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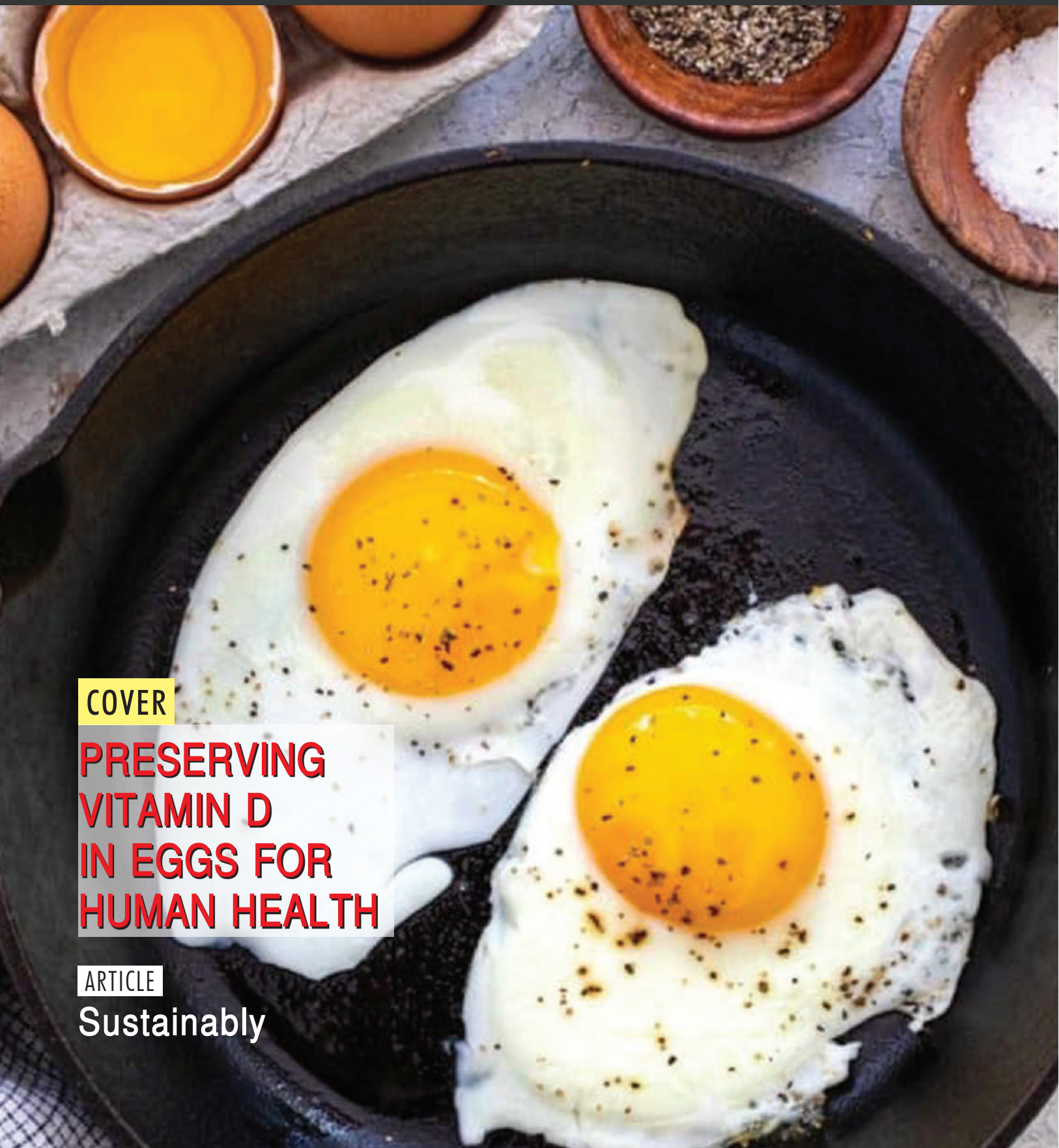
INDIAN POULTRY REVIEW

THE MAGAZINE OF INDIAN POULTRY INDUSTRY | MARCH 2024



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ARTICLE

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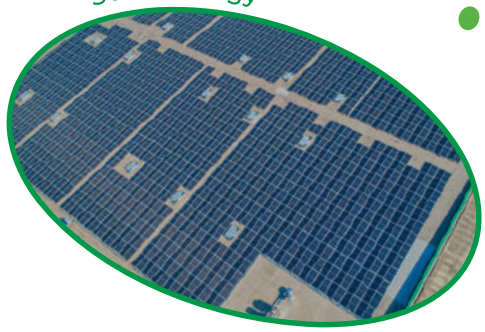

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Volume 58 | Issue 07 | March 2024

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Achieved 241 HHE in 60 Weeks
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Weeks Above 90%	30
Cum Feed / Egg	125
% Achievement	94%
Feed Cost / Egg @ Rs. 26/KG	Rs. 3.25

6 Batch Taken Till Now

Sri Sakthi Poultry Farm,
Namakkal District, Tamil Nadu

Mr. S. Natesan

Achieved 222 HHE in 57 Weeks
With 102 g Feed Intake/Day (Laying Period)

Peak Weekly Production	96%
Weeks Above 90%	21
Cum Feed / Egg	123
% Achievement	93%
Feed Cost / Egg @ Rs. 27/KG	Rs. 3.32

3 Batches Taken Till Now

Srinivasa Poultry Farm,
krishna District, Andhra Pradesh

Achieved 184 HHE in 50 Weeks
With 102 g Feed Intake/Day (Laying Period)

M. Sivarama Krishnaiah

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Cum Feed / Egg	121
% Achievement	94%
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25/02/2024

The Edit

QUO VADIS ?

In recent years, it is alarming to notice some states in the country keen to prohibit the eating of non-vegetarian food including eggs and chicken.

We are well aware that in the recently formed Madhya Pradesh government's first cabinet meeting the most important decision was to prohibit the sale of fish, meat and eggs in the open markets. We have seen such a decision being taken earlier by the Madhya Pradesh government when it discontinued eggs in the mid-day meal of students. It is pertinent to state here that World Health Organisation (WHO) as well the board of medical practitioners always recommend eggs as the best protein food in the world to nourish human health and to boost immunity. During COVID-19, health experts across the globe advised the consumption of chicken and eggs as an easy and inexpensive way to increase immunity against the deadly virus.

According to the 2005-06 Indian National Family Health Survey, 75 percent of Indians are non-vegetarian. The data for 2015-16 under the same survey show 78 percent of women and 70 percent men are non-vegetarians thus debunking the belief that India is a majorly vegetarian country.

This confirms that even the economically challenged in the country prioritise on spending on milk and eggs whenever they can afford to. As and when finances permit, they consume fish and meat as well.

In such a scenario, it remains a mystery why a section of people are trying to force the majority to change their traditional food habits.

G. N. Ghosh
Managing Editor

Indian Research

Effect of Dietary Supplementation of Different Zinc Sources on the Carcass Traits of Broilers

By
Shubhnish*, V.S. Panwar, B.S. Tewatia and Jyotsana
Department of Animal Nutrition, College of Veterinary Sciences. Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar-125004. Haryana, India

Zinc is the most commonly added trace mineral in poultry feeds. It helps in promoting growth rate and feed efficiency of birds. The recently discovered nano particles of zinc have the advantage over the other conventional forms due to their extreme small size, unique physical properties and more retention in body tissues. This study investigated the effects of supplementation of different zinc sources of different carcass traits and meat quality of broilers. The experiment was conducted on 160 one day old broiler chicks divided into four treatment groups having four replications of ten birds in each. Broilers were fed basal ration as per BIS standard in all treatment groups. T1 was taken as control while T2, T3 and T4 groups were supplemented with inorganic, organic and nano zinc respectively. After completion of feeding trial of 42 days representative samples of muscles were taken for analysis of different parameters as per AOAC (2013). The T4 group showed significant increase in dressing percentage, weight of gizzard, liver, kidney and lowest abdominal fat among all treatment groups. The breast and thigh muscles also had highest CP content and lower moisture and EE in T4 group. Thus it can be concluded that nano zinc supplementation in broilers produce lean carcass which may be due to high anabolic activityin muscles.

Effect of Fenugreek Powder (Trigonella foenum-graecum) Supplementation on the Performance of Laying Hens

By
T. Saxena*, A. Kumar, J. Srivastav, R.K. Sharma and Srivastav
College of Veterinary and Animal Sciences, GBPUA&T Pantnagar, U.S Nagar, Uttarakhand

Optimum egg production is important to meet the future demands of growing population in the world. Egg production and quality depend on nutritional management and health of laying birds. Due to the negative impacts of synthetic feed additives such as antibiotics, natural alternatives is used to improve the production and egg quality of layer hens has become important. Among the various natural feed additives, fenugreek has the potential to reduce stress factors and boost production through improved growth and feed intake, as well as improved egg quality. In poultry nutrition, fenugreek seed has been incorporated at low levels as feed additive in substitution of antibiotics and coccidiostats also used to reduce egg yolk cholesterol. Fenugreek (Trigonella foenum-graecum) is a multifunctional herb belonging to the family of Fabacecae is known for its antifungal, antiviral, anticarcinogenic, antidiabetic and antimicrobial properties. This plant is one of the oldest medicinal plants with excellent medicinal and nutritional properties. Fenugreek contains numerous bioactive constituents such as alkaloids, flavonoids, steroid and saponins. Alkaloids of this plant include trigocoumarin, nicotinic acid, trimeth coumarin. and trigonelline. Fenugreek seed is rich source of phytoestrogens and antioxidants.Inclusion of fenugreek in laying hens diet can positively affect the feed conversion ratios (FCRs) and improves the immune system of laying hens.

Differential Regulation of Hormones Amino Acids, Expression of Amino Acid Transporters and Hormone Receptors During Early and Mid Laying Period and Their Modulation by Organic Selenium in Aseel Hens

By
N. Anand Laxmi*, R. K. Mahapatra, M. Shanmugam and K.S. Raja Ravindra
Directorate of Poultry Research, Rajendranagar, Hyderabad, India

The present experiment was conducted in Aseel breed of chickens reared at Directorate of Poultry Research Institute farm. It is known that amino acids, hormones and expression of receptors and transporters are required for nutrient absorption and flow of nutrients for production purposes. Till date no studies have been conducted in this variety with respect to differential level of these parameters during early (EP) and mid (MP) period and further effect of additional Se (Selenoyeast, Se2) on melatonin (MET), ghrelin (GHLI) and steroid hormones and other mentioned physiological parameters. In the present study, two groups of Aseel chickens at 22 weeks of age were maintained. One control group, reared on basal diet containing 0.3mg of Se. The other group was supplemented with additional 0.3mg of Seleno yeast along with basal diet. Treatment was initiated at 24 weeks, and continued till 28 weeks of age (EP), and then resumed from 32 to 36 weeks of age (MP). When compared between the control groups of EP and MP period, the mean level of hormones MET, GHL, was less and steroid hormones more ($P<0.05$) at MP compared to respective levels at EP. Supplementation of Se2 decreased level of melatonin, progesterone and Ghrelin and increased estradiol at EP. At MP the plasma level of all the four hormones increased. Supplementation of Se2 significantly decreased concentration of 11/15 plasma amino acids and the expression of amino acid transporters decreased in jejunum and increased in magnum tissue at both EP and MP. Expression of MET receptors in I jejunum was inversely proportional and directly in magnum to MET hormone concentration at both EP and MP; expression of GHL receptor was inversely proportional to GHL concentration in both the tissues at EP and MP. Further Se2 supplementation increased egg production significantly ($P<0.01$) at both EP and MP. In conclusion it can be said that Se2 supplementation increased the utilisation of hormones at EP and increased at MP which modulated the physiological parameters of the magnum tissue greater when compared to jejunum, resulting in beneficial effect on egg production performance in chickens.

Source: XXXVII Indian Poultry Science Association Conference, November 2022

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Article

Betaine: Optimizing Poultry Health in Heat Stress Condition

Dr. Sanket Wakchaure
Nutritionist – Poultry
Trouw Nutrition South Asia

What is Betaine?

It was first discovered in the juice of sugar beets. Naturally accumulated in plants as osmolyte to protect against salt and temperature stress. Derivative of glycine (amino acid). Neutral molecule with bipolar structure (zwitterion) as shown in Fig. 1 contains three methyl groups.

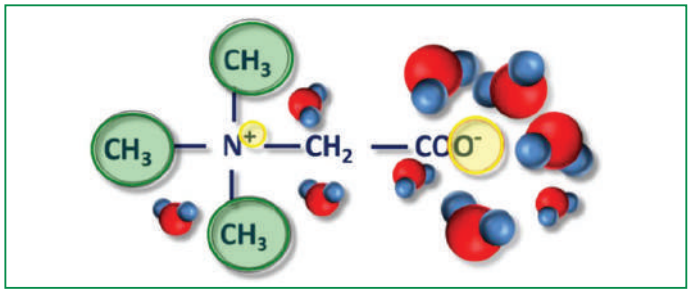

Fig. 1: Chemical Structure of Betaine

Betaine Functions As (mode of action)

Methyl donor– methyl groups used for protein synthesis and other metabolic processes. Methyl groups play a pivotal role in several cellular processes, including DNA methylation, synthesis of phosphatidylcholine, and protein synthesis. Choline and betaine are both capable of donating methyl groups. However, for choline to do so, it must first be converted into betaine as shown in Fig. 2. In poultry, the capacity to synthesize betaine from choline is limited, thus making dietary supplementation the primary source.

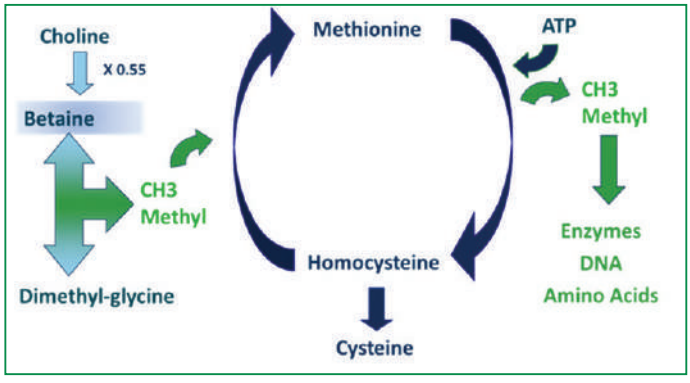

Fig. 2: Role of betaine in the methionine cycle in liver

Betaine can substitute for choline in performing the following functions:

1) Regulating fat metabolism in the liver to prevent abnormal fat accumulation in hepatocytes

2) Serving as a methyl donor for the formation of methionine and creatine, through its involvement in the transmethylation pathway

Betaine cannot replace choline in the function of maintaining cell membrane and structure as an emulsifier to transport lipids, since choline is a constituent of phospholipids. Similarly, betaine cannot replace choline as a precursor of acetylcholine in the transmission of nerve impulses.

B. Osmo-regulator– ability to bind and retain water in a reversible manner.

Osmolytes are compounds that aid in the regulation of osmotic pressure within cells and tissues, playing a crucial role in preserving cellular integrity. Dehydration, disease, heat stress, and other factors can cause alterations in the water content of cells. Osmolytes can be either inorganic ions such as Na^+, K^+, Cl^-, or organic compounds such as amino acids, certain sugars, and betaine.

Betaine plays a crucial role in stabilizing cellular metabolic function during periods of stress, preserving the cell's capacity to uptake nutrients, unlike osmolytes such as Na^+, K^+, and Cl^-. Moreover, it offers protection to intracellular enzymes against osmotic inactivation.

Heat Stress

Heat stress is a major challenge in poultry production, especially during the hot summer months. It occurs when birds face difficulty in achieving a balance between body heat produced and heat loss. This imbalance can lead to several health issues and production losses.

Causes of Heat production

- Hot environment
- High feed intake
- High physical activity
- Overcrowding of birds in a limited space

Heat stress response to maintain normal body temperature.

- Increased panting
- Spreading of wings
- Moves toward shades and cooler surfaces or at the place where airflow is more.
- Blood-swollen wattles and comb
- Divert blood from internal organ to the skin which darken skin color.
- Birds try to move away from each other.
- Less physical activity
- Eats less and drinks more water which will cause loose or watery droppings.

Impact on poultry production

Heat stress production losses depend on maximum temperature, duration of high temperatures, rate of temperature change, and relative humidity of the air.

↑ Mortality	↓ Feed intake
↓ Gut health	↑ CFCR
↓ Body weight	↓ Meat quality
↓ Immunity	↓ Egg production.
↓ Egg weight	↓ Eggshell quality
↓ Albumin height	↓ Hatchability

Impact on a molecular level

- Free radical generation, cell damage
- Intestinal barrier damage (shown in Fig. 3)
- Electrolyte imbalance.

