for human and animal health and immunity. The use of n-3-fatty acids to yield functional foods impacts the nutritive value of animal products (and modulates animal and human

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immune function. The dietary n-6 : n-3 ratio is essential for a proper immune system function. Increasing the n-6: n-3 ratio augments inflammation due to elevated pro-inflammatory mediators (cytokines), such as tumor necrosis factor α (TNF), interleukin-1 (IL-1) and IL-6. Increased cytokine levels adversely influence animal appetite. The effects could be attributed to T lymphocyte signaling pathways, as well as cytokine and eicosanoid synthesis (i.e., mediators of inflammatory response), and by varying the molecular configuration of lipid portfolios. Thus, it seems that an optimum n-6: n-3 ratio between 2–4:1 is essential to avoid an excessive inflammatory response and their resultant health hazards. This correction can be made by using n-3-rich feeds/foods. In addition, the n-6:n-3 ratio impacts egg, meat, and milk quality and animal immunity. However, the nutritional requirements of essential fatty acids need further exploration.

However, IgG was increased due to feeding a fish-oil-enriched diet, and fish oil and canola raised γ -globulin and α 2-globulin. In addition, avian influenza and Newcastle disease antibody titers were sustainably increased due to enriching a broiler diet with 1.5% coconut fat. Fish oil supplementation increased follicle length and width of the bursa of Fabricius and depth of the thymus cortex, but the fish oil decreased the follicle length-to-width ratio. The improved immunity of broilers supplemented with canola oil concurred with an increased villus height-to-depth ratio. There was also an augmented antioxidant balance in broilers supplemented with coconut and canola oil. The n-3 fatty acids addition enhances antibody production against the Newcastle disease virus. Dietary fish oil markedly

increases antibody titers and the relative spleen and bursa weights compared to the control group. Coconut fat ameliorates broiler digestion of lipid and raised productive performance during the course of coccidiosis infection.

Feed Additives

Nutritional immunomodulation is defined as the impact of additives on certain functions of the immune system and/or decrease hazards of infection by bacterial, viral, protozoa, and fungus. Some feed additives, such as photogenic plants, plant extract, prebiotic, probiotics, synbiotics, bee pollen and propolis, yeast, and enzymes, have reported immunomodulatory effects. Hence, there is a great interest in using them to decrease the environmental hazards and carry-over effects of antibiotics on human health. Their effects include improving metabolic status, decreasing physiological stress, inhibiting the excursion of cytokines by the macrophages, and antimicrobial activity, thus enhance immunity.

It is widely recognized that beneficial microbiota—probiotics, lactic acid bacteria, and *Saccharomyces cerevisiae*, with its cell wall constituents glucan and MOS—and organic acids are necessary for immunity and gut health. These additives substantially contribute to several mechanisms for disease prevention and control of pathogen growth. They improve antioxidants status, vitamin synthesis, and nutrients digestion. Beneficial microbiota can also help maintain animal health. In this respect, the progress in the probiotic as immunomodulatory interventions shows the prospect to improve animals' tolerance to bacterial diseases such as salmonella, help detoxify aflatoxin, and decrease the hazards of nitrate. The advantageous impact of

immunobiotics on immunity and subsequent health of an animal is directly regulated by indirect a direct interrelationship. The proliferation and differentiation of cells, production of cytokines, secretion of IgA, synthesis of antimicrobial peptides, and increased intestinal cell tight junctions may be affected by the interaction activity between microorganisms and the response of both non-immune and immune cells.

Minerals

The immunological effects of minerals and their essential role in immunity and health are well-known. Microelements such as calcium (Ca), phosphorus (P), and vitamin D3 are essential for bone health and preventing bone disease (rickets, osteomalacia, and lameness). These benefits are critical for broilers and laying hens to prevent cage layer fatigue and poor eggshell quality. Essential micro-minerals such as zinc (Zn), iron (Fe), chromium (Cr), copper (Cu), selenium (Se) and iodine (I), are important as antioxidants and immune and health enhancers, and they are required for red blood cell and thyroid hormone functions. In general, the recommended doses of trace minerals to boost immunity are ~50–100% higher than the levels needed for productive performance. This requirement depends on the type of and form of the mineral, animal age and strain, environmental stress, and hygienic conditions. However, some elements—particularly heavy metals—can have a negative effect on the environment, causing pollution due to increasing mineral excretion in animal manure.

A recent trend in mineral nutrition has focused on replacing inorganic minerals with organic sources and nanoparticles, particularly green nanoparticles obtained from plant tissues, on improving mineral



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utilization, animal immunity, and decrease environmental pollution. Furthermore, these green nanoparticles are highly biodegradable and, therefore, do not exert negative consequences on the environment.

The use of nano-minerals in trace mineral nutrition increases their bioavailability, decreases antagonism between minerals at intestinal sites, and reduces excretion and, hence, trace-minerals related pollution. The nutritive nanoparticles enhance performance in livestock and poultry and immunity due to increased digestive effectiveness.. Nano-forms of Cu and Zn can have a cumulative influence and may become a substitute for chelated organic and inorganic forms and can improve animal performance and immunity.

Zn is the second most abundant microelement after iron. It has many functions, including nucleic acid synthesis and repair, metabolism, immune response, redox homeostasis, and apoptosis, and it plays a vital role in the host-pathogen relationship. Zn homeostasis is closely connected with the normal operating of both eukaryotic and prokaryotic cells, and thus many pathogens are indirectly or directly influenced by perturbations in Zn homeostasis. Zn inhibits the activity of RNA polymerase in a number of viruses, including coronavirus, hepatitis C virus, arterivirus, and rhinovirus. Immunity of poultry were improved due to Zn supplementation (112). In addition, zinc is a cofactor for the thymus hormone thymulin and modulates cytokine release and proliferation. Zinc plays important role as a nonpharmacologic immune booster in broiler chicks.

The trace mineral Selenium is essential for human and animal nutrition. It is used to sustain physiological function,

immunity, health, and product quality. Selenium is an essential constituent of the 24 selenoproteins in the avian genome. In addition, Se is a constituent of the antioxidant enzyme glutathione peroxidase (GPX). This enzyme guards cells against oxidative stress. Selenium is also part of the deiodinase enzyme essential for the activation of the thyroid hormone. The main functions of selenoproteins are control of redox of biochemical function, antioxidant balance systems, thyroid hormone anabolism and catabolism, anticancer protection, and immune function booster. Hence, Se-enhanced animal products can improve animal immunity, prevent diseases caused by Se deficiency, and enrich general health. Se fortification can enhance the antioxidant balance of animals and improve product quality and animal performance.

Vitamins

Vitamins boost animal immunity. Recent recommendations have been made to boost animal immunity and health under normal and heat stress conditions using vitamins: 200 mg/kg diet vitamin C, 100–200 mg/kg diet vitamin E, and 2500–4000 mg/kg diet vitamin D3. Water-soluble vitamin C improves the antioxidant balance, provides antiviral function, relieves oxidative stress, enhances immunity, and spares vitamin E. α -Tocopherol, known as vitamin E, is the most common natural fat-soluble vitamin; it acts as an antioxidant that guards cell membranes against oxidative impairment due to lipid peroxidation. It also enriches the function and proliferation of lymphocytes and macrophages and increases phagocytic activity and decreases oxidative damage under normal and heat stress conditions. Vitamins E and C have a great effect on productive performance and immune response of animals exposed to heat stress.

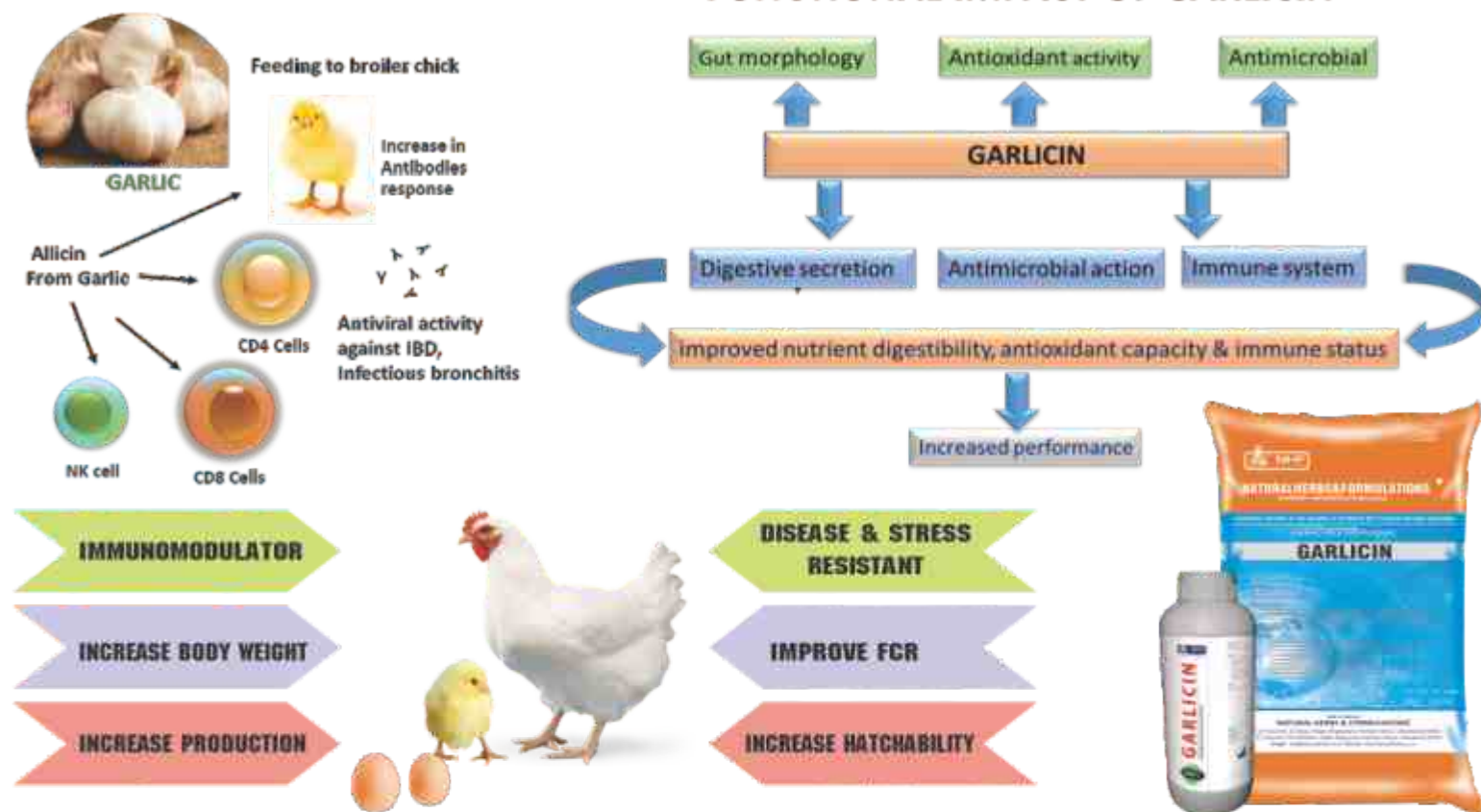
Vitamin D3 reportedly has immunological effects that considerably influence the progress of skeletal health, muscle, and Ca and P homeostasis. Eggshell formation and bone health in laying hens is essential and involves the integration between the metabolism of Ca, P, and vitamin D3. Vitamin D3 or its active form 25-(OH)D, both have strong immunomodulatory properties with the ultimate help of T cells (Th2).

