English monthly from Hyderabad, India

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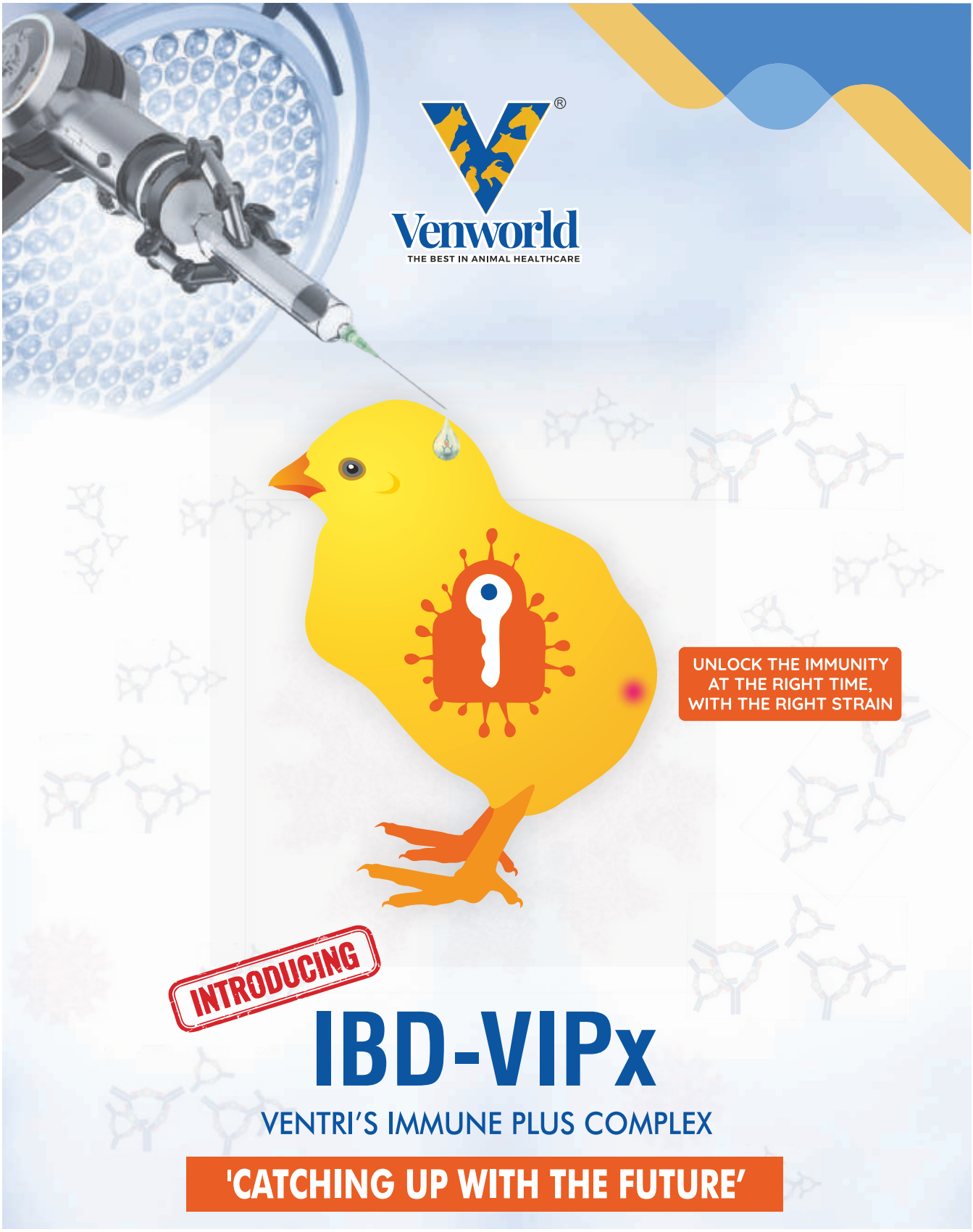


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# Poultry Fortune

English Monthly Magazine
*(Established in May 1991)*
Volume 23 Number 10 May 2022

**Editor & Publisher**
M. A. Nazeer

**Editorial & Business Office:**
**POULTRY FORTUNE**
NRS Publications,
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E-mail: info@poultryfortune.com
Website: www.poultryfortune.com

**Annual Subscription**
India : Rs. 800
Foreign Countries : US $ 100
or its equivalent.

Poultry Fortune will be sent to the subscribers in India by Book Post, and to foreign subscribers by AirMail.

Edited, printed, published and owned by M. A. Nazeer and published from BG-4, Venkataramana Apts., 11-4-634, A.C.Guards, Hyderabad - 500 004, India. Printed at Srinivasa Printers.
Registered with Registrar of Newspapers for India with Regn. No. 72452 / 99. Postal Regn.No. RNP/HD/1067/2021-2023.


Views and opinions expressed in the technical and non-technical articles/ news are of the authors and not of Poultry Fortune. Hence, we cannot accept any liability for any loss or damage arising from the use of the information / matter contained in this magazine.
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**Subscriptions for Poultry Fortune, English monthly, should be sent to:**
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# Poultry industry is going to be affected if inputs for Feed are not made available at reasonable price

***The move to restrict or remove antibiotic growth promoters (AGPs) in feed is one of the most challenging issues to hit the animal industry in recent years. It goes without saying that reducing or removing antibiotics from the farm is not an easy task. Taking away this long- established practice has serious implications for producers in terms of the health of their livestock and business. Most importantly, the daily challenge of providing optimal animal performance is severely compromised due to the depletion of available tools to fight against unpredictable diseases such as Necrotic Enteritis (NE). According to recent research, such challenges are reportedly on the rise and believed to be contributing to high economic losses.***

Dear Readers,

The May 2022 issue of ***Poultry Fortune*** is in your hands. In the news section, you may find news about...

**Dr V. Sunder Naidu,** a leading poultry industrialist in India and the promoter of Balaji Hatcheries Group of Companies based at Chittoor, Andhra Pradesh, passed away on 28 April 2022. He was 85 years old. Dr Sunder Naidu was a very simple and humble successful businessman in poultry industry and he helped poultry industry to grow well in Chittoor and Rayalaseema region of Andhra Pradesh state, and had a very good business relations with neighbouring states dealers to get better farm gate price to farmers for eggs and chicken.

**All India Poultry Breeders Association** and Biotech Consortium India Limited along with Animal Nutrition Society of India organised a knowledge sharing *"Workshop on Feed Requirements for Livestock Sector: Opportunities and Challenges"* on April 12, 2022 in Hyderabad. More than 80 participants from poultry industry, seed industry, scientists from research institutions and universities, nutritionists, officials from central and state animal husbandry department, media and other stakeholders participated in the workshop. Dr O. P. Chaudhary, Joint Secretary, Department of Animal Husbandry and Dairying, Government of India indicated that contributions of livestock sector in total agriculture and allied sectors has increased significantly. He stated that the issue of supply and availability of Soyabean Meal and Maize has been brought to the notice of the government as also price volatility. He assured that government is committed to support the livestock industry and several initiatives have been taken including permission to import GM soyabean meal. He appreciated this initiative and requested to send the recommendations to the department.

Mr Suresh Chitturi, MD, Srinivasa Farms and Vice President, All India Poultry Breeders Association and Mr D. Raghava Rao, MD, Kohinoor Hatcheries Private Limited shared detailed information on the current feed requirements and potential demand over next decade. It was stressed that the industry holds great potential not only to meet increasing domestic requirement, but also can lead the exports of animal products. However, this requires consistent supply of feed to make it competitive in the international market. For example, the gap in supply and demand of protein meals is estimated at approx 4 MMT in 2022 and likely to increase to 7 MMT by 2025. The gap is expected to increase over time as the demand for milk, eggs and meat continues to grow as the Indian economy grows.

**National Egg Coordination Committee (NECC)** has appealed to the Government of India to allot at least 2.0 million tons of damaged Wheat, Paddy and / or Broken Rice - unfit for human consumption - for use in poultry feed, as a partial substitute for maize, so as to enable the farmers to tide over the unprecedented crisis caused due to acute shortage and steep increase in the price of maize and soya meal in the domestic market. It's one of the worst

*Contd on next page*

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

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

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

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

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crisis in the history of poultry industry. NECC sources said that during the past few years, and particularly during the past one year, there was a significant increase in the price of Maize due to various reasons beyond the control of farmers, such as increased volume of exports and diversion of significant volumes of maize for production of bio-fuel in Bihar, which is a major maize-producing State. NECC sources said that they are hopeful that the Government would respond favourably to our appeal and come to the rescue of farmers and allot the damaged grains for production of poultry feed, and enable the farmers to tide over the crisis and continue to retain their only means of Iivelihood.

**Grasim Industries Ltd** organised Consultants Interaction cum Technical Meet on 25 March 2022 at Nala Hotels, Namakkal. The event was well attended by prominent consultants from Namakkal region. Grasim Industries, the flagship company of USD 48.3 billion Aditya Birla Group, started as a textiles manufacturer in India and today is a leading global player in VSF and the largest chemicals (Chlor-Alkali-s) player in India. Grasim Industries is also the manufacturer of Prosodium - a superior source of sodium for poultry diets. Later, a Q&A session was organised where the invited consultants shared their feedback on ProsodiumTM and the changing trends in Poultry Feed formulation. Manufactured in 4 locations across India, Prosodium is available with dealers at all the prominent poultry hubs of India.

**Avitech Nutrition** has announced the launch of PhyGeno, a new division specializing in natural solutions. PhyGeno manufactures plant-based products (phytogenics) for poultry, aquaculture, cattle and swine sectors. PhyGeno embraces Ayurveda's vast knowledge of plants and combines it with modern manufacturing and evaluation techniques to offer safe, healthy and effective solutions. The company says that PhyGeno represents Avitech Nutrition's commitment towards a more sustainable world-healthier products for human consumption with a minimal impact on the environment.

**The Karnataka Poultry Farmers and Breeders Association** is submitting a memorandum to both the Central and the State Governments urging for severe action against maize hoarders. With some traders and farmers hoarding Maize, the price of maize is skyrocketing impacting hugely the poultry sector leading to de-growth in chicken consumption. The President of KPFBA, Dr Sushanth Rai and General Secretary Dr Anjan Goswami said that availability of maize had become a serious concern. Firstly, there is almost 15 to 20% shortfall in maize production and secondly, the government is allowing export of maize (about 10 to 15%), affecting the domestic requirements. Compounding these two issues are the hoarders who are trying to make huge profits at the expense of the poultry and other sectors.

**Perstorp** launched Gastrivix Avi, a unique gut health solution combining the benefits of valeric and butyric acid. The company is the first to pioneer the commercial use of valeric acid in animal nutrition, following successful trials of Gastrivix Avi. Like butyric acid, valeric acid is naturally created by the gut microbiota of broilers, although in too small quantities for optimal gut health during production cycles. Perstorp has used complex organic chemistry to create esters of valeric acid, which were tested over many years in a multitude of combinations with butyric acid esters to develop the right synergy, and the best match with nature.

**The Tamil Nadu Veterinary and Animal Sciences University** has been ranked first among the 15 State veterinary universities in India by the Indian Council of Agricultural Research (ICAR) in its recent (2020) rank list. ICAR ranks the agricultural universities, including veterinary, horticulture and fisheries universities, based on a set of quality indicators. The major parameters are teaching, resources and outcome, research impact and excellence, extension and outreach and peer recognition. TANUVAS has taken the 12th place on the list of agriculture, veterinary, horticulture and fisheries universities across the country. It is a significant achievement, because it has moved from the 41st rank in 2017 to the 12th rank in 2020.

**CLFMA** of India in association with Maharashtra Cooperative Development Corporation (MCDC) organised a Web Meeting on March 9, 2022 in Pune with topic *Connecting Maize Farmers directly with Poultry Industry*. CLFMA Chairman Mr Neeraj Kumar Srivastava and Mr Milind Aakre, Managing Director, MCDC addressed the meeting. About 38 participants attended the Webinar. MCDC has shown interest to associate with CLFMA officially to connect CLFMA Feed Manufacturers with the FPOs' who are Maize growers.