The Role of Betaine in Enhancing Poultry Health During Heat Stress

a) Betaine aids in preserving intestinal integrity by facilitating water retention, increasing cell volume, promoting anabolic activity, and maintaining cellular integrity as shown in fig. 4. which are representative photomicrographs of the ileum after 10 days of the experiment from broilers fed a control diet (CON, A and C) and betaine (BET, B and D) on villous height under thermoneutral (TN, A and B) or after 10 days being exposed to heat stress (HS, C and D).

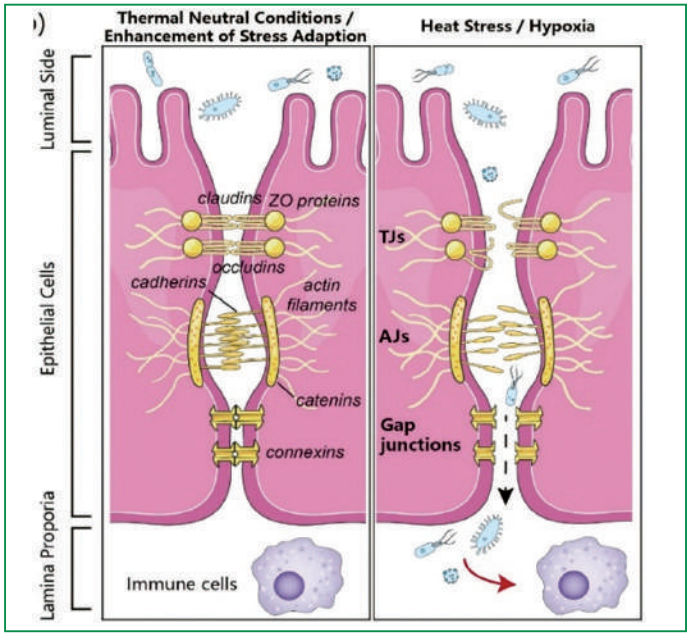

Fig. 3 - Intestinal barrier damage in HS (Soheil Varasteh, et al. Nutrients, 2020)

b) Betaine has three methyl groups in its structure and donates them in various metabolic reactions, which can spare compounds like methionine, choline, and folic acid. Therefore, supplementing with betaine may reduce the need for these nutrients.

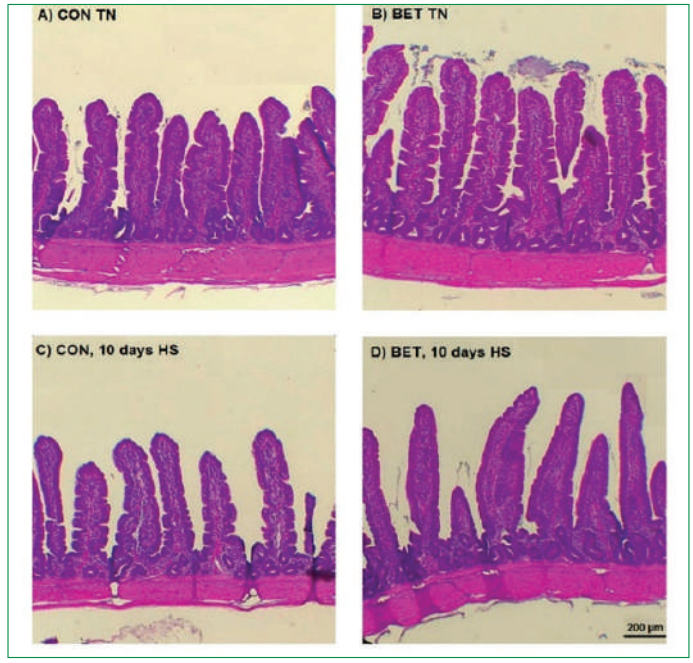

Fig. 4 - Impact of betaine on intestinal integrity of broiler birds in Heat stress conditions (Shakeri et al, Animals 2020)

c) The growth rate of poultry birds is enhanced by betaine, which conserves energy that would otherwise be expended on the Na+/K+ pump and Calcium pump in high temperatures. This conserved energy can then be directed towards growth.

d) Betaine enhances the concentration of beneficial short-chain fatty acids, such as acetic and propionic acid, which are vital to host bacteria like Lactobacillus and Bifidobacterium in poultry. This improvement enables these bacteria to effectively inhabit the caecum and inhibit the colonization of harmful bacteria in the intestinal tract.

e) Betaine supplementation in laying hens leads to an increase in daily egg mass production, reduces thin eggshell issues which are related to heat stress, and helps to enhance serum concentrations of estradiol and melatonin.

f) Trouw Nutrition's Betaine is proven to elevate production performance even under heat stress conditions, notably increasing breast meat percentage through the provision of essential methyl groups, as depicted in Fig. 5. Recognizing that high-performing animals demand superior nutrition for sustained health and

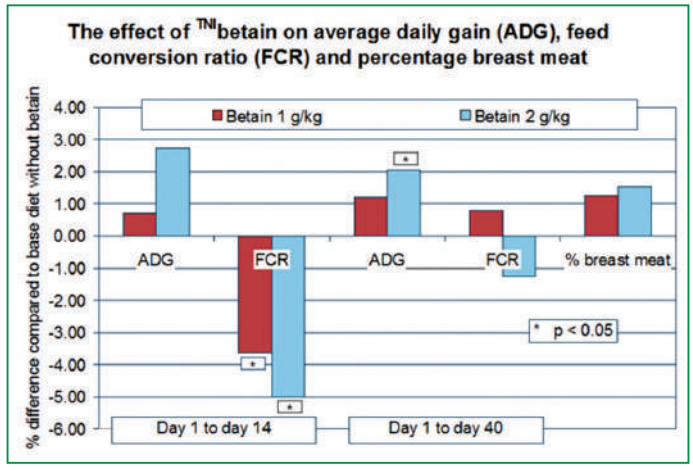

Fig. 5: Effect of Trouw Nutrition betaine on broiler performance

Contrasting the Attributes of Trouw Nutrition's Natural Betaine with Synthetic Betaine	
TNIbetain96	**Betaine HCL**
Natural source	Synthetic source
High Betaine content (>96%)	Lower betaine content (70-74%)
Sweet taste & smell	Profound (acid) taste & smell
pH = 7 (neutral)	pH = 1-1,5 (very acid)
Non-corrosive	Highly corrosive
Highly soluble in water (approximately 99%)	Low solubility in water, around 50%
Proven product, strong technical dossier	Availability of technical data limited
Easy to process, no risks for equipment & workers	Specific precautions for equipment & workers required
Molecular weight 117.15 g/mol	Molecular weight 153.61 g/mol
Without residues TMA (trimethylamine)	Residues of TMA (trimethylamine) that can cause irritation and damage at the level of membranes.
Very low levels of Cl– ion (less than 0.1%) which means that there is no interference with its osmolyte function	Cl- ion concentration is never less than 20%.
Free flow powder	Hygroscopic (formation of lumps)

optimal growth, Selko Feed Additives introduces TNIbetain. This meticulously tested supplement supports animal performance across multiple metabolic pathways. TNIbetain adheres strictly to the stringent quality standards upheld by Trouw Nutrition Feed Additives.

Recommended Dosage

For broiler, layer, and breeder birds: 0.5 to 1 kg per ton of feed. However, in challenging conditions such as heat stress, the Betaine dosage can be increased to up to 2 kg per ton of feed.

g) Betaine has been found to significantly enhance hematological parameters, including RBC and platelet count, while reducing the number of heterophils and increasing the number of lymphocytes. The reduction in lymphocyte count during heat stress is attributed to the rise in inflammatory cytokines, which stimulate hypothalamic production of corticotrophin releasing hormones.

h) Betaine aids in the expansion of intestinal mucosa, thereby enhancing the absorption and utilization of nutrients, which results in improved digestibility of crude protein, crude fiber, ether extract.

i) Studies have demonstrated that betaine interacts with lipid metabolism by promoting the oxidative catabolism of fatty acids through its involvement in carnitine synthesis. Therefore, betaine can be utilized to increase the proportion of lean meat and reduce fat in poultry carcasses.

j) Betaine acts as an osmoregulatory in the intestine, optimizing water and salt balance within cells for efficient nutrient absorption and reducing litter moisture. It increases villus height, protecting enterocytes during challenges like coccidiosis, and strengthens the gut, reducing damage during infections as shown in Fig. A, B and C.

The various effects described are either directly or indirectly linked to betaine's osmoregulatory function and its role in methionine biosynthesis.

Conclusion

Betaine emerges as a pivotal component in poultry health management, particularly in the face of heat stress challenges. Originating from sugar beets, its molecular structure rich in methyl groups facilitates its dual function as a methyl donor and osmoregulator, essential for maintaining cellular integrity and supporting metabolic processes. Amidst heat stress conditions, Betaine supplementation showcases remarkable efficacy, preserving intestinal integrity, conserving energy expenditure, and enhancing production performance. Its multifaceted benefits extend to improvements in hematological parameters, nutrient absorption, and lipid metabolism. With its proven effectiveness and adherence to stringent quality standards, Betaine stands as a crucial asset in optimizing poultry health and performance under challenging environmental conditions, exemplifying the potential of innovative nutritional strategies in safeguarding livestock welfare and productivity.

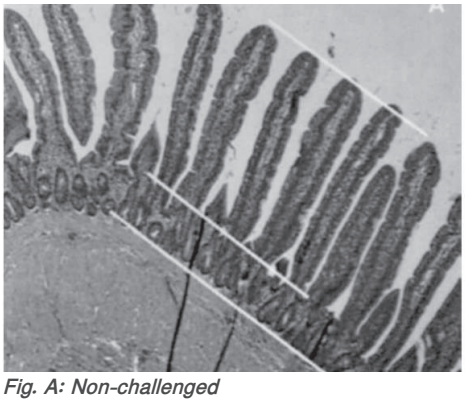

Fig. A: Non-challenged

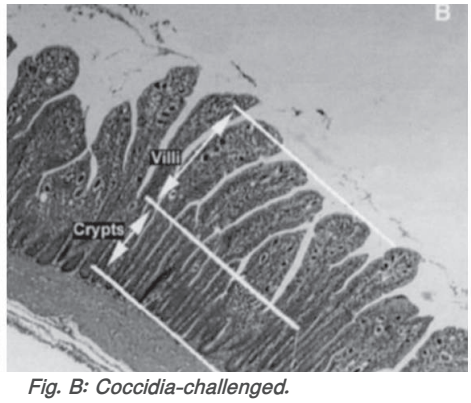

Fig. B: Coccidia-challenged.

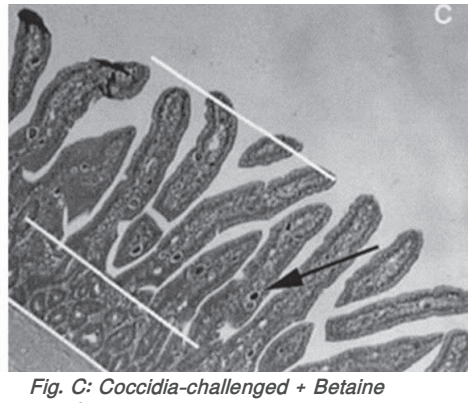

Fig. C: Coccidia-challenged + Betaine supplementation.

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Article

Effective Mycoplasma Management in Poultry by Proven Antimycoplasmal Drugs

Dr. Sachin Patil
DGM - Key Clients, Huvepharma SEA

Introduction

Avian mycoplasmosis was primarily described in turkeys in 1905 and in chickens in 1930. There are 23 named species of mycoplasma recovered from avian sources but only two of them are established pathogens for domestic poultry as Mycoplasma gallisepticum (MG), Mycoplasma synoviae (MS) causes 'Chronic Respiratory Disease'. Mycoplasma pathogens cause upper respiratory and locomotory illness in chickens and other avian species. They are responsible not only for clinical diseases but also for decreased weight gain, lowered feed conversion efficiency, reduced hatchability, and downgrading at slaughter (Bradbury, 2001).

Mycoplasma gallisepticum (MG) infection in the commercial poultry industry is common in many areas. Despite the great efforts by poultry breeding companies made towards eradication of pathogenic mycoplasmas from poultry flocks, still Mycoplasma gallisepticum infection is of continuing economic concern in commercial broiler breeder chicken flocks. Failure in eliminating the disease in grandparent (GP) stock; it persists in broiler breeders and broilers through vertical transmission. The continued presence of MG in commercial broiler breeder flocks suggests that efforts at eradication were not highly successful. This organism is smaller than common bacteria and larger than viruses, but lacks a cell wall. This characteristic makes MG extremely fragile (no cell wall) and difficult to culture (specialised growth requirement) and host adapted (avian only).

Respiratory tract infections are of great importance in poultry industry, causing heavy economic losses. Mycoplasma gallisepticum and Mycoplasma synoviae are the most pathogenic organisms of the respiratory tract.

Other respiratory tract infections include both viral pathogens (Newcastle disease virus, Infectious bronchitis virus, Avian influenza virus) and bacterial pathogens (Salmonella pullorum, Escherichia coli, Avibacterium paragallinarum, etc.) cause diseases independently and in association with each other and causes Complex Chronic Respiratory Disease (CCRD).

Mycoplasma control requires integrated approach involving diligent biosecurity, animal husbandry and disease surveillance. The consequences of wide spread infection in breeder operation can be devastating result of both as direct and indirect losses occurring throughout the production cycle (Ley, 2003).

Transmission

MG and MS can spread through horizontal and vertical route of susceptible birds with infected chickens; spread may also occur by contaminated airborne dust, droplets, or feathers (Ley and Yoder, 1997). It can be transmitted through the chicken hatching egg to the offspring. MG has been isolated from the oviduct of infected chickens and semen of infected roosters (Yoder and Hofstad, 1964).

Clinical Sign

Both diseases are economically important, egg transmitted and hatchery disseminated diseases. They lead to tremendous economic losses in poultry production as a result of decreased hatchability and egg production, reduced quality of day-old chicks, reduced growth rate. Chicken showed swelling of the facial skin, and the eyelids, increased lacrimation, congestion of conjunctival vessels, and respiratory rales.

Mycoplasma synoviae (MS) infection is usually known as infectious synovitis, an acute-to-chronic infectious disease for chickens involving primarily the synovial membranes of joints and tendons sheaths. However, during recent years, MS has less frequently been associated with synovitis but more frequently associated with airsacculitis in chicken.

Pathogenesis

It is presumed that MG enters the respiratory tract by inhalation of aerosols or via the conjunctiva and attaches to mucosal cells by its well-organized terminal organelles, which remains and spreads in respiratory system.

As MG and MS are exhibiting with no cell wall, it is readily killed by most of the disinfectants, heat, and sunlight, and does not survive for prolonged periods outside the host. MG can remain viable:

1. Chicken faeces for 1-3 days at 20°C
2. Muslin cloth 3 days at 20°C or 1 day at 37°C
3. In egg yolk 18 week at 37°C or 6 week at 20°C

It only remains viable in the environment, outside the chicken, for typically up to 3 days. For this reason, MG is fairly easy to eliminate on single age, all-in all-out poultry farms since MG can be transmitted vertically. Establishing the MG-clean status of breeder flocks and maintaining that status can be accomplished by participation in-control programmes. An MG eradication programme may be initiated by treatment of breeders and their hatching eggs to reduce egg transmission. Attempts to eliminate egg transmission of MG by medication of breeder flocks or their progeny with antimycoplasmal prevention drug have generally been able to produce considerable reduction in rate of MG infection but generally were not adequate to obtain entirely infection-free flocks. Previously successful methods were the treatment of hatching eggs with heat and/or antimycoplasmal. For heat treatment, eggs were gradually heated in a forced-air incubator to reach an internal temperature of 46.1°C over 12-14 hours and then allowed to return to room temperature (Yoder, 1970). Hatchability was sometimes reduced 8-12%, but MG and MS appeared to be inactivated. Egg dipping with a temperature or pressure differential has been used by several researchers as a means of getting antibiotics into hatching eggs to eliminate egg transmitted MG (*Allset al., 1963; Hall*

et al., 1963; Surat and Bruins, 1963).

Losses Can Occur as Result of:

1. Decreased egg production
2. Decreased egg hatchability
3. Decreased day old chick quality and chick viability
4. Increased chick mortality
5. Higher FCR and low weight gain
6. Costly control measures involving biosecurity, vaccination and medication

Control of pathogenic avian mycoplasma can consist of one of three general approaches, according to Kleven (2008): The mycoplasma infection are transmitted both horizontally and vertically and it's remained in the flock constantly as sub clinical form. To control MG infection in broiler breeder, laying hens and commercial broilers chicken the major specific focus is given on vaccination and medication.

1. Maintenance of Flocks, Which are Free of Infection

To keep a flock free of infection is difficult, especially in areas where large populations of chickens have grown up, as the industry has expanded. To maintain freedom from mycoplasma requires a mycoplasma free source, on a single age, 'all in all out' site, with good biosecurity and an effective monitoring system.