Vitamin B groups are also essential for boosting immunity due to their crucial role in the metabolism of protein, fat, and carbohydrates, and adequate vitamin B intake is essential because water-soluble vitamins are not stored in the body, and daily supply must be ensured.

Conclusion

The health status of the present day poultry is facing new challenges day by day which can be conquered by the right scientific and advanced nutritional approaches and thus, making the poultry farming more profitable and presentable in the global market. There is a stiff competition and restrictions in the global market of poultry products which can be conveyed with proper management of emerging diseases with economic productions and quality poultry products free of elements detrimental to human health. Researchers have made efforts to prevent such damage to poultry and poultry products through dietary manipulations. Different disease conditions are responsible for high morbidity and mortality of poultry. Nutritional strategy and proper feed formulation with specific dietary regimen can combat this up to a certain extent by minimizing the incidence of various infectious diseases, nervous disorders and metabolic disorders.

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Round Worms in Poultry

Navjot Singh Resum

Veterinarian, Poonch, J&K 185101



Introduction

Like most of the mammals and birds, Chickens are also prone to worms as they can pick up a variety of different parasites, both external and internal. These parasites can interfere with feed absorption, weight gain, egg production and, in severe cases can lead to death. Among all, the large roundworm, *Ascaridia galli* is the most common internal parasite found in backyard and free range chicken flock worldwide. Roundworms, also called ascarids, are the most common intestinal parasite found in poultry.

Damage

Roundworms in chickens infest the gut, they do damage in several ways. Burrowing larva does the most damage because they destroy tissues that the bird needs for the absorption of nutrients. This damage from burrowing can also cause hemorrhaging (bleeding) leading to anemia.

An adult *A. galli* absorbs nutrients directly from the gut, effectively stealing food from the bird and causing nutritional deficiencies and emaciation. If the infestation is severe, there may even be intestinal blockage due to a large quantity of worms.

- Pale comb/wattles
- Delayed crop emptying
- Reduced number of droppings
- Worms found in feces or egg

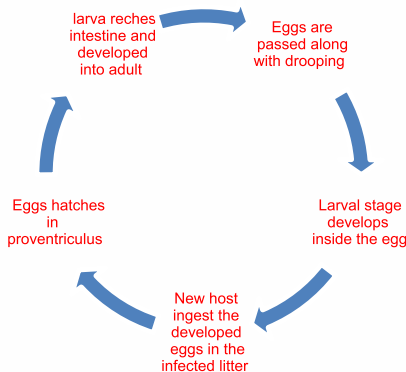
Diagnosis and Control

Diagnosis is based on necropsy of suspect birds and finding significant numbers of worms along with damage to the intestinal mucosal lining and loss of body condition. Fecal sample examination and finding a large number of ascarid eggs in unthrifty chickens is also suggestive of infestation.

The only approved drug for treatment of roundworms in poultry is Piperazine which acts as GABA agonist. Piperazine compounds mediate their anthelmintic action by paralyzing parasite. Affected parasites are then expelled from their predilection sites by normal enteric movements.

Signs and symptoms

- Undigested feed in feces
- Reduced appetite
- Atrophy of breast muscle and decreased body fat
- Decreased growth/weight loss
- Diarrhea with increased white urates



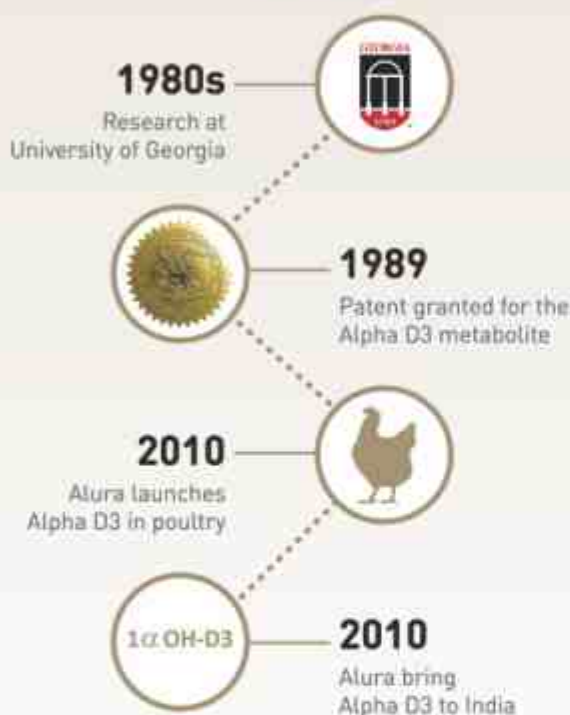
Life cycle of *Ascaridia*

The life cycle of roundworms is relatively simple and may take as little as 35 days to complete.



Image showing round worm (Arrow Mark) in intestine of poultry bird

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Winter Management in Poultry Farming

Dr Milind Rainchwar

Technical Service Manager – South Central Asia,
Novus International



Poultry rearing is an art as well as a science and management plays most crucial role in deciding profitability of this business. It has been observed in past several years that high market rates of broiler meat & eggs are observed only in those times when rearing is very difficult due to harsh climate and thus, demand is more than supply. Therefore, it is very important to understand and implement the best management practices in such harsh climate.

Every region in India has different climatic challenges and variable climate extremes and thus management practices differ between different parts of country. But almost all parts of India experience three to five distinct seasons across the year.

Winter is one of the seasons which presents very harsh temperature extremes and maintaining live ability and production becomes very difficult without taking extra measures. Management in winter is very difficult and often described as double edged sword, as a very perfect balance is required between climate management and ventilation management. Similarly, a very careful decision making is required to reduce cost of production and to provide healthy environment at the same time. It requires ample of experience to understand the economic feasibility of cost involving management practices.

Chickens are unable to maintain body temperature in young age and



although they improve their tolerance to cold with age, they cannot perform well when ambient temperature drops below 20 degrees Celsius and start exhibiting stress and drop in productivity. Failure to provide optimum temperature very frequently results in high mortality, high disease incidence and drop in performance.

Although ways of practicing the management in harsh climate may differ slightly across region, the basic principles remain same. Below listed are few basic principles which may guide proper decision making.

- Proper temperature and humidity suitable for the age is always required
- Proper ventilation to provide fresh air and removing gases inside house is always required
- The rearing surface and bedding material should be always warm and dry
- The drinking water should be maintained at suitable temperature to promote water intake
- The feed & feeding practice should help bird to maintain their body temperature, metabolism, and osmo-regulation



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To achieve these goals, following practices are implemented across country

- External heat source is provided to keep the poultry shed warm and dry
- False ceiling is often used to reduce the volume of shed
- Various types and layers of curtains and jute bags are used to insulate the farm
- Round brooding is often practiced when spot heating is done

As stopping the air flow becomes necessary to maintain temperature, it is very difficult to remove the gases like ammonia and to keep bedding material dry in winter. These challenges affect the respiratory, hepatic, and gut health directly.

The wet litter and humid conditions provide a very suitable environment for gut pathogens like Coccidiosis and Clostridium. The stressed and immunosuppressed birds become easy target for these gut pathogens and therefore, very high-performance losses are observed due to poor gut health. It is a well-known fact that body only gets that part of nutrition, which gut retains. An unhealthy gut loses a lot of nutrients which are necessary for weight gain and egg production. The major part of poultry immune system is also situated in gut. Thus, healthy gut is key to a developed immune system.

While managing good managemental practices, essential needs such as Proper feed and water is an utmost

need to optimise performance during this difficult time. Gut health compromise always leads to poor performance and thus loss in business. Different feed additives play crucial role in maintaining and improving gut health such as Protease, NSPase Enzyme, Probiotics, Essential oils, Organic Acids, etc.

Serine Protease, A broad spectrum protease when added in the feed improves the digestibility and absorption of Amino acids which otherwise are the food for pathogens in the hind gut like Clostridium, Salmonella, etc. This Protease thus enables the improved digestion of Nutrients and reduces the pathogenic load and helps to improve litter condition.

Serine protease has other benefits as well. It has good impact on neutralisation of trypsin inhibitor, an Antinutritional factor in Soybean. Use of Serine Protease also helps to reduce the allergen proteins like Lectins, B Conglycinin by significant amount which otherwise causes the gut irritation. Hence, Proper use of Protease in winter leads to improved litter quality with better absorption of nutrients.

NSPase when added in the feed improves the absorption of nutrients and helps to reduce wet litter condition. Improvement in litter quality leads to the less damage by pathogens.

Organic Copper has the strong impact on litter quality in winter

(copper is antifungal in nature). It helps to improve the Clostridium cluster IV & XIVA which are responsible to increase the Lactobacillus count in the gut and maintains or improve microflora through competitive expulsion. This, then enables to improve the litter quality.

Organic Acids such as Coated Benzoic acids helps not only to reduce pathogenic bacteria such Clostridium, Salmonella as well they help to improve Lactobacillus count in gut through increase in Clostridium clusters IV and XIVA which are responsible for Increase in Lactobacillus count.

Essential oils are considered primarily Digestive enhancers apart from their immune function. They help to digest the nutrients in early stages effectively where endogenous enzyme is not active fully. Also, they impede quorum sensing, thus acts as Antibacterial in nature too.

Addition of Good organic Acids such as formic Acids, Propionic acids in water to keep water acidification at par is key to improve water quality. Water intake is always a concern in winter. Thus, Effective use of Organic acids along with water Sanitisers to improve water quality and intake should always be considered in winter season.

Below are some pics showing the brooding in Winter and Impact of Winter on gut Health if not managed well...





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Gout in Poultry

Dr. V. Rajendra Prasad

Gout in India is still one of the major causes for huge mortality and morbidity in poultry, causing great monetary losses to the producers.

Gout due to water deprivation, particularly in the winter season in various parts of India should be taken care of by providing optimal brooding temperatures.



Causes of Gout

- Nutritional including minerals, vitamins, and protein.
- Infectious diseases viral as IB, Astro and IBD
- or metabolic as Ascites – Hypoxic conditions increase the production of uric acid.
- Ascites in the initial stages can lead to symptoms of gout.

Managemental causes:

- Water deprivation
- or improper hatchery management like Improper egg storage,
- Inadequate incubation conditions,
- Improper conditions in chick holding room,
- Chicks held for a long in hatchery
- or transported for a long distance without water.

Mycotoxins, drugs, or chemicals.

Prevention & Treatment includes

Breeder management along with adequate farm and hatchery management are crucial in preventing incidences of gout.

No medication alters the course of IBV infection, but we can give antimicrobial therapy to reduce

mortalities caused by complicating bacterial infections.

Immuno modulators in water for few weeks will considerably reduce the intensity.

Feed needs to be supplemented with good quality acidifier and toxin binder to take care of mycotoxin and microbial (bacterial and fungal) load respectively.

Supplement with Electrolytes, Vitamins, and minerals in drinking water

Reducing the protein concentrations in feed and feeding with maize grain particles for three

to five days to reduce the exertion of kidneys and to expel uric acid.

Use of jaggery (concentrated sugar) also seems to be beneficial.

The producer should be proactive enough to include optimal additives/supplements in water that would aid in cutting down the usual mortality pattern.

Any practice that encourages flushing out uric acid crystals should be adopted, the easiest and vital being boosting up water intake, or else the whole effort of providing medications through water can be futile.