**In the Articles section – *Importance of Water Quality in Poultry Health and Production*,** *authored by* Prof R.N. Srinivas Gowda discussed that a bird can survive several weeks without food, but only a few short days without water. Broilers drink a great deal of water. It is suggested that 5.28 ml / bird / day of age is a good method of predicting the water consumption of broiler chickens. Birds require water nearly about 2 liters / every kg of feed consumed at 70°F. This means that it takes around 3. 5 liters of water for every kilogram of bird grown that is if an average lifetime feed conversion of 1Kg.

Another article titled ***Varieties / Strains of Chicken used for Rural Backyard Poultry Farming,*** *authored by* Dr R. Shirisha, Assistant Professor, Department of Poultry Science College of Veterinary Science, Mamnoor, Warangal, said that Backyard Poultry Farming is a promising option for rural livelihoods. It requires low initial investment. Boost up family income for better utilization of family laborers who are not able to perform other works like old family members or children. It is a potent tool for upliftment of socio economically backward people.

Article titled ***All About Feed - Gut Health Special: Nutribiosis is key is post - AGP gut health,*** *authored by* Dr Milan Hruby, Global Applications Senior Manager, Danisco Animal Nutrition (IFF), informed that the move to restrict or remove antibiotic growth promoters (AGPs) in feed is one of the most challenging issues to hit the animal industry in recent years. Now, as global health bodies step up efforts to fight the threat of antimicrobial resistance in humans - viewed as a major public health issue - the use of antibiotics in the food chain is coming under ever greater scrutiny. It goes without saying that reducing or removing antibiotics from the farm is not an easy task.

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

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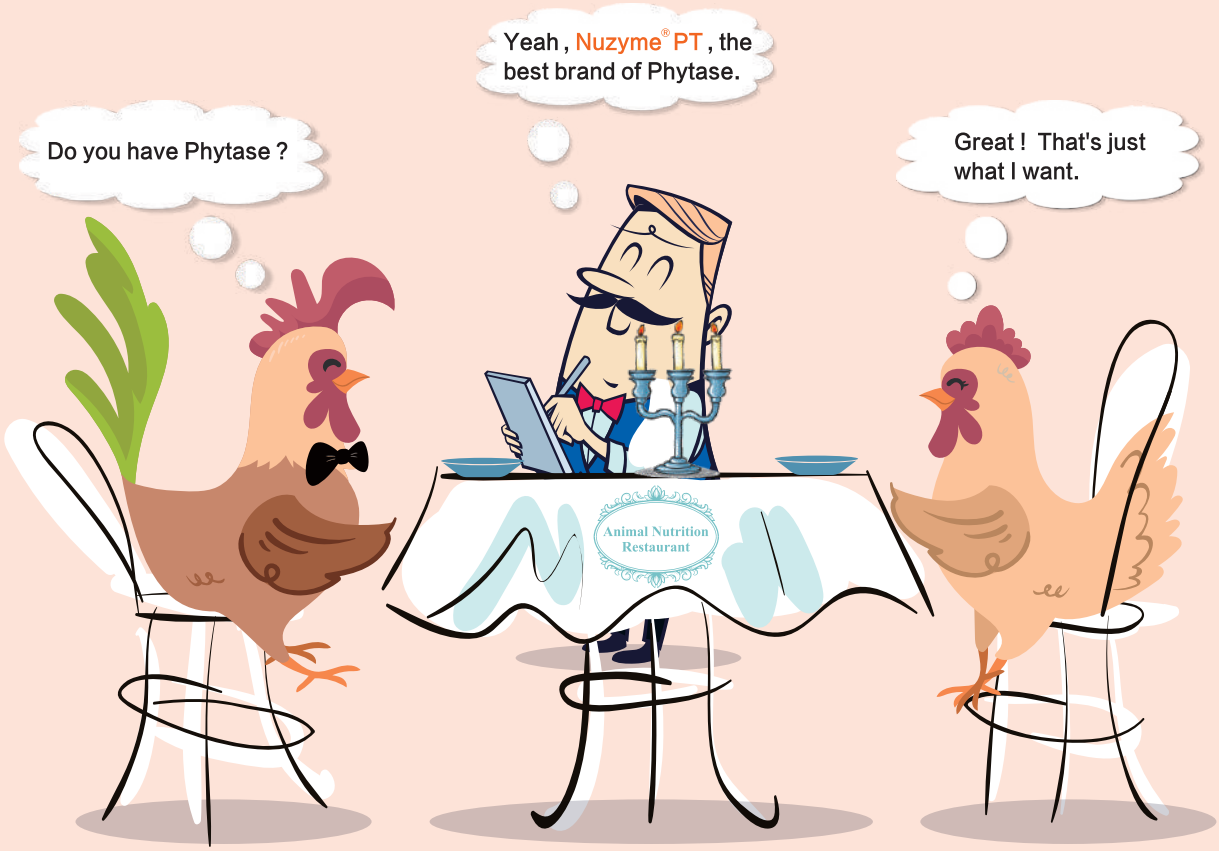


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# Workshop on Feed Requirements for Livestock Sector: Opportunities and Challenges held on at Hyderabad


*Dr VIbha Ahuja, CGM - Biotech Consortium, Suresh Chitturi, Vice President AIPBA & MD, Srinivasa Farms along with Dr S.V. Rama Rao in the workshop.*

In India the livestock sector particularly poultry, cattle and aqua is growing at a rate of 8-10% and thereby the requirement of feed is also increasing, as it constitutes 65-70% of the production cost. In the recent past the industry has faced challenges with respect to availability and high cost of inputs viz. soyabean meal, maize etc. The potential feed requirement in the coming years is expected to increase further in view of changing food habits, increase in protein demand etc. Technological interventions are urgently needed to ensure availability of enough quantities and good quality feed in cost-effective manner for the survival and growth of the animal husbandry sector.

In view of the above, All India Poultry Breeders Association and Biotech Consortium India Limited (BCIL) along with Animal Nutrition Society of India (ANSI) organised a knowledge sharing "Workshop on Feed Requirements for Livestock Sector: Opportunities and Challenges" on April 12, 2022 at Hotel Avasa, Hyderabad. More than 80 participants from poultry industry, seed industry, scientists from research institutions and universities, nutritionists, officials from central and state animal husbandry department, media and other stakeholders participated in the workshop.

Dr O. P. Chaudhary, Joint Secretary, Department of Animal Husbandry and Dairying, Government of India indicated that contributions of livestock sector in total agriculture and allied sectors has increased significantly. He indicated that the issue of supply and availability of soyabean meal and maize has been brought to the notice of the government as also price volatility. He assured that government is committed to support the livestock industry and


*D. Raghava Rao*

several initiatives have been taken including permission to import GM soyabean meal. He appreciated this initiative and requested to send the recommendations to the department.

Mr Suresh Chitturi, MD, Srinivasa Farms and Vice President, All India Poultry Breeders Associationand Mr D. Raghava Rao, MD, Kohinoor Hatcheries Private Limited shared detailed information on the current feed requirements and potential demand

*A view of participants in the workshop*

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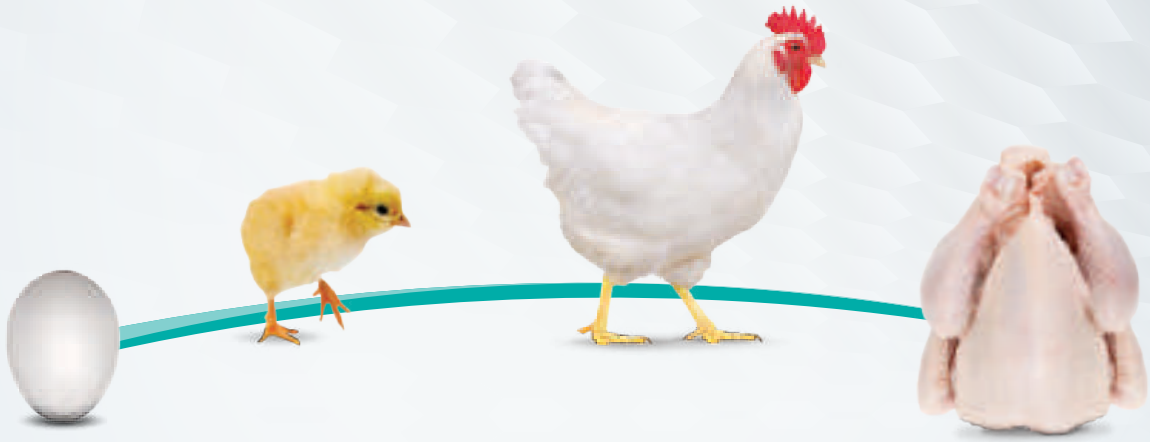

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*Suresh Chitturi, Vice President AIPBA & MD, Srinivasa Farms along with Dr Udeybir Singh, President, Animal Nutrition Society of India answering queries.*

over next decade. It was stressed thatthe industry holds great potential not only to meet increasing domestic requirement, but also can lead the exports of animal products. However, this requires consistent supply of feed to make it competitive in the International market. For example, the gap in supply and demand of protein meals is estimated at approx..4 MMT in 2022 and likely to increase to 7 MMT by 2025. The gap is expected to increase over time as the demand for milk,eggs and meat continues to grow as the Indian economy grows.

It was opined that all options including the use of GM crops and novel derivatives should be explored. They also stressed that adoption of GM crops be encouraged so as to increase the productivity which will bring benefit not only to farmers but also to the livestock farmers and industry. The industry participants desired those imports may be permitted in the short term to meet the current demand and at the same time streamlining of policies and investments in research for facilitating use of GM crops for increasing productivity for tapping future potential.

Dr Vibha Ahuja, CGM, BCIL spoke about safety and nutritional aspects of GM crops. She informed that state of the art internationally accepted methodologies are available for pre-market safety assessment of GM Crops and indicated that there are no confirmed reports of any adverse effect from the use of GM crops in the last 25 years in more than 70 countries. She also clarified various myths prevalent regarding the use GM crops by the feed industry and provided factual information.

Dr S. V. Rama Rao, Principal Scientist (Animal Nutrition) from ICAR-Directorate of Poultry Research spoke about nutritional requirements of Poultry and how research can contribute to enhancing productivity.

Mr Ram Kaundinya, Director General, Federation of Seed Industry of India and Dr Paresh Verma, Executive Director -Bioseeds Division, DCM Shriram Limited, Hyderabad informed that India has been lagging behind in the area of


*Suresh Chitturi - talking to media at the Feed workshop*

GM crops despite highly successful experience with Bt Cotton, which turned India into second largest exporter of cotton in the world from an importing country. They highlighted several issues and sought urgent interventions from the Government to introduce well proven technologies in the country to meet the demand from livestock sector.

Senior representatives from US Grains Council and US Soyabean Council provided information on the global scenario that included use of by-products such as DDGS as a source of high protein and high phosphors and also introduced tools such as nutritional calculator for improving the nutrition for the livestock industry.

Participants shared their views and requested the associations to prepare strategic plans and approach the government for time bound decisions so that the industry can benefit from the use of new technologies such as GM crops.

The workshop was well received and recommendations will be forwarded to the Department of Animal Husbandry for their consideration.

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# NECC asks govt to allot 2 million tons of damaged Wheat, Paddy, Broken Rice for use in Poultry Feed

National Egg Coordination Committee (NECC) has appealed to the Government of India to allot at least 2.0 million tons of damaged Wheat, Paddy and/or Broken Rice - unfit for human consumption - for use in poultry feed, as a partial substitute for maize so as to enable the farmers to tide over the unprecedented crisis caused due to acute shortage and steep increase in the price of maize and soya meal in the domestic market. It's one of the worst crisis in the History of the Poultry Industry.

NECC sources said that during the past few years, and particularly during the past one year, there was a significant increase in the price of Maize due to various reasons beyond the control of farmers, such as increased volume of exports and diversion of significant volumes of maize for production of bio-fuel in Bihar, which is a major maize-producing State.

The prce of maize in the domestic market has increased from Rs.18,000/- per ton during the last year, to approximately Rs.25,000/- per ton presently - and" it is expected to increase further to Rs.30,000/- per ton.

NECC has stated that due to such increase in maize price, the average cost of production has gone up from Rs.4.00 per egg last year, to Rs.4.75 - Rs.5.00 presently. However, average farmgate price is hovering around Rs.3.50 per egg. thus resulting in a net loss of Rs. 1.50 to 1.75 per egg for the farmers.