2. Control by Vaccines

The use of mycoplasma vaccines in breeding and laying hens has grown over recent years to reduce the impact of infections, but these can confuse the usual serological monitoring systems. They may control an infection in the chicken clinically but there is still a potential risk of vertical transmission to the egg and chick. Vaccination could not completely prevent the occurrence of EAA, although a significant reduction of EAA egg production (approximately 50%) was recorded. Moreover, a delay in the onset of egg production was observed in the vaccinated birds (*Feberweeet.al.2009*).

1) Killed/Inactivated Vaccines

- These are M. gallisepticum killed organisms with oil emulsion adjuvants to protect the birds from infection with virulent M. gallisepticum
- Several adjuvant enhanced bacterin vaccines but they are expensive and administration is difficult because they need to be injected twice with a 4-6 week interval (*Ley, 2003*)
- Killed vaccines have been shown to reduce, but not eliminate the M. gallisepticum infection and are not effective in long term control of infection in multiple age farms
- Killed vaccination did not reduce horizontal spread of M. gallisepticum (*Levisohn et. al., 2000*)
- These are more stable and safer than live vaccine

2) LIVE/ATTENUATED VACCINE

There are three types of live vaccines available for M. gallisepticum viz.

A. CONNECTICUT F-STRAIN

B. MG 6/85 STRAIN

3. TS-11 STRAIN (TEMPERATURE SENSITIVE MUTANTS)

A. CONNECTICUT F-STRAIN

- Live F-strain IA. gallisepticum vaccine is a relatively mild strain that originates from the Connecticut F strain of United States. Despite the advantages of the F-strain vaccine it has many of the disadvantages of the inactivated vaccines
- MG free chickens tend to lay better than F-strain immunised ones
- F-strain is too virulent for young chicks
- F-strain is capable of lateral spread in the flock
- F-strain does not completely block trans ovarian transmission when birds are challenged with virulent MG

B. MG 6/85 STRAIN

- The 6/85 strain of MG is in lyophilised form and originate from United States
- It has low virulence in chicken
- Vaccinates were protected against airsacculitis and colonisation of the trachea was detectable from 4 to 8 weeks after vaccination (*Ley, et. al., 1997*)

C. TS-11 STRAIN

- TS-11 is a live chemically induced mutant strain of MG is in frozen form and developed from Australian MG field isolate (*Whithearet. al.,1990a*)

3) CONTROL BY SPECIAL ANTIBIOTICS

Medication of a flock but can prevent subsequent losses in breeders & laying hens. MS Infections could be treated with antimicrobial use in breeders, layers flock and eggs to prevent vertical transmission

Control of MG and MS infection in broiler chicken by medication is the most practical way to minimize the transmission of disease and economic losses

- The most important macrolide agent used for treatment and control of mycoplasma infection is Tilmicosin Phosphate
- Tilmicosin is a broad-spectrum bacteriostatic synthesized from tylosin molecule which is having 75% more intra alveolar concentration in the lungs tissue to work efficiently against mycoplasma as organism remain intracellular in the cell and tissue

In Broiler Breeder For Commercial Layers

- It is very important to treat chicks from day first of life to combat against mycoplasma, Tilmicosin Phospate-25% @ dose rate of 15-20mg/kg body weight through drinking water for 3 successive days every 5 weeks up to for 16th to 20th weeks
- After 20th or 24th week incorporate Tiamulin through feed as per recommendationof veterinarian
- It is emphasized to follow best antimycoplasmal drug prevention programme through feed.

In Commercial Broilers

- It is suggested to use TylosinTartarate 100% through drinking water for first 3 days @ dose rate of 65 mg/kg of BW
- In high risk or known source of infected breeders it is suggested to use Tilmicosin Phosphate-25% through drinking water for first 3 days @ dose rate of 15mg/kg of BW

The medication can be repeated on a monthly, three weekly or two weekly basis depending on the mycoplasma status of the flock or the 'risk' of breakdown from the proximity of infected neighbours

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Sl No.	Active Ingredients	Dosage	Mode of Administration
1	Pharmasin (Tylosin Tartarate-100%A)	75-110 mg/kg of body wt.	Water
2	Tylovet Premix (Tylosin Phosphate 10%)	500-1000 ppm/Ton of feed	Feed
3	Inj Tylovet B (Tylosin Base-20% Injection)	10-15mg/kg of BW	Intramuscular
4	Vetmulin-10% (Tiamulin hydrogen Fumarate-10%)	15-30 mg/kg of body wt.	Feed
5	Vetmulin-80% (Tiamulin Hydrogen Fumarate-80%)	15-30 mg/kg of body wt.	Feed & Water
6	Rodotet (Tiamulin HF 3.3% + CTC 10%)	1-1.5/ Ton of feed	Feed
7	Tilmovet liquid (Tilmicosin Phosphate-25%)	15-20 mg/kg of body wt.	Water

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COVER

PRESERVING VITAMIN D IN EGGS FOR HUMAN HEALTH

"Sunshine vitamin"— D is an essential component of vertebrate nutrition, and epidemiological surveys confirm a chronic vitamin D insufficiency in the human population. Eggs are one of the few natural sources rich in vitamin D. Over time, researchers worldwide team up in cracking the code in how best to ensure and preserve vitamin D in eggs. IPR collates several researches towards the same goal

Whole eggs are a good source of vitamin D as well as wonderfully nutritious food. Most of the protein in an egg is found in the white, and the fat; vitamins and minerals are found mostly in the yolk. The yolk from one large egg contains 37 IU of Vitamin D, or 5% of the DV. A few factors affect the vitamin D level of egg yolks. Sun exposure of the chicken, the vitamin D content of the chicken feed and exposing liquid yolk to UV light will increase vitamin D in the egg. When given the same feed, pasture raised chickens that roam outside in the sunlight produce eggs levels 3-4 times higher.

Additionally, eggs from chickens given vitamin D-enriched feed may have up to 34,815 IU of vitamin D per 100 grams of yolk. So if one yolk is about 17 grams, you'll get around 2.5 times the DV of vitamin D in a single egg. Choosing eggs from chickens raised outside or marketed as high in vitamin D can be a great way to meet daily vitamin D requirements.

Researchers Linda C Browning and Aaron J Cowieson in their study titled,"Vitamin D Fortification of Eggs for Human Health" go on to prove eggs are one of the few natural sources rich in vitamin D, containing both vitamin D_3 (D_3) and 25-hydroxyvitamin D_3. In order to establish the potential for enrichment of eggs with D_3 and 25(OH)D_3, a total of 162 hens were fed three levels of D_3 in combination with three levels of 25(OH)D_3. Egg yolks were analysed for their D_3 and 25(OH)D_3 contents, and egg production, egg weights and feed efficiencies were recorded.

Results: The contents of D_3 and 25(OH)D_3 in egg yolk increased significantly with increasing dietary concentrations. There were no significant differences in egg mass, egg weight or feed efficiency. Depending on the dietary

concentrations used, it was possible to produce eggs with between 100 and 500 IU vitamin D, providing scope to meet the recommended daily requirement of vitamin D for children or adults.

Conclusion: The addition of higher levels of D_3 and $25(OH)D_3$ produced eggs with sufficient vitamin D to meet the recommended daily requirements of adults and children without any detrimental effect on production parameters.

In another research titled, **"**$25(OH)D_3$–Enriched or Fortified Foods are More Efficient at Tackling Inadequate Vitamin D Status than Vitamin D_3**"**, researchers Jing Guo, Julie A Lovegrove, D Lan Givens explore:

The ability to synthesise sufficient vitamin D through sunlight in human subjects can be limited. Thus, diet has become an important contributor to vitamin D intake and status. However, there are only a few foods (e.g. egg yolk, oily fish) naturally rich in vitamin D. Therefore, vitamin D-enriched foods via supplementaing the animals' diet with vitamin D or vitamin D fortification of foods have been proposed as strategies to increase vitamin D intake. Evidence that cholecalciferol (vitamin D_3) and calcifediol ($25(OH)D_3$) content of eggs, fish and milk increased in response to vitamin D_3 supplementation of hens, fish or cows' diets was identified when vitamin D-enrichment studies were reviewed.

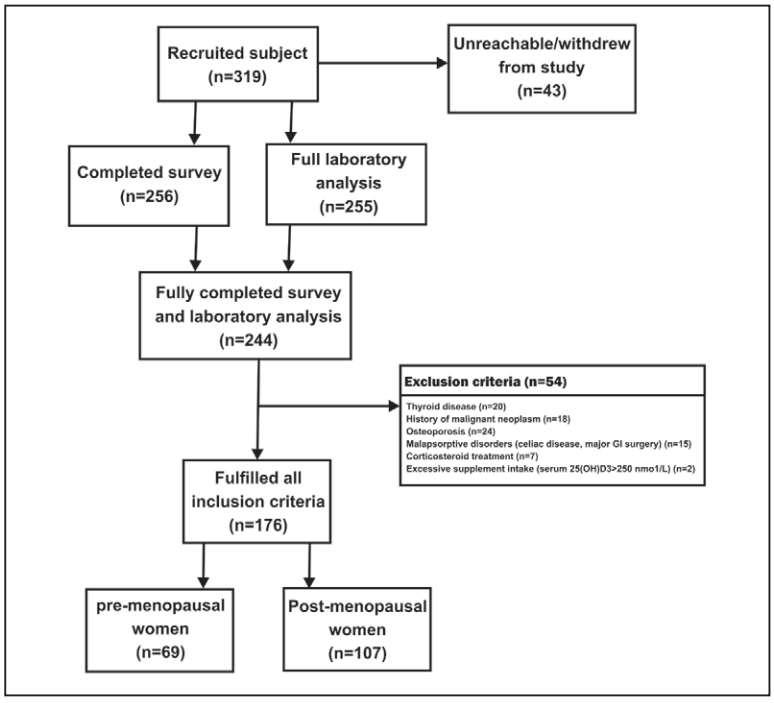
However, evidence from supplementation studies with hens showed only dietary $25(OH)D_3$, not vitamin D_3 supplementation, resulted in a pronounced increase of $25(OH)D_3$ in the eggs. Furthermore, evidence from randomised controlled trials indicated that a $25(OH)D_3$ oral supplement could be absorbed faster and more efficiently raise serum $25(OH)D_3$ concentration compared with vitamin D_3 supplementation. Moreover, evidence showed the relative effectiveness of increasing Vitamin D status using $25(OH)D_3$ varied between 3.13 and 7.14 times that of vitamin D_3, probably due to the different characteristics of the investigated subjects or study design. Therefore, vitamin D-enrichment or fortified foods using $25(OH)D_3$ would appear to have advantages over vitamin D_3. Further, well-controlled studies are needed to assess the effects of $25(OH)D_3$ enriched or fortified foods in the general population and clinical patients.

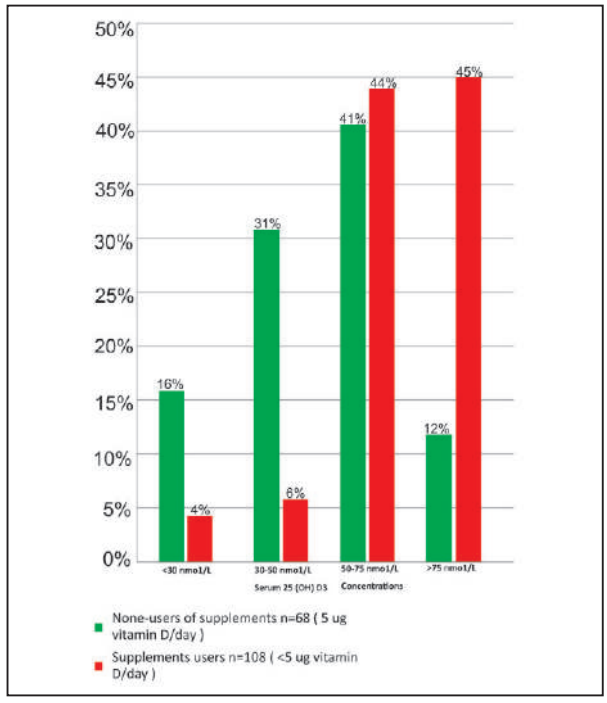
In a further Slovenian research by Vid Vičič, Ruža Pandel Mikuš, Saša Kugler, Ksenjia Geršak, Joško Osredkar and Andreja Kukec named **"**Vitamin D Fortification of Eggs Alone and in Combination with Milk in Women Aged 44-65 Years: Fortification Model and Economic Evaluation**"**, they found egg and milk (including yoghurt) fortification could cost-effectively increase vitamin D intake in the Slovenian population of women between 44 and 65 by almost five-fold, and could significantly lower the prevalance of vitamin D deficiency. It needed additional research and changes to legislation needed before this can be introduced.

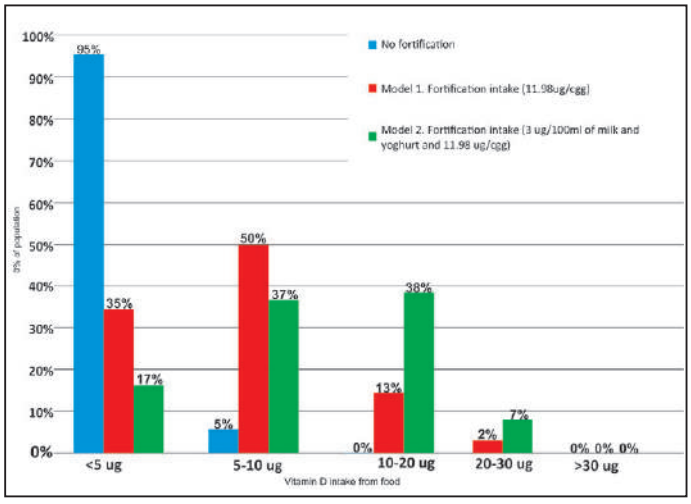
Introduction: For almost nine decades, the fortification of foods with vitamin D has been proven effective in preventing rickets. This study aims to build and economically evaluate a fortificaton model based on egg biofortification and milk (including yoghurt) fortification.

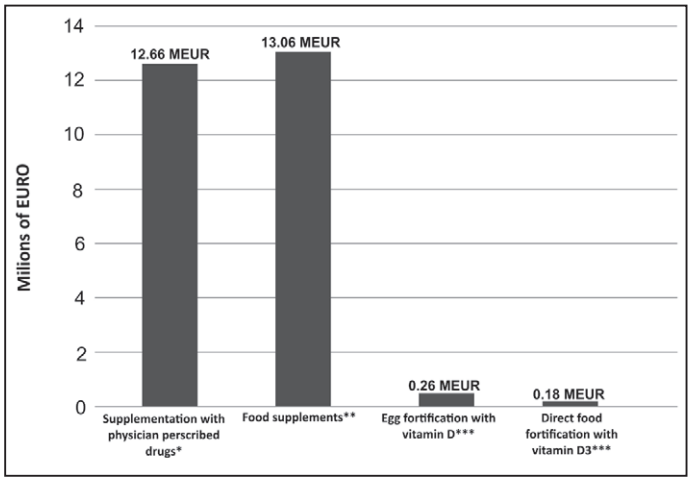
Methods: A cross-sectional study was carried out between 1st March and 31st May 2021. 319 healthy women from the central Slovanian region aged between 44 and 65 were recruited for the study, with 176 participants included in the final analysis. For the fortification model calculations, the vitamin D contents of unenriched milk (including yoghurt) and eggs were replaced by enriched foods containing vitamin D. The economic evaluation was done using available drug and food supplement prices. Fortification costs were calculated using vitamin D prices provided by suppliers.

Results: Mean vitamin D intake from food was 2.19±1.34µg/d. With fortification Model 1 (enriched eggs), it would be: 6.49±4.45 µg/d, and with Model 2 (enriched eggs and milk): 10.53±6.49 µg/d. Without fortification, none of the participants would reach a daily vitamin D intake >10µg. With fotification Model 1 (egg fortification), 15.3 % would reach >10 µg and with Model 2 (egg and milk fortification) 46.2 % would reach >10µg.The economic comparison of the annual cost of 10µg vitamin D/d/person was EUR 6.17 for prescription drugs, EUR 6.37 for food supplements, EUR 0.09 for direct milk fortification and EUR 0.12 for egg biofortification with vitamin D.









Linda C Browning and Aaron J Cowieson in their further study on Interactive effects of vitamin D_3 and Strontium on performance, nutrient retention and bone mineral composition in Laying Hens summerise:

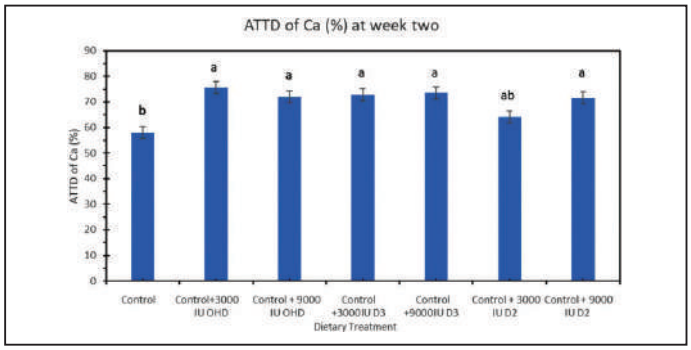
Background: Strontium is currently prescribed for patients with osteoporosis to increase bone density and reduce bone fractures but its relevance in animal nutrition is obscure. In order to investigate the effect of supplementation of Strontium and vitamin D_3 on performance, egg quality and skeletal integrity in poultry, a total of 108 laying hens, 99 weeks of age, were fed three levels of Strontium (0, 500, 1000 mg kg (-1) and two levels of vitamin D_3 (2500, 5000 iu kg (-1) over a 12 week period.