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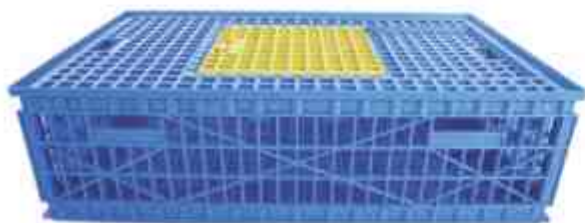
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Layer Poultry Medicine Schedule Chart

Mr. Rakesh Kumar

Director - Marketing

Growel Agrovet Private Limited | www.growelagrovet.com

Layer Poultry Medicine Chart has been prepared by renowned poultry veterinarians while keeping in mind that a healthy layer poultry bird should lay maximum and the best quality of eggs. As we know that a healthy layer poultry birds need balanced nutrition with enough proteins, vitamins, minerals, calcium, hygienic water & other nutrients apart from a hygienic environment for better egg production.

One more important thing is that layer poultry birds need different nutrients at different life cycle stages. So we should keep in mind that the birds should lay the maximum best quality of eggs possible, and the birds should remain healthy.

Keeping all these factors in mind, we have prepared the following Growel' layer poultry medicine chart:

1. Viraclean: The shed should be cleaned three days before layer poultry birds come to the farm, and Viraclean should be regularly sprayed inside and for three days. All feeders,

drinkers & equipment should be washed with Viraclean solutions twenty-four (24) hours before the birds reach the farm. Once birds reach the shed, Viraclean should be sprayed regularly inside and outside the shed three times a week.

2. Aquacure: Aquacure should be mixed regularly with drinking water. Medicines should also be given with Aquacure treated water.

3. Electral Energy: After birds reach the farm, Electral Energy must be given on the first day and the second day in the morning. In summer or during any stress, it should be given regularly.

4. Respiratory Herbs:

Respiratory herbs should be given as a preventive dosage from the third day to the sixth day. The preventive dosages of Respiratory Herbs should be one ml. for 100 birds. Under the



Rakesh Kumar

condition of CRD and E-Coli, the dosages should be 5-10 ml. for every 100 birds till recovery.

5. Amino Power: Amino Power should be given from day one till getting the standard egg production curve. After getting the standard egg production curve, it should be given thrice in a week.

6. Growvit-A: Growvit-A should be given from the first week and should be given a week thrice.

7. Growvit Power: Growvit Power should be given from the second week, and it should be given thrice in a week, with a blend of Grow B-Plex 50/50 ratio.

8. Grow B-Plex: Grow B-Plex should be given from the second week, and it should be given thrice in a week, with a blend of Grow B-Plex 50/50 ratio.

9. Growmin Forte Plus: Growmin Forte Plus should be given from the third week, and it should be given thrice in a week.

10. Growlive Forte: Growlive Forte should be given the fourth week, and it should be



given a week thrice.

12.Grow Cal -D3: Grow Cal-D3 should be given once the egg production starts, and it should be given a week thrice.

13.Grow E- Sel Power: Grow E-Sel Power should be given from the thirtieth (13) week, and it should be given thrice in a week.

Special Notes:

- The Layer Poultry Medicine Chartschedule can differ from one to three (1-3) days.
- For best results, Growel medicine should be given from day one. Medication should be given preference in the morning.

- If same day two medicines are given, then one medicine should be given in the morning and one in the evening.
- The water should be mixed with medicines so much that all water mixed medicines should be consumed at the earliest possible time, approximately within 2-3 hours.
- Always take care that medicines should not be wasted or left in a drinker or feeder. First, shake well all liquid medicines before every use, then mix the medicines properly with feed or water.

The proper method of feeding layer poultry medicine chart as per schedule:

- Medicine mixed water should be kept only that bird should drink it within two to four hours.
- Always take care that medications should not be wasted or left in a drinker or feeder.
- For a better result, follow the medicine chart schedule from day one.
- Usually, try to feed the medicines in the morning.
- Shake well all liquid medicines before every use.
- Then, mix the medication properly with feed or water.
- Keep sufficient drinkers and feeders.



Team Pixie wishes you a very **HAPPY NEW YEAR**

2022
Happy New Year

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Cultivated and Cruelty-free – ShioK Meats

ShioK Meats, co-founded by Dr. Sandhya Sriram, CEO and Dr. Ka Yi Ling, CTO has come a long way since its inception in 2018 as the first cultivated seafood and meat company in Southeast Asia and the first cultivated crustacean (shrimp, lobster, crab, crayfish) company globally to bring sustainable, healthy, cruelty-free, and delicious cultivated meat to the world.

They are committed to bringing this novel technology to the forefront of global food systems to feed 10 billion people by 2050. As a pioneer venture, they also

continue to educate consumers on the benefits of cell-based meat technology for the environment, human health, and animal welfare.

ShioK Meats has made significant progress in a short span of three years. They launched their first cell-based shrimp and lobster prototypes in exclusive tasting sessions in 2019 and 2020, respectively. The company currently employs 30+ scientists, engineers, food technologists, and business professionals and intends to launch in Singapore latest by 2023.

ShioK Meats, headquartered at Singapore, has also received the coveted Startup SG Tech Proof-of-Value (POV) grant from Enterprise Singapore to fast-track technology development/ commercialization.

ShioK Meats is the world's first cell-based crustacean meat company to raise a bridge funding round from South Korea's leading food industry players Woowa Brothers Asia Holdings and CJ CheilJedang Corporation and Vietnam's top seafood exporter Vinh Hoan Corporation. The total raised capital has reached approximately



US\$
3 0
million
till date.

This bridge round also included further investment from existing investors such as IRONGREY (Korean family office investing in global tech companies), Big Idea Ventures (USA/Singapore), Twynam Investments (Australia), Henry Soesanto (CEO of Monde Nissin), The Alexander Payne Living Trust (USA), Beyond Impact Vegan Partners (Europe), Boom Capital Fund (USA), Toyo Seikan Group Holdings (a Japan-based packaging and manufacturing company) and Mindshift Capital (UAE).

The Shiok team is very excited to be backed by partners who believe in their potential to scale and are equally passionate about the cell-based meat and seafood space. The next 12-18 months will be crucial, as the funds will allow them to advance their R&D efforts and build a state-of-the-art production facility in Singapore. They will expand operations, collaborations and also work on vertical and/or horizontal integration within the alternative protein industry.

Dr. Sandhya Sriram, the CEO and co-founder of Shiok Meats Pte. Ltd., Singapore, has over ten years of

experience working with muscle, adipose, cells, and stem cells. After graduating with a Ph.D. from Nanyang Technological University in Singapore, she pursued her postdoctoral work at A*STAR in Singapore. After postdoctoral work, she took up business development at a research institute. A multifaceted and talented Dr Sandhya has been recently named as part of the 2021 class of Bloomberg New Economy Catalysts and as one of Forbes Women in Tech.

She is also an advisor and investor to trailblazing Food Tech start-ups and has spoken at leading industry conferences worldwide. A proud mother to a 7-year-old, she is a 'conscious lifestyle' blogger, and an avid traveler and in her own word a 'productive juggler.'



The Effects of Phytogenic Feed Additives (Naturogen-510) on Performance

Gina Medina, L. Jungbauer and K. Wendler, Delacon Biotechnik, Steyregg, Austria and C.W. Kang, Konkuk University, Seoul, South Korea.



The poultry industry today faces challenges such as rising feed and production costs apart from the demand of being one major source of animal protein in response to the growing global human population in the perspective of food safety and security.

The ban on the use of in-feed antibiotics in Europe has influenced the increasing awareness of the consumers for food safety and health risk. Documented negative effects of using antibiotic growth promoters in feed triggered the continuous evaluation of in-feed natural growth promoter as an alternative. For the last 10 years, the studies on the use and benefits of natural products in the animal industry increased significantly.

Phytogenic feed additives (PFA) are products of plant-origin that includes herbs, spices, essential oils and other plant extracts. PFA are known to stimulate digestive processes and to improve gut health. Increased nutrient digestibility is reflected in better animal performance.

Different effects of PFA compounds like antioxidative properties (especially monoterpenes thymol and

Treatments	Protein digestibility %	Energy availability %
T1 (Control/ basal diet)	91.90	84.00
T2 (reduced nutrient density diet)	91.50	81.30
T3 (T1 + PFA at 150g/ mt feed)	94.80	86.20
T4 (T2 + PFA at 150g/ mt feed)	96.80	85.90

Table 2. Effect on protein digestibility and energy availability.

carvacrol, flavonoids, anthocyanes), antimicrobial actions (phenolic compounds being the principal active components), growth promoting efficacy (for example stabilising feed hygiene, by affecting the ecosystem of gastrointestinal microbes, improving digestibility) and improvement of flavour and palatability of feed are reported for broilers.

In several publications Awaad et al. (2010), Jafari et al. (2009) and Liu et al. (2010) show positive effects of plants and plant extracts on the immune response and antibody titers to NDV of broilers. The aim of the study was to determine the effects of phytogenic feed additive (Naturogen- 510) on zootechnical performance, immune response and nutrient digestibility in broilers.

Materials and methods

A total of 840 male day-old Ross 308 male broilers were randomly distributed to four experimental treatments based on a 2x2 factorial design, supplementation of commercial phytogenic feed additive (Naturogen-

510) and the recommended and reduced dietary nutrient levels respectively.

Each treatment was replicated seven times with 30 broilers per replicate. The birds were fed with corn/soy starter (1-21 days) and finisher (22-35 days) mash rations for 35 days based on the following treatments:

- Basal/control diet (T1).
- Diet with reduced nutrient level (T2).
- T1 plus 150g of phytogenic feed additive (T3).
- T2 plus 150g of phytogenic feed additive.

The nutritional matrix of the tested PFA was considered in the formulation of the reduced nutrient density diet. Feed and water were provided ad libitum. Parameters measured were feed intake, body weight, feed conversion ratio, mortality, Newcastle disease virus antibody titer and protein and energy digestibility.

Broilers were inoculated with

Table 1. Zootechnical performance results.

Treatments	Day 1-35			
	ADG (g/d)	ADFI (g/d)	FCR (g/g)	Final body weight (g)
T1 (Control/ basal diet)	48.01 ^{bc}	91.88 ^a	1.92 ^a	1721
T2 (reduced nutrient density diet)	47.56 ^a	89.16 ^a	1.88 ^a	1656
T3 (T1 + PFA at 150g/ mt feed)	50.41 ^{ab}	91.71 ^a	1.82 ^{ab}	1754
T4 (T2 + PFA at 150g/ mt feed)	48.75 ^{bc}	87.68 ^b	1.80 ^b	1698

Values with different superscripts differ significantly (P < 0.05)

Calculated nutritional content	Starter (1-21 days)		Finisher (22-35 days)	
	T1/T3	T2/T4	T1/T3	T2/T4
ME _{in} (kcal/kg)	3,100	3,045	3,150	3,100
Crude protein (%)	21.50	20.50	19.64	19.00
Ca (%)	1.00	1.00	1.00	1.00
Available P (%)	0.40	0.35	0.30	0.25
Lysine (%)	1.13	1.07	1.02	0.97
Cys+Met (%)	0.90	0.86	0.73	0.70

^a Recommended ^b Reduced

Table 3. Approximate calculated nutritional content of the starter and finisher diets.