Unable to withstand such continuous losses, thousands of small and marginal farmers, and even breeders have already shut down or suspended or scaled down their operations. Most of the farmers and breeders are on the verge of insolvency.

Under these circumstances partial substitution of maize with other cheaper commodities is the only viable option to help the farmers to retain their means of livelihood, as well as to ensure that eggs and chicken would continue to be available to the poorer sections of the consumers at an affordable price.

NECC sources said - "we are hopeful that the Government would respond favourably to our appeal and come to the rescue of farmers and allot the damaged grains for production of poultry feed, and enable the farmers to tide over the crisis and continue to retain their only means of livelihood"


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# A leading Poultry industrialist in India
# Dr V. Sunder Naidu Passes Away at 85

**Hyderabad:** A leading Poultry industrialist in India and the Promoter of Balaji Hatcheries Group of Companies based at Chittoor, Dr V. Sunder Naidu passed away on 28 April 2022 in a hospital at Hyderabad. He was 85 years old.

Sunder Naidu was born on July 1, 1936 in Chittoor, Andhra Pradesh. His parents Govindu Naidu and Mangammala were farmers. He was married to Pemmasani Sujivana. He has two daughters, Sailaja who is the daughter-in-law of Eenadu's Ramoji Rao, and Neeraja who is taking care of father's poultry business.

Dr Naidu holds a Bachelor's degree in Veterinary Science from Bombay Veterinary University. Started his career as a veterinary doctor and later promoted Balaji Hatcheries in 1972 and worked hard for the development of poultry industry in Rayalaseema region in particular and other places in general. It also created jobs for thousands of people.

*Dr V. Sunder Naidu*

Sunder Naidu has served as the President of Andhra Pradesh Poultry Federation. He worked closely with farmers. Naidu was awarded many prizes for his contribution in the field of poultry.

Earlier, Naidu had set up the Netaji Balanand Sangh to motivate the youth of his village towards education. Apart from providing sports equipment to the youth of the village, he also helped in setting up a library (Sunder Naidu Charity Work). From his student days, Naidu was passionate about serving the community and always worked with a spirit of unity.

**Condolence Messages**

Former Chief Minister of Andhra Pradesh, Mr N. Chandrababu Naidu, expressed shock at the demise of Dr V. Sunder Naidu and stated that his death is a great loss to the poultry industry.

Mr Chitturi Suresh Rayudu, Chairman, International Egg Commission, said that Dr V. Sunder Naidu was a rare personality who dedicatedly worked for the development of poultry industry and to provide nutritious food to the people.

*Dr V. Sunder Naidu with B.V. Rao and others in 1980s*

*Dr V. Sunder Naidu with Shaik Imam and others*

*Dr V. Sunder Naidu with Ms Anuradha J. Desai, Chirperson, VH Group and others*

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# Grasim Industries organises Consultants Interaction - cum - Technical Meet


*A view of Grasim Industries Consultants Interaction - cum - Technical Meet at Namakkal*

Grasim Industries Limited, the flagship company of USD 48.3 billion Aditya Birla Group, started as a textiles manufacturer in India and today is a leading global player in VSF and the largest chemicals (Chlor-Alkali-s) player in India.

Grasim Industries Ltd. is also the manufacturer of ProsodiumTM - a superior source of sodium for poultry diets.

On 25th March 2022, a Consultant Interaction cum Technical Meetwas organised at Nala Hotels, Namakkal. The event was well attended by prominent consultants from Namakkal region.

Addressing the participants. Mr. Chirag Cheema, GM (Chemical VAP Sales Head) welcomed all and gave a brief introduction about the company and the product. He highlighted that till now Poultry farmers/

feed manufacturers were primarily dependent only on Salt or Sodium Bicarbonate to meetthe sodium requirement of birds. ProsodiumTM is a new chlorine free and cost effective alternative in this direction. Emphasising on the safety credentials of ProsodiumTM, Mr Cheema informed that this product is free from presence of heavy metals like Lead, Arsenic, Chromium etc. that makes it absolutely safe for Poultry birds. Thereafter, Dr Rakesh Sikri, (Consultant) delivered the technical presentation on ProsodiumTM and shared live field trial data on product performance at various dosages of ProsodiumTM .

Dr Sikri stated that ProsodiumTM is a cost effective alternative to Sodium Bicarbonate. Enriched with 32% Sodium, ProSodium helps in

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Later, a Q&A session was organised where the invited consultants shared their feedback on ProsodiumTM and the changing trends in Poultry Feed formulation.

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# Avitech Nutrition launches PhyGeno, a new division specializing in natural solutions

Avitech Nutrition is pleased to announce the launch of PhyGeno, a new division specializing in natural solutions. PhyGeno manufactures plant-based products (phytogenics) for the poultry, aqua, cattle and swine sector.

PhyGeno embraces Ayurveda's vast knowledge of plants and combines it with modern manufacturing and evaluation techniques to offer safe, healthy and effective solutions.

PhyGeno initial product portfolio includes Avitriol (NaturalBioactive Vitamin D3), GenoLiv (Herbal Hepatoprotective), Green-C(Herbal Vitamin C) and PhyCholine (Herbal Choline).

PhyGeno represents Avitech Nutrition's commitment towards a more sustainable world-healthier products for human consumption with a minimal impact on the environment.

# Hoarding of Maize, Poultry Sector Adversely Affected

- *Chicken consumption sees de-growth*
- *Export of maize adds to the problem*

**11 April 2022:** With some traders and farmers hoarding maize, the price of maize is skyrocketing, impacting hugely the poultry sector, leading to de-growth in chicken consumption. The Karnataka Poultry Farmers and Breeders Association (KPFBA) is concerned about this adverse trend and is submitting a memorandum to both the Central and the State Governments, urging for severe action against maize hoarders.

The President of KPFBA, Dr Sushanth Rai B. and the KPFBA General Secretary, Dr Anjan Goswami, said that availability of maize had become a serious concern. Firstly, there is almost 15 to 20% shortfall in maize production and secondly, the government is allowing export of maize (about 10 to 15%), both affecting the domestic requirements. Compounding these two issues are the hoarders who 'unscrupulously' are trying to make huge profits at the expense of the poultry and other sectors.

The KPFBA said that production costs are going up, as the price of raw material such as maize and soyabean have been going up for some months now. While the minimum support price of maize is Rs. 18.70 per kg, the price has always been above that. In October 2021, the price of maize was Rs. 19 per kg and in a matter of six months, it had shot up to Rs. 26, an increase of over 35%. With the cost of production going up, the poultry sector has no other choice but to increase the retail price.

With increasing price of chicken at the retail level, the KPFBA states there has been a significant drop in the consumption of chicken as people in both urban and rural areas have either reduced consumption or taken to alternate protein sources. The KPFBA has been trying its best to keep retail prices under check, but with cost of production going up, the association is seeking immediate government intervention.


*Coutesy: NECC*

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# Roz khao ande?

## Why introducing eggs in mid-day meals in Karnataka has been a bone of contention

*Despite opposition from religious groups, Karnataka plans to add eggs to the school lunch. Only 13 states and three Union Territories have eggs on their mid-day meal menus.*

*The mid-day meal scheme covers 11.80 crore children across India. AFP*

**April 14, 2022:** Malnutrition is a problem prevalent across India, especially among children. In a step to tackle it, the Bharatiya Janata Party (BJP) government in Karnataka is planning to expand its initiative of serving eggs in mid-day meals in more schools across the state from the next academic session.

The pilot phase was started in December 2021, where eggs were served in seven "backward" districts in north Karnataka. Now the BJP wants to bring in more schools under this programme, The Indian Express reports.

For those children who do not consume eggs, fruits and other alternatives would be made available.

In a country, where more than 33 lakh children are malnourished, this move to introduce eggs – an excellent source of protein and other key nutrients – by the Karanataka government should be lauded. But on the contrary. Even as the proposal awaits the state government's approval, it faces opposition from various religious communities – the influential Ligayats and the Jains.

It's a politics vs nutrition debate that started in 2021 in Karnataka, but other states have also been embroiled in a similar row in the past. We take a look at what mid-day meals provide, the need to improve nutrition, and the long-standing dispute over it.

**The significance of the Karnataka government's initiative**

The proposal, which was implemented between December 2021 and March 2022, is expected to be finalised and then placed before the Karnataka Cabinet, reports The Indian Express. The state government is expected to bear the cost, which is approximately Rs 6.50 for an egg.

If the Cabinet gives a go-ahead, Karnataka will become the first BJP-ruled state to introduce eggs in the mid-day meal scheme.

Launched by the Indian government in 1995 and renamed PM Poshan Shakti Nirman or PM Poshan in 2021, the scheme which has evolved since its inception covers 11.80 crore children across Classes 1 to 8 across the country. The lunch programme aims to meet the nutritional requirements of children attending government schools and those run by municipal corporations. For many of the country's poor children enrolled in these educational institutions, the food they are provided here is the only wholesome meal of the day.

**The opposition to eggs**

Yet the initiative has been opposed by religious leaders in the state, who believe that introducing eggs in school meals would influence the food culture in Karanataka.

When the controversy first erupted in November last year, Sri Vishwaprasanna Theertha Swami of the Pejavar Matha in Udupi (National President of Lingayat Dharma Mahasabha), Channa Basavananda Swami, Bhattaraka Charukeerthi Swami (who is a prominent Jain seer) were among the leaders who urged the Karnataka government to not "force" vegetarian students to eat eggs, according to a report in The News Minute. Some suggested that students could be given the cash set aside for eggs and others insisted that the protein intake would be taken care of if students are provided pulses, milk, and fruits.

Eggs in meals

Most states avoid eggs in the mid-day meal. In India, only 13 states and three Union Territories currently have eggs on the menu.

Eggs are in the meals in Tamil Nadu every day, while in Andhra Pradesh


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*If the state Cabinet gives a go-ahead, Karnataka will become the first BJP-ruled state to introduce eggs in the mid-day meal scheme*

they are served five days a week. Telangana serves eggs thrice a week, while Jharkhand, Odisha, and Tripura do it twice. In Bihar, Kerala, Mizoram, Uttarakhand, West Bengal, and Assam, eggs are served once a week. Sikkim has eggs for lunch only once a month.

Andaman and Nicobar Islands serve eggs thrice a week, while in Ladakh it is served once a week, and twice in Puducherry.

For students who do not eat eggs, fruits are given instead.

**A typical school lunch menu**

While there's no one menu for all, authorities need to ensure that the nutritional component of the meal made up of rice, pulses, vegetables, oil, and fat provides at least 450 calories and 12 grammes protein to children in primary grades. For upper primary children, the requirements are 700 calories and 20 grammes of protein, reports The Indian Express.

Keeping eggs off the menu

Dietary habits vary across the country with large parts of the population being vegetarian. When choices related to religion come into the picture, the matter becomes sensitive, often triggering a political debate like the one in Karnataka.

**However, it is not the** only state that has faced opposition to eggs in mid-day meals.

The BJP has opposed the inclusion of eggs on school menus in Madhya Pradesh. Chief Minister Shivraj Chauhan had rolled back the decision taken by the Congress government in the state under Kamal Nath to introduce eggs in Anganwadi meals in 2015.

In 2019, Congress and the BJP sparred over eggs in mid-day meals. Eggs had been removed from these meals by the Raman Singh government in 2015 but were re-introduced in January 2019 by Chief Minister Bhupesh Bagel from the Congress. It later came up with a proposal to home-deliver eggs to students who want them instead of serving them at school.

The BJP-led Karnataka government's move to introduce eggs then comes as a surprise, especially in the wake of calls in the state to ban halal meat.

# Perstorp launches Gastrivi Avi–a unique gut health solution combining the benefits of valeric and butyric acid

Perstorp is expanding on its innovative range of broiler feed solutions after the launch of Gastrivix Avi inlate March 2022.

The company is the first to pioneer the commercial use of valeric acid in animal nutrition, following successful trials of Gastrivix™ Avi. Like butyric acid, valeric acid is naturally created by the gut microbiota of broilers, although in too small quantities for optimal gut health during production cycles. Perstorp has used complex organic chemistry to create esters of valeric acid, which were tested over many years in a multitude of combinations with butyric acid esters to develop the right synergy, and the best match with nature.