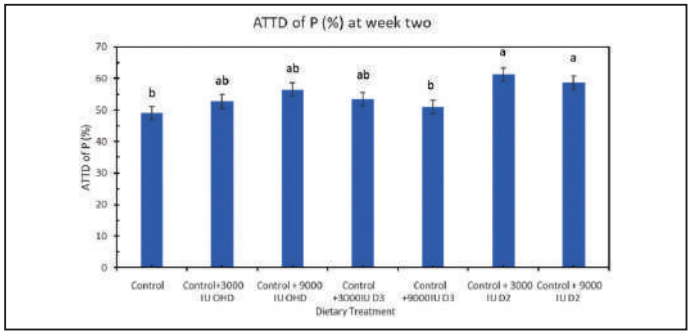
Results: There was an improvement (P <0.05) in egg production and feed conversion efficiency with Strontium at 500 mg kg (-1) and a significant increase in egg weight in those hens fed additional vitamin D_3. Supplemental Strontium increased Phosphorus, Sodium and Strontium retention in birds fed 2500 iu D_3 kg(-1) but reduced Phosphorus, Sodium and Strontium retention in birds fed 5000 iu D_3kg (-1), resulting in an interaction (P < 0.01) between strontium and vitamin D_3. Addition of 5000 iu D_3kg (-1) increased egg weight (P <0.05); predominently by increased albumen content (P <0.05), whereas strontium supplementation reduced egg weight (P <0.001). Similarly, 5000 iu kg (-1) D_3 increased apparent metabolizable energy (P < 0.05); in contrast, strontium supplementation reduced (P < 0.05) apparent metabolizable energy.

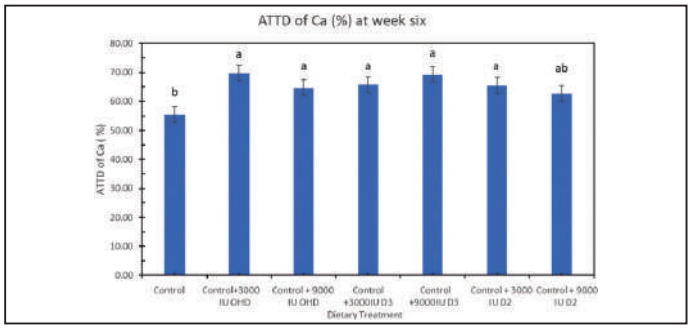
Conclusion: The addition of 500 mg kg (-1) strontium significantly improved egg production and feed efficiency; however, further investigation needs to be undertaken to refine the optimum level of strontium required to maximize hen performance. The interrelationship between strontium and vitamin D_3 requires further exploratory study.

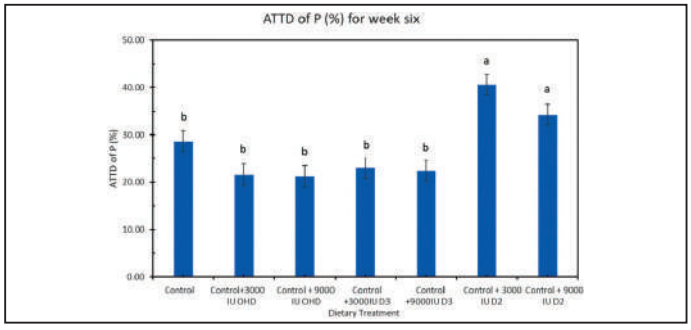
In yet another path breaking experiment by R. Adhikari, D. White, J D House and W K Kim to capture the Effects of Additional Dosage of vitamin D_3, vitamin D_2 and 25-hydroxyvitamin D_3 on Calcium and Phosphorus utilization, egg quality and bone mineralization in laying hens finds out:

Abstract: Vitamin D is essential for the metabolism of Calcium (Ca) and Phosphorus (P) in birds. The objective of the study was to evaluate the effect of different isoforms of dietary vitamin D on









Ca and P utilization, egg quality and bone mineralization of laying hens. A total of 42 Lohmann white laying hens at 57 weeks of age were randomly assigned to 7 dietary treatments for 6 weeks. Dietary treatments were: 3,000 IU/kg Vit D_3 as control, and control with additional 3,000 IU/kg 25-hydroxyvitamin D_3(T1), 9,000 IU/kg 25-hydroxyvitamin D_3(T2), 3,000 IU/kg vitamin D_3(T3), 9,000 IU/kg vitamin D_3(T4), 3,000 IU/kg of vitamin D_2(T5) or 9,000 IU/kg of vitamin D_2(T6).

Egg production and egg quality was measured weekly. Faecal samples were collected at weeks 2 and 6 to measure Ca and P utilization. After 6 weeks, the left tibia and femurs were collected to measure bone mineral density (BMD) and bone mineral content (BMC). A 1-way ANOVA with Turkey HSD means separation test was used for statistical analysis.

There were no significant differences in egg production, egg quality, BMD or BMC of tibia and femurs among the treatments ($P > 0.05$). T6 significantly reduced feed intake ($P < 0.05$). The apparent total tract digestibility (ATTD) of Ca was higher ($P < 0.012$) in treatments supplemented with additional vitamin D, irrespective of forms. The ATTD of P was higher ($P < 0.0001$) in T5 compared to the other treatments at both time points. The utilization of Ca and P by laying hens can be improved through the addition of different isoforms of vitamin D in diets.

However, additional vitamin D supplementation to laying hens, regardless of forms, had no effect on either bone mineralization or measures of egg quality.

In India, a research undertaken under the title of "Production of Vitamin D_3 Enriched Designer Chicken Eggs by Direct Ultra Violet Blue (UVB) Light Exposure by Megha P S and Ramnath V, shows:

Abstract: The market demand for designer eggs has been increased in the recent past. In the present study, chicken eggs were enriched with vitamin D_3 by UVB exposure @3h/day. The trial was commenced from 29 weeks of age and conducted for 12 weeks on thirty-two number of crossbred layer birds (White Leghorn N strain and Desi). The vitamin D_3 concentration in egg was significantly higher ($p < 0.01$) in the treated group compared to the control group. The vitamin D3 concentration in eggs of UVB light exposed birds was 72.34+1.55µg/10 g egg yolk and it was significantly higher compared to untreated group (17.92+1.98µg/10 g egg yolk). These results clearly indicated an enriching influence of UVB radiation on the concentration of vitamin D3in eggs and therefore recommend an easy, heap and safe procedure for producing designer eggs.

Vitamin D is known to help keep bones, teeth and muscles healthy, as well as being important for the immune system. But some research also suggests that people with low levels of the vitamin also have a higher risk of developing seasonal affective disorder (SAD), which is particularly prevalent in the winter

An extension of the same topic was was studied under the title, "Naturally Enhanced Eggs as a Source of Vitamin D: A Review by Line Lundbæk Barnkob, Aikaterini Argyraki and Jette Jakobsen" to highlight the following: Three methods to produce eggs naturally enhanced with vitamin D; There is a linear inter-trial relationship between vitamin D3 in feed and vitaminD3content in egg; Feed is superior to UVB rradiation in regards to vitamin D enhancement in eggs; Egg yolk can be

vitamin D enhanced by direct exposure to UVB radiation and naturally enhanced eggs can contribute to increased vitamin D intake in the general population.

Background: It is estimated that on annual basis 40% of the European population is either vitamin D insufficient/deficient. A way to increase the vitamin D intake is to fortify a broader range of foods or by increasing the natural vitamin D content in food sources that already contain vitamin D. Eggs is once again considered part of a healthy varied diet and eggs contain a wide range of micro nutrients including vitamin D.

Scope and Approach: Review of production methods to naturally enhance eggs with vitamin D, and discussion of the perspectives of vitamin D enhanced eggs as part of the strategy to increase the dietary intake of vitamin D.

Key findings and Conclusions: There are three ways to naturally enhance the vitamin D content in eggs: feeding more vitamin D3/25(OH)D_3 to the hens, exposing the hens to UVB and exposing liquid egg products to UVB. Naturally enhanced eggs can contribute to increased vitamin D intake. An inter-trial linear relationship between vitamin D_3 in feed and vitamin D_3 in eggs was found. Within the linear range a maximum of 20µg/100g yolk was obtained with feed contain 617.5µg/kg feed. Feed can provide higher levels of vtamin D in eggs than UVB exposure of the hens. However, the European maximum for vitamin D in feed for for layers at 80µg/kg limits the beneficial effect. Vitamin D content in liquid egg products can be tailored by adjusting the UVB dose, however further research is needed.

The latest Foods 2023 journal publishes the study, "The Influence of Storage and Cooking on the Vitamin D Content of 25-Hydroxyvitamin D_3 Enriched Eggs", for which the UK's largest free-range egg company, Noble Foods, has teamed up with researchers at Newcastle Unversity to find out how best to preserve vitamin D, known as the "sunshine vitamin" when storing and cooking eggs.

Scientists analysed vitamin D-enriched eggs from the Noble Foods branded, Happy Egg Co, to determine how the vitamin's concentration was affected by different cooking and storage methods, as part of an Innovative UK-funded piece of research.

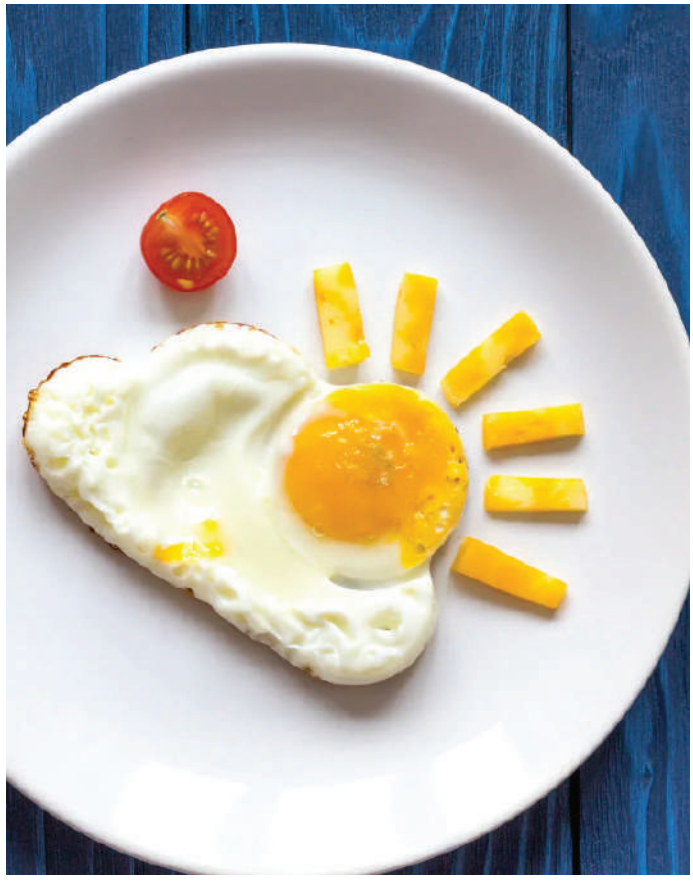
Vitamin D is known to help keep bones, teeth and muscles healthy, as well as being important for the immune system. But some research also suggests that people with low levels of the vitamin also have a higher risk of developing seasonal affective disorder (SAD), which is particularly prevalent in the winter.

Temperature at Which Eggs are Kept

The team compared eggs stored in a fridge to the equivalent of out on the kitchen worktop, and five different ways of cooking the eggs–scrambled, microwaved, poached, hard boiled and fried.

Lead author Tom Hill, Professor of Nutrition at Newcastle University, said the best way of retaining vitamin D in the eggs was to keep them out of the fridge at an ambient temperature. Scrambled and poached eggs retained most of the vitamin.

"We know that more than 90% of the British population is not getting enough dietary vitamin D and there is an urgent need to develop foods that will solve this problem. Our previous studies have shown how we can successfully enrich eggs with vitamin D through the hens' diet, which could be a valuable food source in helping address the widesprad problem of deficiency in the UK," said Hill. He added, "Now we know, it's not only about the diet the hens are fed that can significantly increase the amount of vitamin D in the egg, but the way you cook them that influences how much you are going to be consuming."



In the latest research, after storing the eggs and cooking them with the method under the test, batches of eggs were freeze-dried and analysed for vitamin D and 25-Hydroxyvitamin D. The scientists used true retention to measure the proportion of vitamin D remaining in the cooked food in relation to vitamin D originally present in a given weight of the food before cooking. They found it ranged from 78-109%. This approach allows for different percentage weight losses which occur after cooking caused by water loss, for example.

Cooking Method of Eggs

After being kept at an ambient temperature, such as on the worktop, the best method of cooking eggs to preserve the vitamin D to the least successful were:

Scrambled Eggs (109%) Microwaved (109%) Poached (93%) Hard boiled (80%) Fried Eggs (78%)

Comparing the enriched eggs to normal ones, vitamin D was found to be 22-132% higher, depending on the method of cooking applied. Hill has been working with Noble Foods and DSM to examine whether feeding hens supplementary vitamin D in their diets translates into enriched eggs. The findings show that with a whole new diet rich in vitamin D, the more vitamin D is present in the eggs the hens lay. Feeding flocks of commercial hens up to 75µg of vitamin D in each kg of feed for 6 weeks improves the total vitamin D content in the eggs by up to 40%.

This has led Noble Foods to adopt the diet for their flocks. The enriched diet of the hens at the Happy Egg Co. means they lay eggs with 28% more vitamin D per 100g than regular eggs. This means that 2 large eggs provide more than 94% of the European daily guideline, which is the benchmark for food labelling in the UK. Hill added, "The bigger picture here is that we are providing the benefits of working with industry longer term, to develop real-world food solutions, which tackle nutrient deficiencies in the UK population."

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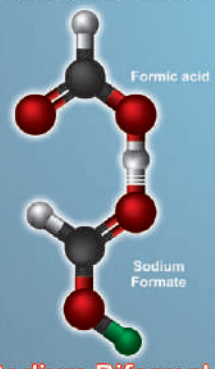

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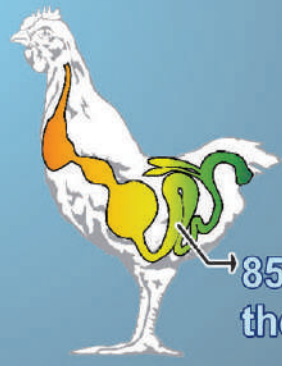

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"Venkateshwara House", S.No.: 114/A/2, Pune - Sinhagad Road, Pune - 411 030 (India) Tel : +91-20-24251803 Fax : +91-20-24251060 / 24251077

www.venkys.com e-mail : ahp@venkys.com

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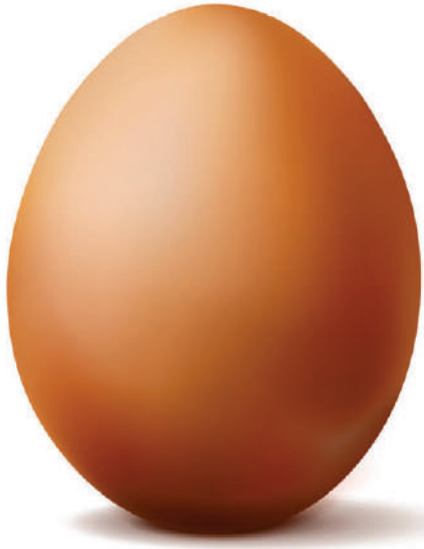

IDEAL EGGS:-

Clean, Free of cracks, correct shape, within acceptable weight range...

Better Uniformity (No runts/stunts)

GANGA HATCHERIES

We deal in only 430Y hatching eggs

Our Hatching eggs are free from vertically transmissible diseases like the Fowl Typhoid, Mycoplasmosis, Reo, Adeno, CAV etc.

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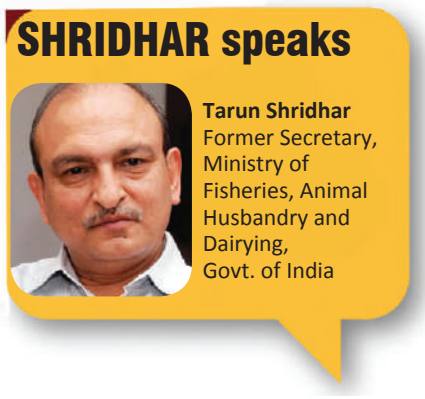
Corporate Office:
Village Bhalsi,
Near Ganga Filling Station (NAYARA)
Panipat 132113, Haryana (India)
Mob.: +91-94160-00350
E-mail: gangahatcheries@gmail.com
Web: www.gangagroup.org.in

Cobb

Article

HenCyclopedia

Eggciting and Eggsquisite Eggstravaganza



"Laughter is brightest in the place where the food is." This Irish Proverb is *"as sure as eggs is eggs"*. If some *eggocentric* lovers of the egg think that the proverb amounts to "*over-egging* the pudding", they better be advised that you "*don't try to teach your grandmother how to suck eggs*."