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What if we could harness
the benefits of immunity boosting
herbs and further potentiate it with
Organic Selenium and Vitamin E.



**ImmuNex Plus - Finally an immunity booster that leads to
measurable improvement in performance and profitability.**

- Improved titer against ND & IBD vaccines.
- Improved health of immunogenic organs like bursa, spleen, thymus and peripheral lymphoid tissues.
- Generates ability to positively respond to various stress factors.
- Better response to ancillary treatment.
- Improved FCR and healthier birds.

	ND titer (\log_2)	Mortality (%)
T1 (Control/ basal diet)	2.29	7.62
T2 (reduced nutrient density diet)	2.00	5.71
T3 (T1 + PFA at 150g/ mt feed)	2.57	6.67
T4 (T2 + PFA at 150g/ mt feed)	2.43	4.76
Basal diet (control)	2.14	
Diet w/ PFA	2.50	

Table 4. Effect on antibody titer and mortality.

commercially available live NDV vaccine by intra- muscular injection on the 14th day of the experiment.

Blood was taken from the jugular vein from two weeks after injection. Serum samples were analyzed for anti-NDV antibody titers by ELISA with commercial kits, following the manufacturer's directions.

Feed samples were analyzed for nutritional content. Data were analyzed using a randomized complete block design following

GLM procedure of SAS and statistical significance at $P \leq 0.05$.

Results and discussion

The overall zootechnical performance effect on body weight, daily gain, feed intake and feed conversion ratio are shown on Table 1.

The treatment diets with PFA (T3 and T4) showed numerically higher final body weight than diets without PFA (T1 and T2) by 1.9% and 2.5% respectively.

Reduction on nutrient density level lowered feed intake and daily weight gain which resulted in significantly better feed conversion ratio (T1 vs T2). The addition of commercial PFA product either at the recommended /normal basal diet or at reduced

nutrient density diet (Table 3) showed significant improvement in feed conversion ratio after 35 days by 5.2% and 4.2% respectively. The higher protein digestibility and energy availability on diets supplemented with PFA either at recommended or reduced nutrient density as reflected in (Table 2) might contribute to the better body weight and FCR.

An overall statistical analysis has shown that the addition of tested PFA (Naturogen-510) significantly improved ($p=0.006$) feed conversion ratio from $1.89 \pm 0.09\text{g/g}$ in the control groups to $1.80 \pm 0.05\text{g/g}$ (-5%) in

the groups with PFA on day 35. The results supported other studies conducted demonstrating the beneficial effect of phytogenic feed additives. PFA have shown to stimulate secretion of digestive juices, enhances activity of digestive enzymes and reduces intestinal ammonia formation. The increased secretion of digestive enzymes might improve nutrient breakdown and thus, increase availability and absorption of nutrients.

Based on the blood serum analysis for antibody titer against Newcastle disease virus, the addition of tested PFA at both control/basal diet and

reduced nutrient density diets increased the amount of antibody by 12.2% and 21.5%, respectively.

Similarly, the same positive effect on mortality was reflected in diets with the PFA as shown on Table 3. The results demonstrated that PFA added to broiler diets can enhance immunological activity.

Liu et al. (2010) showed that the addition of plant extracts (Radix astragali, Radix codonopsis, Herba epimedii, Radix glycyrrhizae) to the drinking water improved immune response and increased antibody titers to NDV.

Awaad et al. (2010) showed that eucalyptus and peppermint oils are able to implement humoral immune response in chicks against ND. While Jafari et al. (2009) reported that the addition of fresh garlic to broiler diets has the potential to increase serum globulins in broilers vaccinated against common broiler pathogens.

Conclusion

This study has shown the beneficial and promising effects of phytogenic feed additive (Natutogen-510) on zootechnical performance, immune response and nutrient digestibility in broiler production.

MANAGING YOUR BIRDS DURING WINTER / COLD STRESS

INDIAN HERBS



WINTER CHALLENGES:

Respiratory infections, wet litter and foot pad dermatitis

ANIMUNIN

To keep respiratory tract clean and optimally functional

ANIMUNIN POWDER

A natural alternate to conventional antibiotic (Tiamulin, Tylosin, CTC) for prevention of respiratory diseases

ANIMUNIN LIQUID

As an adjuvant alongwith conventional antibiotics for treatment of CRD/ respiratory infections

EUCALYPTUS

OCIMUM SANTUM



CARDAM

CURCUMA LONGA

CEDRUS DEODARA

Anti-septic,
Anti-allergic

Anti-inflammatory
action

Respiratory
stimulant

Mucolytic,
Demulcent

Decongestant,
Antitussive, Expectorant

FEED INCLUSION RATE

Powder: 750g - 1 kg per ton of feed.

Liquid: To be given once daily with drinking water.

Broilers	Layers	Quantity (per 100 birds)
0-2 Weeks	0-8 Weeks	10 ml
3-4 Weeks	9-20 Weeks	20 ml
5th Week & onwards	21-72 Weeks	40 ml

- To be given regularly in broilers, layer-chicks and growers.
- In layers to be given 7-10 days every month, as required.
- Double quantity is recommended for broilers and during challenging conditions (for first 10 days).



1 Ltr & 5 Ltr 10 kg & 25 kg

Let your birds inhale ammonia free air.....

AMMOFREE

Premix

Natural solution for minimizing ammonia emission



At 10 ppm:

Respiratory discomfort, Reduced performance



At 25 ppm:

Reduced respiratory immunity, Increased incidences of respiratory diseases



At 50 ppm:

Eye irritation, Lachrymation, Conjunctivitis



At 100 ppm:

Ascites, Breast burns, Dermatitis, Carcass condemnation



USAGE

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

FEED INCLUSION RATE

200-250g/ton of feed, or as advised by the poultry consultant.



1 kg



10 kg

AMMONIA

A detrimental air toxicant in poultry house

Indian Herbs Launches

Minera-P

Blend of glycinated trace minerals fortified with phyto-molecules



Chlorophyll
enhances mineral
absorption



Alkaline
improves digestion



Essential
Amino acids
& Minerals



Minerals
Antioxidant & Adaptogen



Antioxidant
improves egg production



- Higher body weight gain
- Better feed conversion ratio (FCR)

- Optimized dressing percentage
- Higher meat yield

- Higher fertility and hatchability
- Progeny benefits

- Higher egg production
- Better egg quality

- Increased calcium absorption
- Higher leg and bone strength

- Boosts immunity
- Better vaccination response

- Reduces stress
- Reduces foot pad dermatitis

- Helps attaining full genetic potential

Mixing Ratio (Per MT of Feed)

	For complete replacement of inorganic minerals	For partial replacement of inorganic minerals or on top applications
Layer	500 g	250 g
Broiler	500 g	250 g
Breeder	750 g to 1 Kg	500 g



25 kg

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Poultry Disease Prevention and Management

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Poultry is the fastest growing business sector in animal agriculture in India. The estimated worth of poultry sector is estimated to be approximately rupees one lakh crores. The poultry industry in India has endured an exemplary transformation in structure and operation during the last two decades and modified into a mega-industry with the presence of a huge number of workers from a mere backward poultry farming that appears to be very fast. When we see the complete overview, the production of crops has been growing at a rate of 1.5-2% per annum whereas the production of eggs and broilers has been growing at a rate of 8-10% per annum. India is the third-largest producer of eggs and the fifth-largest producer of chicken meat in the world. Chicken meat is the second most widely consumed meat in the world and has come out as the second most widely consumed meat in the world. Prevention and control of



diseases is one of the most important aspect for sustaining the profitability of poultry business. This key fact explains why knowing the cost of manufacturing is critical, how to use bench marking to track firm profitability, and how to utilise financial ratios to predict future viability. For the prevention and control of poultry diseases, keep the following essential factors in mind.

After maintaining a clean and hygienic environment through

proper poultry farming practices, routine preventative actions are the next line of defence against disease. Among the preventative strategies are:

- Vaccination
- Parasite control
- Identifying and treating sick birds
- Separating multi-age flocks
- Practising routine biosecurity procedures between flocks and staff working with them.



Vaccination: Many poultry diseases can be prevented with vaccination. Follow a proper vaccination programme or only buy stock that has been properly vaccinated. When purchasing chicks or pullets, ask your supplier for vaccination certificates.

Poultry vaccinations include: Avian encephalomyelitis, Chicken anaemia, Egg drop syndrome 76, Fowl cholera, Fowl pox, Infectious bronchitis, Infectious bursal disease, Infectious bursal disease, Infectious coryza, Infectious laryngotracheitis, Marek's disease, Newcastle disease.

For breeders of poultry, when vaccinating: Always follow the label's recommendations, including the storage conditions. Use syringes and needles that are disposable. Be sure to properly dispose of any unwanted vaccines, syringes, or needles, and keep the area clean but never use detergents or disinfectants near immunisation equipment. Before vaccinating with fowl pox or Marek's HVT vaccine, do not disinfect your skin because this will kill the vaccine virus.

Parasite control

Internal and external parasites will be more prevalent in birds kept on the floor with access to pastures and outdoor spaces.

It's critical to have a preventative programme in place for birds kept in these conditions and to treat them as needed. This reduces physical stress and keeps birds in good health, allowing them to resist sickness. Parasites can be controlled by:

- Regularly inspecting birds for external parasites
- Spraying or dusting birds thoroughly with an approved insecticide if you can see lice or mites - spray the shed, perches and nests thoroughly, making sure the insecticide gets into crevices
- Cleaning sheds and rotating ranges to prevent worms
- Regularly checking faecal material for any sign of worms
- Always checking the label on worming treatments for withholding periods as some are not suitable for production birds
- Consulting a veterinarian.

Remove sick birds

Observe your birds on a regular basis for symptoms of illness or difficulties within the flock, such as feather plucking. Remove unwell chickens and other poultry from the main flock and consult a professional for a diagnosis. The appearance of sick birds differs

from that of healthy birds. Once you've identified the ailment or problem, you'll be able to administer the appropriate treatment. Keep sick birds separated from the rest of the flock until they have fully recovered. It is critical to follow any withholding periods if medication is administered.

Multi-age flocks

When younger birds are introduced into a flock of older birds, the chance of disease transmission from the older birds to the younger birds increases. Diseases and pathologies that younger birds have not been exposed to are often built into the resistance of older birds. When introducing new birds to a flock, there is a higher chance of feather pecking and social difficulties. From a disease standpoint, single-aged flocks are preferred. If this is not possible and you have multi-age flocks, you should:

- Separate age groups - use an all-in/all-out method for each age group to ensure that facilities and equipment are thoroughly cleaned and disinfected between batches.
- Always start work with younger poultry and finish with the oldest.