Gastrivix Avi has been created to meet the bird's biological needs, support gut integrity and promote reliable growth and performance. Perstorp believes that the solution will solve multiple challenges for the industry, by reducing feed volumes for the broiler's lifecycle, providing consistent growth results, and boosting ROI.

Dr Antonia Tacconi, Global Product Manager of Gut Healthat Perstorp commented: "We can now prove that the synergy of these two esterified acids works better than one. After multiple trials, we have seen a reliable and consistent improvement on FCR for broilers thanks to the effects of butyric and valeric acid. With valeric acid, we have essentially found the missing ingredient."

Gastrivix Avi is a dry product that is easy to handle, palatable, has no dangerous goods restrictions and has no odor issues . Perstorp believes Gastrivix Avi represents an new important step in supporting and improving animal performance.

The product will be the first new product to be produced on the brand new state of the art production line for powder products at Perstorp's Waspik plant in the Netherlands.

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# Teja Poultry Agencies opened at Hyderabad

**Hyderabad:** Teja Poultry Agencies, a new poultry dealership outlet was inaugurated by Mr D.S Subramaniam, Managing Director of Tara Group on 17 April 2022 in LB Nagar, Hyderabad. Mr Gone Pavan Kumar and Mr Gone Mahaveer, brothers, are the partners of Teja Poultry Agencies.

Pavan Kumar has 13 year of experience in poultry pharmaceuticals. He started his career In TTK Health Care Ltd as a Veterinary Sales Representative and worked 2 years, then joined Zydus Animal Health as a Veterinary Service

Executive and later got promoted as a Region Manager in 2013 and continued his job till 4 April 2022. He resigned to the job and started the outlet.

Mahaveer is also having experience in poultry pharmaceuticals with Pentagon Nutritions Pvt Ltd and started Teja Poultry

*D.S. Subramaniam inaugurating Teja Poultry Agencies in Hyderabad*

Agencies in Shadnagar near Hyderabad in January 2021. They have now two branches at Shadnagar and LB Nagar supplying poultry medicines, supplements and vaccines.

Prominent farmers, dealers & distributors and representatives like Mr M.Srikanth Reddy, M. Prakash Reddy, Krishna Reddy, Trinath, B. Appa Rao, Manikyala Rao, Ramesh, Ramana Rao, Srikanth Reddy, Rajanarayana Reddy and Dr Sudhakar Chainpure

attended the inaugural ceremony of Teja Poultry Agencies.

**Take care of your collections first**

*In a message Mr D.S Subramaniam said:*

Dear Pavan,

I was so happy yesterday April 17, morning looking at the unity of you three brothers and your father. Not only that, all your three respective wive's parents were also present , coming all the way from Jagitial. It is very rare now a days that brothers stay united after their respective marriages. As an elder brother, the credit of this unity goes to you only. My sincere regards to all your elders and my blessings to all others.

Do the business very safely, do not go for sales, you must take care of your collections first. Your principal money must be safe always. Never compete with others, you have started this dealership to earn money ethically, just do it, concentrate on your profits. Be very choosy in selecting your customers. Select good paymasters. Pay to all your suppliers on time. Practice basic ethics always.

God Bless You All ! Have a successful business ahead !

Kind Regards,

Tara Subramaniam .

*Teja Poultry Agencies Brothers with D.S. Subramaniam and M.A. Nazeer, Editor, Poultry Fortune.*

# More than 27,000 Chickens Boiled Alive After Computer Error at Poultry Farm

*More than 27,000 chickens were boiled alive in a ventilation system malfunction, described by a judge as 'a disaster'.*

Gergana Krasteva, 28 Apr 2022: Hudson & Sanders, the firm managing the Leicestershire poultry farm, were fined £44,000 over the computer failure that happened nearly two years ago.

Leicester Magistrates' Court heard there were 50,000 chickens at Hose Lodge Farm in Colston Bassett when the systems that regulated air flow failed.


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*Hudson & Sanders, the firm managing the poultry farm, were fined £44,000*

As the temperature in the large barn rose rapidly, more than half of the animals died, while the ones that survived still suffered dramatically. The birds could not cool down because of the ventilation failure, causing them heat stress, unnecessary suffering and death. An alarm sounded when the temperature rose to 37°C, alerting staff, but it should have been set to go off 10°C lower, the court was told. Leicestershire County Council prosecuted Hudson & Sanders for being negligent in its care of the birds, which were being farmed for their meat.

Trading standards also said the company had failed to ensure there were enough staff to look after the chickens and that they were not trained to the level they needed to be.

This meant those on shift did not know what to do at a time of such crisis.

Six months prior the incident, in November 2019, a vet from the Animal and Plant Health Agency had visited the farm, raising concerns about lack of staff and its ventilation plan.

Gary Connors, from the county council, said: 'This was an awful but thankfully rare incident in terms of the scale of unnecessary suffering.

'However, we hope the level of fine prompts businesses operating in this sector to review their operations to ensure they have adequate staffing and procedures in place to avoid such a distressing incident happening again.'

The court heard Hudson & Sanders had no previous conviction for animal welfare offences and had an otherwise excellent reputation in the industry.

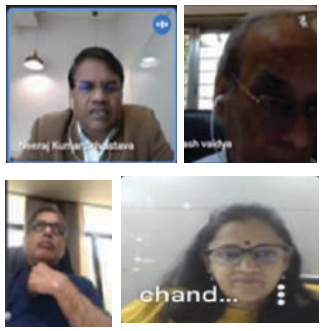
*Leicester Magistrates Court heard there were 50,000 chickens at Hose Lodge Farm in Colston Bassett at the time of the disaster*

# MCDC, Pune along with CLFMA organizes Web Meeting

*Neeraj Jumar Srivastava*

CLFMA Chairman Mr Neeraj Kumar Srivastava delivered the Welcome address and introduced CLFMA to the participants. He thanked all the participants, industry colleagues, CLFMA Members, all eminent speakers, etc for joining the Web Meeting. Some of the Eminent Speakers were Viz. Shri. Milind Aakre, Managing Director, MCDC who gave an introduction of Maharashtra Cooperative Development Corporation. The Second eminent speaker, was Shri. Shrushri Siddhi Satpute, Regional Head Rest of Maharashtra and Goa of Receivables Exchange of India Ltd. (RXIL), Pune, who spoke on "Information of receivable discounting". The third and last eminent speaker was Shri. Ravi Kantimahanti, Director, Agri 10 X, who delivered presentation on the topic "Digital Platform".

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




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

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# Incubator for Poultry Production – A Sustainable Resource for Rural Women Entrepreneurs

*The Broody Hens are used for stock multiplication. Women are in charge of all aspects of rural poultry production. This highlights the important relationship between women and rural poultry, as well as its role in ensuring the livelihood security of the rural farming community. However, the Rural Poultry Chicks' non-availability is regarded as a problem.*

**Shivam Dwivedi, April 28:** Rural poultry farming is considered a profitable enterprise in the Andaman and Nicobar Islands due to the sale of eggs and meat. Approximately 75% of farm families have 6 to 12 Rural Birds in their backyard. Rural birds lay 40 to 80 eggs per hen per year, with 31 percent consumed by the family, 57 percent sold, and only 12 percent used for hatching.

The Broody Hens are used for stock multiplication. Women are in charge of all aspects of rural poultry production. This highlights the important relationship between women and rural poultry, as well as its role in ensuring the livelihood security of the rural farming community. However, the Rural Poultry Chicks' non-availability is regarded as a problem.

However, the scarcity of Rural Poultry Chicks is regarded as one of the major impediments to the development of Rural Poultry Farming in the Islands. Furthermore, there is no commercial supplier of Rural Poultry Chicks on the Islands.

*A Rural Women with Mini Incubator Facility to hatch their own chicks*

The ICAR-Central Island Agricultural Research Institute, Port Blair, Andaman & Nicobar Islands conceptualized the idea of "By the Farmers to the Farmers" using the Mini Incubator-cum-Hatcher for continuous production and supply/availability of Chicks to address the issue of non-availability of Rural Poultry Chicks in the Islands.

The Institute also organized a series of hands-on training and demonstrations for rural women on the selection of fertile eggs, cleaning and hygienic handling of fertile eggs, operation of a Mini Incubator, and a scientific package of practices for improving rural chicken production. The ICAR-CIARI, Port Blair, trained a total of 2,202 farmers from 25 villages in the Andaman and Nicobar Islands and Minicoy, Lakshadweep on the operation of the Mini Incubator.

A total of 7 Mini Incubator-cum-Hatcher Units (240 Eggs Capacity) were established as part of the community-based demonstration under the DBT-Biotech Kisan Hub Project at various villages in South Andaman and North & Middle Andaman Districts.

The three units were also established as the Incubation Facility at the ICAR-CIARI, Port Blair, KVK, Sippighat, and Regional Station, Minicoy, Lakshadweep. Farmers formed a backward and forward link to ensure the long-term production and distribution of rural poultry chicks. They were also given Exposure Visits and Demonstrations Programs to help them disseminate the technology's use to other farmers.

Joyshana, Meenakshi, Rani Anbumlar, and Binitha Singh from South Andaman and Asima Roy from Middle Andaman initiated the Micro-Enterprise on Mini Incubator for hatching and began selling the Rural Poultry Chicks on a commercial basis.

Over a two-year period, approximately 1,000 farmers, including 650 farm women, used the Mini Incubator Facility to hatch their own chicks. The adopted farmers produced and distributed approximately 25,000 chicks and ducklings to the other farmers.

Farm Women Micro-Entrepreneurs earn Rs. 11,000 to Rs. 13,000 per month from the Hatching Facility with the Mini Incubator, their own sustainable resource for Rural Poultry Chicks, and the continuous sale of Rural Birds and Eggs. Their Net Income is significantly greater than their previous Monthly Income. Entrepreneurship via the Mini Incubator has become a sustainable source of income for their families.

***Source - ICAR***

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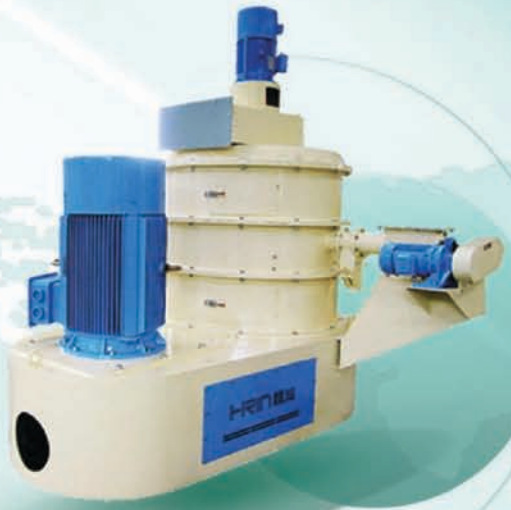

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# Importance of Water Quality in Poultry Health and Production

Email: drrns.gowda@gmail.com

*Prof Dr R.N.S. Gowda*

**Introduction**

Summer is on setting and water is an important nutrition in Summer months. The quality of water and its importance in poultry is discussed in this paper.

**WATER:** The Critical Nutrient and is an essential nutrition to any living beings on earth. In an essay on **'Water – The Elixir of Life'**. Sir **C V Raman,** the Noble laurite praises the importance of **water**, which is the life giving force to all. The scientist says that man attempted to seek an imaginary **elixir of life**, the divine Amrita, to confer him immortality. But water is the true **elixir of life**. save the water for today and future lives in the world".

Water, oxygen, sunlight, fire and earth are the five most important **elements of life** on earth and amazingly the earth, by luck, has just the correct proportion of each of these five life enabling elements.Water serves as a habitat for more than 50% of all life on Earth. Therefore,it is quite aptly called **"elixir of life".**71% of earth is covered in water (hence the name **blue planet**) and up to 60% of human body is made up of water. Most importantly it is used by all terrestrial animals to drink in order to provide essential minerals for the body's nourishment.

It is also used conventionally to irrigate crops, to boil and make food, to wash clothes, utensils among other things, as a coolant and raw material in industries, to put out fires, in swimming pools and generation of hydroelectricity. We can't live without water.