'Eggs for a healthy future', thus runs the *eggspression* of the World Egg Day 2023 theme; a toast to "the nutritional power of the incredible egg and its potential to combat common nutrient deficiencies across the world", as the International Egg commission *eggsplains*. The commission further states that "the remarkably versatile egg contains 13 essential nutrients in one delicious package. As well as its abundant nutritional merits, the egg is one of the most environmentally sustainable and cost effective animal source proteins available". What the commission does not acknowledge is that the runny egg is punny and funny too; so it is an *eggcellent* stress buster. *Eggsioms* about eggs are aplenty. Why so? There is no definitive answer to this; it could be because we have been eating eggs since human life evolved. The word egg itself evolved from Middle English *oeg* to the old Norse word *egg* in the 14th Century. So let us *egg on*.

A good and robust physical *eggcercise* in the morning is followed by a short period of meditation and invocation to the creation symbolised by the egg, intoning and chanting *OhmmmmmmmLet*. By now your appetite has been sufficiently whetted and you long for an omelette, the most preferred dish for breakfast. A *good egg* that you are, you know that *you can't make an omelette without breaking an egg*. You make a bold move and break the egg and discover that besides the white, the egg has a *yolk* too to offer. Or perhaps your preference is for a *hard boiled* egg, precisely because it is *hard to beat*. A strong *eggspresso* alongside the breakfast would mark the perfect beginning to the day which promises to be *eggceptional.* Why so? Because you know *eggsactly* what the *eggspectations* are from you.

However, there is a catch. You are a serious fellow not too keen on humour, so obviously you don't appreciate a *yolk* early in the morning, and want only the deadpan egg white. The *comedyhen* is crestfallen as his effort at *cracking up* to *come out of the shell* to make you smile with a good *yolk* has failed, perhaps because it is a *fryday*, a bad day for eggs and a fried *yolk* would quite likely fall flat on the white. The hen may fall victim to *Eggrophobia* against such odds.

But you stay the *sunny side up* and are *eggcited* to get to work. So you *eggcelerate* the car rushing through the *eggspress* lane. But you get caught speeding by an *eggspert* law enforcer while you *eggsit* the lane. The cop *eggsamines* your driving licence and *eggsclaims* that it has since long *eggspired*. He *eggstracts* a hefty fine out of you.

You began the day with a great sense of *eggshilaration* and now it is all *scrambled* heading you towards e*ggshaustion*. Despite walking on *eggshells* the whole day, making *eggstra* efforts, you have

ended up having *egg on your face*. You introspect and choose to *eggshale* the negative energy, and come to a realisation that you erred in *putting all eggs in one basket* and have thus ebbed into the archetypical syndrome of who came first *chicken or egg*. *Eggcitement* of self realisation makes you *eggsclaim a seggcessfulness* which should induce a sound sleep. Alas! It is not the sheep but a human cartoon shaped like an egg that haunts you.

Humpty Dumpty is, undoubtedly, one of the most famous nursery rhymes; and the roly poly character's pictorial representation is inevitably an egg. Here goes the rhyme, *"Humpty Dumpty sat on a wall/Humpty Dumpty had a great fall/All the king's horses and all the king's men/ Couldn't put Humpty together again"*.

What does this *eggsotic* scrambled formation of words mean? More importantly, why is Humpty Dumpty depicted as an egg when there is no reference to his egg identity or even a remote association in this short rhyme. Isn't it quite a *yolk* giving an *eggsaggerated* rotund figure to a children's poem character?

The answer is offered by Lewis Carroll of 'Alice in Wonderland' fame through his 1872 novel 'Through the Looking-Glass'. Chapter six of the book is entitled 'Humpty Dumpty' and apparently, it's here that Humpty first appeared as an egg. "However, the egg only got larger and larger, and more and more human: when she had come within a few yards of it, she saw that it had eyes and a nose and mouth; and when she had come close to it, she saw clearly that it was Humpty Dumpty himself. 'It can't be anybody else!' she said to herself. 'I'm as certain of it, as if his name were written all over his face."

Though Carroll may have introduced Humpty as an egg, he cannot be credited with the original nursery rhyme. So what was Humpty before he was portrayed as an egg? If he were to be a chicken, a really long standing debate, who came first, would have been settled. In the end, that's the point. Humpty Dumpty can be anything, a cannon, a king, an egg, a vase, a short person, a drink, an idea. Even us.

Whether you like them scrambled, poached, over easy, or fried, eggs are one of the best foods around. After all, they're a powerful protein, a simple breakfast, and the absolute boss of breakfast and brunch

Whether you like them scrambled, poached, over easy, or fried, eggs are one of the best foods around. After all, they're a powerful protein, a simple breakfast, and the absolute boss of breakfast and brunch. But in addition to tasting absolutely *eggsceptional*, eggs also offer a ton of opportunities for egg puns. *Yolks* around eggs abound to crack you up. And if you consider the author of this piece to be a practical *yolker* and any of the *yolks* out here as *eggcellent*, please be free to *poach* them, although be careful while *poaching* eggs; you might be accused of stealing.

Egg is the undisputed king of breakfast and a versatile cuisine for all our meals. There is no *eggstent* to its myriad virtues. Let us be the *eggsplorers* of the egg. On the contrary, if we *eggnore* it, we may confront the fate of the dinosaurs: eggstinction. However, if you are an *eggstraterrestial* you may nourish no such *eggspectancy*.

I am a *hard-boiled veggan*. But if you think I have been an *egghead* and the *eggsamples* in this article have made you eggy, I *eggspect* you to *eggspress* generosity and *eggscuse* me. Or else I may become *veggsatious* and assume the persona of the proverbial *eggsterminator*.

Eggs on bread, eggs on rye/ Eggs in the sky, by and by/ My love for eggs will never die/ Since eggs will never tell a lie - Unknown.

SUSTAINABLY

O. P. Singh
Managing Director,
Huvepharma SEA
(Pune) Pvt. Ltd

Shaping Livestock Solutions

Huvepharma's strategic investments this decade is directed towards renewable energy installations. Investments of € 269 million in solar panel, geothermal and green hydrogen installations are underway to reduce our reliance on fossil fuels and advance on our commitment to be carbon neutral by 2030.

Huvepharma's product portfolio of veterinary products and feed additives is derived from fermentation. Its manufacturing facilities have over 70 years of expertise. Carrying out fermentation at large scale requires a blend of tradition and know-how, advanced equipment, a high level of process control and automation as well as continuous and reliable access to key utilities.

Huvepharma's Manufacturing Facilities Will be Carbon Neutral by 2030

In line with the European Green Deal, Huvepharma is investing in renewable energy installations to ensure that it is self-reliant and autonomous for its energy needs. We manufacture our own products, from strain to shelf, and, therefore, control the full manufacturing process. Auditing the environmental claims of a third party is not required. This is not a claim which many companies can make within the animal health and nutrition sectors. Our production sites in Europe and the USA, coupled with our 'Strain to Shelf' philosophy, mean that autonomous production and transparency are assured.

The Manufacturing Process

Four critical utilities are required for the manufacturing process. Reducing the carbon footprint of each of these critical utilities is central to Huvepharma's ambitions.

These four critical utilities are used throughout the fermentation process and in downstream processing. Huvepharma is reducing its reliance on fossil fuels and the carbon footprint of these key utilities through a focused approach.

Huvepharma's electricity requirements can be fulfilled via the national grid, our cogeneration plant or by renewable energy installations, such as solar panels. Steam production is produced via our cogeneration plant, incineration plants or by steam boilers, powered by compressed or natural gas.

Fermentation starts with a pure culture of the micro-organism in the laboratory. The preparation of 'seed material" in flasks follows, which is then transferred to small fermenters.

During the upstream processing phase (USP), the content of the inoculators is transferred into large fermenters. Once the energy-intensive fermentation phase is complete, the fermentation broth is processed downstream.

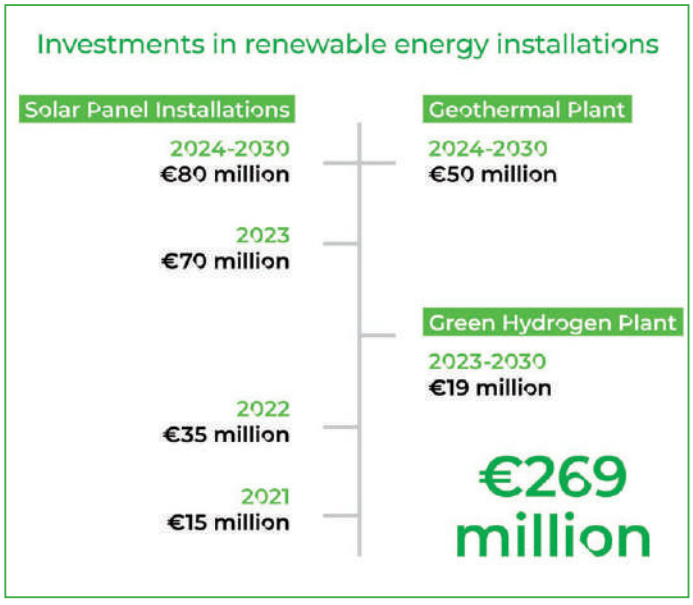
Downstream processes (DSP) include steps such as filtration, extraction, concentration, purification and drying. The active product ingredient (API) is then ready for further processing into the finished forms (products) which are used to shape livestock solutions.

The Pathway to Carbon-Neutral Production

Huvepharma's pathway to carbon-neutral production comprises significant investments of € 269 million in renewable energy installations.

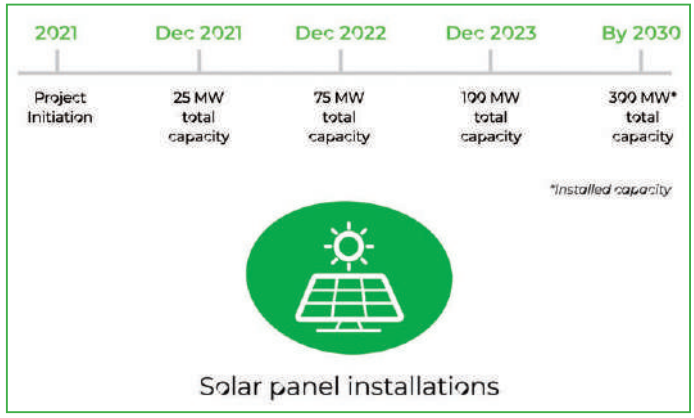
The renewable energy installations comprise of solar panels, a geothermal plant and a green hydrogen production facility. These installations will produce electricity for the manufacturing process. The combined installations have an installed capacity of 317MW. Based on this installed peak capacity, Huvepharma will reach its goal of carbon neutrality.

There is a 45 - 47MW electricity requirement for the manufacturing process across our three factories in Bulgaria and these operate 24 hours a day, 7 days a week and 365 days per year. During the summer months, excess electricity produced by the renewable installations will be supplied into the national grid.



Solar Panels Installations

Solar power is the conversion of energy from sunlight into electricity. In the final six months of 2022, an average of 7% of the electricity requirement was already produced through solar panels. As more panels are installed, this percentage will increase. Upon completion, the installed 300MW will require approximately 300 hectares and is sufficient for 300'000 households. The total investment in solar panels is € 200 million.



Green Hydrogen Production

Green hydrogen production takes place through water electrolysis using solar generated electricity. 10MW of solar energy will be used in the facility to produce green hydrogen which will be utilised in the steam boilers to reduce natural or compressed gas usage. In addition to lowering our reliance on natural gas, green hydrogen is emission-free at the point of use and will reduce carbon emissions for steam generation substantially. The investment comprises € 19 million.

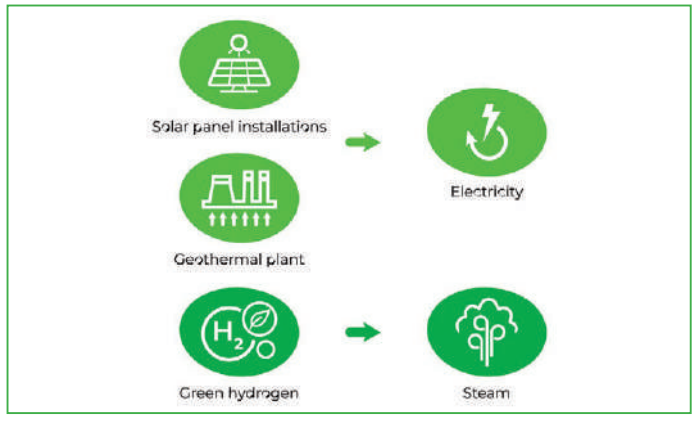
Geothermal Plant

Huvepharma's investment of € 50 million (2024 - 2030) in geothermal energy will produce 17MW of energy.

Renewable Energy Inputs

Solar panel installations and the geothermal installed peak capacity plant will produce electricity for the manufacturing process. The installed capacity will be 317MW. Green hydrogen will be utilised in steam boilers.

Huvepharma's energy requirement is 45 - 47MW. Based on the installed capacity of renewable energy, Huvepharma will be certified as carbon neutral.



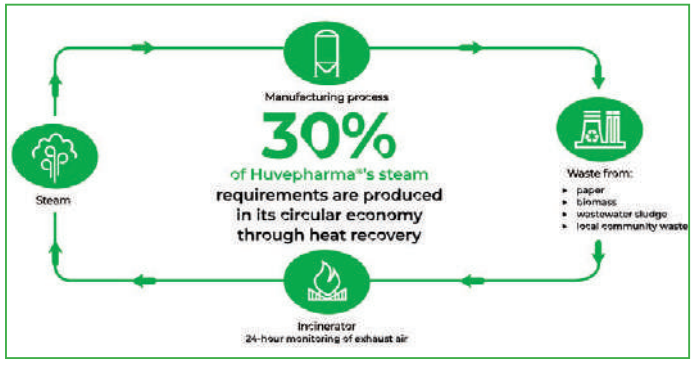
Energy Efficiencies

Investments in renewable energy installations have been coupled with improved energy efficiencies to accelerate Huvepharma's pathway to carbon neutral production. Central to this is the circular economy approach. A circular economy involves the reuse and regeneration of materials as a means of continuing production in a sustainable way.

- Facilities which contribute to the circular economy approach: Incineration plants which utilise waste and by-products for the production of steam
- Water cooling plants which constantly recycle water used for cooling

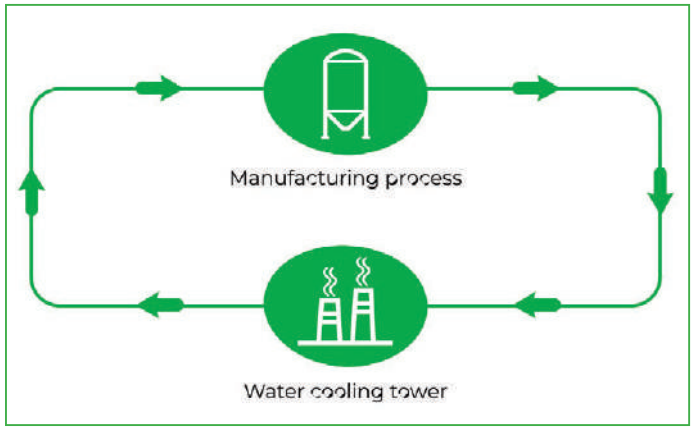
Incinerator Plant

Steam is a critical utility and essential for the fermentation inputs in the manufacturing process. As part of the circular economy approach, the incinerator plants minimise the use of resource inputs and the creation of waste, pollution and undesirable emissions. 30% of our steam requirements are reduced through heat recovery in the incinerator plants.



Water Cooling Facility

Water for cooling in the manufacturing process is continuously recycled in the water cooling facility and reused in production.



Huvepharma is steadily and consistently reducing its carbon footprint by implementing innovative technologies in equipment and supporting installations. The new fermentation plant, commissioned in 2019 and one of the largest in Europe, is 15% more efficient than a traditional plant. Ongoing equipment renovations and upgrades and waste energy utilisation contribute to improving energy efficiencies.

Environmental Protection

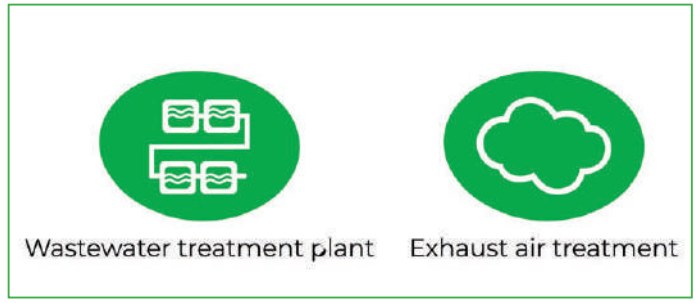
Over the past 15 years, Huvepharma has invested in supporting installations which minimise the impact on the environment. The benefits of these investments are both societal and environmental.