Overcoming the Common Challenges in the Pre-pullet Stage

Pre-pullet stage is comprised of chick and grower stage, which is the most important stage of layer life, influencing the future performance of flock as well as the economy of farm. Set of expectations from the pre-pullet stage are,

1. **Standard body weight**
2. **Liveability**
3. **Sexual maturity at optimal age and weight**
4. **More marketable eggs or minimal pullet eggs**

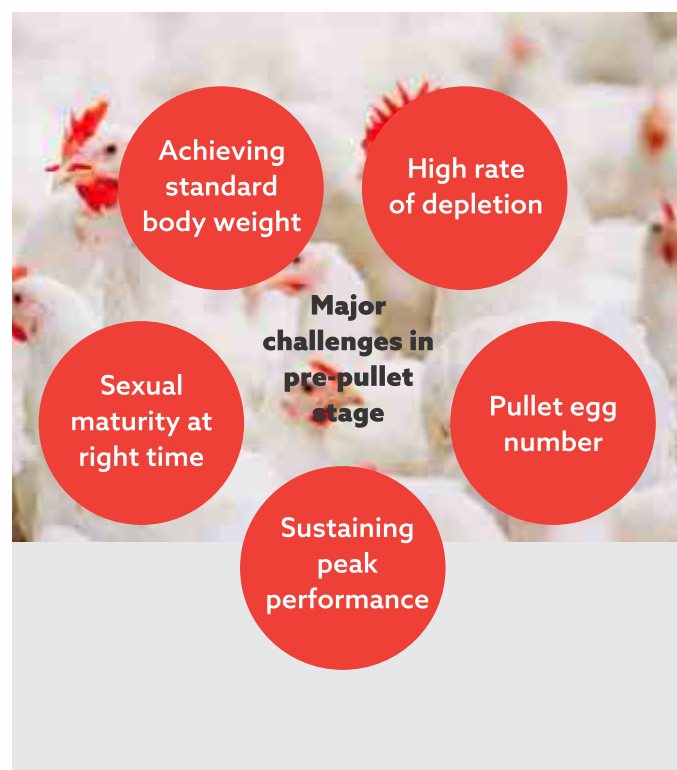
These expectations can be achieved only by providing utmost managemental and nutritional support to the birds right from an early age. This insight points out the common challenges and the

possible way to overcome the same during pre-pullet stage.

Normally, in the farms, a marked deviation in the performance parameters was observed when compared to breeds' potential. Based on the general observation, the possible causes would be inappropriate management, imbalanced nutrition, environmental influence, etc.

Economic Impact of Deviation from Standards.

For a flock of 10,000 birds, with pullet rearing cost of approximately Rs 300/bird, egg rate considered as Rs 4.50, pullet egg rate as Rs 3.25 and Rs 5.00 as an investment through medication of each bird for course correction.



1 % production drop during peak:

**Impact of
₹ 31,500**

1-week lesser peak production:

**Impact of
₹ 3,150**

1% extra mortality:

**Impact of
₹ 67,925**

5 more pullet eggs:

**Impact of
₹ 53,125**



Asses based on observation from farms & feedback from egg producers



1. Standard Body Weight

Pre-pullet stage is the fast-growing stage of caged layer. Each breed has different standards for the growth rate and feed intake, but almost in all the breeds, 90% frame size is developed by 12-16 weeks of age. So, monitoring weekly body weight will give a comprehensive evaluation of the flock. Assessment of body weight to the standard and flock uniformity is essential, at least once a month (4th, 8th, 12th, 16th weeks). A random sampling of 100 birds is recommended from different locations of the flock.

**Proper body weight -
The most important criterion
for better performance
of caged layer birds**



Early detection of deviation in body weight can be corrected much efficiently than at a later stage. Proper body weight is an important criterion for better uniformity of flock, thus influencing the sexual maturity, pullet eggs, peak performance and laying cycle. There are some critical aspects to be taken care to achieve the standard body weight during chick and grower stage. Major points are,

- Day-old chick & its environment
- Brooding management
- Space allocation
- Nutrition and gut health of chick.

1.1 Day old chick & its Environment

Before the arrival of chicks, the farm should be furnished with all equipment in good working order, thoroughly cleaned and disinfected, including the side curtains. Temperature should be maintained for 24 hours prior to the placement of the chicks.



Chicks should be placed at the earliest in the farm to minimize stress. Provision of water and feed should be provided along with proper lighting source. Chick qualities like weight, physical

appearance and alertness should be monitored properly to evaluate the health of flock.

1.2 Brooding Management

Chicks cannot be able to maintain their body temperature for the first few weeks. To provide comfort and wellness to the birds, it is mandatory to supply the required temperature at the farm level. Along with the temperature, minimum ventilation is also critical for this chick stage. Ventilation will improve the air quality inside the shed by facilitating oxygen, removing foul gas from shed and help to maintain the required relative humidity between 60-70 %.

**Brooding -
Meant for comfort
and wellness**



1.3 Space Allocation

It is the keystone to obtaining the deserved uniformity in the flock. Increased density, even at marginal levels, would affect the micro-environment around the bird and feed/watering behaviour, which further influences the flock health. Provision of proper space for chicks and growers, feeders and water will reduce the competition among the birds. Compromise on comfort will cause stress on the birds. Stressed birds will succumb to accidental death, high rate of disease incidence, etc. Wastage of feed and water is another problem of insufficient space allocation, which causes economic loss to the farm.



**Adequate
Space**



**Better
Uniformity of Flock**

1.4 Nutrition & Gut Health

Balanced nutrition is a vital factor for better bird performance. Quality of feed varies with availability and high price of major raw materials (RM) and increased levels of alternate RM usage. Though inclusion of alternate RM will reduce feed cost, the flock productivity will get affected drastically. High inclusion of alternate raw materials in feed reduces the digestibility.



Raw material selection should be made with utmost care, otherwise, there might be chances of indigestion and toxicity-related problems, which lower the performance of birds. Substandard water quality will increase the chance of bacterial load in the farm and impair the gut health of flock.

2. Livability

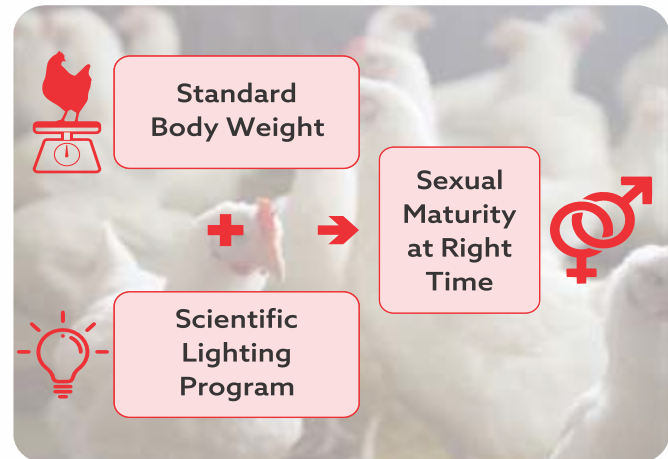
In chick and grower period, birds may face disease challenges like infectious laryngotracheitis, newcastle disease, *E.coli*, chronic respiratory disease, infectious coryza, wing rot, etc. Because of these disease challenges, mortality rate might be increased. The feed intake of birds will reduce, and it leads to low body weight and poor uniformity.



The immune support programs either through feed or drinking water along with the vaccination schedule should be followed to prevent and /or minimize the impact of pathogenic challenges. Stress due to change in environment, biosecurity breach, usage of alternate RM, etc. will increase the depletion rate.

3. Sexual Maturity

Sexual maturity is always interlinked with bodyweight and lighting program. Flock uniformity and a properly developed GI tract will support achieving the desired body weight and sexual maturity at the right time. Chicks are sensitive to



light intensity (20-30 lx) and its duration. The light should be provided as per the bodyweight rather than the age. Chicks need 24 hours of light during the first week, followed by 20 hours till 7 weeks of age. From 7th week to the week when birds achieve 1.0 kg body weight, it requires 14 hours of lighting. The light should be increased by 30 minutes per week, after attaining 1.0 kg body weight. laying stage requires 16 hours of lighting.

4. Pullet Eggs

Pullet egg number is directly proportional to the bodyweight of bird and lighting program. Early lighting will cause poor egg weight and prolapse. Delayed lighting will delay the peak and result in a lesser number of eggs. Egg size and number can be improved by proper nutrition and lighting management. Stressed birds produce more pullet eggs so, necessary action has to be done to eliminate all the stress factors during the chick and grower stage.

5. Sustaining Peak Performance

Peak performance will indicate the health of flock and farm. Peak performance in weeks and percentage need to be achieved as per the breed standard for better economic efficiency of the flock. **Standard body weight, sexual maturity and depletion will directly influence the peak performance.** Proper care of pre-pullet stage will bring better efficiency in laying cycle.



Pre-pullet stage is an important phase of the caged layer. This period is called as investment period for laying cycle. Maximum care during brooding and growing will pay maximum returns during laying, and no correction can be efficiently done once this phase is over.

Farm Level Check list

Following could be an indicative physical checklist to assess the farm and bird health.

CHICK	GROWER
Comfort in brooding	Space & shifting time
Early nutrition	Sexual maturity on time
Feed wastage	Feed consumption & wastage
Weekly bodyweight	Standard bodyweight
Early chick mortality	Disease & weak birds
Debeaking	Grading & culling
Effective vaccination	Effective vaccination
Water quality & facility	Water quality & facility

Measures to Overcome the Challenges

Two important pillars to be corrected to overcome the major challenges in the field are management aspects and enhancing the nutritional and health aspects of diet.

MANAGEMENT	NUTRITION
Brooding	Immunomodulators
Space	Anti-stress Factors
Light	Gut Health Modulators
Vaccines	Enzymes
Bio security	Toxin Binders
Water	Trace Minerals

Source

Management guides of various layer breeds in South Asia.

Note

Observed challenges and suggestive measures are based on the general broader observation from multiple flocks and feedbacks from layer farmers. The actual challenges and requirements might vary at individual farm levels, hence, it is suggested to consult a management expert and nutritionist for most appropriate measures.

KEPREX™ LP is a comprehensive feed additive and supplement solution for enhancing nutrition and health aspects of pre-pullet diets, for better body weight, uniformity, livability, body weight at sexual maturity, more saleable eggs and future flock performance while adopting suitable management practices.

Please do reach Kemin



KEPREX™ LP

Reclaim Your Peace of Mind

KEMIN®

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The Effects of Intestinal Microbiota and Metabolites on Broiler Chicken Health and Performance

Dr. Neelam Chaudhary

Category Manager, Agri Commodities Krimanshi Technologies Pvt. Ltd.



Over the course of decades, India's poultry sector business has undergone a paradigm shift from a simple backyard occupation to a large commercial agri-based enterprise. High-yielding layer and broiler varieties, combined with a standardized package of nutrition, housing, management, and disease control practices, have helped India achieve spectacular growth rates in egg and broiler production. In poultry production, feed efficiency and high bird performance are critical goals. To attain these objectives, the quality of the feed, environmental circumstances and as well as bird health must be taken into account. The phrase "gut health" has become a key indicator of poultry health, it is an important and complex area that combines diet, microbiology, immunology, and physiology. The delicate equilibrium between the host, the intestinal microbiota, the intestinal environment, and dietary components is essential for gut health. Any imbalance in the gut environment puts gut health at risk, which can have an influence on the poultry's health and production performance.

The role of intestinal bacteria on broiler chicken performance has been investigated for decades. The distal intestine is home to the vast majority of gut bacteria, with concentrations approaching 10^{11} to 10^{12} cells/g, the highest ever observed for any microbial habitat. Nutritional digestion, absorption, metabolism, and general health and growth performance of poultry are all improved by gut bacteria and their metabolic products. Understanding the impact of feed additives on the intestinal microbiota of chicken, as well as their implications on general health and growth performance and interconnections will aid in the development of new dietary and management techniques, which will result in increased feed consumption and improved chicken growth performance.