In terms of usage volume, agriculture utilise approximately 70% of the global water demand, with industry and domestic demand at 20% and 10% respectively. In domestic usage, drinking and cooking only contribute to 10% of our daily water usage with bath taking the lions share (at an average of 55 liters per day). Globally,2.2 billion people lack access to the safe drinking water and 4.2 billion people lack of hygienic needs.

Therefore, we need to conserve the water and use cautiously without polluting it and also save it for future.

**Importance of Water in Poultry Production**

Like any living being, water is an essential nutrient for poultry and therefore supply of quality water is fundamental for good flock performance. The farmer can prevent many diseases in flocks by controlling the quality of the ingested water, will certainly result in decreased costs of management and increase in profit, which are the two essential aims of poultry production nowadays.

**Function of water in poultry**

Water is a critical nutrient in bird's metabolism and nutrition. From a physiology perspective, water consumed by the bird is used for nutrient transportation, enzymatic and chemical reactions in the body, regulation of body temperature and lubrication of joints and organs. Water is required for reducing air temperature in poultry house (including evaporative cooling pads as in EC sheds and fogging systems in cage layer houses) and also to facilitate sanitation.

**Requirement of water in poultry**

While poultry producers are critical about the quality of the feed, the quality of drinking water often neglect and does not receive the same attention as it deserves. In the poultry farming the use of water with adequate physical, chemical and microbiological quality is of fundamental importance. Since many birds have access to the same water source, quality problems will affect number of birds. Water is the nutrient of highest importance, making contaminated water a serious threat to poultry and profits.

Frequent cleaning and monitoring of the drinking system is necessary to maintain a good quality drinking water supply. When products like Vaccines, antibiotics, vitamins, and acids are added to the drinking water this becomes even more important.

Table 1. Water consumption in layer birds as per their age

| Production Stage | Age/Rate of Production | Liters of water per 1000 birds at 21°C |
|---|---|---|
| **Layer pullet** | 4 weeks | 100 |
| | 12 weeks | 160 |
| | 18 weeks | 200 |
| **Laying hens** | 50% production | 220 |

Broilers consume approximately 1.6 to 2.0 times as much water as feed on a weight basis.There is a strong relationship between feed and water consumption; therefore, water can be used to monitor flock performance. Many of the

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electronic controller devises are available tomonitor daily water consumption. Water consumption will be greater in the area of the house that has more birds and where the ambient temperature is high. When birds are not distributed evenly between the front and back of the house in deep litter, it increases the competition for feed and water space. This, combined with the extra heat from excessive numbers of birds, can reduce bird performance.

**Water as a vehicle to spread infection in poultry**

In poultry farming where one single water source supply thousands of birdsand control measures must be considered as priority, in order to prevent the occurrence of diseases that are spread through water, and would certainly result in great economical losses. Although water does not provide ideal conditions for pathogenic microorganism to multiply, they will generally survive for enough time to allow waterborne transmission.

The drinking water plays a role in the transmission of some bacterial, viral and protozoan diseases that are among the most common poultry diseases (Tbale.2). Therefore, clean drinking water is essential for poultry health and performance.

An excellent transmission route of agents responsible for human and animal diseases, mainly those in which fecal-oral transmission occurs, increase the risk of occurrence of waterborne diseases, besides the hazards of carrying zoonosis pathogens to the flock, which would reflect in a Public Health problem.

**Table2. Common poultry infections transmitted by water**

| Bacterial Diseases | Viral diseases | Protozoan diseases |
|---|---|---|
| Chronic Respiratory Disease (CRD) | Newcastle Disease | Coccidiosis |
| Colibacillosis or *E.coli* infection | Avian Influenza | Histomoni-asis |
| Fowl cholera | Marek's disease | |
| Fowl Typhoid | Avian encephalomyelitis | |

**Factors Affecting Water Consumption**

When thinking about the factors that positively influence poultry production, the importance of water is often overlooked in favour of improving feed and environmental factors.

1) **Age of the bird:** Water consumption increases with age but decreases as a percentage of body weight.
2) **Environmental Temperature/Heat Stress:** Water consumption can double and even triple during periods of heat stress. Birds consume more water as temperature increases. One of the main ways birds regulate body temperature is by evaporating water through the respiratory system during panting. As birds pant, water is lost and needs to be replaced in order to maintain body-water balance. Water consumption in broilers increases approximately 7 percent for each degree Fahrenheit increase in temperature.

Table 3. Weekly Water consumption in Broilers (At an average temp 21°C)

| WATER CONSUMPTION IN LITRES/1000 BROILERS | | | | |
|---|---|---|---|---|
| AGE (Wks) | 10° C | 21.1°C | 32.2°C | 37.8°C |
| 1 | 30 | 30 | 34 | 38 |
| 2 | 45 | 61 | 98 | 182 |
| 3 | 72 | 95 | 197 | 360 |
| 4 | 98 | 133 | 273 | 492 |
| 5 | 133 | 174 | 356 | 644 |
| 6 | 163 | 216 | 416 | 757 |
| 7 | 189 | 254 | 462 | 837 |
| 8 | 216 | 288 | 473 | 863 |

3) Water temperature

Drinking water temperatures should be between 50°F to 60°F (10°C to 15°C) for the most comfortable consumption by mature birds, but some studies have indicated that water temperatures of about 77°F (25°C) reduce mortality in chicks. Temperatures over 86°F (30°C) will reduce consumption and birds will refuse to drink if water temperatures are over 111°F (44°C). **Any water temperature below the body temperature of the bird will be beneficial.**

4) **Lighting Program and water consumption:** Light is another environmental factor that can influence bird water consumption. Birds will not drink if they are not eating and vice versa. In operations that utilize lighting programs, two distinct water consumption peaks can be observed. The first peak is just after the lights come on (dawn) and the second is just prior to lights turning off (dusk).

5) **Check the number of Drinker**s

- ✓ Shortage of drinkers leads to competition among birds and weaker birds often suffer the deficiency of water;
- ✓ 14-16 drinkers /1,000 chicks (includes supplemental) should be provided within the brooding area of which 8-10 can be bell type drinkers.
- ✓ All drinkers should be flushed to remove any residual sanitizer.
- ✓ Water must be clean and fresh.
- ✓ Supplemental drinkers should be placed in such a way that the chicks will make the association between supplemental drinkers and the primary source.
- ✓ Adjust pressure to produce a droplet of water visible on each nipple, without dripping.
- ✓ Check for water leaks and air locks.
- ✓ Ensure that nipple drinkers are at the chicks' eye level.

**Why Quality of water is important to maintain health?**

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Water quality should be of concern to all poultry operations. Quality of water is important to maintain health and performance of the bird. Poor water quality impacts bird growth and health and interfere with digestion and impact overall productivity.

The efficacy of vaccines and medications administered through the water lines will be reduced when water quality is poor. Reduced water consumption or cooling capacity may have detrimental effects on both growth and reproduction. Poor water quality could also result in leaky water nipples inside the house, which will wet litter and lead to increased ammonia production and can result in reduced performance and livability.

**Drinking water with Electrolytes:** During periods of potential heat stress, many producers supplement drinking water with electrolytes. Electrolytes are minerals that can be found in the blood and are important for normal cell function and growth. Electrolytes, as the name implies, help regulate nerve and muscle function by conducting electrical signals from nerves to muscles. Electrolytes are also important for the acid-base balance of the blood and fluid retention. Some of the electrolytes found in blood plasma include sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), chlorine (Cl), bicarbonate ($HCO_3$) and sulfate ($SO_4$). The addition of the electrolytes not only replenishes those depleted during heat stress, but also stimulates water consumption. When the results of these are added together (electrolyte intake and increased water consumption), the mortality due to heat stress can be reduced.

**Standards for water quality**: this include factors that affect taste, solid buildup within water systems, and toxicity. Factors that should be observed for poultry production include:

**Table 4. Standards for water quality**

| | |
|---|---|
| **Color:** | Water is colorless, and any color in the water may indicate an increased contamination level. |
| **Turbidity:** | Particles such as clay, silt, sand or organic matter in suspension can cause the water to appear cloudy or muddy. Turbid water can cause leaky nipples and clog fogging nozzles. |
| **Hardness:** | Calcium and magnesium salts cause the water to be "hard" and can lead to scale and sludge buildup within water lines. Hardness reduces the effectiveness of soaps and disinfectants and interferes with the administration of some medications. |
| **Iron (Fe):** | Iron will stain almost everything it contacts, and it is a common water quality issue. Recent studies indicate that iron in the water does not appear to affect poultry health, but some of the iron may form solid particulates such as iron oxide, which can lead to equipment problems. These small particles can cause leaky nipples and block fogging nozzle openings. Either of these conditions can have negative impacts on poultry production. Iron bacteria are more likely to thrive in water with high iron concentrations. As a result, biofilm buildup can occur, which can obstruct nipple drinkers and promote pathogen proliferation. |
| **Manganese (Mg):** | While manganese itself does not cause a negative effect on poultry health, like iron, it can form solid particulates that can cause leaky nipples and clog foggers. |
| **Nitrate-N (N):** | Elevated nitrate concentrations indicate decaying organic material. It has been correlated with poor oxygen use in animals, but recent studies observed no differences in broiler performance with nitrate levels as high as 600 ppm. Presence of nitrate is a good indicator that water should be checked for bacteria. |
| **pH:** | The pH is a measure of acidity or alkalinity. A scale from 0-14 is used to measure pH. A value of 7.0 is neutral, values below 7.0 are acidic and values greater than 7.0 are basic. A pH of 6.0 to 6.8 is preferred for broiler production, but birds can tolerate a pH range of 4 to 8. A pH range of greater than 8 could cause reduced water consumption. |
| **Alkalinity:** | Caused by calcium carbonate, bicarbonate or sulfate. High alkalinity increases the buffering capacity of water. |
| **Total solids:** | Total solids represent the total amount of solid material in both suspension and solution. Total solids are not directly linked to any poultry health issues, but equipment function and water delivery could be negatively affected by total solids, which could influence bird performance. |
| **Toxic compounds:** | The amount will vary depending on the compound, but elements such as lead, selenium and arsenic should be kept below 1.0 ppm to prevent bird health problems as well as residues. |
| **Dissolved oxygen:** | Normal ground water concentrations have little or no dissolved oxygen. Concentrations greater than zero indicate possible surface water influence. |
| **Bacteria:** | Keep bacteria levels to a minimum |

**Microbial load:**

Bacteria levels should be kept to a minimum (Table.5) High levels of bacterial contaminants, minerals, or other pollutants in drinking water can have detrimental effects on normal physiological properties resulting in inferior performance.