Environmental Projects

- Silos for raw material storage to reduce packaging and waste
- Air exhaust treatment facilities
- Wastewater treatment facilities
- Recycling facilities

Societal Benefits

- Noise and odour reduction
- Local waste collection for incineration reducing landfill



Green from Strain to Shelf

Huvepharma is committed to carbon neutral production by 2030. With the significant investments in renewable energy installations and in improving energy efficiencies, we will achieve our sustainability targets. Reducing the carbon footprint of the four critical utilities of the fermentation process (steam, water, compressed air and electricity) is central to these ambitions.

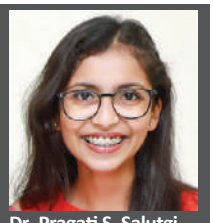
The work is on-going. Improving technologies in, for example, battery storage will allow Huvepharma to harness renewable energy during night time production. The production teams analyse each step of the manufacturing process to reduce, reuse and recycle resources in line with the circular economy approach.

Huvepharma's products contribute to the reduction of livestock emissions at farm level. Combined with the reduction of greenhouse gases in the manufacturing process, Huvepharma is leading the way in sustainably shaping livestock solutions.

Indian Poultry Review spoke to O.P. Singh recently about Huvepharma's ESG journey. Scan the QR Code below to watch the interview:

Article

Bacteriophages: Revolutionary Inventions for Safe Poultry Farming



Dr. Partha P. Biswas
Former Associate Professor & H.O.D.
Dept. of Zoology,
R.K.Mission V.C.College
Kolkata

Dr. Pragati S. Salutgi
Director,
Avians Trades Pvt.Ltd.
Pune

The application of antibiotics in poultry farms has been linked to the global emergence of multi-drug-resistant (MDR) bacteria in recent years. Antibiotics are utilized three to four times more in the farm animal feeding business of our country than in many industrialised and developing nations. It is to be noted that Scandinavian nations such as Denmark, Norway, Sweden, and the Netherlands have set a global example by prohibiting the use of antimicrobials in the livestock industry for prophylactic and growth promotion purposes. On the other hand, the European Union banned the use of antibiotic growth promoters viz; Bacitracin, Spiramycin, Tylosin and others. They can no longer be used as feed additives. The use of bacteriophages for therapeutic purposes (phage therapy) could help address the MDR burden and be considered an important alternative to antibiotics in the livestock industry. In a review, Domingo et al. suggests that bacteriophages have narrow-spectrum activity in contrast to the broad-spectrum activity of antibiotics against bacteria. Bacteriophages are specific to particular bacteria; thus, phage therapy is considered safe and effective compared to antibiotics, in part because they infect a single species, serotype, or strain. This mechanism of action does not inhibit the growth of commensal intestinal flora of birds. Bacteriophage combined with other non-antibiotic entities potentiates the overall effect and acts in synergy to promote sustainable yet economically viable farming.

ANTIBIOTICS	BACTERIOPHAGES
ADVANTAGES: Broad spectrum; and Simple patenting	**ADVANTAGES:** High specificity, which makes it possible to find and individual bacteriophage killer for any bacterium; Search for a new target phage takes only several days or weeks; Inexpensive and ecologically friendly production; Never cause dysbacteriosis; Nontoxic and have no side effects; and Are aliminated from the body after destroying the target pathogen
DISADVANTAGES: Distroy the microflora of the body, creating a threat of secondary infections; Are unable to accumulate at the infections lesion; cause side effects, such as allergies and gastrointestinal disorders; Cause emergence of drug-resistant bacterial strains; and Require much time and money for developing new anti biotics;	**DISADVANTAGES:** Very high specificity: to guarantee successful treatment it is necessary to identify the target pathogen; Difficulties in patenting

Fig.1: *Bacteriophages: Beyond Antibiotics*

Bacteriophages in the One Health Approach

India's 'One Health' vision derives its blueprint from the agreement between the tripartite-plus alliance comprising the Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE), the World Health Organization (WHO) and the United Nations Environment Programme (UNEP) – a global initiative. The 'One Health' concept recognizes that the health of humans, animals and our environment are inextricably linked. The indiscriminate use of antibiotics may improve the overall health and well-being of the birds in the flock, but this comes at the cost of increasing drug-resistant bacteria. The interdependence between the human, animal and environmental aspects of antibiotic resistance is particularly important. Most antibiotics used to treat infections in poultry or livestock are released into the environment and can be transmitted to humans, creating a 'One Health' problem. This possibility has led to increased interest in phage therapy. It is estimated that at least 6 out of 10 known infectious diseases in humans are of zoonotic origin (zoonotic diseases). Therefore, the use of bacteriophages fits into the 'One Health' approach as they can be applied in different contexts (e.g. food, animals or crops), thereby preventing overuse of antibiotics and the spread of antibiotic resistance in humans. The World Economic Forum released their top 10 emerging technologies and this includes phage therapy to beat superbugs and AMR.

Bacteriophages in Nature

Bacteriophages, which literally means "bacteria eaters," are viruses that target and infect bacteria preferentially. According to a report (Gómez-Gómez, C et al.2019. Sci Rep 9, 13281), there are around 4.8 x 10^{31} phage particles in the entire biosphere, which is 10 times the number of bacterial cells on earth. Traditionally, three methods have been used to quantify bacteriophages: (1) the number of plaques on agar plates inoculated with bacteria in which the phages can multiply, (2) the dilution method, which uses bacterial lysis as an indicator of presence, phage assay and (3) measure the time required to lyse a standardised bacterial suspension. Plaques are counted and the phage concentration/titre is usually expressed as the number of plaque forming units (PFU) per 1 ml of the test preparation. Although phage assay (PA) is currently considered the "gold standard" for determining phage concentrations.

Bacteriophages, like other viruses, must multiply in a host cell. Most phages are very specific, infecting just a definite bacterium. Bacteriophages are classified into two types: Lytic and Temperate. A virulent or lytic phage binds to a bacterial host and injects the phage genome into the bacterial host by

using the holin and endolysin protein to create a pore in the bacterial cytoplasmic membrane and peptidoglycan layer. The phage then multiplies itself and transcribes/translates particular proteins, which results in the formation of additional phage particles. Finally, the bacterial host is killed, resulting in the release of bacteriophage offspring into the environment.

Temperate phages can also replicate lytically, but they have developed an alternate replication technique that is not deadly to the bacterial host. The latent growth cycle includes binding of the phage particle to the bacterial host, injection of the phage genome into the bacterial host, inhibition of all phage functions leading to increased lytic growth, and integration of the phage genome into the bacterial genome. At this stage, each bacterial daughter cell acquires an integrated phage genome known as a prophage. Over many generations, the symbiotic interaction between prophage and bacterial host can stay stable.

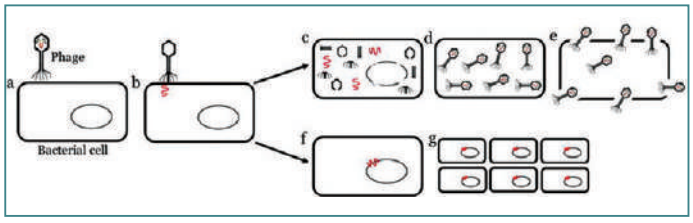


Fig.2: *Phage lytic and temperate or lysogenic cycle of infection. (a) Phages attach to a receptor on a bacterial cell, after which (b) they inject their DNA (red line) into the cytoplasm of the cell. The phages can then continue following the lytic cycle (c-d) & ultimately causes the bacterial cell to lyse (e) to release the phage lineage and the phages continue to infect more target bacterial cells.*
In the lysogenic cycle, (f) the phage DNA integrates into the bacterial genome and (e) when the bacterial cells multiply, the prophage reproduces at the same time.

Bacteriophage: To Combat Bacterial Infections

Reducing bacterial pathogen colonisation within the animals is referred to be a 'pre-harvest' intervention on the route from farm to fork. One of these pre-harvest treatments is phage therapy, which is the primary port of call for bacteriophage use in the poultry sector. These treatments may include orally delivering the phages or adding phages to poultry feed or water sources. Pre-harvest Salmonella elimination might play a significant role in the prevention of pathogen introduction into the food chain and consequently in the reduction of food poisoning in humans. Many studies have focused on the effectiveness of bacteriophages in reducing bacterial count in poultry. The use of cocktail of bacteriophages in drinking water proved to be safe several times. Additionally, studies have shown no effect on people who regularly eat chicken or eggs as part of their diet. Neither the chickens' behavior nor the production is impacted. Campylobacteriosis is the most frequently reported food-borne illness in the EU. Consumption of poultry, especially chicken meat, is considered the most common route for human infection. C-SNIPER (Campylobacter-Specific Nullification via Innovative Phage-mediated Enteropathogen Reduction) provides an alternative to antibiotics which, being highly specific against a single genus of bacteria (Campylobacter), is harmless to plants, animals, and humans, as well as to the rest of the surrounding natural microbiota.

Bacteriophage Cocktail: For Growth and Healthy Gut Microbiome of Birds

The microbiota in the intestine of broilers affects the health, metabolism and immunity of the animals both positively and negatively. Thus, it significantly affects the productivity of animals. Phages, host specific parasites of bacterial cells, are a promising antimicrobial alternative that selectively target pathogens without disrupting the microbiota. This supports the hypothesis that the excessive use of antibiotics can have a negative effect on the health of chickens. Bacteriophage administration has contributed to better weight gain and reduced FCR.

The gastrointestinal microbiota plays a huge part in the resistant framework associated with the gut. The gut microbiome additionally influences efficiency, well being, and growth. Poultry feeds, to a lesser extent, influence the structure of the gut microbiome. In poultry feed by adding substances like phage, it is quite feasible to change the microbial ecology, enhance chicken development, and abatement of creature related ailments. Bacteriophages are used as feed additives to control food-borne microscopic organisms. By diminishing the number of unsafe microorganisms and taking care of foundation of helpful microbiota, the phages do double benefit in chickens.

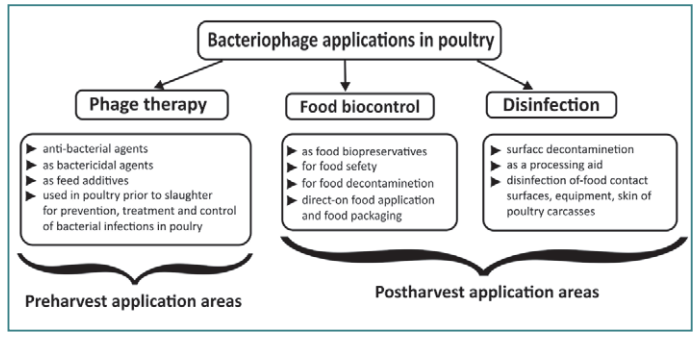
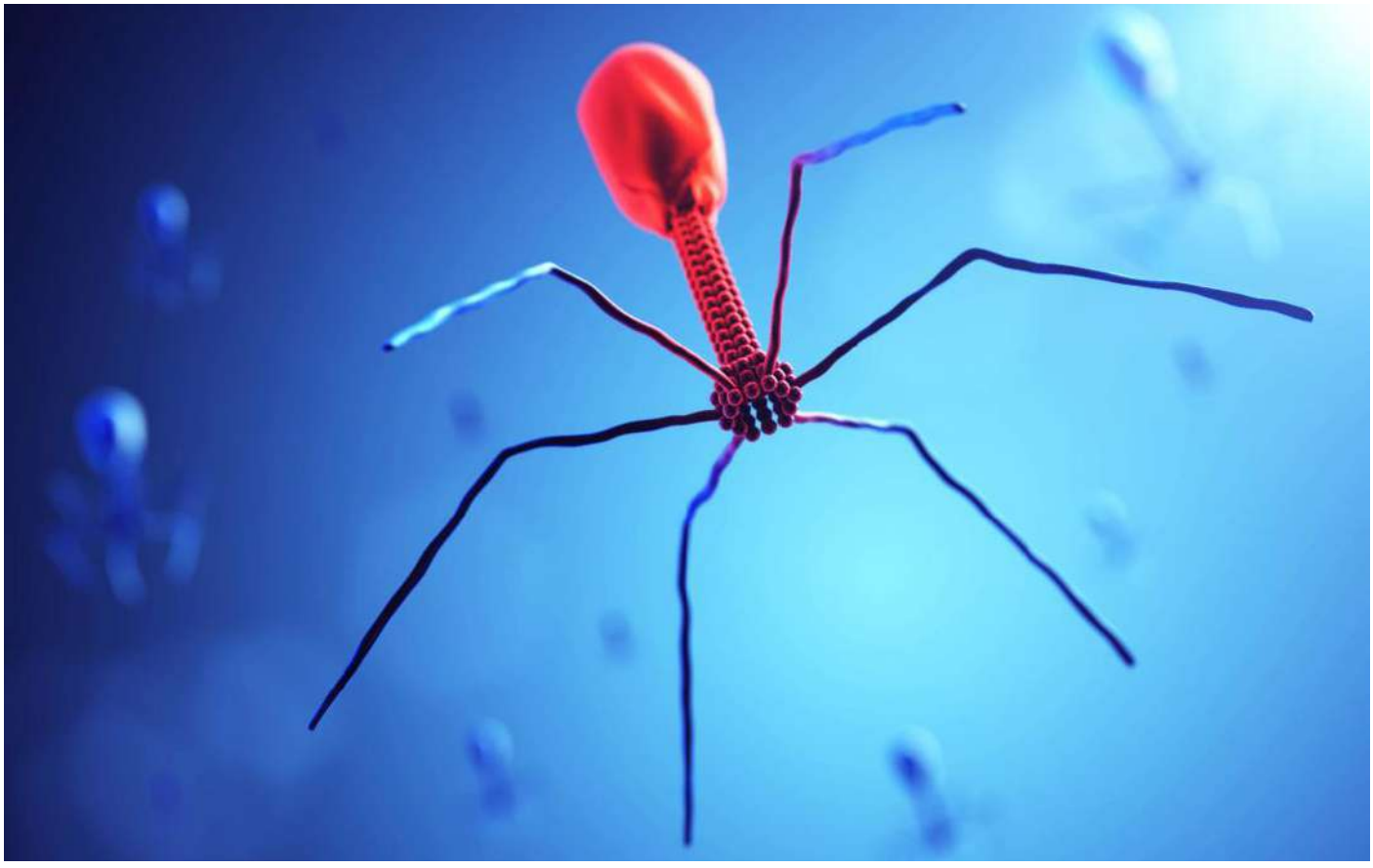


Fig.3 : *Use of bacteriophages in the poultry industry*

Bacteriophage: Biocontroller of Food Pathogens

Human health is mostly concerned with food safety. Foodborne infections cause millions of illnesses each year throughout the world. There are several strategies for inactivating these foodborne bacteria. However, these traditional methods have several drawbacks, such as heat treatment affecting nutritional properties of foods, chemical sanitizers leaving residue on foods and food contact surfaces, high-pressure applications requiring special and relatively expensive equipment, and antibiotic use leading to antibiotic resistance in microorganisms. One method that could overcome these drawbacks is bacteriophage application. Use of bacteriophages in the post-harvest phase is just as important in the control of zoonotic disease spread, through bio-sanitation and bio-controls. Phage-based biopreservation eliminates and neutralises hazardous bacteria from the final product, allowing it to be securely stored for an extended period of time until purchase and consumption by the customer. Phage treatment of raw meat samples has been demonstrated to be beneficial in lowering bacterial load and consequently its presence in the final product. Salmonella, Campylobacter, Escherichia coli and Listeria monocytogenes are the most common bacteria that cause food poisoning in hens. According to the European Food Safety Authority (EFSA), the most frequent zoonotic infections in the EU in 2019 were campylobacteriosis and salmonellosis. Bacteriophage cocktails (combinations of several phages) have been found to effectively reduce Campylobacter in broilers. Salmonellosis in meat is seen in chicken. In vitro and in vivo studies have demonstrated that a mixture of bacteriophages may be utilised to eradicate Salmonella to undetectable levels. Listeria monocytogenes is frequently found in chicken because it can flourish in conditions of high salinity, acidity, and cold. A good number



of bacteriophages that specifically target Listeria species have been found. Another new class of food biopreservatives that can be used directly as antibacterial agents is antibacterial enzymes of bacteriophages known as "phage lysins" or "enzybiotics."This is because bacteriophages have the ability to act on bacterial membranes and kill the bacteria.