Probiotics, prebiotics, organic acids, and exogenous enzymes have been shown to regulate gut flora and are frequently

referred to as "antibiotic alternatives," and they have proven to be effective in programmes aimed at reducing antibiotic use. However, it's vital to remember that their usage is more preventative, the goal is to provide a product that provides a solution to the gut's demands at critical moments in the chicken's life as part of a planned strategy.

Role of Probiotics/ Prebiotics in Poultry Nutrition

Prebiotics: According to the US National Food Ingredient Association, Probiotic sometimes known as "direct fed microbial" is a source of live naturally occurring microorganisms, such as bacteria, fungus, and yeast and are live microbial feed additives that benefit the host animal by enhancing the microbial balance in its intestine. Some of the most often utilized probiotics in poultry are *Bifidobacterium* spp., *Bacillus subtilis*, and *Lactobacillus* spp. A commercial probiotic mixture of yeasts and other microbes improves broiler growth performance without any dose effect from 0.2% to 0.6%.

Bacillus amyloliquefaciens enhances gut health and growth performance is a root-colonizing biocontrol bacteria used to fight plant root pathogens in agriculture, aquaculture, and hydroponics. *Bacillus subtilis* found in soil and the gastrointestinal tract of ruminants and humans has been shown to be effective against *Salmonella* infection, enhances laying performance by increased egg quality and production and helps the immune system and gut health, also when feed supplemented with *B. subtilis* increases the body weights by 4.4% in broiler. *Lactobacillus fermentum*, *Lactobacillus reuteri* enhances growth performance, gut histomorphology, immune system, and gut health. *Pediococcus acidilactici* found in fermented vegetables, fermented dairy products, and meat improves laying performance and modulates the gut

microbiota. *Propionibacterium acidipropionici* found in dairy products contributes to the better development of gut mucosa in poultry. In male broilers, the effects of *Saccharomyces cerevisiae* (SC) cell components on meat quality are enhanced meat tenderness. *Bacillus licheniformis* acts as an immune system enhancer and a hormone regulator has been shown to improve productivity and meat quality in broilers. *Rhodobacter capsulatus* improved poultry health and egg quality. Among the laying hens treated with *C. butyricum*, egg quality improved significantly due to the significant increase in crude protein content of albumen. *Enterococcus faecium* and *Bifidobacterium thermophilus* have improved the quality, size, and productivity of eggs in layers.

Probiotics might be utilized successfully as nutritional aids in poultry feeds in assisting proper development of gut structure and morphology, providing protection against luminal pathogens, produce antimicrobial compounds, modulate immune response and playing an active part in food digestion and utilization to boost animal performance and thus improving poultry meat quality. Unlike antibiotics, probiotics do not develop or spread microbial resistance, making them a more viable alternative to antibiotics.

Prebiotics: Prebiotics were characterised as non-digestible dietary components that foster one or more beneficial bacteria in the gastrointestinal tract, improve GIT health, and perhaps improve host health. Most non-digestible carbohydrates, such as fructo-oligosaccharides (FOS), galacto-oligosaccharides (GOS), mannan-oligosaccharides (MOS), soya-oligosaccharides (SOS), xylo-oligosaccharides (XOS), pyrodextrins and similar carbohydrate polymers, are classified as prebiotics by this definition. Lactulose, mannitol, maltodextrin, raffinose, and sorbitol are also prebiotics and have proven health benefits. Usually, poultry are



given prebiotics orally immediately after hatching, either by spraying them directly in their feed or by adding them directly to drinking water. Prebiotics not only modulate the intestinal microbiota but also improve systemic health, which shows in improved performance parameters such as egg production, body weight gain, feed conversion ratio, and mortality index. Prebiotics appear to have an immune-stimulatory impact on the host as well as the ability to function as adjuvants to augment vaccine-induced immune responses.

Feeding 0.25% FOS and 0.05% MOS to broilers has been reported to boost the diversity and population of *Lactobacillus* and while decreasing the population of *E. coli* and *Clostridium perfringens* in the ileum (Kim et al., 2011). According to Shang et al., (2010) by increasing prebiotic concentrations, dietary supplementation with different levels of inulin reduced coliform bacteria counts in laying hens, while 2.0% of inulin significantly increased cecal *Bifidobacterium* counts. However, the effectiveness of prebiotics is dependent on a variety of factors, including the type of supplement, doses, the composition of the basal diet, animal characteristics, and environmental conditions, all of which have different effects on different poultry species, making it necessary to determine the conditions under which prebiotics are effective and to elucidate the mechanisms(s) of action involved in order to ensure their effective use. As a result, employing current prebiotics or creating novel prebiotics as a feed addition to replace AGP (Antibiotic growth promoter) and modify microbiota for enhanced chicken development and health might be a viable option.

Organic acids: Organic acids like lactate, acetate, propionate, butyrate, tannic, fumaric, and caprylic acids were formerly employed as a preservative to prevent degradation and extend the shelf life of perishable foods both before and after harvest because they regulate microbial contamination. Organic acid supplementation may disrupt cell membranes or macromolecules, as well as nutrition transport and energy metabolism, resulting in bacterial mortality. As a result, organic acids have been added to feed or water to improve GIT disease prevention, immunity, nutritional digestibility, intestinal

health and overall growth performance in broiler chickens.

Exogenous enzymes: Exogenous enzymes are used to compensate for the lack of endogenous enzymes and to counteract the anti-nutritional elements found in both traditional and alternative poultry diets. Because non-conventional feedstuffs are often high in fibres, exogenous enzymes in conjunction with non-conventional ingredients are employed to minimise feeding costs and efficiently utilise non-conventional feed components. Exogenous enzymes have a multifaceted effect owing to their participation in nutrient partitioning and in assisting the growth of certain bacteria by creating nutrients for them. These enzymes are being employed as part of an integrated approach to minimise the economic burden by restricting GIT infections, as well as lowering medicine expenses, enhancing animal performance, and lowering mortality by improving gut health.

In addition to these feed additives, feed material also has an impact on gut microbiota and insect proteins are such ingredients which are gaining importance in the poultry industry in recent years.

Effects of insect meal (Black Soldier Fly) on gut microbiota of poultry

BSFL's nutritional profile, notably its necessary amino acid profile and the ability of insects to synthesise anti-microorganism peptides, stimulates their usage in farm animal feed. Lauric acid (C12:0), which accounts for up to 64% of the total saturated fatty acid content of the BSFL, may provide some health advantages to broilers. Fortuoso et al. (2019) investigated the potential benefits of including 0.03% and 2.6% lauric acid in broiler diets, respectively, and found a significant reduction in *Escherichia coli* and total bacterial counts in excreta samples, improving intestinal health and broiler performance. BSFL micro compounds were shown to inhibit the development of a variety of hazardous pathogens, including gram-positive *Staphylococcus aureus*, methicillin-resistant *S. aureus*, and gram-negative *Pseudomonas aeruginosa*, in vitro (Park et al., 2014). When administered in vitro at a least inhibitory concentration of 25 mg/mL, BSFL has been shown to exhibit antibacterial activity.

Broilers fed a balanced diet including up to 20% full-fat BSFL performed better than those fed a control diet, with the optimal inclusion level falling between 15% and



Uplifting the basic Infrastructure of the Schools - A Novus Animal Nutrition initiative

Novus Animal Nutrition under its CSR initiative has joined hands with Bhumi, India's largest independent youth volunteer non- profit organization

An important goal of their CSR activity has been to make schools more sustainable and to enable holistic education spaces for children by uplifting the basic infrastructure of the schools and turning them into a better place for educational progression for children. In line with this goal, they have taken on implementing various projects in schools of Vellore

distt, Chennai and in chickmagalore distt. (karnataka). They have made Cafeteria shed in Corporation Elementary school, Vaniyampadi, Tamil Nadu. Prior to this, the children used to have their mid-day meals by sitting in the playground. This project has benefitted 200 and above children studying in this school. New Roofing Sheets were

provided for Bharathamatha Nursery Primary school, Vyasarpadi, tamil Nadu to replace the ones that were laid 10 years ago and were leaking, rusted and damaged.

They have set clear goals to enable holistic education and provides safe, non- violent, inclusive and effective learning environment for all. They have created high quality



infrastructure that facilitates better instruction, improves student outcomes and reduces dropout rates, among other benefits.

The objectives of their CSR program includes safe

space with equitable quality education and promote lifelong learning opportunities for all. This CSR initiative of Novus Animal Health must be encouraged by all.



USAPEEC Appoints Greg Tyler to Succeed Jim Sumner as PRESIDENT & CEO



TUCKER, Georgia - (December 15, 2021) - The USA Poultry & Egg Export Council (USAPEEC) Executive Committee has appointed current Chief Operating Officer Greg Tyler as the council's next President and Chief Executive Officer, succeeding Jim Sumner who will be retiring from the position in June 2022 after 32 years leading the organization.

The announcement was made today at the 2021 USAPEEC Winter Meeting.

Under Sumner, the percentage of U.S. chicken production that is exported tripled to about 18 percent, and in 2020 U.S. broiler exports reached 3.6 million metric tons, up 589 percent from 1990. Significant gains also were made in exports of turkey and eggs.

During his tenure, USAPEEC has grown to 16 international offices on four continents, helped open trade with dozens of countries from Mexico to China to Cuba, and launched the International Poultry Council (IPC) and World Poultry Federation (WPF).

Tyler has been with USAPEEC for 25 years, starting as Director of Foreign Market Development & Asian Promotions, then being promoted to Vice President and Senior Vice President for Marketing before being named COO in July 2020. In those roles, he has supervised the international offices and marketing programs implemented in more than 75 countries.

Tyler, who holds bachelor's and master's degrees in agricultural economics from the University of Georgia, serves as Secretary/Treasurer of the U.S. Agricultural Export Development Council (USAEDC), an

export-oriented association representing U.S. commodity trade organizations, farmer cooperatives, and state regional trade groups.

"Jim has an outstanding legacy at USAPEEC," Tyler said. "I've learned a great deal from him in the 25 years we've worked together. My role now will be to build on that and ensure that we adapt to the everchanging global environment with the goal of continuing to increase U.S. poultry and egg exports. This will be achieved through a dedicated worldwide staff and the generous support of our members and funding sources."

Said Sumner, "I'm so proud of what we've been able to accomplish in my time at USAPEEC and grateful to have worked with so many talented people on the council and throughout our industry. I've truly enjoyed it. They've helped make this far more than a job for me. It's been a passion. And while this is not an easy decision, I know that USAPEEC is in good hands with Greg and our staff in the U.S. and around the world and that they will continue to fulfill our important mission for many years to come."

Sumner will remain involved with USAPEEC as a senior advisor and will continue his roles with the IPC and the WPF. He also will continue to serve as the industry's representative to the Agricultural Policy Advisory Committee (APAC) and other groups.

The USAPEEC Executive Committee began the process to prepare for a transition three years ago in anticipation of Sumner's eventual retirement, appointing a

succession committee whose work included reviewing candidates and choosing the next CEO. Identified as a top candidate, Tyler began sharing in some of the position's responsibilities a year ago. He officially will assume the post with Sumner's retirement after the 2022 USAPEEC Annual Meeting next June.

USAPEEC Chairman Chaz Wilson paid tribute to Sumner and said he expected the organization's success to continue under Tyler.