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**Table 5. Minimumpermissible level of microbial load in water**

| | |
|---|---|
| Bacteria<br>Total Heterotrophic bacteria | <br>100 CFU/100 ml |
| *Coliform* bacteria | 50 CFU/100 ml |

**(Cfu: Colony forming units)**

**Table :6. Drinking water quality guidelines for poultry.**

| Contaminant or characteristic Level | Level considered average | Maximum acceptable level Remarks | **Remarks /effects** |
|---|---|---|---|
| **Bacteria**<br>Total bacteria 2.Coliform bacteria | <br>0/ml<br>0/ml | <br>50/ml<br>0/ml | <br>0/ml is desirable<br>0/ml is desirable |
| **Nitrogen compounds** Nitrate<br>Nitrite | <br>10 mg/l<br>0.4 mg/l | <br>25 to 45 mg/l<br>4 mg/l | <br>Levels from 3 to 20 mg/l affect performance. |
| pH | 6.8 to 7.5 | ------- | A pH of less than 6.0 is not desirable. Levels below 6.3 may degrade performance. |
| Total hardness | 60 to 180 | ----- | Hardness levels < 60 are unusually soft; those > 180 are very hard. |
| Naturally occurring<br>Calcium<br>Chloride | Chemical<br>60 mg/l<br>14 mg/l | <br><br>250 mg/l | Levels as low as 14 mg/l may be detrimental if the sodium level is higher than 50 mg/l. |
| Copper | 0.002 mg/l | 0.6 mg/l | Higher levels produce a bad odor and taste. |
| Lead | ---- | 02 mg/l | Higher levels are toxic. |
| Magnesium | 14 mg/l | 125 mg/l | Higher levels have a laxative effect. Levels > 50 mg/ml may affect performance if magnesium and chloride levels are high. |
| Sodium | 32 mg/l | ---------- | Levels above 50 mg/l may affect performance if the sulfate or chloride level is high. |
| Sulfate | 125 mg/l | 250 mg/l | Higher levels have a laxative effect. Levels >50 mg/l may affect performance if magnesium and chloride levels are high. |
| Zinc | ------- | 2.50 mg/l | Higher levels are toxic. |
| **Trace elements** | | | |
| Aluminum (Al) | 5.0 | Fluorine (F) | 2.0 |
| Arsenic (As) | 0.2 | Lead (Pb) | 0.1 |
| Boron (B) | 5.0 | Manganese (Mn) | Off-taste flavor @ 0.05 |
| Cadmium (Cd) | 0.05 | Mercury (Hg) | 0.01 |
| Chromium (Cr) | 1.0 | Nickel (Ni) | 1.0 |
| Cobolt (Co) | 1.0 | Selenium (Se) | 0.05 |
| Copper (Cu) | 0.5 | Zinc (Zn) | 25.0 |
| **Source: Adapted from T.A. Carter and R.E. Sneed, Drinking water guidelines for poultry. Poultry Science and Technology Guide No. 42, North Carolina State University** | | | |

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**Table:7. Suitability of water with different concentrations of Total Dissolved Solids (TDS)**

| TDS (ppm) | Comments |
|---|---|
| Less than 1,000 | These waters should present no serious burden to any class of poultry. |
| 1,000 to 2,999 | These waters should be satisfactory for all classes of poultry. They may cause watery droppings (especially at higher levels) but should not affect health or performance. |
| 3,000 to 4,999 | These are poor waters for poultry, often causing watery droppings, increased mortality, and decreased growth. |
| 5,000 to 6,999 | These are not acceptable waters for poultry and almost always cause some type of problem, especially at the upper limits, where decreased growth and production or increased mortality probably will occur. |
| 7,000 to 10,000 | These waters are unfit for poultry but may be suitable for other livestock. |
| 10,000 and above | These waters should NOT be used for any livestock or poultry. |
| **Source:** | **National Research Council. 1974. Nutrients and toxic substances in water for livestock and poultry. National Academy of Sciences, Washington, DC** |

Many of the water quality standards for poultry drinking water were originally developed from those for human drinking water. Few of the standards recommended today are based on research utilizing broiler or layers. Recently, a series of studies have been conducted examining the effects of iron (Fe), manganese (Mn), nitrates ($NO_3$) and pH levels in drinking water on poultry performance. The results of these studies have found that very high levels of Fe, Mn and $NO_3$ do not impact broiler health. In those studies, no differences in performance were noted up to 600 ppm of Fe, 600 ppm of $NO_3$ and 20 ppm of Mn. It should be noted that the water lines were thoroughly flushed between studies and that particulates that result from high Fe and Mn levels can lead to equipment problems such as leaky nipples and clogged fogging nozzles. Broiler performance is more likely to be affected by improper equipment function rather than bird health due to high concentrations of these substances. Poor water quality can lead to increased microbial growth (such as iron bacteria) and **biofilm** buildup.

**What is Biofilm and how it is formed?**

A **biofilm** is a syntrophic consortium of microorganisms in which cells stick to each other and often also to a surface. The biofilm serves as a breeding ground for a variety of microorganisms (see table 8) especially **bacteria adhere to surfaces by excreting a slimy, glue-like substance,** and can include algae, protozoa, and other microorganisms sugars, proteins, iron, and manganese. As such it is a serious issue on the poultry farm.

Biofilm formation is considered to be a protective mode for microorganism survival in a hostile environment. The biofilm protects microorganisms against pH stress, UV radiation, chemical exposure, phagocytosis and dehydration. Besides the protective effect of a slimy matrix, biofilm has an important role in the spread of antimicrobial resistance by hiding bacteria which are carrying genes coding for antibiotic resistance.

***Biofilm can spread disease and increase the risk of antimicrobial resistance,***

"There is a relationship between water quality and biofilms," poor water quality could be one thing that could lead to a biofilm build up." Biofilm is best described as a protective layer that shelters micro-organisms from the elements. Experts believe biofilm gives off an odour that makes drinking water less desirable. They also believe it spreads disease and increases the risk of antimicrobial resistance, as surviving micro-organisms that hide in tiny nooks in pipes pass resistance genes on to the next generation (see table).

**Table8. Commonly found microorganisms in Biofilm**

| | |
|---|---|
| E.coli spp | Streptococcus aureus |
| Salmonella spp | Listeriamonocytogenus |
| Pseudomonas spp | Mycobacterium spp |
| Vibrio cholera spp | Amoeba |
| Klebsiella spp | Giardia lamblia |
| Legionella spp | Enterovirus |
| *Stenotrophomonasmaltophilia* | |

**Biofilm control**

The ultrasound device needs to be installed between the drinking lines where a PVC-mounted transducer is attached to a control unit. In situations where livestock live on the ground, such as in poultry houses, two transducers are needed to treat 700-750 meters of waterline. Chickens in cages require just 1 unit for every 750 meters.

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**Table9. Water quality, Indications and treatment options**

| Water quality Indicator | Average levels considered | Maximum Accepted Level | Indications | Treatment Options |
|---|---|---|---|---|
| **Total Bacteria**<br><br>**Total Coliforms** | 0 CFU/ml<br><br>0 CFU/ml | 1000 CFU/ml<br><br>50 CFU/ml | Dirty system, may taste bad and COULD have pathogens in the water system Water with >50 total coliforms or any faecal coliform has been in contact with human or animal faeces | Clean the system between flocks with approved sanitizing cleaners and establish a daily water sanitation system when birds are present Shock chlorinate as well |
| **pH** | 6.5 - 7.8 | 5-8 | below 5 - metal corrosion above 8 - Water sanitizers work poorly, "bitter" taste. | Raise pH with soda ash ($Na_2CO_3$), lime Ca $(OH)_2$ or sodium hydroxide (NaOH) Lower pH- phosphoric acid, sulphuric acid and hydrochloric acid for strong alkalinity, citric acid and vinegar for weak alkalinity |
| **Alkalinity** | 100 mg/l | 300 mg/l | Associated with bicarbonate, sulphates and calcium carbonate • Can give water a bitter taste which makes it undesirable to the birds High levels can make it difficult to lower the pH Can be corrosive to cool cell pads | Acidification Anion Exchange de-alkalizer Can be reduced by removing free $CO_2$ (carbon dioxide) through aeration |
| **Total Hardness** | Soft 0 - 75mg/l as $CaCO_2$ Somewhat hard 76 to 150mg/l | Hard 151 to 300 Very Hard >300mg/l | Hardness causes scale which reduces pipe volume and drinkers hard are to trigger or leak (main factors are calcium and magnesium, but iron and manganese contribute small amount) | Do not use water softener if water already high in sodium unless using potassium chloride instead of sodium chloride (salt) Polyphosphates will sequester or tie-up hardness and keep in solution Acidification to below pH of 6.5 |
| **Calcium (Ca)** | 60 mg/l | | No upper limit for calcium, but if values are above 110 mg/l may cause scaling | Treatment same for hardness |
| **Magnesium (Mg)** | 14 mg/l | 125 mg/l | May cause flushing due to laxative effect particularly if high sulphate present | Treatment same for hardness |
| **Iron (Fe)** | 0.2 mg/l | 0.3 mg/l | Birds tolerant of metallic taste. Iron deposits in drinkers may cause leaking Can promote growth of bacteria such as *E. coli* and Pseudomonas | Treatment includes addition of one of the following: chlorine, chlorine dioxide or ozone then filtration removal with proper sized mechanical filtration |

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| | | | | |
|---|---|---|---|---|
| **Manganese** | 0.01 mg/l | 0.05 mg/l | Can result in black grainy residue on filters and in drinkers | Similar to iron but can be more difficult to remove due to slow reaction time Chlorination followed by filtration most effective in pH range of 8.5, needs extended contact time with chlorine prior to filtration unless using Iron X media Ion exchange resin if pH is 6.8 or above Greensand filters with pH above 8.0 |
| **Chloride (Cl)** | 50 mg/l | 150 mg/l | Combined with high Na levels, can cause flushing and enteric issues Can promote Enterococcus bacterial growth | Reverse osmosis, blend with non-saline water, keep water clean and use daily sanitizers such as hydrogen peroxide or iodine to prevent microbial growth |
| **Sodium (Na)** | 50 mg/l | 150ml/L | With high Cl levels can cause flushing Can promote Enterococcus bacterial growth | Reverse Osmosis Blend with non-saline water Keep water clean and use daily sanitizers such as hydrogen peroxide or iodine to prevent microbial growth |
| **Sulphates** | 15 - 40 mg/ | l200 mg/l | Sulphates can cause flushing in birds Rotten egg smell is hydrogen sulphide, by-product of sulphur-loving bacteria growth - this can cause air locks in water system as well as flushing in birds Since sulphides can gas off, test results may underestimate actual level present | Aerate water into a holding tank to gas off sulphur Anion exchange (chloride based) Treatment with oxidizing sanitizers then filtration If a rotten egg odour is present, shock chlorination of well is recommended plus a good daily water sanitation program while birds are present |
| **Nitrates** | 1 - 5 mg/l | 25 mg/l | Poor growth and feed conversions May indicate fecal contamination, test for coliform bacteria . | Reverse osmosis Anion exchange |
| **Lead** | 0 mg/l | 0.05 mg/l | Can cause weak bones and fertility problems in broiler or turkey breeders | Lead is not naturally occurring. Look for pipes, fittings or solder that contain lead Water softeners and activated carbon can reduce lead |
| **Copper** | 0.002 mg/l | 0.6 mg/l | High levels can cause oral lesions or gizzard erosion | Source is most likely from the corrosion of pipes or fittings |
| **Zinc** | 1 .5 mg/l | | Higher levels may reduce growth rates | Look for locations where water may have come in contact with galvanized containers Water softener and activated carbon will reduce adsorption |

**Reducing Bacterial load**

The following are safe and effective concentrations in the drinking water:

- Chlorine: 2-3ppm
- Chlorine Dioxide 0.1-0.3ppm
- Peroxide 25-50ppm
- Routine sanitizers such as low level chlorine, low level peroxide or chlorine dioxide do an excellent job of keeping clean water sanitary.
- These routine sanitizers do not work well against biofilms that are already established.They cannot penetrate beyond

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the surface of the biofilm

- Peroxide treatment in between flocks will penetrate and loosen the biofilm.
- Take extra caution to ensure that the waterlines are well vented when using peroxide.
- Trigger all nipples during procedure using a commercial disinfectant as a final step in cleaning protocol will ensure that all remaining pathogenic microorganisms are eliminated.
- Do not exceed manufacturers suggested concentrations.
- Be cautious when using disinfectants containing aldehydes and ensure that the waterlines are well flushed prior to receiving birds.
- Once the lines have been cleaned and new birds are in the barn it is good practice to use a routine sanitizer.

**Water treatment**

It involves **adding chlorine to water** and can be performed using chlorine containing compounds. In poultry operations, the commonly used chlorine sources for poultry drinking water sanitation are **sodium hypochlorite**, elemental chlorine gas and **calcium hypochlorite**. Chlorine will kill bacteria and microorganisms that live in the water, but this product will not affect the biofilm in the drinker lines. Other than that, it will also affect the taste of the water and therefore the animals could drink less.

The following precautions need to be followed during chlorination:

- Do not chlorinate market age birds under extreme heat stress.
- Measure residual chlorine at the waterer to maintain at least a 1.0 ppm level at the drinker mid-house.
- Discontinue chlorination and administer powdered milk solution before vaccination to neutralize chlorine since chlorine kills vaccines.
- Use caution since chlorine solutions are acidic and often oxidize soft rubber.

**Guidelines for chlorination**

It is available in two forms:

a) **Calcium hypochlorite**- white powder that contains 70% of available chlorine.

b) **Commercial solution of Sodium hypochlorite** - clear liquid with 10 to 12% available chlorine.

In emergency situations, bleach may also be used as chlorine source; it contains available chlorine levels of 2.0%.

Sanitizing with **chlorine dioxide** is a good option because its use in similar water supplies does not cause the taste or odor issues. Chlorine dioxide kills bacteria and viruses similar to or better than chlorine and is unaffected by a wide pH range.