Bacteriophages as Bio-sanitisers and Bio-preservatives

Phages have been shown to be effective as bio-sanitisers and bio-preservatives against many foodborne pathogens. Phages are able to disrupt biofilm development and prevent bacterial colonization in equipment and machinery. Phage biocontrol is a natural "green" technology that helps target pathogenic microorganisms without affecting beneficial microorganisms. Biocontrol, on the other hand, involves the application of bacteriophages to meat products and carcasses and has been repeatedly shown in studies to be very effective in reducing dangerous infections. The SDQ phage belongs to the Myoviridae family and consists of a hexagonal head, a long neck and a short tail. This phage can sterilize a culture of 109 CFU/ml S. aureus in 12 hours and multiply 1000 times in that time. Its pH stability tests have shown that SDQ is stable at pH 4.0 to 11.0. According to test results, bacteriophages do not change the organoleptic properties of food. Phage can also be used in the post-harvest phase during food processing and packaging to prevent contamination with potential pathogens and its cost is also low.

Phage Delivery Challenges

Phages are most stable at pH levels between 4 and 10. Natural phages, on the other hand, retain lytic activity across the stomach and do reach the site of infection, according to the research. To protect phages from acidic conditions, other treatments such as dry or liquid formulation solutions have been developed. Microencapsulation in chitosan-alginate microspheres maintains phage survival following 1 hour exposure to simulated stomach juice (pH = 2.4 with pepsin enzymes). Liposome-encapsulated phages are much more stable in simulated stomach fluid (pH = 2.8).

Bacteriophage Products: Indian Entry

Indian companies have recently begun to launch phage based products, either in partnership with international corporations or using indigenous technology.

While bacteriophage products can be used for treatment alone, their positioning and inclusion in the routine preventive strategies yields much better results. It is time that the focus of animal rearing shifts the lens from a treatment aspect to a preventive aspect.

Conclusion

Bacteriophages (phages) are natural predators of bacteria and are ubiquitous in the environment. The use of host-specific bacteriophages has been promoted as a cost-effective and adaptable approach to control zoonotic bacteria. Phages have unique advantages compared with antibiotics. They replicate only on the targeted subset of bacteria, avoiding the imbalance of commensal gut flora (dysbiosis) often caused by broad-spectrum antibiotics. Additionally, they only replicate as long as the targeted bacterium is present and so are naturally self-limiting. Despite having some challenges, bacteriophage application seems to be a promising method to increase food safety. Commercial phage products are continuing to get approvals from international authorities and becoming more popular. In food industry, phages can be used pre-harvest, prior to slaughter or during food processing. While decreasing the viability of bacteria, bacteriophages do not affect sensory properties (organoleptic properties) and nutritional values of the foods, human health, and environment.

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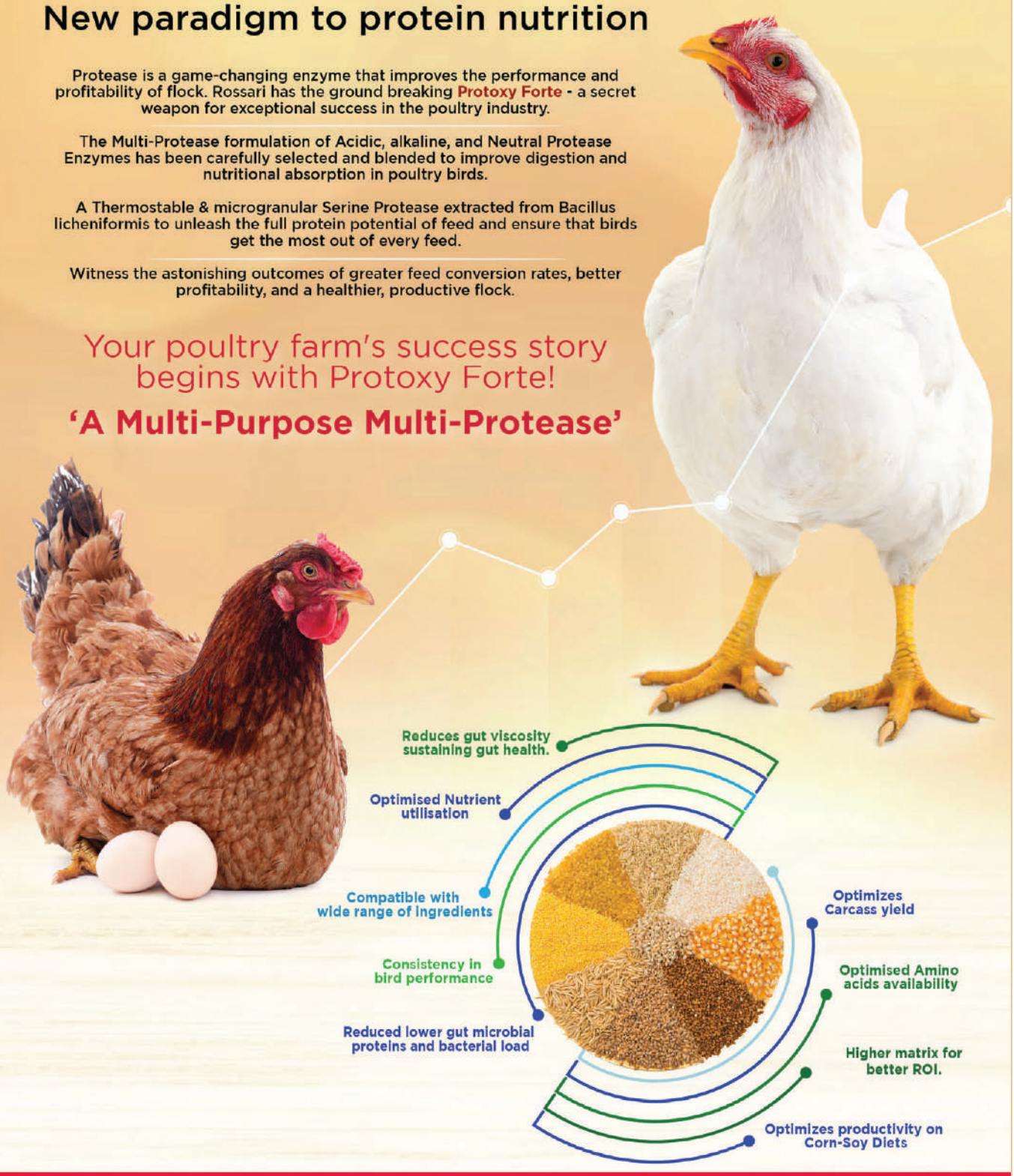

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Next Generation Poultry Genetics In Africa

The African poultry industry employs more than 50 million people across the continent and has a market value of more than US$ 16 billion. As a result, Africa is home to millions of poultry farmers, most of whom are small-scale farmers who rely on their birds for food and money. However, the African poultry sector has various obstacles to overcome, including disease outbreaks, low productivity and high mortality rates. Nevertheless, a fresh era of genetic technology is offering hope for the future of African poultry agriculture in response to these obstacles. Genome editing and genomic selection will enable poultry breeders to choose favourable qualities with more accuracy and speed than traditional breeding approaches, resulting in faster genetic development, better disease resistance and enhanced feed efficiency.

Next generation genetics, such as genome editing and genomic selection, offer great opportunities for American poultry farmers, enabling them to increase their birds' genetic potential and alleviate some of the industry's issues. Breeders can use these to select for desirable features with more accuracy and speed than traditional breeding approaches, leading to faster genetic development better disease resistance and enhanced feed efficiency. Genome editing and genomic selection are two strategies that are transforming animal breeding, particularly in African poultry breeding programmes. Genome editing is a technique that allows scientists to make exact modifications to an organism's DNA. It entails the use of enzymes that can cut DNA at specific locations, allowing for the insertion, deletion or replacement of genetic material. For example, scientists at the University of Edinburgh, Scotland, recently employed genome editing to generate avian flu-resistant chickens. The researchers were able to prevent the virus from replicating in the chicken's cells by deleting a section of its DNA, thereby making the bird immune to the disease.

Genomic selection, on the other hand, is a strategy that analyses DNA information to predict an animal's breeding value. It entails analysing thousands of genetic markers spread across the genome which can be used to determine an individual bird's genetic value. By choosing the best animals for breeding and shortening the generation interval, the method has the ability to accelerate the genetic progress of poultry. Both genome editing and the genomic selection have benefits and drawbacks. They can also be employed in combination to produce the best outcomes. Genome editing can be used to introduce new genetic variants into a population, while genomic selection can be used to identify the best breeding individuals. However, genome editing is costly and time-consuming, and may have unforeseen consequences for the genome. Genomic selection, however, relies on the notion that genetic markers are associated with the traits of interests, which is not always the case. Despite these limitations, genome editing and the genomic selection are effective techniques for improving the efficiency and sustainability of African poultry breeding programmes. They can help small scale farmers to enhance their productivity of profitability while decreasing the environmental impact of poultry production.

INTERNATIONAL

'Product of USA' Meat Labels Could Disrupt Supply Chains, Ottawa argues

The United States Department of Agriculture announced a final rule on conditions for when voluntary "Product of USA" or "Made in the USA" labels may be used, stating they will be allowed for meat, poultry and egg products only when they are derived from animals born, raised, slaughtered and processed in the United States.

Agriculture Secretary Tom Vilsack says, in a news release, the rule, which takes effect in 2026, will ensure that when consumers see the label, they can know that every step involved, from birth to processing, was done in America.

But Canada's Agriculture Minister, Lawrence MacAulay, and International Trade Minister Mary Ng say in a joint statement they're disappointed the rule does not appear to take into account concerns they've raised related to the "unique and important trading relationship" between the two countries.

They say the "meat and livestock sectors in Canada and the United States work closely together" and that Canada intends to raise the issue during the agriculture ministers trilateral meeting with United States and Mexico scheduled to take place in Colorado.

The rule is a sharp change from current policy, which allows voluntary use of such labels on products from animals that have been imported from a foreign country and slaughtered in the U.S., as well also on meat that's been imported and repackaged or further processed.

"The announcement is a vital step toward consumer protection and builds on the Biden-Harris Administration's work to bolster trust and fairness in the marketplace where smaller processors can compete," Vilsack said in the news release after announcing the final rule at the National Farmers Union Annual Convention in Phoenix, Ariz.

The USDA release said the final "Product of USA" rule is supported by petitions, as well as thousands of comments from stakeholders, and data from a nationwide consumer survey. It also said the "Product of USA" or "Made in the USA" label claim will continue to be voluntary.

The joint statement from MacAulay and Ng said Canada is "reviewing the final rule carefully."

"Our indispensable relationship allows producers, processors and consumers on both sides of the border to benefit from efficient, stable and competitive markets, while ensuring a reliable supply of high-quality products," the statement said.

"Canada remains concerned about any measures that may cause disruptions to the highly integrated North American meat and livestock supply chains."

A statement from the Canadian Cattle Association, which represents beef farms and feedlots, called the rule "the most onerous standard in the world."

"It is crucial to address any issues that threaten or diminish cattle and beef trade between Canada and the U.S.," CCA president Nathan Phinney said in the statement.

"We are very concerned that the rule will lead to discrimination against live cattle imports and undermine the beneficial integration of the North American supply chain."

The voluntary labeling rules are different from country-of-origin labels, known as COOL, which required companies to disclose where animals supplying beef and pork are born, raised and slaughtered. That requirement was rolled back in 2015, after international trade disputes and a ruling from the World Trade Organization.

Bengaluru's Egg Consumers Cross National Average

On an average, Bengaluru consumes close to 200 eggs per head annually, which is double the national average, according to Prof. G. Devegowda, President of the Institution of Veterinarians of Poultry Industry.

Speaking at a World Egg Day event last October, Prof. Devegowda said the city consumes 75 to 80 lakh eggs per day. The event was organised by the Karnataka Cooperative Poultry Federation Limited and Department of Animal Husbandry and Veterinary Services at Veterinary College, Hebbal.

He said factors such as population size, awareness on the benefits of egg consumption, purchasing power and easy availability contribute towards higher egg consumption. In Karnataka, consumption of eggs is more in the southern parts than the northern areas, he added. "In mega cities such as Bengaluru, egg consumption is higher, compared to rural areas," he further said.

"Eggs contribute to health and wellbeing, providing critical nutrients, including protein, choline, riboflavin (vitamin B2), vitamin B12, biotin (B7), pantothenic acid (B5), iodine and selenium, which play a vital role in supporting muscle and bone health, brain development and more," he explained.

Karnataka produces 2.5 crore eggs per day. Giridhar Kothawar, the Business Head of National Egg Coordination Committee (NECC), said post-pandemic, there has been a surge in egg consumption in the country.

"Post-pandemic, there has been an increased awareness on maintaining good health. Egg is an affordable food source that helps provide the nutrients required," he added.

He said 33-35 crore eggs are produced in the country daily, with the southern states accounting for a larger share of that production figure, adding that Karnataka's production for 2023 touched 2.5 crore.

Layer poultry farming is taken up on a large scale on the outskirts of Bengaluru and its neighbouring districts Koppal, Hospet, Mysuru, Challakere, Davanagere and others.

Prof. Devegowda said farmers who are into layer poultry farming are facing difficulties in running their businesses, but those who are running bigger farms are witnessing growth.

Robust Demand Pushes Millet Prices Above MSP; Increases Crisis in Poultry Industry

Private trade purchases of millets, including bajra, maize, and ragi, have caused prices to surge 15-20 per cent above the Minimum Support Price (MSP) in crucial agricultural states like Karnataka, Rajasthan, Maharashtra, and Uttar Pradesh.

This surge in prices has been attributed to robust demand from value-added millet-based products introduced by major corporates like ITC Foods and Tata Soulfull, alongside the increasing demand for millets in animal feed, particularly in the poultry and starch industries.

The government's proactive promotion of millets as sustainable and healthy crops has further bolstered demand for these coarse cereals, marking a significant departure from past trends, officials told media.

Despite this surge, government procurement agencies like the Food Corporation of India (FCI) have seen a notable decrease in purchases under the MSP operations for the 2023-24 kharif season. Against the expected procurement of 1.54 million tonnes (MT) of coarse cereals, only 0.64 MT has been purchased so far, with a major focus on Bajra, primarily in Uttar Pradesh, Haryana, and Gujarat.

Previously characterized by distress sales, the turnaround in the millet market has led farmers to fetch prices higher than MSP, resulting in lower procurement by government agencies.

Currently, maize prices in key mandis of Punjab, Haryana, and Rajasthan are hovering around Rs 2500-2600/quintal, well above the MSP of Rs 2090/quintal for the 2023-24 kharif season.

Similarly, ragi prices in Karnataka and bajra prices are also ruling above their respective MSPs.

Rajnikant Rai, Divisional Chief Executive of ITC agri-business, highlighted that market prices of key millet varieties are averaging 15-20 per cent above the MSP, signalling a significant market shift.

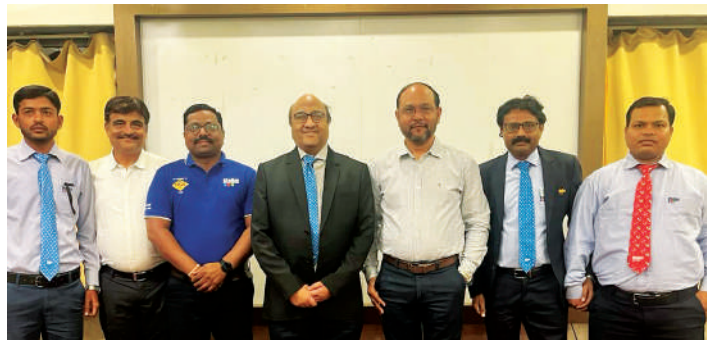
To further boost millet production, corporations like ITC are working with farmers' producer organizations (FPOs) in states like Andhra Pradesh and Maharashtra to source millets directly from the farm gate. This collaboration aims to enhance output, improve product quality, and develop post-harvest technologies.

However, this surge in millet prices is not without consequences.

Ricky Thapar, Treasurer of the Poultry Federation of India, noted that higher bajra prices are pushing up the cost of poultry feed and overall production costs of broiler meat.

Despite the surge in private trade and market prices, the government's procurement efforts under schemes like the Pradhan Mantri Garib Kalyan Anna Yojana primarily focus on rice and wheat, leaving millets largely out of the procurement ambit.

Stallen Organises Dynamic Technical Seminars



Stallen South Asia Pvt Ltd. recently conducted farmers' meetings at Ahmednagar and Sangli in Maharashtra with the objective of addressing critical issues pertaining to poultry health.

The theme of the seminar at Sangli on 10th February was "Gut Health in Poultry: Alternative Solutions to AGPs for Sustainable Poultry Production". Dr. Sanjay Singhal, Chief Operating Officer, Stallen delivered the welcome address. The Chief Guest and main speaker of the evening was Dr. Rais Rajpura, Associate Professor at Anand Agriculture University. His presentation delved into various alternatives to AGPs including probiotics, organic acids, acidifiers, enzymes and essential oils. Dr. Amit Janbandhu, Stallen's Product Manager presented innovative alternatives using Stallen's cutting edge products. The vote of thanks was delivered by Amit Patil, Sales Executive, Stallen.