"Working with Jim for many years has been a privilege, both professionally and personally," Wilson said. "This line gets thrown around a lot, but it's really true in this case: he is a giant in our industry. He seems to know everyone and just about everything, and the work he has done to develop the export market around the world for U.S. poultry and egg products over three decades can't be overstated, and probably not duplicated. That said, no one is better suited and positioned than Greg to take over and carry USAPEEC forward in the coming years. He's proven himself in every arena and overcomes every challenge, and we anticipate great things ahead with him at the helm."

About USAPEEC

Founded in 1984, the USA Poultry & Egg Export Council (USAPEEC) is a non-profit, industry-sponsored trade organization dedicated to increasing exports of U.S. poultry and egg food products in all foreign markets. USAPEEC has a network of 16 representative offices worldwide and operates programs in 75 countries.



Omnichannel Player Fipola Announces 26 Outlets Across Bengaluru

Fipola Retail India, chennai founded brand operates 48 outlets across 7 cities in Chennai, Coimbatore, Hyderabad, Vellore, Tripura, Puducherry and now available in Bangalore.

"We are opening 100 outlets across South India by the end of March 2022 and 250 outlets in Pan India by 2023, " said Mr. Sanjoy Kumar Das, Chief Operating Officer. The company has targeted Rs. 140 crores by the end of March 2022 and Rs. 428 crores by the next financial year 2022- 2023, he added.

"We have already opened outlets in HSR Layout, AECS layout, Banashankari, Varthur Road near WhiteField , BTM layout, Indiranagar, KR Puram, Yelahanka during November and December. By January 2022, we will start the rest of the 20 stores in Bengaluru & will be adding 6 more stores in March 2022", Sanjoy added.

Fipola has an online presence too with more than 50 per cent of its revenues generated from its own app,

website and merchant platforms like Swiggy and Dunzo.

Fipola Retail India, a south India based, omnichannel meat D2C seafood retail brand was founded in December 2016. Fipola offers unlimited choice of meats (fish/poultry/Lamb/Goat), cuts and flavours. Fipola stands for FRESH Fish (FI) Poultry (PO) Lamb (LA).



ABTL

GLIMPSE FROM THE VIV MEA EXHIBITION 2021 AT ADNEC, ABU DHABI



Dr. Yogesh Jadhav & Dr. Rajendra Prasad with
Dr. Atul Rajput – Poultry Consultant from Pune, India.



Dr. Yogesh Jadhav & Dr. Rajendra Prasad with Mr. Imran Uddin
Shagor of Progressive Hatcheries from Bangladesh.

Looking back we can say that VIV MEA 2021 was a very successful exhibition. We'd like to thank everyone who made it a memorable with an everlasting experience.

Huge thumbs up to the VIV worldwide organization who made this event possible in the wonderful city of Abu Dhabi.

"ABTL"



Dr. Yogesh Jadhav with Mr. Niamat Ullah
Poultry Nutritionist, Bangladesh.



Team ABTL along with Dr. Ali Imam from Bangladesh
& Mr. Tunde Adewoye from Nigeria.

EVERLASTING MEMORIES FROM VIV MEA EXHIBITION-2021.



Team ABTL with Mr. Ali Kalbani &
Dr. Vikas Garad from Oman.



Team ABTL with Dr. Hadi from
Osool Poultry – Oman.

VIV expo has focused on the future of the global poultry industry and is also featuring the latest trends in dairy, fish, poultry, eggs & livestock. VIV MEA boosted our trade opportunities and great to see all at the global meet and proud to watch the leading model for boosting their exports.

Dr. Rajendra Prasad-Technical & Marketing Consultant, ABTL.



Team ABTL with Ms. Valerie Daher
– Utrix, Lebanon.



Team ABTL with Mr. Al-Shanfari & Dr. Kapil Jadhav
of Asaffa Foods from Oman.

EVERLASTING MEMORIES FROM VIV MEA EXHIBITION-2021.



Dr. Rajendra Prasad along with Mr. Shrikrishna Gangurde of Avee Broilers from Nashik, India.



Team ABTL along with Mr. Abdul Lateef from Dubai.

Glad to meet our esteemed customers and visitors after long time. Thank You to all visitors for your exceptional support at our ABTL booth during VIV MEA 2021. Hope to see you all again very soon.

Dr. Yogesh Jadhav – Export Manager, ABTL.



Dr. Rajendra Prasad along with Mr. Bayram KOC – M.D. & Dr. Gurcan Iyisan General Manager of Polimed from Turkey.



Dr. Yogesh Jadhav & Dr. Rajendra Prasad with Ms. HebaEL - Import & Export Manager from Egypt.



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Brand Revamp: Indian Poultry Enterprise Major Suguna Foods Preps for Nationwide Retail Presence



towards a new beginning and makes India nutritionally richer, healthier, and stronger.

"This rebranding exercise is a major initiative that we have undertaken to be relevant in today's digital world" quoted Mr. Soundararajan, Chairman of Suguna Group. He also stated that "We are laser-focused on increasing our business in India and expanding our market share worldwide with this new, refreshed brand strategy."

With an investment of ₹100 crores, the group plans to magnify its retail presence nationwide through opening 1,000+ outlets by 2025, he added. The

Bangalore: The Coimbatore-based 9000+crore Indian Poultry enterprise Suguna Foods proclaimed the launch of

its first click and mortar brand, Delfrez. With a complete brand restructuring, Suguna group envisages a March



existing 250 retail outlets in three southern states will be rebranded as Delfrez with 40 more stores added in the next four to six months in the western and northern States. The product range available under the brand would also be expanded.

Delfrez will be accessible through leading online & offline channels like Big Basket, Swiggy, Grofers, and Jiomart, housing an array of products that would be into Ready to Eat, Ready to Cook, and Marinates segments.

Executive Director of Suguna Foods- Mr. Vignesh Soundararajan, said: "Suguna Foods has four main verticals — Suguna Chicken, Suguna Feeds, Delfrez and Mother's Delight. We are a producer of live chicken and have an integrated value chain. By rebranding the processed chicken, mutton, and egg products, we want to focus on the farm-to-fork concept. Currently, about 5 % of our business is from processed products. These should contribute to 20 % of the company's topline by 2025."





Tyson Foods Donates \$100,000 in Wildfire Relief to Support Kansas Cattle Farmers and Ranchers

Donation to Kansas Livestock Association will help family and independent cattle producers affected by recent wildfires

Tyson Foods is donating \$100,000 to help support cattle farmers and ranchers affected by the recent wildfires in north central Kansas. Many family and independent farmers lost their homes, barns, and livestock.

"Our partnership with family and independent cattle producers is important to us, and we want to do our part to help those whose lives have been affected by the devastating wildfires," said Shane Miller, group president, Fresh Meats for Tyson Foods. "We're grateful for the longstanding

relationships we have with our Kansas independent cattle suppliers and stand beside them during this difficult time."

The company's donation will be made through the Kansas Livestock Association.

Tyson Foods employs more than 5,800 team members in seven locations in the state of Kansas, and partners with more than 300 independent cattle producers in the state to purchase approximately \$2 billion of cattle every year.

"This significant donation from Tyson is greatly appreciated," said KLA Chief

Executive Officer, Matt Teagarden. "Their support, along with that of other generous donors from across the country, will go a long way in helping Kansas livestock producers impacted by the fires and severe weather rebuild."

KLA and the Kansas Livestock Foundation are accepting donations to support farmers and ranchers impacted by the fire. The Foundation is working to identify a committee of livestock producers who will assess needs and oversee the distribution of funds raised.

Eggoz raises \$3.5 million in funding led by Nabventures



EGGOZ
Healthy and Nutritious

Eggoz, a brand of fresh and chemical-free eggs has announced that the company has raised \$3.5 million in

Series-A funding led by Nabventure, a venture growth equity fund that invests in agriculture, food, rural businesses and agri/rural financial service.

The funding also saw participation from Avaana Capital, Rebright Partners, Bellerive Capital and angel investors Sanjiv Rangrass and Indresh Saluja.

With this funding, the company plans to use the funds for increasing its brand footprints, egg-based products and entering new geographics

Abhishek, Co-founder, Eggoz commented on this recent funding, and said, "Eggoz is a vertically integrated farm-to-consumer startup, building a brand in a \$12B egg consumption market that is growing at 15% CAGR and 98% of total eggs are still consumed in unpackaged format. We, at Eggoz, are building the first nationwide farm to consumer brand that is centred around superior quality, high bioavailable nutrition and freshness. Over the past four years, we have developed our quality integration model and are now poised for rapid growth. I am thrilled to partner with NABVENTURES for the next phase of growth and our existing investors Avaana and Rebright for supporting us through thick and thin. I welcome all the investors to the Eggoz table as we scale the brand and platform to new heights and make Eggoz a household brand name."

"We in NABVENTURES believe that this initiative of Eggoz will bring egg production closer to the consumption centres in North India while augmenting farmers' income. We shall be working closely with Eggoz to deepen their penetration in the rural areas amongst farmers and other community groups." – Gills John, Vice President, NABVENTURES

Eggoz, Founded by Abhishek Negi, Uttam Kumar, Aditya Singh who are alumni of IIT Kharagpur and Pankaj Pandey, Gurgaon-based Eggoz today is India's only focused consumer brand play in eggs, which procures and delivers fresh and chemical-free eggs from farm to retailers within 24 hours of laying.

Besides its primary presence in Delhi-NCR, Eggoz is also present in major cities like Allahabad, Bhopal, Chandigarh, Indore, Patna and Ranchi.

The brand claims to work closely with farmers with an integrated model, ensuring 100% natural feed to birds and deploying IoT (Internet of things) and farmer app tech platforms.

Crysbro launches 2 new poultry products to local market

Sri Lanka's leading poultry producing giant Crysbro, renowned for its commitment to world-class quality assurance as well as an industry-leading vertically integrated manufacturing process, recently announced the launch of two new poultry products to the local market.

A guaranteed quality-controlled and home-grown product from start to finish, the two new products are the 12-cut 'Lesi Chicken' pack and the 'Frozen Griller Chicken' without giblet. Both new products are ISO 9001:2015, ISO 14001:2015, ISO 22000:2018 and Halal certified, reassuring the

consumer that they are purchasing a high-quality poultry product.

Commenting on the recent launch, Crysbro Senior Marketing Manager Amores Sellar said: "Our new poultry products are innovatively created to suit the personal preferences of every consumer. While convenience and nutritional value come with no doubt, the consumers can enjoy their chicken knowing that they're consuming a product that was crafted with much attention to detail and care, every step of the way."

By introducing new technology and safety measures into their processes, Crysbro is actively addressing the rising demand for poultry meat and eggs in Sri Lanka while greatly minimising risk to public health. By introducing new technology and safety measures into their processes, Crysbro is actively addressing the rising demand for poultry meat and eggs in Sri Lanka while greatly minimising risk to public health.

Future Meat Technologies Raises \$347 Million Series B Marking the Largest Investment Ever in Cultivated Meat

Co-led by ADM Ventures, Investment to Accelerate Plans For The Mass Production Of Cultivated Meat In The United States

Future Meat Also Announces It Has Surpassed Previously Announced Timelines, Successfully Reducing the Cost of Cultivated Chicken To \$7.70 Per Pound, \$1.70 Per Breast

Future Meat Technologies, (Future Meat), the first an industry-leading company developing innovative technology to produce cultivated meat, announced that it has raised

\$347 million in Series B round of financing.