Following are some action & interactions which we must understand while preparing drinking water to poultry:

- Hydrogen peroxide ($H_2O_2$) and Chlorine (Cl) are not compatible so should not be used at the same time. Both are oxidizing agents and in compatible.
- Copper sulfate is not compatible with Chlorine (Cl) however Copper sulfate which is an antimicrobial & antifungal agent actually enhances the effectiveness of $H_2O_2$ so they can be run at the same time with separate medicator.
- Organic iodine (Not the inorganic) is very compatible with Chlorine. This combination can help to prevent a full-blown respiratory infection if it is used early enough to treat sniffing, a loose croupy cough.
- Iodine, like Chlorine, works better at a lower pH.
- Chlorine is not compatible with any compound that act as reducing agent which would include most minerals water additives. For example, products that contain copper, sulfur or iron will tie up with the Chlorine and make it unavailable to work effectively as a sanitizer.
- Antibiotics like Chlortetracycline & tetracycline works best in low pH range. If alkaline water, adding good acidifier liquid actually enhances absorption of these products. But product like Penicillin & Sulpha drugs works better in pH above 7 so turning off the water acidifier during medication with penicillin & sulpha group is recommended.
- Vaccines are typically protein so at any time vaccines are used in water, the water pH should be above 4.
- All sanitizers lose efficacy at colder water temperatures. Chlorine, chlorine dioxide & peroxide/ozone are all temperature sensitive so colder water will slow down their reaction time.
- Peroxide is strong oxidant and contact with personnel is extremely dangerous. Peroxide deteriorates gradually even when stored correctly.
- There would be slime blooms in water system after the use of antibiotics. The antibiotic disrupts the microbial population in waterline system just as it does in the GI tract, allowing microbes such as yeast & mould to grow undisturbed. So, thorough cleaning of water pipeline system to remove the slime using 3% hydrogen peroxide solution with high pressure flushing water routinely is recommended as & when required.
- Sanitization, regular testing, checking for biofilm in pipes and thoroughly cleaning lines between flocks can all help to ensure water quality is as high as possible. Adding an enhanced acidifier product will deliver additional performance benefits as well as reducing the level of bacteria in the water.

**Water Management Tips**

- **Conduct Regular water tests.** Each farm should have its well water tested. Water quality can change during periods of heavy rain or drought and additional water tests during these periods will ensure that water lines continue to deliver adequate water volume for both the birds and the cooling systems.

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- **Change filters regularly.** Sediment and other particulates can cause leaky water nipples that can have negative effects on litter quality. Clogged filters restrict water flow to the drinker and cooling systems. In some cases, simple cartridge filters may not be adequate, such as for water with high iron. In those cases, other water treatments will need to be considered.
- **Flush water lines regularly.** A high pressure flush should be performed on water lines between each flock and after adding supplements through the medicator (e.g. vaccines, medications, vitamins, electrolytes, etc.).
- **Plan ahead before treating water.** Before implementing water treatment or sanitation programs, consult your veterinarian to ensure that contaminants in your water will not react negatively and cause the water system to become clogged.

**Taking a Water Sample**

- The results of a water analysis will be reliable only if the samples are taken correctly. Your county health department will probably be willing to work with you in obtaining water samples and having them tested for bacteria and chemicals in the State Health Department laboratories. Commercial laboratories will also perform water tests for a fee. Be sure to specifically request that your samples be tested for the chemicals and other factors that can be detrimental to poultry production as well as for the presence of microorganisms.
- When you collect samples, remember that the water should first be allowed to run for several minutes to allow a representative fresh sample to reach the water outlet. The outlet should than be sterilized by flaming or other suitable method, and the sample should be placed in a sterilized container. The sample should arrive at the testing laboratory within 24 hours if bacteria tests are to be accurate.

**Conclusion**

Water is involved in every aspect of poultry operations cleaning, washing and drinking. It plays important roles in regulating body temperature, metabolism- digesting food, and eliminating body wastes. At normal temperatures, poultry consume at least twice as much water as feed. When heat stress occurs, water consumption will double or quadruple. A safe clean and adequate supply of water is therefore essential for efficient poultry production and maintenance of health.

Poor water quality can interfere with digestion and impact overall performance. It can also hinder the effectiveness of vaccines and medications that are delivered via the water lines. More often than not though, poor water quality creates indirect problems. It can clog up water lines and cooling systems. This, in turn, restricts consumption and cooling capacity, both of which can have a detrimental effect on growth and reproduction. Therefore maintenance of water quality is important in all poultry operations.

# VARIETIES / STRAINS OF CHICKEN USED FOR RURAL BACKYARD POULTRY FARMING

Email: sisrisharamayan55@gmail.com

***Dr R. Shirisha , M.V.Sc., Ph.D.,*** *Assistant Professor, Department of Poultry Science*
*College of Veterinary Science, Mamnoor, Warangal*

**Backyard poultry:**

Backyard poultry Farming is a promising option for rural livelihoods. It requires low initial investment. Boost up family income for better utilization of family laborers who are not able to perform other works like old family members or children. It is a potent tool for upliftment of socio economically backward people.

Backyard poultry birds convert waste material like home kitchen waste, vegetable waste, green grass, etc., into high-quality eggs and meat for human consumption Importance of poultry can be highlighted through generation of income and employment along with its role in family nutrition.

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**Extreme heat stress adversely affects production, performance and farm profitability**

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

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## Highlight Points

- Backyard poultry farming involves negligible feed cost due to better utilization of agricultural by-products.
- It provides employment to the rural small-scale farmers, women, unemployed youth and old members of family along with extra income to the rural communities.
- Eggs and meat from backyard poultry farming fetches high price as compared to those from intensive poultry farming.
- Livestock interventions that target species under the control of women like backyard poultry farming may enhance the impact upon household food and nutrition security through empowerment of women.
- It minimizes environmental pollution per unit poultry produce as compared to intensive or semi-intensive poultry farming because major problem in intensive or semi-intensive poultry farming is environmental pollution due to high density of bird.

Backyard poultry production can cater the nutritional requirements of the family. Acts as an ATM, because as per family need the birds and eggs can be sold at any time with cash in hand. Quality of chicken and egg is better in terms of organic farming as the birds are raised in stress less environment and consumers are willing to pay higher prices for high quality desi chicken meat or egg.

Most of the backyard poultry production comprises of rearing indigenous birds with poor production performances. However, over the period of time improved strains have been introduced by extension and development agencies.

In order to enhance the socioeconomic and nutritional status of the rural population, there is a need to promote backyard poultry farming with improved chicken varieties that are suitable under village condition. several chicken crosses were developed to meet the demand of backyard poultry farming depending on the specific need of people of the region.

**1. Rajsree (Raja- Rajendranagar and sri-money):** Poultry Research Station (PRS) of P.V. Narasimha Rao Telangana Veterinary University (PVNRTVU), Rajendranagar, Hyderabad, has developed a promising dual purpose backyard poultry variety.

It is combination of 3 exotic (White leghorn, Rhode Island Red and Dahlem Red) and non -descript breed Rajasri as it is hardy, attractive with multi-coloured plumage, capable of self-propagation, have good body conformation with capacity to escape from predators, a good scavenger and less susceptible to diseases.

Moreover, their multi coloured plumage, resemble to desi birds, which fetch almost double the price when compared to broiler chicken. Eggs being brown shelled will also fetch more price when compared to commercial white shelled eggs.

**Production performance:**

- Egg production: 150 -160 eggs per annum
- Body weight by 18 weeks of age: 1.5 kg
- Age at first egg: 5-6 months
- 20 weeks Rajasri male weight: 1750 gms
- 20 weeks Rajasri Female weight: 1500 gms

**2. Vanaraja:**

Vanaraja is a dual-purpose variety developed by the Project Directorate on Poultry Hyderabad for free range farming in rural and tribal areas.

**Production performance:**

- Males weigh about 1.2 to 1.5 kg at 10 wks and females lay about 120-140 eggs in lying year.
- Attractive feather colour
- Low input cost
- Disease resistance
- Better survival rate
- Large brown egg resembling desi egg
- Desi hens can be used for brooding of vanaraja eggs

**3. Krishibro:**

- Developed by the Project Directorate on Poultry (ICAR), Hyderabad.
- Multi-coloured commercial broiler chicks

**Production performance:**

- Attain body weight by 6 weeks of age with less than 2.2 feed conversion ratios.
- The survivability of this bird up to 6 weeks of age is around 97%.
- These birds have attractive colour plumage and are
- well adapted to tropical weather conditions.
- The commercial Krishibro has highly resistance against the common poultry diseases like Ranikhet and Infectious bursal disease.
- Advantages : Hardy, Well adapted and Better survivability

**4. Gramapriya:**

- It was developed by the Project Directorate on Poultry based in Hyderabad.
- Gramapriya is a layer type variety

**Production performance:**

- The bird has the production potential of 230-240 eggs in a year and can lay 160-180 eggs in free-range conditions with minimum supplementary feeding.
- The males weigh around 1.2 to 1.5kg at 15 wks. of age
- The bird has coloured plumage and lays bigger (57-59g) and brown eggs.
- It is hardy and livability is high.

**5.Giriraja:**

- Giriraja breed of chicken suited for mixed and backyard farming developed by Karnataka Veterinary, Animal, and Fishery Sciences University in Bangalore

**Production performance:**

- Females lay 130-150 eggs per year, with each egg weighing 52-55 grams.
- The eggs have a good hatchability (80-85 per cent), and enable farmers to raise their own stock. Their shells are brown in colour and thicker than that of other commercial eggs.
- The bird's exhibit better growth compared to local varieties
- Being good scavengers, they feed on a variety of insects and green foliage. They can also be fed on farm and kitchen waste.

**6. Swarnadhara:**

- Swarnadhara is a hybrid chicken breed developed at department of Avian Production and Management (DVPM), Hebbal, Bangalore.• It is a Hardy bird having high egg production potential along with better growth compared to other local varieties and are suited for mixed and backyard farming. The bird can be reared for its eggs and meat.

**Production performance:**

- Hens attain a body weight of about 3 kg and the cocks about 4 Kg by 23rd week.
- They lay about 180-190 eggs in a year.
- The eggs have good hatchability (80-85 per cent)
- The eggshell is brown in colour and thicker than that of other commercial eggs/.
- They can be raised as free roaming birds and can be fed with locally available material

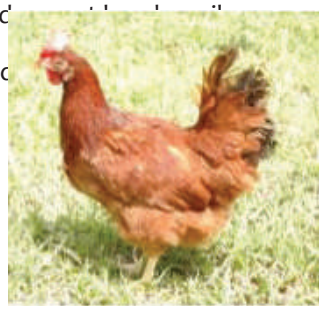
**7.Gramalakshmi and Gramasree:**

- These two varieties have a high production potential along with better growth rate suited for mixed and backyard farming developed by College of Veterinary and Animal Sciences, Mannuthy.
- Gramalakshmi birds are white in colour with black speckles throughout the body while
- Gramasree birds are dark brown with a sprinkling of black, and grey on different parts of the body.

**Production performance:**

- The hens attain a body weight of 1.4 kg in five months and start laying eggs after 160 days.
- The males attain a body weight of 1.5 kg in three months and are popular for their meat, which is low in fat content compared with present day broilers.
- Both the varieties lay about 200 eggs each year with each egg weighing about 50 grams.
- The eggshell is brown in colour and thicker than that of

**Raja Sri male**



**Raja Sri fe male**

**Vanaraja**

**Gramapriya**

**Giriraja**

**Swarnadhara**

**Gramalakshmi**

**Gramsree**

# All About Feed - Gut Health Special

# Nutribiosis is key is post - AGP Gut Health

**Dr Milan Hruby,**
*Global Applications Senior Manager,*
*Danisco Animal Nutrition (IFF).*

***With the global regulation of antibiotic growth promoters expected to accelerate, what action can animal producers take to correct associated performance losses? Dr Milan Hruby, Global Applications Senior Manager at Danisco Animal Nutrition (IFF), explains how taking a wider view offers a potential solution to this complex issue.***

The move to restrict or remove antibiotic growth promoters (AGPs) in feed is one of the most challenging issues to hit the animal industry in recent years. Now, as global health bodies step up efforts to fight the threat of antimicrobial resistance in humans - viewed as a major public health issue - the use of antibiotics in the food chain is coming under ever greater scrutiny. It goes without saying that reducing or removing antibiotics from the farm is not an easy task. Taking away this long- established practice has serious implications for producers in terms of the health of their livestock and business. Most importantly, the daily challenge of providing optimal animal performance is severely compromised due to the depletion of available tools to fight against unpredictable diseases, such as Necrotic Enteritis (NE). According to recent research, such challenges are reportedly on the rise and believed to be contributing to high economic losses.