The 14th February seminar at Ahmednagar was titled, "Diseases of Colour Birds: Immunity and Vaccination". Dr. Sanjay Singhal delivered the welcome address. Dr. Mahendra Chaudhari a prominent poultry consultant was the keynote speaker. He shared valuable insights and practical tips on disease management strategies to optimise bird production, emphasising the significance of controlling diseases for achieving optimal results. Dr. Dushyant Pande, Product Manager-Vaccines, Stallen spoke on the importance of vaccination in preventing commonly occurring diseases in birds. The seminar concluded with a vote of thanks from Macchindra Shinde, Regional Manager, Stallen.

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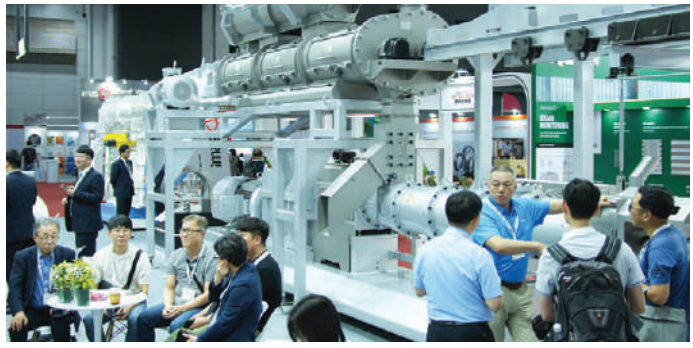
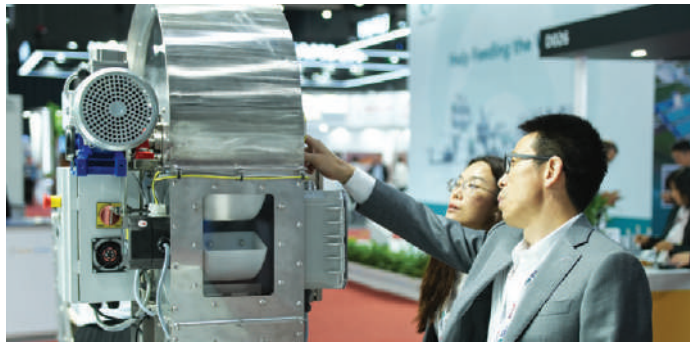




The 16th edition of VICTAM Asia and GRAPAS Asia 2024, in co-location with Health & Nutrition Asia was held at BITEC, Bangkok from 12th to 14th March 2024. The event saw the attendance of 8,722 trade visitors from 73 countries. 315 exhibitors participated from the animal feed, pet food, aqua feed as well as rice, grain and flour processing industries.

VICTAM Asia and GRAPAS Asia witnessed an increase of 42.5% visitors over the last edition organised in 2022.

A host of senior business leaders and top executives from over 40 leading organisations as well as ASEAN investors, presidents of relevant associations, ambassadors, and university professors attended the expo.

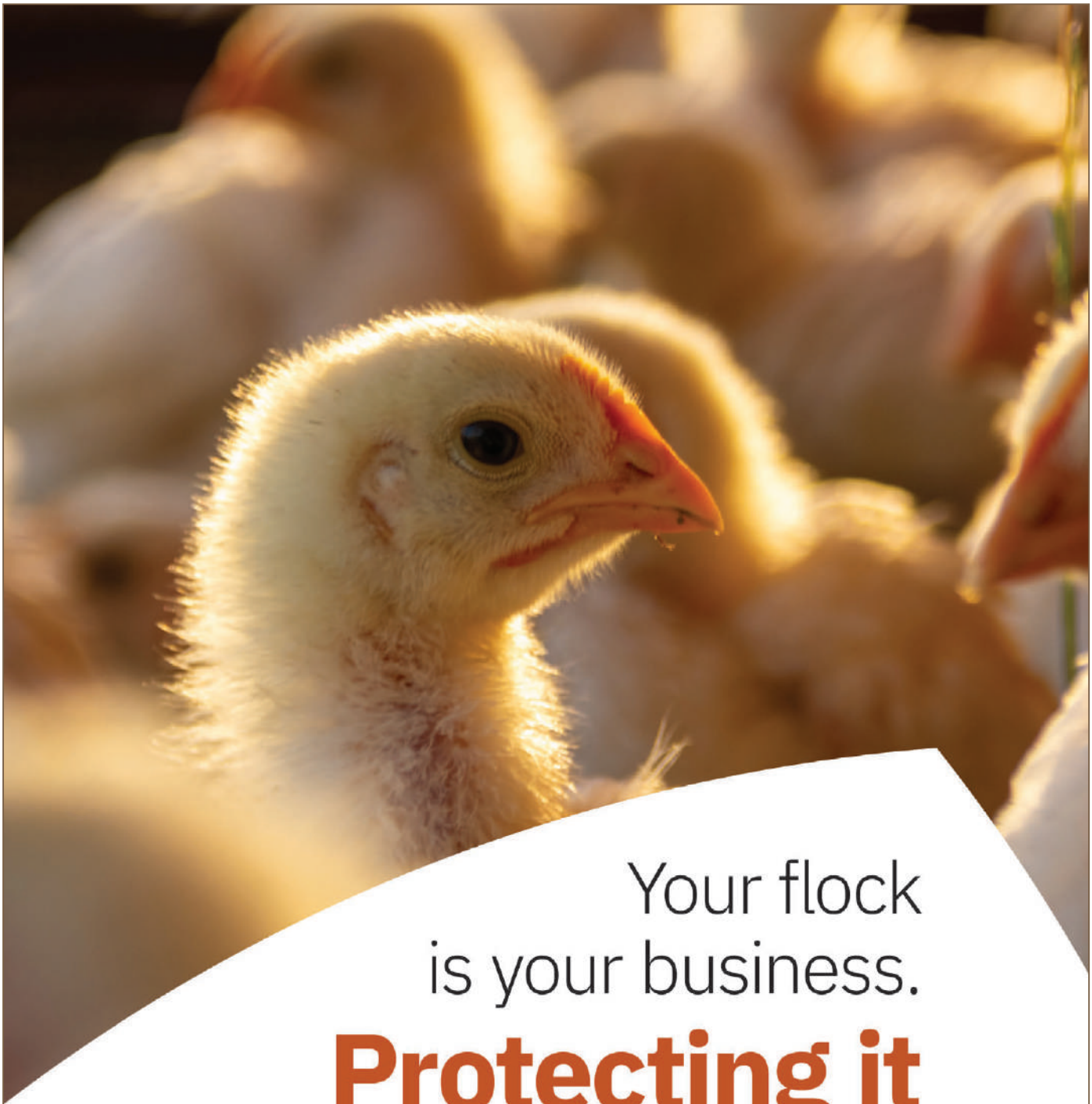
Visitors also got the opportunity of attending high quality conferences and technical seminars featuring 141 speakers from 14 countries.

The Victam Foundation hosted the 3rd International Feed Technology Congress (IFTC) in association with Wageningen University. The Chairman was Professor Leo den Hartog and Dr. Mai Anh Khoa (Thai Nguyen University – Vietnam), Dr. Nazri Nayan (Universiti Putra Malaysia), Dr. Pairat Srichana (CP Group), and Dr. Thomas van der Poel (WUR) spoke about the developments and challenges in the ASEAN feed industry.

In the conference titled "Flour Milling Maximised", the discussions revolved around the continuous transformation of the wheat processing industry. Speakers included Adi Witono (Bogasari), Peer Hansen (Eye-Grain Aps.), Sirichai Songsermpong (Kasetsart University) among others.

During the Thai Feed Mill Association (TFMA) conference, Pornsil Patchrintanakul (President TFMA), Dr. Witthawat Songsujaritkul (Trouw Nutrition Thailand), Mr. Amnat Chidthaisong (King Mongkut's University of Technology, Thonburi) spoke about modernizing and exploring the future of livestock feed in 2024 and managing the carbon footprint in feed.

The next edition of VICTAM Asia and GRAPAS Asia together with Health & Nutrition Asia is scheduled for 10th–12th March 2026, at BITEC, Bangkok.



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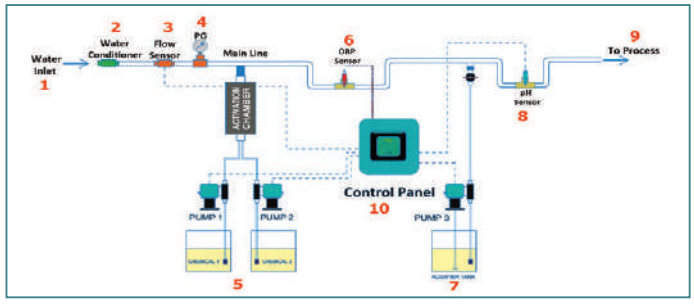
Introducing Boom-Ox: A Revolutionary Water Treatment Solution

Brightwell Aquatech LLP, a Pune based startup owned by Balasaheb Jadhav and promoted by Dr. Santosh Ire, has recently introduced a patented groundbreaking solution for water treatment challenges. This marks a significant milestone in the quest for sustainable and accessible clean water solutions.

While water is the most essential nutrition, it is least focused upon. However, 80% of all diseases globally, for both humans and livestock, are a result of consumption of unsafe water, inadequate sanitation and poor hygiene.

This is where Boom-Ox, a patented engineering solution for providing safe, potable water for poultry, dairy, swine and cattle comes into play.



Salient features of Boom-Ox:

- ORP based automated dosing of stabilized ClO_2, with IoT sensors
- Backed by robust Israeli technology
- A potent combination of water disinfectant and acidifier
- Automated, sensor-based technology to maintain ORP and pH 24 X 7
- All -in-one patented technology
- Robust and maintenance free device

Brightwell Aquatech was the only Indian start-up to be selected for a presentation at Health & Nutrition Startup Pitching 2024 organized at VICTAM Asia, on 14th March. This was indeed a proud moment for the country's livestock sector.

The mode of working of Boom-Ox is as follows:

- Water Inlet: Machine Installed at this point. Common inlet pipe from tank / source to the whole farm
- Water Conditioner: This helps to neutralise the majority of ions, metals and hardness causing agents
- Flow Sensor: Helps to check flow of water and accurate dosing of medicines
- Pressure Gauge: To maintain water pressure
- Chlorine Dioxide Solutions: The two solutions need to be filled and refilled once a signal is received from the device. This solution can't be changed by other source as it is calibrated with the control panel of the machine
- ORP Sensor: Helps maintain desired ORP (650+ mV) as set in the device
- pH Solutions: The acidifier solutions need to be filled and refilled once a signal is received from the device. This solution can't be changed by other source as it is calibrated with the control panel of the machine
- pH Sensor: Helps maintain desired pH (5.8-6.0) as set in the device or needed
- IoT Device: This device is an indicator of all parameters which are set and it sends notification messages. It needs to be implemented at the last shed and last row and last point so that water treatment can be done as per set limits of ORP and pH from last point to start point
- Control Panel: This is the brain of the machine. It receives all signals and gives solutions as per given commands. Most important and patented instrument
- Entire machine is well assembled, dust proof, water resistant, rodents resistant and durable. Size of the machine is approximately one office table and can be mounted on the wall
- Maintenance free machine except minor calibration of sensors once in a quarter which the user can do
- Best ROI : Cost of medicines is almost equal to the existing price but it gives much better ROI than traditional ways of water treatment. User can replace all the available solutions for water treatment including pipeline flushing and cleaning
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EW Nutrition Acquires Biostabil from dsm-firmenich

In a recent communiqué, EW Nutrition, announced its acquisition of the Biomin Biostabil product line from dsm-firmenich. This grants EW Nutrition ownership of a well established and successful range of silage inoculants.

The transaction was successfully completed on 1st March 2024 and under the services agreement, active support will be provided to all customers in the coming months even as EW Nutrition takes over the asset, brand and go-to-market. The financial details of the sale have been kept confidential.

Speaking on the acquisition, Jan Vanbrabant, CEO of EW Nutrition said, "The agreement we have concluded gives us a solid foothold in a sector where we are currently developing a more substantial presence. EW Nutrition continues to expand strategically, enriching its portfolio with market-leading solutions, developed in-house or through acquisitions. The Biomin Biostabil line joins an innovative portfolio that has been growing tremendously in the last three years with the launch of Ventar D and Pretect D, our Feed Quality and Pigment lines acquired in 2021, and yet another momentous global launch coming up shortly. This solid, well-proven line of silage inoculants will be an important addition to customers of EW Nutrition's On-Farm Solutions business around the world.

Nandus Foods Honoured: One of the Top 3 Retail Startups in India

Nandus Foods, the hyperlocal and omnichannel meat retail brand from Nanda Group was recently awarded as one of the top three retail startups in India by Retailers Association of India.

Nandus was in the news in 2023 when it crossed a revenue of Rs. 100 crores. The brand operates more than 50 stores across Bangalore and Hyderabad.

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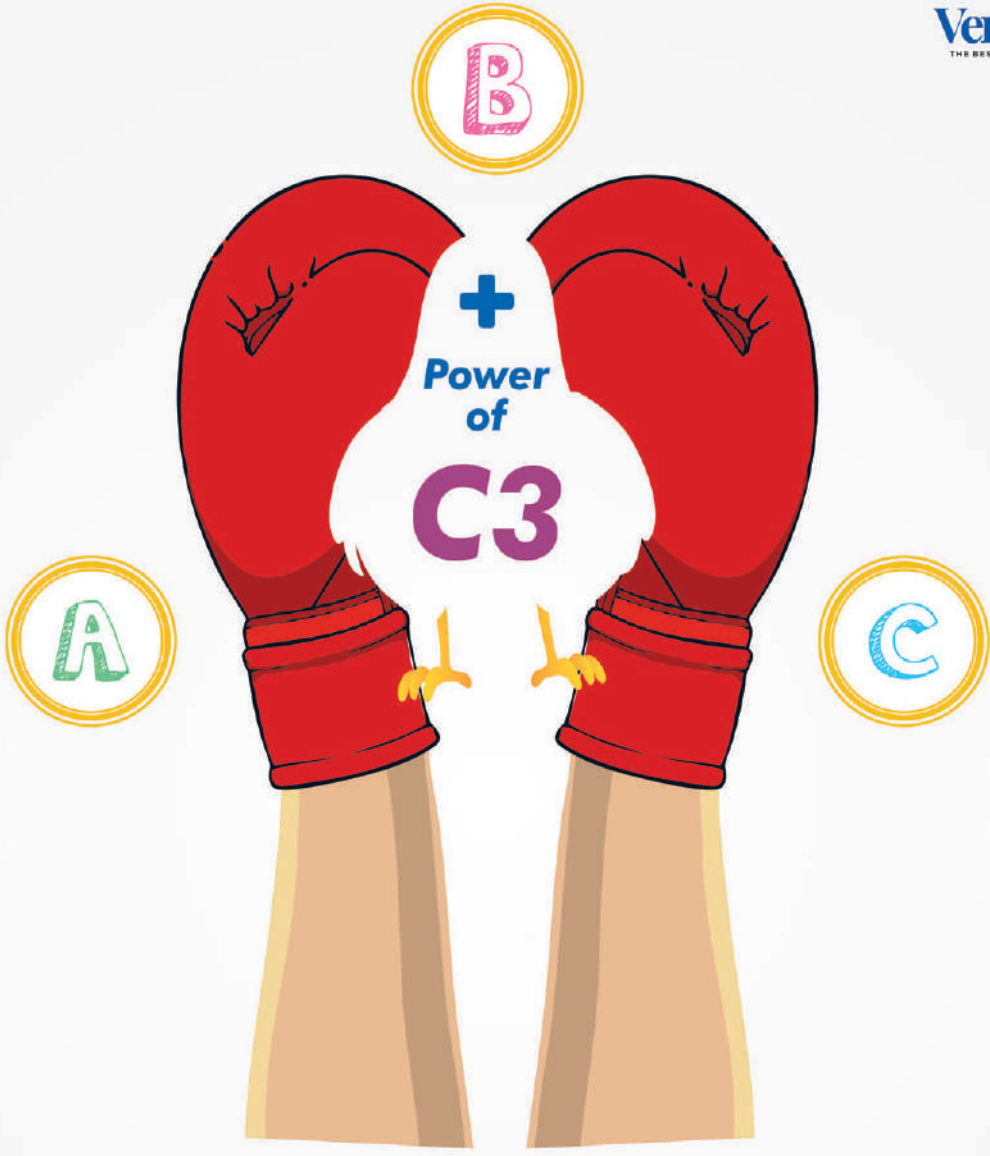

VH-COR4

Infectious Coryza Vaccine Inactivated

Effectively Redefined For Current Challenges

VENTRI BIOLOGICALS
(Vaccine Division of VHPL)

'Venkateshwara House', S. No. 114/A/2, Pune Sinhagad Road, Pune 411030. **Tel.:** +91 (020) 24251803, **Fax:** +91-20-24251060 / 24251077.

Email: ventri.biologicals@venkys.com

www.venkys.com