The round was co-led by ADM Ventures, the venture investing arm of ADM, a global leader in human and animal nutrition. It also included participation from a global investor in leading technology companies, the Menora Mivtachim pension and insurance fund which manages over \$85 billion in assets, and S2G Ventures.

Other investors included industry leaders Tyson New Ventures, the venture capital arm of Tyson Foods and Rich Products Ventures, Manta Ray Ventures, Emerald Technology Ventures, ADM Capital (Cibus Fund), Bits X Bites, and the Sander Group. The company noted these investors represent massive support from key players in North America, Europe, and Asia.

"We are incredibly excited by the massive support of our global network of strategic and financial investors," said Professor Yaakov Nahmias, founder and president of Future Meat. "This financing consolidates Future Meat's position as the leading player in the cultivated meat industry, just three years after our launch. Our singular technology reduced production costs faster than anyone thought possible, paving the way for a massive expansion of operations. Our team will break ground on the first-of-its-kind, large-scale production facility in the United States in 2022."

Future Meat opened the world's first cultivated meat production line in Israel earlier this year, and is now scouting several locations in the United States for its projected large scale production facility.

Alongside its Series B funding, the company also announced that it is now producing cultivated chicken breast for just \$7.70 per pound, or \$1.70 per 110-gram chicken breast, down from under \$18 per pound just six months

ago. This cost reduction already surpassed the 18-month timeline projection that was announced in May of 2021 by the company's former chief executive Rom Kshuk.

UAE lifts ban on import of eggs, other poultry products from India

The United Arab Emirates (UAE) has lifted a ban on import of eggs and other poultry products from India, ahead of Prime Minister Narendra Modi's visit to the country in the January month. The move follows an assurance by New Delhi that it would follow biosafety norms set by the World Organization for Animal Health to prevent infection from bird flu.

India will be able to export table eggs, hatching eggs and day-old chicks to the UAE "from two establishments in Tamil Nadu," officials said. Poultry imports from India were banned since at least five years due to concerns over bird flu. India had sought market access for eggs under the trade pact it is negotiating with the UAE.

Poultry is one of the 1,100-odd products, including washing machines, air-conditioners, refrigerators, spices, tobacco, cotton fabrics, textiles and leather, whose exports New Delhi wants to increase through the agreement. The UAE is keen to get duty concessions from India for its dates, confectionary and sugar-based products.

The UAE is India's third-largest trading partner and bilateral trade was almost \$60 billion in FY20. It was India's second-largest export destination after the US, with an export value of around \$29 billion.

Modi is expected to announce the India-UAE Comprehensive Economic Partnership Agreement (CEPA), India's

first in the Gulf region, during his proposed visit. "Besides goods trade, the pact is of strategic importance for India and we can gain in services and investments and also seek long-term business visas with the UAE," the official said.

To ensure no circumvention of duties takes place through rerouting of trade routes, New Delhi has pushed for the mandatory 35% value addition in the origin country to claim duty exemption under the pact.

VDL Jansen: the new name of Jansen Poultry Equipment



As of 1 January 2022, Jansen Poultry Equipment will continue under the name VDL Jansen.

As of 1 October 2020, Jansen Poultry Equipment has been taken over by VDL Groep. A strategic choice of Mr. Ab Jansen, founder of Jansen Poultry Equipment, to safeguard the continuity for the long term and for VDL a strategic choice to further strengthen her market position in the agricultural sector.

The new logo of VDL Jansen is:

VDL Jansen

VDL Jansen (formerly Jansen Poultry Equipment) was founded in 1986 by Mr A. H. Jansen for development and production of the first automatic laying nests. With the knowledge of technology and poultry Jansen succeeded in developing the most sought-after laying nest. Today the company offers a wide range of poultry systems and has grown to become a flourishing international company with its headquarters located in the Netherlands.

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Barwala	482	494	518	522	522	527	527	527	512	512	512	512	517	520	520	520	520	520	510	515	519	519	519	519	507	509	502	502	502	502	513.84	
Bengaluru (CC)	450	450	455	470	485	495	505	505	505	505	505	505	505	505	505	505	515	520	520	520	500	505	510	515	515	515	515	515	515	515	502.10	
Brahmapur (OD)	464	452	458	483	493	503	508	513	513	513	513	513	507	509	514	516	516	506	506	506	506	506	508	511	511	511	511	506	506	506	506	503.03
Chennai (CC)	470	470	470	470	485	485	505	505	505	505	505	505	505	505	505	515	525	525	525	525	510	510	510	520	520	520	520	520	520	520	506.45	
Chittoor	463	463	463	463	478	478	498	498	498	498	498	498	498	498	498	508	518	518	518	518	503	503	503	513	513	513	513	513	513	513	499.45	
Delhi (CC)	505	505	520	555	555	555	555	555	555	540	540	540	540	545	545	545	545	545	545	545	545	545	545	545	545	545	535	535	525	525	525	540.32
E.Godavari	444	432	437	459	469	479	484	489	489	489	489	489	489	484	486	490	492	492	485	485	485	485	485	487	487	487	487	480	480	480	480	479.71
Hyderabad	425	435	445	455	465	470	475	475	475	475	475	460	465	470	475	480	483	470	470	460	464	468	472	476	476	476	465	465	465	467	469	466.65
Ludhiana	483	485	501	521	522	522	528	528	528	516	512	505	508	518	518	518	518	518	518	518	511	519	519	519	519	519	509	507	507	501	501	513.42
Mumbai (CC)	490	490	500	510	520	530	535	540	540	540	540	540	525	530	535	540	545	545	535	535	525	530	533	537	541	541	541	530	530	530	530	530.10
Muzaffarpur (CC)	524	524	538	552	552	562	562	562	557	552	552	552	557	562	567	567	567	562	557	557	562	567	567	567	567	562	557	552	552	552	552	556.19
Mysuru	447	447	457	472	487	497	505	505	505	505	505	505	505	505	505	505	515	518	518	518	500	505	510	515	515	515	515	515	515	515	515	501.97
Nagpur	455	455	465	480	505	505	510	510	510	510	495	495	495	495	510	510	510	500	500	500	500	505	510	510	510	510	500	510	515	515	515	500.32
Namakkal	450	450	450	465	465	485	485	485	490	490	490	490	490	490	490	500	500	505	505	495	495	495	500	500	505	505	505	505	505	505	505	490.16
Patna	514	519	533	548	548	552	552	552	548	543	543	538	552	557	557	557	557	555	552	552	557	557	557	557	553	552	548	548	548	548	548	548.45
Pune	490	492	497	515	525	535	540	540	540	540	540	540	530	535	540	545	545	545	535	535	535	540	540	540	540	540	540	530	520	520	522	531.32
Ranchi (CC)	524	524	533	548	548	562	562	562	562	557	552	552	557	562	562	562	562	562	562	562	562	562	567	567	567	562	557	557	557	552	552	556.10
Vijayawada	454	442	447	469	479	489	494	499	499	499	499	499	494	496	500	502	502	495	495	495	495	495	495	497	497	497	497	490	490	490	490	489.71
Vizag	440	440	440	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	494.19
W.Godavari	444	432	437	459	469	479	484	489	489	489	489	489	484	486	490	492	492	485	485	485	485	485	485	487	487	487	487	480	480	480	480	479.71
Warangal	427	437	447	457	467	472	477	477	477	477	477	462	467	472	477	482	485	472	472	462	466	470	474	478	478	478	467	467	467	469	471	468.65
Prevailing Prices																																
Allahabad (CC)	490	505	538	548	548	548	543	538	533	529	524	529	538	543	543	543	538	538	533	533	533	538	538	538	538	538	533	533	538	538	538	535.00
Bhopal	470	475	480	510	510	520	520	520	520	482	482	482	500	505	505	501	505	505	505	505	505	510	515	515	515	515	510	510	510	510	510	504.10
Hospet	410	410	415	430	445	455	465	465	465	465	465	465	465	465	465	465	475	480	480	480	460	465	470	475	475	475	475	475	475	475	475	462.10
Indore (CC)	460	460	490	501	501	505	510	510	500	500	500	500	500	510	510	510	510	510	500	495	500	510	510	510	510	510	510	505	505	505	505	502.00
Jabalpur	451	454	477	490	493	496	501	501	490	485	487	490	498	501	503	503	503	493	488	491	492	496	498	500	500	500	500	502	502	505	507	493.45
Kanpur (CC)	490	490	524	538	538	538	538	538	538	529	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	519	521.29
Kolkata (WB)	500	495	515	525	535	540	550	555	560	560	560	560	550	555	557	557	557	557	557	557	557	557	557	560	560	560	560	560	540	540	540	547.61
Luknow (CC)	533	533	550	563	563	563	563	563	567	567	557	557	557	557	567	567	567	567	567	567	567	567	567	567	567	567	560	560	560	560	560	561.19
Raipur	445	450	458	485	495	495	500	500	506	506	500	483	490	500	505	500	505	505	505	495	495	505	510	510	510	510	510	510	510	510	510	497.35
Surat	480	480	490	500	505	510	515	520	520	520	520	520	520	525	530	535	540	540	540	540	540	542	545	547	549	549	549	530	530	532	532	525.65
Varanasi (CC)	517	527	533	547	557	567	567	553	553	553	553	557	560	563	567	567	557	557	557	557	563	567	567	567	560	560	560	560	560	560	563	556.65

Editorial Calendar 2022

No.	Publishing Month	Article Deadline	Advertising Deadline	Focus
1	January	30-Dec-21	3-Jan-22	Disease Prevention
2	February	30-Jan-22	3-Feb-22	Nutrition Management
3	March	30- Feb- 22	3-Mar-22	Vaccination
4	April	30-Mar-22	3-Apr-22	Heat Stress
5	May	30-Apr-22	3-May-22	Cold Chain Management
6	June	30-May-22	3-Jun-22	Feed Production
7	July	30-Jun-22	3-Jul-22	Layers, Cages, Eggs
8	August	30-Jul-22	3-Aug-22	Genetics & Breeding
9	September	30-Aug-22	3-Sep-22	Biosecurity
10	October	30-Sep-22	3-Oct-22	Winter Management
11	November	30-Oct-22	3-Nov-22	Environmental Control System
12	December	30-Nov-22	3-Dec-22	Industry Outlook

“Under perfect conditions,
many vaccines work,
but conditions are not
perfect in the field.



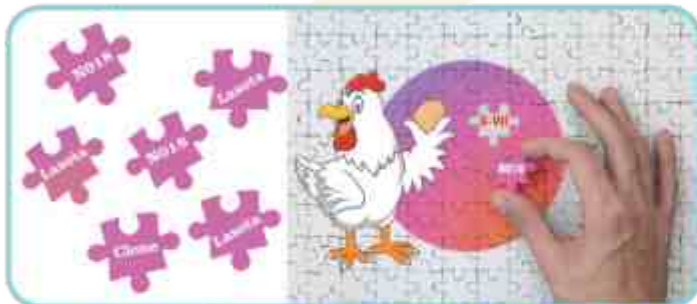
VAKSIMUNE® NDL Inaktif VAKSIMUNE® NDL Inaktif 0.1



Inactivated Vaccine in oil emulsion
Newcastle Disease virus - ND18 strain

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- ◆ High antigenic mass and broader Protection against NDV virulent genotypes
- ◆ Whole virus vaccine technology

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Ensure protection from following infectious syndrome in layers/breeders

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NDL Inaktif



NDL Inaktif 0.1



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