In considering alternatives to conventional antibiotics, however, it is not a question of a simple, "one size fits all" replacement. There are too many variables to consider such as farm management, national legislation and feed ingredient availability, to name a few. In addition, the use of antibiotics in - and of - itself is a complex process. Although they are known to suppress sensitive populations of bacteria in the intestines, for example, it is also recognised that they do not discriminate between beneficial and non-beneficial types. Viewed in this context, continuing to look solely at nutrition as a stand-alone solution, without also considering the implications of the fields of microbiome and gut & immune function, is no longer an option. Animal performance is always an interaction of all three pillars (nutrition, microbiome and gut & immune function) within the gut - a state we refer to as nutribiosis. The aim is to understand how to positively influence all three pillars to achieve balance in the gastrointestinal tract (GIT) - also known as a "favourable nutribiotic state" - and so deliver the sought-after positive performance benefits in the animal.

**Challenges to nutribiotic state**

The removal of antibiotics from feed will naturally challenge the delicate nutribiotic balance, but it should be noted that their use does not allow for a "favourable state" in the first place. Under challenge the three pillars can become unbalanced and it is this lack of harmony that creates an "unfavourable state" in the gut; leading to reduced health and performance. This is why taking a holistic approach is vital. It helps to build a deeper understanding of these inter-connected relationships and opens up new opportunities to improve overall production.

**Nutritional challenges**

Nutritionally, one of the greatest challenges to animal performance is high levels of undigested nutrients. While 100% digestibility can never be achieved, reducing levels as far as possible is a key goal for nutritionists and producers alike. This is partly because undigested feed reaching the terminal ileum provides ideal substrates for non-beneficial bacteria to feed on and thrive – and when the beneficial bacteria becomes outnumbered, it can lead to subclinical diseases, inflammation and gut damage. One opportunity that warrants further investigation is the use of feed enzymes to further remove undigested substrates. One

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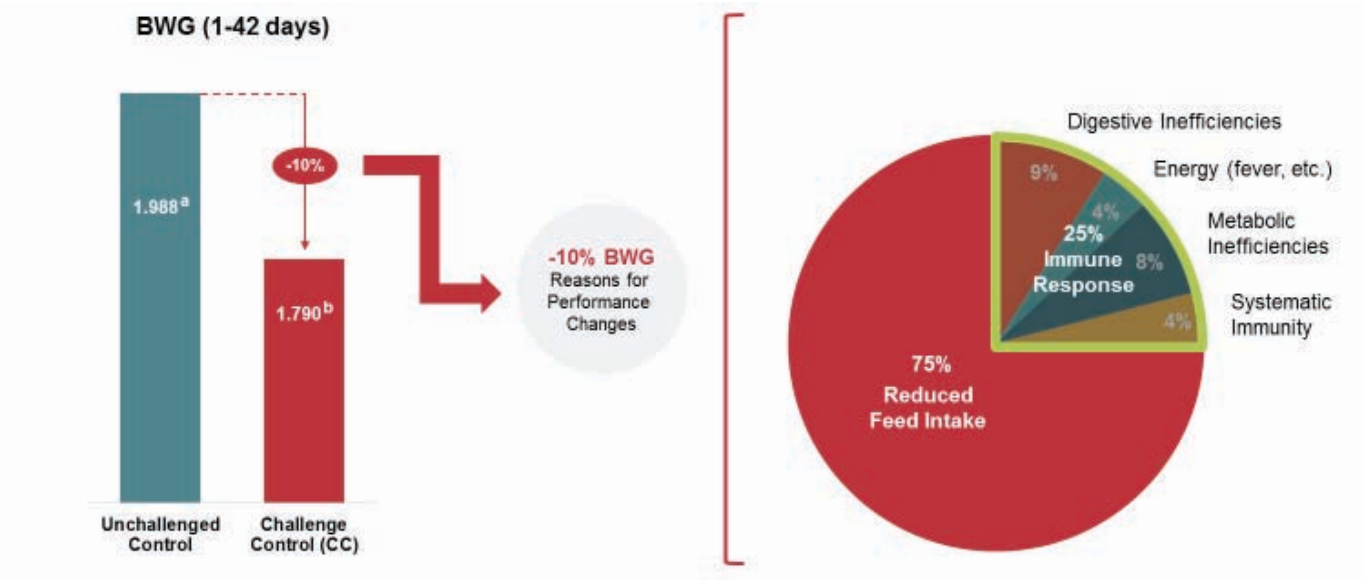



*Figure 1 -25% of total performance drop during challenge can be attributed to the immune response of the animal.*

study1 looking at the impact of xylanase, amylase and protease enzymes on levels of three undigested nutrients (protein, starch and fat) found that this intervention had a positive effect on all three nutrients. Levels of undigested starch, for example, dropped by 43%. Further research is helping to build on this knowledge; not just in terms of the types of feed or substrate needed for the microbes to work on, but also how to increase the production of short-chain

fatty acids and potentially benefit the gut cell or gut microbiome through changes of substrate such as arabino-xylooligosaccharides or AXOS production.

**Non-nutritional challenges**

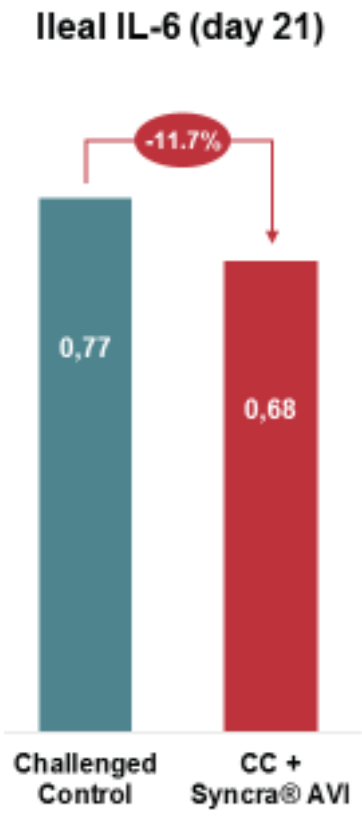
It is also important to understand the impact of non-nutritional challenges on the nutribiotic state. Particularly, how the immune response cuts into animal performance. Danisco Animal Nutrition has carried out a number of studies with NE-challenged birds which, unsurprisingly, demonstrate a significant reduction in performance. A recent study estimates that an immune response can account for 25% of total body weight reduction during a challenge. (See Figure 1). A promising way to address these types of non-nutritional challenges is with probiotics. What is interesting from a nutribiosis perspective is that, with studies2 demonstrating a positive influence on both microflora and gut health, these helpful bacteria can be seen to work constructively on all three pillars within the GIT. The next step is to demonstrate probiotic value within an antibiotic-free narrative.

Figure 1 -25% of total performance drop during challenge can be attributed to the immune response of the animal.

**Multi-pronged approach**

While enzymes and probiotics undoubtedly offer benefits individually, one of the most exciting areas to explore what happens when they are used together. Our data points to a clear opportunity to make considerable gains. Specific enzyme and probiotic combinations have been shown to improve key aspects of gut health including digestibility of key nutrients in broiler diets and enhanced intestinal integrity. Research also suggests this intervention contributes to a significant reduction in inflammation. IL-6 is a key pro-inflammatory cytokine which initiates the acute phase protein response and induces fever, see Figure 2. This cytokine is typically elevated during times of physiological stress.

There are other issues to consider which are subject to further research. Improving the water holding capacity of intestinal cells, with the use of organic osmolytes like betaine for example, may improve the nutribiotic state.




Phytogenics could also be part of an integrated approach. Equally important is effective facilities management; housing, vaccination, education should all play a part in efforts to rectify any performance losses brought about by the reduction in antibiotics. So as the industry continues to evolve towards antibiotic-free production, the understanding of nutribiosis offers a new platform to explore additional opportunities; providing valuable insights for improved animal performance, welfare and gut health – and ultimately helping producers make more profitable decisions for commercial success.

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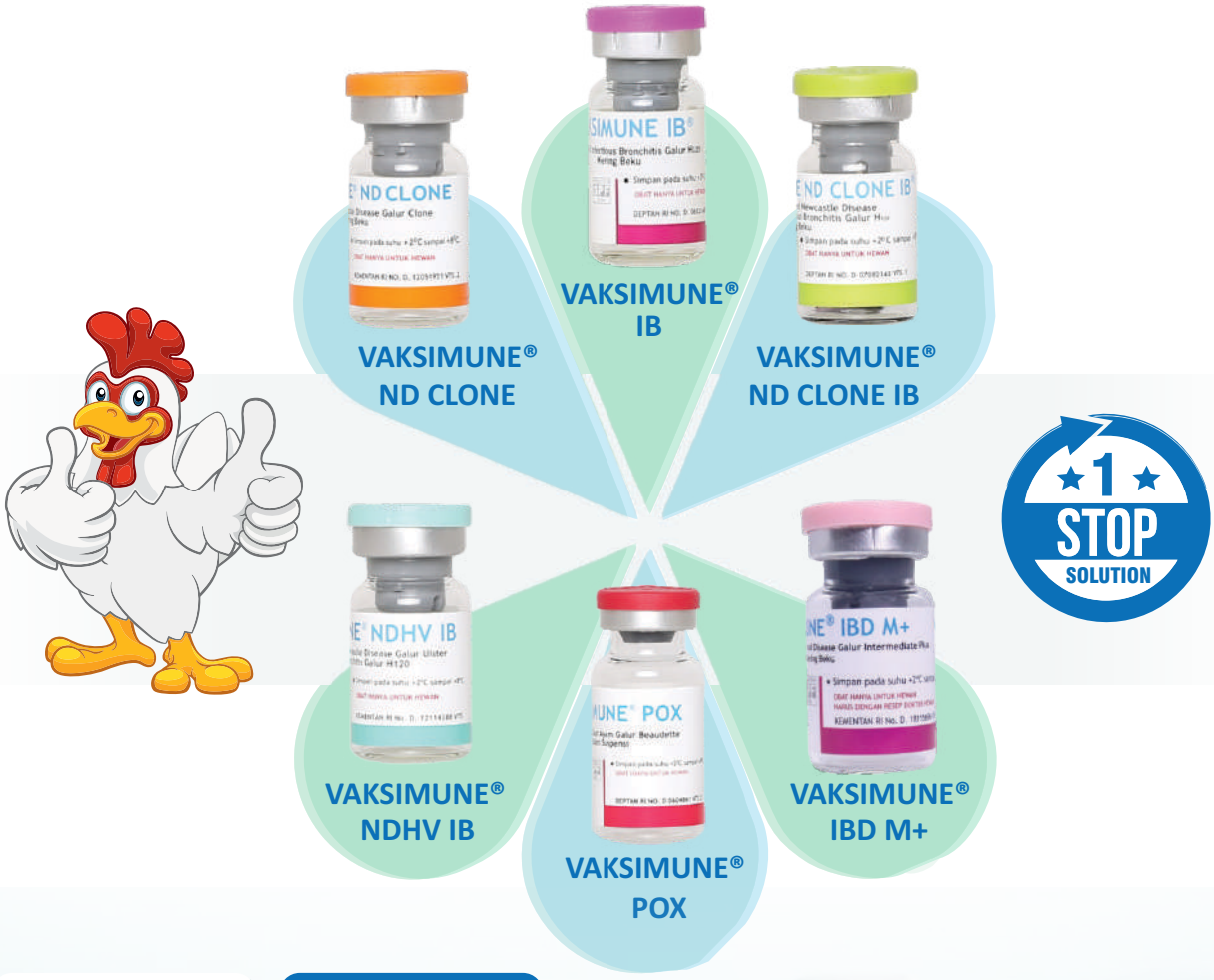


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Postal Regn. No. HD/1067/2021-2023
Published on 8 May 2022

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